COLLEGE OF ENGINEERING AND TECHNOLOGY,
BAMBHORI POST BOX NO. 94, JALGAON – 425001. (M.S.)

(With NBA Accredited Programmes)

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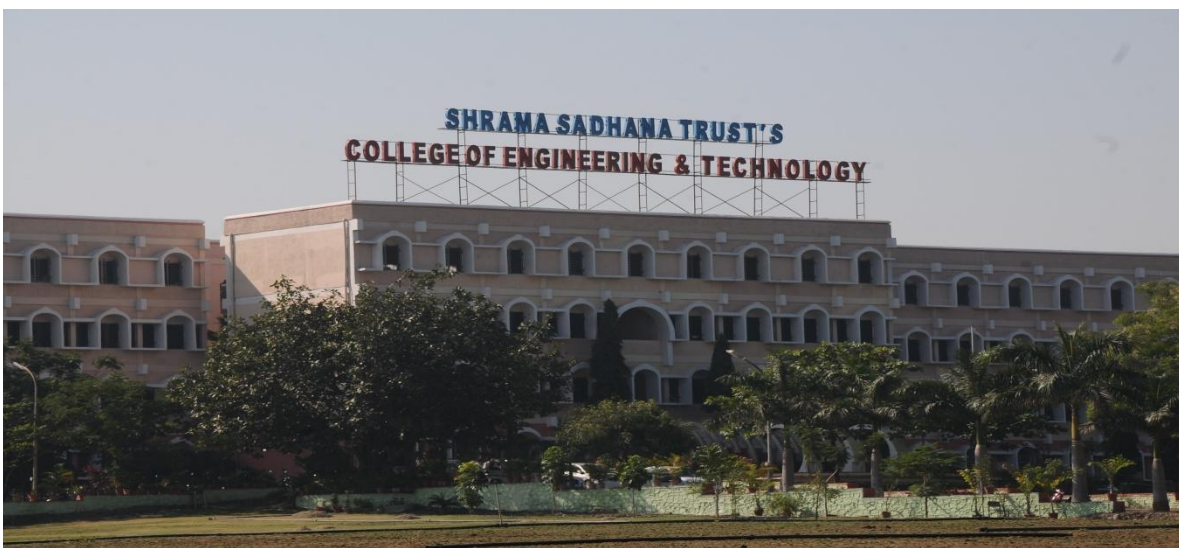
Mandatory Disclosure

Part-III

January 2019



Shrama Sadhana Bombay Trust's
COLLEGE OF ENGINEERING AND TECHNOLOGY
BAMBHORI, POST BOX NO. 94, JALGAON – 425001 (M.S.)
Included under section 2 (f) & 12 (B) of the UGC Act, 1956
Grade B ++ (2.91) NAAC Accredited
ISO 9001:2015

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Ref. No. COET/Exam./ / 19 Date:

C E R T I F I C A T E

Certified that all enclosures contained in PART-I , PART-II & PART-III bearing page no.01 to page no.2482 are pertaining to our institution which are being submitted in two separate above mentioned bound booklets/box file of Mandatory Disclosure. All xerox copies may be treated as original.

PRINCIPAL

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Second Year Engineering

(Biotechnology Engineering)

Semester - III

Faculty of Science and Technology

'A' Grade
NAAC Re-Accredited
(3rd Cycle)

COURSE OUTLINE

W.E.F. 2018 – 19

NORTH MAHARASHTRA UNIVERSITY, JALGAON

STRUCTURE OF TEACHING & EVALUATION

S.E. (BIOTECHNOLOOGY Engineering) W.E.F.2018-2019

Syllabus Structure for Second Year Engineering (Semester – III) (Bio. Tech.) (w.e.f. 2018 – 19)

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Biology	B	3	1	-	4	40	60	-	-	100	4
Bioprocess Calculations	C	3	-	-	3	40	60	-	-	100	3
Unit Operations	C	3	-	-	3	40	60			100	3
Microbiology	D	3	-	-	3	40	60	-	-	100	3
Bioprocess Industrial Economics & Management	A	3	-	-	3	40	60	-	-	100	3
LAB Unit Operations	C	-	-	2	2	--	-	25	25 (OR)	50	1
LAB Microbiology	D	-	-	2	2	--	-	25	25 (PR)	50	1
LAB Good Manufacturing Practices	D	1	-	2	3	-	-	25	25 (OR)	50	2
		16	**1**	**6**	**23**	**200**	**300**	**75**	**75**	**650**	**20**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA: Internal Continuous Assessment**

Syllabus Structure for Second Year Engineering (Semester – IV) (Bio. Tech.) (w.e.f. 2018 – 19)

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Biostatistics	B	3	1	-	4	40	60	-	-	100	4
Process Heat Transfer	C	3	-	-	3	40	60	-	-	100	3
Immunology	D	3	-	-	3	40	60	-	-	100	3
Biochemistry	D	3	-	-	3	40	60	-	-	100	3
IPR& Entrepreneurship	A	3	-	-	3	40	60	-	-	100	3
Process Heat Transfer	-	-	-	2	2	-	-	25	-		1
LAB Immunology	-	-	-	2	2	-	-	25	25 (PR)	50	1
LAB Biochemistry	-	-	-	2	2	-	-	25	25 (PR)	50	1
LAB- Environmental Biotechnology	D	1	-	2	3	-	-	-	25 (OR)	50	2
Environmental Science*	H	-	-	-	-	-	-	-	-		
		16	**1**	**8**	**25**	**200**	**300**	**75**	**75**	**650**	**21**

*Environmental Studies will be applicable to the Direct Second Year Admitted Students Only

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA: Internal Continuous Assessment**

Biology					
COURSE OUTLINE					
Course Title:	*Biology*	**Short Title:**	*Bio*	**Course Code:**	

Course description:

This course is introduced for learning the basic fundamentals of Life sciences (zoology & Botany) to undergraduate students. The prospectus includes a prior knowledge of Biotechnology. The goals of the course are to understand the basic principles of Biology and its applications in the field of Engineering.

	Hours/week	No. of Weeks	Total hours	Semester credits
Lecture	03	14	42	04
Tutorial	01	14	14	

Prerequisite course(s):- ---

Course objectives:

1. Students will understand the structures and characteristics or functions of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles.
2. Students will learn the basic principles of inheritance at the molecular, cellular and Organism levels.
3. Students will test and deepen their mastery of genetics by applying this knowledge in a variety of problem-solving situations.

Course outcomes:

After successful completion of this course the student will be able to:

1. Use current techniques and analysis methods in molecular biology and genetics.
2. Understand the current concepts in Cell Biology, Stem Cell Biology and Development.
3. Know the structure/function of the basic components of prokaryotic and eukaryotic cells including macromolecules and organelles.
4. Demonstrate proficiency with at least one instrument commonly used in biological research (microscope, etc).

COURSE CONTENT

Name of the Subject: Biology		**Semester:**	III
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Diversity of Organism and Cell Biology

Introduction: Living systems, Bio-mimicry, Metabolism, Taxonomy, Concept of species, Structural organization of life, Concepts of modern cell, history of cell, Cell theory, Structure of cell:- Cell shape, size and cell number, Types of cells:- Prokaryotic cells and Eukaryotic cells,

Chemistry of cells. **Cell Division:** Cell cycle, mitosis, meiosis, mitotic cell division, cell cycle check points, meiotic cell division, embryonic cell division, cell death.		
Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**
Plant and Animal Kingdom **Plant Kingdom:** Introduction to plants, Salient features of major plant groups: Bryophyta, Pteridophyta, Gymnospermae, Angiospermae, **Plant Growth & Development:** Introduction, Seed Dormancy, Seed Germination, Phases of growth, Plant growth hormones. **Animal Kingdom:** Animal Classification, Salient features of non-chordates upto phylum level: Phylum porifera, phylum Cnidaria, Phylum Ctenophora, Phylum Platyhelminthes.		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Plant Cell and Animal cell culture and Applications **Plant Cell Culture:** Brief introduction to cell culture with respect to the properties of plant cells, Media requirements, Typical media used, Classification of tissue culture, callus culture, cell suspension culture, Application of callus culture and cell suspension culture, Plant cell cultivation Bioreactors **Animal Cell Culture:** Brief introduction to animal cell culture, Culture medium: Natural and Artificial media, introduction to balanced salt solutions and simple growth medium, Brief discussion on the chemical, physical and metabolic functions of different constituents of culture medium, Animal Bioreactors.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Microbial Culture and Applications: Introduction, Microbial Culture Techniques, growth curve, Pure culture techniques – microbial culture media, isolation, identification and maintenance of cultures, incidences of microorganisms in soil, water, air, food and sewage, food spoilage organisms, Applications of Microbial Culture Technology.		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Biotechnology and its Applications: Definitions, scope of Biotechnology, Recombinant DNA Technology: Making Recombinant DNA, Tools in Genetic Engineering, Polymerase Chain reaction (PCR). **Applications of Biotechnology:** Bioinformatics, Biomechanics, Biotechnology of waste treatment, Biosensors, Forensic science, Food Biotechnology, Fermentation Technology.		
Text Books:		
1. B.D. Singh " Genetics" Kalyani Publications Third Edition. 2. C.B. Pawar"Cell Biology" Himalaya Publications, Third Edition. 3. C.B. Pawar"Cell and Molecular Biology" Himalaya Publications. 4. Text book of Zoology by V.K. Agrawal, S. Chand Publication. 5. Text book of Botany by Dr. B.P. Pandey S. Chand Publication.		

6. Text book of Biotechnology by R.C. Dubey, S. Chand Publications.

Reference Books:

1. P. K Gupta, Introduction to Biotechnology, Rastogi Publications.
2. B.D.Singh, Biotechnology: Expanding Horizons, Kalyani Publishers, New Delhi, Second Revised Edition, 2008.
3. S.S.Purohit, Biotechnology: Fundamentals and Applications, Agrobios (India), 4^{th} Edition, 2005.
4. Andreas D. Boxevanis, Bioinformatics, Wiley International
5. David W. Mount, Bioinformatics: Sequence and Genome analysis, Cold Spring Harbour.
6. Bruce E Rittmann, Rurry L.Mc carty, Environmental Biotechnology:Principles and Applications, Mcgraw Hill international.
7. B. Sivashankar, Food Processing and Preservation, Prentice Hall ,India
8. Bhojwani, S.S.and Rajdan, Plant Tissue Culture: Theory and Practice, Revised Edition, Elsevier
9. Freshney, Culture of Animal Cells, 5th Edition, Wiley-Liss, 2005
10. M.J. Pelczar, Jr. E.C.S. Chan and N.R. Krieg, Microbiology 5^{th} Ed., TMH Book Company.

Bioprocess Calculations

COURSE OUTLINE

Course Title:	*Bioprocess Calculations*	**Short Title:**	*BPCAL*	**Course Code:**	

Course description:

The goals of the course are to understand the basic principles of Bioprocess Calculations and their applications in different areas. It is highly essential to know the stoichiometry of the processes, conditions to achieve maximum product formation and recycle of the unused materials for better economy. Therefore, knowledge of process calculations is the first and foremost requirement for the success of a Biotechnology Engineering student

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	03	14	42	03

Prerequisite course(s):----

Course objectives:

1. To make the student familiar with the basic chemical calculations
2. To study the material balance of unit operations used in process industries.
3. To study the material balance of bioreactions.
4. To understand the energy balance of physical operations.
5. To understand energy balance of bioreactions.
6. To make student familiar with psychrometric chart, steam table etc.
7. To make the student familiar with combustion of fuels.

Course outcomes:

After successful completion of this course the student will be able to:

1. Differentiate between different units and dimensions and solve relevant problems.
2. Have the ability to identify, formulate and solve engineering problems.
3. Have gained fundamental skills in solving material balance problems with and without bioreactions.
4. Have gained fundamental skills in solving energy balance problems with and without bioreactions.
5. Understand humidity, humid heat, humid volume, dry-bulb temperature, wet-bulb temperature, psychometric chart & steam table.
6. Find out the energy requirements for combustion of fuels.

COURSE CONTENT			
Bioprocess Calculations		**Semester:**	III
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Units & Dimensions:

Basic & Derived Units, Dimensional Analysis, Dimensional & Empirical Equations. Different Ways of Expressing Units of Quantities & Physical Constants.

Properties of Gases, Liquids &Solids: Ideal & Real Gas Laws, Critical Properties, Properties of Mixtures & Solutions , Kay's Rule.

Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**

Material Balances without reaction:

Law of conservation of mass, Material balance of unit operations such as Distillation, Mixing, Filtration, Evaporation, Liquid -Liquid Extraction and Solid Liquid Extraction.

Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**

Material Balances with reaction:

Concept of limiting &excess reactants, conversion, yield and Selectivity . Material Balance of biochemical reactions. Material balance with recycle, by pass and purge stream of Bioprocesses.

Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**

Energy balances:

Basic Energy Concept ,Units, Enthalpy, General Energy Balance equation ,Enthalpy Change in Non reactive Processes: sensible heat change, heat capacity, specific heat, sensible heat change with constant Cp, Change of Phase : Enthalpy of Condensations, Heat of solution, study of steam table, energy balance calculations without reaction, enthalpy change due to reaction, heat of combustion, heat of reaction for process with biomass production, heat of reaction with oxygen as electron acceptor, heat of reaction with oxygen not the electron acceptor, energy balance equation for cell culture, fermentation energy balance.

Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**

Humidity & Combustion

Humidity & saturation, Define Humid Volume, Humid Heat, Dry bulb temperature, Wet bulb temperature etc. Psychometric chart. Combustion: Introduction, fuels, calorific value of fuels, air requirements.

Text Books:

1. Bhatt & Vora ,Stoichiometry :Tata McGraw Hill.
2. Shekhar Pandharipande and Samir Mushrif, Process Calculations. Pune Vidyarthi Griha Prakashan, Pune.
3. K.A. Gavhane, Stoichiometry, Nirali Publications.

Reference Books:

1. Prasad Rao& DVS Murthy ,Process Calculations for Chemical Engineers:McMillanIndia, New Delhi.
2. Pauline M. Doran, Bioprocess Engineering Principles, Academic Press an Imprint of Elsevier.
3. Hougen O.A, Watson K.M, & Ragatz R.A. Chemical Process Principles Part-I Asia Publishing House, Mumbai.
4. Himmelblau D.M. Basic principles and calculations in Chemical Engineering, Prentice Hall Publication.

Unit Operations

COURSE OUTLINE

Course Title:	*Unit Operations*	**Short Title:**	*UO*	**Course Code:**	

Course description:

Course Description: The goals of the course are to understand the basic principles of fluid mechanics and their applications in different areas. The subject needs to be studied by the biotechnology students to understand the characteristics and properties of fluids as regards to the processing of raw ingredients in the industry. The subject also includes solids handling and process characteristics for solids to process in industrial operations.

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	03	14	42	04

Prerequisite course(s): --

Course objectives:

1. To study fluid properties and dynamics of fluid flow.
2. To make the students analyze the flow measurement principles and equipments.
3. To study and classify different types of pumps, blowers and compressors.
4. To make the student familiar with properties of solid.
5. To understand separation technique and to understand laws of crushing and grinding.
6. To study the industrial importance of mechanical operations.

Course outcomes:

After successful completion of this course the student will be able to:

1. Understand the following terms in relation to fluid mechanics: viscosity, density, specific gravity, and surface tension. Measure the properties listed above for any given fluids.
2. Apply their knowledge to minimize head losses and evaluate flow through a pipe system by using different types of flow meters.
3. Understand the principles of manometer to calculate pressure of the fluids.
4. Understand the handling of solid and size reduction of solid.
5. Identify the separation technique.

COURSE CONTENT			
Unit Operations		**Semester:**	*III*
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Properties of Fluid

Definition of fluid, mass density, specific weight, specific volume, specific gravity .viscosity concept, viscosity measurement: cone and plate viscometer, use of viscometer with fermentation broths, factor affecting broth viscosity, surface tension, capillarity. Types of fluid: ideal fluid, real fluid, Newtonian and non Newtonian, ideal plastic fluid etc.

Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**

Dynamics of Fluid Flow:

Continuity equation, Euler's equation of motion, Bernoulli's equations for different conditions. pressure measurements: Hydrostatic law. Pascal law, principle and types of manometer, Major and minor losses in pipes .

Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**

Flow through Pipeline:

Flow measurement: Flow through Orifice meter, Nozzle meter, venturi meters, Rotameter and Pitot tube. Reynolds experiment.

Pumping of Fluids: Pumping equipments: working and construction of the Reciprocating pump, Centrifugal pumps, Peristaltic pump. Introduction to Compressors and Blowers.

Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**

Solids and Their Handling:

Properties of solids, Particle size, Specific surface area of the Mixture, Average particle size. Laws of crushing, Types of Crushers such as Blake Jaw crushers, Gyratory crusher, Hammer mill , Ball mill , Ultra fine grinders , Open and Close circuit Grinding .

Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**

Screening: Screening equipments such as Grizzly, Gyratory screens, Trommels, Oscillating Screens, Calculation of screen Effectiveness.

Transportation of Solids: Operation of Conveyor Screw Conveyor, pneumatic Conveyor.

Mixing: Necessity of mixing ,Types of Impeller ,Radial and Axial Flow ,Different flow patterns in mixing **.**

Text Books:

1. Dr. R. K. Bansal, Fluid Mechanics: Laxmi Publications, New Delhi.
2. Pauline M. Doran, Bioprocess Engineering Principles, Academic Press an Imprint of Elsevier.
3. R. S. Hiremath and A.P. Kulkarni , Unit operations of Chemical Engg. (Mechanical operations Vol.-I: Everest publication.

Reference Books:

1. I P. Chattopadhaya Unit operations of chemical engineering-volume I: Khanna Publication New Delhi, 2nd edition 1996.
2. V.P. Gupta, Alam Singh and Manish Gupta Fluid Mechanics, Fluid mechanics and hydrostatics: CBS publishers New Delhi.
3. J. M. Coulson and R.F. Richardson, Chemical Engg. Vol. I & II : Butter worth & Heinemann.
4. W.L. McCabe & J.C. Smith, Unit operations in Chemical Engineering: McGraw Hill Ltd.

Microbiology					
COURSE OUTLINE					
Course Title:	*Microbiology*	**Short Title:**	*MB*	**Course Code:**	

Course description:

This course is aimed at introducing the fundamentals of basic Microbiology to undergraduate students. The background expected includes a prior knowledge of Biology. The goals of the course are to understand the basic principles of life sciences and their applications in Engineering trade.

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	03	14	42	04

Prerequisite course(s):---

Course objectives:

To build a necessary platform for analyzing the complex issues in microbiology, including the evolution and diversity of microbes; cell structure and function; metabolism; information flow and the role of microbes in ecosystems.

Course outcomes:

After successful completion of this course the student will be able to:

1. Apply their knowledge in research related to the use of microbes for human welfare like food production, pigment production, pharmaceutical products etc.
2. Communicate the fundamental concepts of microbiology, both in written and in oral format;
3. Should be able to analyze and simplify the complex issues in microbiology.

COURSE CONTENT

Microbiology		**Semester:**	*III*
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Introduction of Microbiology:

Microbiology and its Scope; History of Microbiology: Contribution of Various Scientists in the Development of Microbiology, Incidences of Microorganisms in Environment, Classification of Microorganisms: Prokaryotes and Eukaryotes (Cell Structure), Morphology and Physiology of Bacteria, Yeast, Molds, Algae and Viruses, Identification of Microorganisms

Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**

Microscopy, nutritional requirements of microorganisms and microbial culture media, isolation, identification and maintenance of cultures (preservation), characteristics of pure culture, enumeration techniques.

Unit–III:	No. of Lectures: 08 Hours	Marks: 12

Basic terms: sterilization, disinfection, antiseptic, sanitizer, germicide, microbiostasis, antimicrobial agents, preservatives, factors influencing antimicrobial activity, mechanisms of cell injury, physical and chemical methods of control of microorganisms with principle, temperature, desiccation, osmotic pressure, surface tension, radiations, filtration, antiseptics and disinfectants, halogens, heavy metals, detergents, dyes.

Unit–IV:	No. of Lectures: 08 Hours	Marks: 12

Microbial Growth

Modes of Cell Division, Microbial Growth Kinetics: Growth Rate & Generation, Mathematical expression for Growth, Growth Curve, Diauxic Growth Curve, Continuous Culture: Chemostat and Turbidostat, Synchronous Culture: Selection by Size and Age, Selection by induction techniques.

Unit–V:	No. of Lectures: 08 Hours	Marks: 12

Antibiotics & Other Chemotherapeutic Agents

Characteristics of Chemotherapeutic Agents, Antibiotics and their Mode of Action, Antifungal Antibiotics.

Text Books:

1. Powar and Daginawala, General Microbiology, Vol I and vol II , Himalaya Publishing House.
2. R.C.Dubey & D.K.Maheshwari, A Textbook of Microbiology, S. Chand Publications.
3. Stainer R.Y., Ingraharn J.L., Whoolis M.L. and Painter P.R. General Microbiology. The McMillan Press Ltd

Reference Books:

1. M.J. Pelzer, Jr. E.C.S. Chan and N.R. Krieg, Microbiology 5 Ed. , TMH Book Company.
2. Industrial Microbiology by Casida

Bioprocess Industrial Economics & Management

COURSE OUTLINE

Course Title:	*Bioprocess Industrial Economics & Management*	**Short Title:**	*BIEM*	**Course Code:**	

Course description:

This course is introduced for learning the basic fundamentals of Bioprocess Industrial Economics and Management to undergraduate students. The goals of the course are to understand the basic knowledge of economics, various factors to be considered during industrial set up, marketability of product etc.

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	03	14	42	03

Prerequisite course(s): ---

Course objectives:

The objective of the course is to provide the basic knowledge of Bioprocess Industrial Economics and Management, economics, profitability, various factors to be considered during industrial set up, marketability of product etc.

Course outcomes:

After successful completion of this course the student will be able to:

1. Apply the basic knowledge of economics in order to design the bioprocesses at low cost
2. Apply knowledge of marketability to communicate effectively about various bioprocesses of products.
3. Apply the knowledge to set up a bioprocess Industry in all respect
4. Estimate the cost of final product
5. Calculate the profitability and losses during the product formation.

COURSE CONTENT

Bioprocess Industrial Economics & Management		**Semester:**	III
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Bio process Design Considerations:
Technical feasibility survey, process development, flow diagram, equipment design and specifications, marketability of product, availability of technology, raw materials, equipments, human resources, land and utilities, site characteristics, waste disposal, government regulations and other legal restrictions, community factors and other factors affecting investment and production cost, Indian Bioprocess Industry - Current Status and Trends.

Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**

Cost Estimation: Factors affecting investment and production cost, capital investment, fixed investment and working capital, estimating equipment cost by 6/10 factor rule, method of estimating capital investment, Different costs involved in total product cost, computer automization in costing.

Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Investment Cost and Profitability: Interest and investment cost, type of interest, types of taxes and tax returns, types of insurance and legal responsibility, depreciation, types of depreciation, and methods of determining depreciation. Profitability, mathematical methods of profitability evaluation, cash flow diagram, break even analysis, balance sheet, pricingissue method and income statement.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Fermentation Economics: Introduction, isolation of microorganisms of potential industrial interest, strain improvement, market potential, effects of legislation on production of antibiotics and recombinant proteins, plant and equipment, media, air sterilization, heating and cooling, aeration and agitation, batch process cycle times, continuous culture, recovery costs, water usage and recycling, effluent treatment.		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Bioproduct Economics: Bioproduct regulation, Fermentation process economics: A complete example, Economic consideration of commercial Bioproduct: Enzymes, Proteins via rDNA, Antibiotics, Vitamins, Alkaloids, Nucleosides, Steroids, Monoclonal antibodies, Brewing and wine making, Fuel Alcohol Production, Organic and Amino acid manufacture, Single cell protein, Anaerobic methane production.		
Text Books:		
1.Peter M.S. Timmerhaus K.D. Plant Design and Economics for Chemical Engineers. McGraw Hill. 2. Vilbrandt F.C. and C.E. Dryden, Chemical Plant Design. McGraw Hill		
Reference Books:		
1. O.P.Khanna Industrial Engineering and Management, Dhanpat Rai Publications Pvt. Ltd. New Delhi. 2. Dewett and Varma, Elementary Economic Theory, S Chand and Company Ltd New Delhi 3. James E. Bailey, David F. Ollis, Biochemical Engineering Fundamentals, Mc Graw-Hill Book Company. 4. P. F. Stanbury, A. Whitaker and S. J. Hall, Principles of Fermentation Technology, Aditya Book PrivateLimited. 5. T.R. Banga and S.C.Sharma, Industrial Organization and Engineering Economics, Khanna Publications, New Delhi.		

Lab Unit Operations

LAB COURSE OUTLINE

Course Title:	*Lab Unit Operations*	**Short Title:**	*Lab UO*	**Course Code:**	

Course description:

This course is intended to provide engineering students with a background in important concepts and principles of Unit operations.

Laboratory	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	2	14	28	1

End Semester Exam (ESE) Pattern:	**Oral (OR)**

Prerequisite course(s):---

Course objectives:

The objective of the laboratory is to impart the fundamental knowledge of Unit operations to the students and develop their ability to apply the specific procedures to analyze the experimental results.

Course outcomes:

After successful completion of lab Course, student will be able to:

1. Determine properties of Fluids .
2. Analyze the characteristics curves of Centrifugal Pump.
3. Determine the coefficient of Venturi meter, Orifice meter.
4. Identify the fluids flow laminar , turbulent by Reynolds Experiment.
5. Estimate to minor losses in pipes.
6. Determine the fanning friction factor for given pipe.
7. Determine the effectiveness of the Vibrating screen.
8. Determine power requirement for crushing

<table>
<tr><td colspan="4" align="center">LAB COURSE CONTENT</td></tr>
<tr><td colspan="2" align="center">Lab Unit Operations</td><td>Semester:</td><td align="center">III</td></tr>
<tr><td colspan="2">Teaching Scheme:</td><td colspan="2">Examination scheme</td></tr>
<tr><td>Practical:</td><td>2 hours/week</td><td>End semester exam (ESE):</td><td>25 marks</td></tr>
<tr><td colspan="2"></td><td>Internal Continuous Assessment (ICA):</td><td>25 marks</td></tr>
<tr><td colspan="4">List of the Experiments (Note: Minimum Eight Experiments from the following)</td></tr>
<tr><td colspan="4">1. Determination of Viscosity.
2. Study of Manometers
3. Verification of Bernoulli’s theorem.
4. To determine the coefficient of Venturi meter, Orifice meter.
5. Reynolds Experiment.
6. Minor losses in pipe.
7. To determine the fanning friction factor for given pipe.
8. To study the characteristics curves of Centrifugal Pump.
9.To study of the different types of Fans, Blowers & Compressors
10. Jaw Crusher : To verify the laws of crushing & grinding
11. Ball Mill :To verify the laws of crushing & grinding
12. Vibrating Screen : To find out the effectiveness of the Vibrating Screen</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td colspan="4">Text Books:</td></tr>
<tr><td colspan="4">1. Dr. R. K. Bansal, Fluid Mechanics: Laxmi Publications, New Delhi.
2. R. S. Hiremath and A.P. Kulkarni , Unit operations of Chemical Engg. (Mechanical operations Vol.-I: Everest publication.</td></tr>
<tr><td colspan="4">Reference Books:</td></tr>
<tr><td colspan="4">1. I P. Chattopadhaya Unit operations of chemical engineering-volume I: Khanna Publication New Delhi, 2nd edition 1996.
2. V.P. Gupta, Alam Singh and Manish Gupta Fluid Mechanics, Fluid mechanics and hydrostatics: CBS publishers New Delhi.
3. J. M. Coulson and R.F. Richardson, Chemical Engg. Vol. I & II : Butter worth & Heinemann.
4. W.L. McCabe & J.C. Smith, Unit operations in chemical engineering: McGraw Hill Ltd.</td></tr>
<tr><td colspan="4"></td></tr>
</table>

Guide lines for ICA:
Students must submit ICA in the form of journal. Each practical should be well documented. Faculty in charge will assess the practical continuously and grade or mark each practical on completion date declared for each practical.
Guidelines for ESE:
ESE will be based on the oral examination of laboratory experiments submitted by the students in the form of journal.

Lab Microbiology					
LAB COURSE OUTLINE					
Course Title:	*Lab Microbiology*	**Short Title:**	*Lab MB*	**Course Code:**	

Course description:

In this laboratory, course emphasis is on the understanding of basics of identification, isolation, cultivation of microorganisms from the enormous diversity found in environment and its application for the human welfare. The learner here can use this knowledge and apply in allied branches of Biotechnology as required.

Laboratory	Hours/week	No. of weeks	Total hours	Semester credits
	02	14	28	01

End Semester Exam (ESE) Pattern:	**Practical (PR)**

Prerequisite course(s):---

Course objectives:

The objective of the laboratory is to impart the fundamental knowledge of biology at the microscopic level to the students and develop their ability to apply the specific procedures to analyze the experimental results.

In this lab, students will be familiar with the use of microorganisms as lab tools and various biological equipments which they can apply in research and Development in the field of Biotechnology

Course outcomes:

After successful completion of lab Course, student will be able to:

1. Use the microscope effectively and observe and identify the characteristics of microorganisms.
2. Stain the microbes for better visualization and characterization of cells and cell organelles
3. Identify and examine the microorganisms from the food sample and environment.
4. Enumerate the microbes by various methods including viable cell count, haemocytometer and turbidity measurement.
5. Prepare the media and cultivate the microorganisms by different methods.
6. Isolate the microorganisms by streak plate method, pour plate method, serial dilution method etc.
7. Different techniques for the maintenance and preservation of microorganisms.

9. Study the effect of antimicrobial agent , UV radiation & heat on microbial growth.
10. Examine the water samples microbiologically.

<table>
<tr><th colspan="4">LAB COURSE CONTENT</th></tr>
<tr><td colspan="2">Lab Microbiology</td><td>Semester:</td><td>III</td></tr>
<tr><td colspan="2">Teaching Scheme:</td><td colspan="2">Examination scheme</td></tr>
<tr><td>Practical:</td><td>2 hours/week</td><td>End semester exam (ESE):</td><td>25 marks</td></tr>
<tr><td colspan="2"></td><td>Internal Continuous Assessment (ICA):</td><td>25 marks</td></tr>
</table>

List of Experiments (Note: Minimum Eight Experiments from the following)

1. Study and use of microscope
   a. Examination of prepared slides
2. Preparation of laboratory media:
   a. Autoclaving,
   b. Preparation of agar slants and agar plates.
   c. Preparation of liquid media.
3. Isolation & Cultivation of microorganisms (Bacteria & Fungi) on solid and liquid media and observation of cells
   a. By streak plate method
   b. By pour plate method.
   c. By spreading
   d. Observation of cells:
      i. Cultural characteristics,
      ii. Biochemical characteristics
4. Staining techniques:
   a. Simple staining,
   b. Gram staining,
   c. Lactophenol cotton blue mounting of fungi.
5. Isolation by serial dilution method, maintenance & preservation.
6. Influence of antimicrobial agent,
7. UV radiation & heat on microbial growth.
8. Study of bacterial growth curve. (Turbidity measurement as direct expression of growth)

Text Books:

1. H.W. Seeley Jr. and Paul J.Van Demark, “Microbes in action”. A laboratory manual of Microbiology.D.B. Taraporevala Sons & Co. Pvt. Ltd.
2. Ed. J.R. Norris and D.W. Ribbons, “Methods in Microbiology”, Vol. 3 A, Academic Press, London & New York.

3. Ronald M. Adas, Alfred E. Brown, Kenneth W. Dobra and Llnas Miller (1986). Basic Experimental Microbiology. Prentice Hall.
Reference Books:
1. Aneja K.R.(2nd Edn., 1996). Experiments in Microbiology, Plant pathology, Tissue Culture and Mushroom Cultivation. Wishwa Prakashan, New Age International (P) Ltd. 2. S. Harisha. An Introduction to Practical Biotechnology. Laxmi Publications (P) Ltd. New Delhi.
Guide lines for ICA:
Students must submit ICA in the form of journal. Each practical should be well documented. Faculty in charge will assess the practical continuously and grade or mark each practical on completion date declared for each practical.
Guidelines for ESE:
ESE will be based on the practical examination of laboratory experiments submitted by the students in the form of journal.

Lab Good Manufacturing Practices

LAB COURSE OUTLINE					
Course Title:	*Lab Good Manufacturing Practices*	**Short Title:**	*Lab GMP*	**Course Code:**	

Course description:

This course provides an overview of the quality system of management controls for research laboratories and organizations. To ensure the uniformity, consistency, reliability, reproducibility, quality, and integrity of the final product. This lab course is introduced to understand basic good manufacturing practice to maintain the product quality.

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
Theory	01	14	14	03
Laboratory	02	14	28	

End Semester Exam (ESE) Pattern:	**Oral (OR)**

Prerequisite course(s):

11^{th}, 12^{th} Science.

Course objectives:

The objective of the laboratory is to impart the fundamental knowledge of good manufacturing practices at the research level to the students and to develop their ability to apply and follow good practices in production.

Course outcomes:

Upon successful completion of lab Course, student will be able to:

1. Follow fundamental compliance requirements for current GMP.
2. Apply compliance protocols in all efforts aimed at generating regulated data for evaluation by the US FDA and regulatory agencies overseas.
3. Demonstrate their understanding good practices in production.

LAB COURSE CONTENT			
Lab Good Manufacturing Practices		**Semester:**	III
Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**	**End semester exam (ESE):**	***25 marks***
		Internal Continuous Assessment (ICA):	***25 marks***

List of Experiments (Note: Minimum Eight Experiments from the following)

Introduction to GMP.

2. Product quality review.
3. Starting materials for various industries.
4. Packaging materials.
5. Waste materials management.
6. Prevention of cross-contamination and bacterial contamination during production.

7. Personal hygiene.

8. Labeling.

9. Drafting the device master record.

10. Obtaining information on GMP requirements.

Text Books:

1. M.K. Satish, Biosafety and Bioethics, I.K. International publishing house.
2. Mindy J. Allport-Settle,Good Manufacturing Practice (GMP) Guidelines: The Rules Governing Medicinal Products in the European Union, EudraLex Volume 4 Concise Reference PharmaLogica, Inc.

Reference Books:

1. Joseph D. Nally Good Manufacturing Practices for Pharmaceuticals, Sixth Edition (Drugs and the Pharmaceutical Sciences), edited, CRC Press.
2. Mindy J. Allport-Settle, Current Good Manufacturing Practices: Pharmaceutical, Biologics, and Medical Device Regulations and Guidance Documents Concise Reference Create Space Independent Publishing Platform.

Guide lines for ICA:

Students must submit ICA in the form of journal. Each practical should be well documented. Faculty in charge will assess the practical continuously and grade or mark each practical on completion date declared for each practical.

Guidelines for ESE:

ESE will be based on the oral examination of laboratory experiments submitted by the students in the form of journal.

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Second Year Engineering

(Biotechnology Engineering)

Semester - IV

Faculty of Science and Technology

‘A’ Grade
NAAC Re-Accredited
(3rd Cycle)

COURSE OUTLINE

W.E.F. 2018 – 19

Biostatistics					
COURSE OUTLINE					
Course Title:	*Biostatistics*	**Short Title:**	*BST*	**Course Code:**	

Course description:

This course is a combination of both elementary probability and basic statistics with a strong emphasis on Biotechnology applications. The course coverage explores the probability; probability distributions; probability densities; curve fitting; correlation and regression; sampling distributions; inferences concerning means; inferences concerning variances; inferences concerning proportions; analysis of variance; factorial experimentation.

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	03	14	42	04
Tutorial	01	14	14	

Prerequisite course(s):----

Course objectives:

1. Students will understand the Probability distribution. Namely, Binomial, Poisson and Normal distribution are discussed which will allow them to apply to engineering problems.
2. Students will understand what is meaning of bi-variate data and correlation between them.
3. Students will learn how to fit a curve to given data.
4. Students will also understand meaning of sampling.
5. Students will earn to test a hypothesis based on a sample.
6. Students will also learn various tests, for large sample and small sample.
7. Students will learn Experimental design.
8. Students will learn 2^2,2^3designs

Course outcomes:

After successful completion of this course the student will be able to:

1. Will be able to use Probability distributions effectively. Also will be able to know a given set of data will follow which distribution.
2. Will be able to calculate the mean and variance of a probability distribution.
3. Can use sampling for performing any real experiment which is otherwise very expensive
4. Will be able to use t-test, F-test and chi square test etc. for Goodness of fit to test hypothesis.
5. Able to apply Randomization to avoid confounding the variable under investigation with other uncontrollable variables.

<table>
<tr><td colspan="6">COURSE CONTENT</td></tr>
<tr><td colspan="3">Biostatistics</td><td colspan="2">Semester:</td><td>IV</td></tr>
<tr><td colspan="3">Teaching Scheme:</td><td colspan="3">Examination scheme</td></tr>
<tr><td>Lectures:</td><td colspan="2">3 hours/week</td><td colspan="2">End semester exam (ESE):</td><td>60 marks</td></tr>
<tr><td colspan="3" rowspan="2"></td><td colspan="2">Duration of ESE:</td><td>03 hours</td></tr>
<tr><td colspan="2">Internal Sessional Exams (ISE):</td><td>40 marks</td></tr>
<tr><td colspan="2">Unit–I:</td><td colspan="2">No. of Lectures: 08 Hours</td><td colspan="2">Marks: 12</td></tr>
<tr><td colspan="6">Probability Distributions
Random variables, The mean and variance of a Probability distribution, The Binomial and Poisson distributions, The Poisson’s approximation to the Binomial Distribution. Continuous random variable, and Normal Distribution, Normal approximation to the Binomial Distribution.</td></tr>
<tr><td colspan="6"></td></tr>
<tr><td colspan="2">Unit–II:</td><td colspan="2">No. of Lectures: 08 Hours</td><td colspan="2">Marks: 12</td></tr>
<tr><td colspan="6">Curve Fitting , Correlation and Regression
The method of Least Square, Curvilinear regression (quadratic, exponential), Correlation coefficient and its properties .Regression coefficient, line of regression.</td></tr>
<tr><td colspan="6"></td></tr>
<tr><td colspan="2">Unit–III:</td><td colspan="2">No. of Lectures: 08 Hours</td><td colspan="2">Marks: 12</td></tr>
<tr><td colspan="6">Sampling
Definitions of (population, sample, statistic, parameter, hypothesis, null hypothesis, alternative hypothesis, critical region, level of significance),Interval estimation, Confidence interval, confidence limit, Sampling, types of sampling, type-I error, type-II error. Test of sampling for single mean, two means. Hypothesis concerning one proportion, Hypothesis concerning two proportions.</td></tr>
<tr><td colspan="6"></td></tr>
<tr><td colspan="2">Unit–IV:</td><td colspan="2">No. of Lectures: 08 Hours</td><td colspan="2">Marks: 12</td></tr>
<tr><td colspan="6">Small sample test and Chi-square test
Small sample test(1.Student t-test for an assumed mean and equality of means of two populations when sample observations are independent, 2.F-test for comparison of variances of two populations,)Chi-square test for independence of attributes, Goodness of fit and homogeneity of samples.</td></tr>
<tr><td colspan="2">Unit–V:</td><td colspan="2">No. of Lectures: 08 Hours</td><td colspan="2">Marks: 12</td></tr>
<tr><td colspan="6">Experimental Designs
Principles of experimental designs, Completely randomized, Randomized block and Latin square designs, Simple factorial experiments of 2^2,2^3,2^4,Confounding in factorial experiments (mathematical derivations not required);Analysis of variance(ANOVA)and it’ s use in the analysis of RBD.</td></tr>
</table>

Text Books:

1. A Text Book of Engineering Mathematics, by N.P. Bali and Manish Goyal.
2. Gupta S. C. Fundamentals of Statistics. Himalaya Publishing House, NewDelhi
3. Khan. Biostatistics. Tata Mc Graw Hill Publishers.

Reference Books:

1. Miller& Freund's Probability and Statistics for Engineers (Sixth Edition),by Richard A. Johnson.
2. Probability and Statistics for Engineers (India Edition),by Jay L. Devore
3. Statistical methods in biology by Norman T .J .Bailey (3rdEdition), Cambridge University Press (1995).
4. Daniel W.W.(9th Edn. 2009).Biostatistics: A Foundation for Analysis in the Health Sciences.

Process Heat Transfer					
COURSE OUTLINE					
Course Title:	*Process Heat Transfer*	**Short Title:**	*PHT*	**Course Code:**	
Course description:					
This course introduces students to key concepts and principles required to analyze problems involving heat exchange and energy conversion. Objective of the course is to study modes of heat transfer and development of relations to calculate hear transfer rate					

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	03	14	42	04

Prerequisite course(s):----

Course objectives:

1. To make the student familiar with conduction, convection and radiation phenomenon.
2. To understand condensation and boiling operations with regards to the processing of bio chemicals.
3. To develop the relations for rate of heat transfer to achieve optimized operations.
4. To study the types of heat exchanger and their uses in different industrial operations.
5. To study the types of evaporator and their uses for various industrial processes and applications.

Course outcomes:

After successful completion of this course the student will be able to:

1.Demonstrate general applications of heat transfer modes as conduction, convection and radiation in biochemical process industry.
2. Control the different parameters which are required for various biochemical processes.
3. Know the working and principle of all types of evaporators which are used in industries.
4. Know working and principles of all types of Heat Exchanger equipments which are widely used in biochemical, fermentation and pharmaceutical industries.
5. Apply their knowledge to condensate and boiling the various types of biochemicals and other fluids used in industries.
6. Design of heat exchange equipments.

COURSE CONTENT			
Process Heat Transfer		**Semester:**	IV
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Conduction in solids

Fourier's law of heat conduction, steady state heat conduction through walls (single and multilayer), heat flow through cylinder, sphere, unsteady state heat conduction, Thermal insulation, Optimum thickness of Insulation, Critical radius of insulation.

Unit–II:	No. of Lectures: 08 Hours	Marks: 12
Convection Classification of convection(natural convection and force convection), individual and over all Heat transfer coefficients, Fouling factor, Flow arrangement in heat exchanger, Log mean temperature difference (LMTD), Wilson Plot, Extended surfaces-fins, classification of extended surfaces, Effectiveness of fin.		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Radiation heat transfer Fundamental of radiation, black body radiation, Kirchhoff's law, radiant heat exchange between nonblack surfaces, Laws of black body radiation, Radiation shield.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Heat exchange equipments: Heat exchangers (Double pipe , Shell and tube ,Kettle type ,plate type Heat Exchangers). Effectiveness factor, capacity and NTU.		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Evaporation: Types of evaporator (Jacketed pan evaporator, Calendria type evaporator, single effect evaporator. Forced circulation evaporator, Multiple effect evaporator. **Boiling and condensation**: Heat transfer to boiling liquids**:** Pool boiling of saturated liquid, Boiling point curve. Condensation, Film wise and drop wise condensation.		

Text Books:

1. Dawande S.D. Principals of Heat Transfer and Mass Transfer. Central Techno Publications, Nagpur.
2. K.A.Gavhane, Heat Transfer ,Nirali Prakashan.

Reference Books:

1. W.L.Mc Cabe and J.C.Smith , Unit operations in chemical engineering. McGraw Hill Ltd
2. Coulson & Richardson , Chemical engineering. – Volume. I, Pergamon Press
3. Kern D.Q. Process Heat Transfer, McGraw Hill Book 1NC New York, 1950
4. Pauline M. Doran, Bioprocess Engineering Principles, Academic Press an Imprint of Elsevier

Immunology					
COURSE OUTLINE					
Course Title:	*Immunology*	**Short Title:**	*IMM*	**Course Code:**	

Course description:

This course is introduced for learning the basic fundamentals of the defense mechanism of human body. The prospectus includes a prior knowledge about the immunity, mechanisms and the therapy or treatment for curing the diseases.

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	03	14	42	04

Prerequisite course(s):---

Course objectives:

To build a necessary platform for analyzing the chemical basis of immune system, including the introduction to immune organs and their role in biological systems, antibodies, and other immune molecules, fundamentals of techniques used in immunology.

Course outcomes:

After successful completion of this course the student will be able to:

1. Understand the basic principles of modern immunology and an introduction to methods used in immunological research.
2. Describe the cells, molecules and pathways involved in the induction and regulation of innate and adaptive immune responses and how regulatory responses can be exploited therapeutically.
3. Demonstrate an understanding of how vaccines work and of the requirements for developing new safe and effective injectibles and mucosal vaccines.
4. Integrate information on the role of the immune system in asthma and chronic obstructive pulmonary disease and the use of this information to develop new therapies for these conditions.

COURSE CONTENT

Immunology		**Semester:**	IV
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Introduction to Immunology

Properties of immune response, Innate and acquired Immunity, active and passive immunity. Cells & Tissues of Immune System: Lymphocytes, Classes of lymphocytes, antigen presenting cells, NK Cells, Mast Cells, Dendritic Cell, LPT cells, Organs of the Immune System, Bone marrow, Thymus, Lymph node, Spleen, MALT.

Unit–II:	No. of Lectures: 08 Hours	Marks: 12

Molecular Immunology

Molecular structure of antibody, Classification, Isotypes, Synthesis assembly and expression of immunoglobulin molecules, Nature of antigens, function and diversity, Generation of anti-body diversity, Antigens: Different characteristics of antigens, mitogens, Hapten, Adjuvants.

Unit–III:	No. of Lectures: 08 Hours	Marks: 12

MHC Molecule & Immune Mechanism

Discovery of MHC complex, Role of MHC, Structure of MHC molecule, Binding of peptides to MHC molecules, MHC restriction.
Mechanism of Immune Response: Cytokines, T- cell receptors, B cell activation cell complement system, antigen processing and presentation, regulation of immune response.

Unit–IV:	No. of Lectures: 08 Hours	Marks: 12

Immunological Techniques

Antigen- antibody reactions, Immunodiffusion, immuno - electrophoresis, ELISA: Direct ELISA, Indirect ELISA, Dot ELISA, Sandwich ELISA, RIA, Rocket immuno - electrophoresis, Agglutination reaction, Precipitation reaction, Flow cytometry, Ouchterlony diffusion.

Unit–V:	No. of Lectures: 08 Hours	Marks: 12

Applied Immunology

Immune system in health and disease, autoimmunity, hypersensitivity, Immunology of graft rejection methods and precautions, GVHD, Hybridoma technology: - Fusion of myeloma cells with lymphocytes, production of monoclonal antibodies and their application.

Text Books:

1. C.V. Rao “ A Textbook of Immunology” Narosa Publishing House.
2. Kuby “ A Textbook of Immunology” Freeman Publication.

Reference Books:

1. Roitt I.M. (1998) Essentials of Immunology. ELBS, Blackwell Scientific Publishers, London.
2. Ivan Riot- Essentials of Immunology (6th Edition), Blakswell Scientific Publications, Oxford, 1988.
3. Benjamin E and Leskowitz S, IMMUNOLOGY A short course wiley liss, ny 1991Immunotechnology.

Biochemistry

COURSE OUTLINE

Course Title:	*Biochemistry*	Short Title:	*BCH*	Course Code:	

Course description:

This course is aimed at introducing the fundamentals of basic Biological chemistry to undergraduate students. The background expected includes a prior knowledge of Biology and chemistry from HSC (science) and first year engineering knowledge. The goals of the course are to understand the basic principles of life sciences and their applications in engineering trade.

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	03	14	42	3

Prerequisite course(s): Biology

Course objectives:

To build a necessary platform for analyzing the chemical basis of biological phenomenon, including the introduction to biomolecules and their role in biological systems, fundamentals of techniques used in biochemistry.

Course outcomes:

After successful completion of this course the student will be able to:

1. Identify the classes of biomolecules and their role in the biological system.
2. Explain the functions and properties of biomolecules
3. Explain the synthesis of biomolecules in biological system and how it directly relate the energy generation in body.
4. Separate biomolecules from the source by biochemical techniques and its application for human welfare

COURSE CONTENT

Biochemistry		Semester:	IV
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	No. of Lectures: 08 Hours	Marks: 12

Carbohydrates & their Metabolism

Structure, Classification & Functions of Carbohydrates: Monosaccharides, Oligosaccharides, Polysaccharides. Metabolism: Glycolysis, Gluconeogenesis. TCA cycle, Pentose phosphate pathway , Glyoxylate cycle & Electron Transport Cycle (Brief), Regulation of glycolysis & TCA.

Unit–II:	No. of Lectures: 08 Hours	Marks: 12

Proteins & Amino Acids

Structure, Classification &Functions of Amino acids & Proteins. Metabolism: Amino acid degradation: Summary of amino acid catabolism, amino acid degradation to pyruvate, Acetyl

COA, & α- ketoglutarate, Urea cycle. Biosynthesis: Amino acid synthesis overview, six essential amino acid synthesis, synthesis of glutamate, glutamine, proline & arginine.

Unit–III:	No. of Lectures: 08 Hours	Marks: 12

Lipids & their Metabolism

Structure & Functions of lipids: Triacyglycerols, Glycerophospholipids, sphingolipids, Cholesterol, phosphatidylinositols, eicosanoids. Oxidation of fatty acids. Biosynthesis: Fatty acids, Triacylglycerols, & Cholesterol, Glyceroneogenesis

Unit–IV:	No. of Lectures: 08 Hours	Marks: 12

Nucleotides & Vitamins

Vitamins: Introduction, Classification, Biochemical Functions, RDA, Dietary Sources, Deficiency. Structure & Functions of nucleotides. Biosynthesis of nucleotides: denovo synthesis of purine & pyrimidine synthesis and its regulation, salvage pathway.

Unit–V:	No. of Lectures: 08 Hours	Marks: 12

Enzymes & Membrane transport

Enzymes: Introduction, Classification, mechanism of enzyme action, factors affecting enzyme activity (concentration of enzyme, substrate, temperature, pH), units of enzyme activity. Membrane transport: Architecture of membranes: Fluid mosaic model. Passive transport: Solutes, glucose, chloride-bicarbonate exchanger, Active transport: Na^+. K^+ ATPase, F-type ATPase, P-type ATPase.

Text Books:

1. U Satyanarayana & U. Chakrapani, Biochemistry.
2. Donald Voet, Judith G. Voet, Charlotte W. Pratt, Principles of Biochemistry, International Student version
3. Lehninger A.L., Neston D.L., N.M. Cox “Principles of Biochemistry”, CBS Publishers & Distributors.
4. Lubert Stryer “Biochemistry”, W.H. Freemen & Co. , New York.
5. Weil J.H. “General Biochemistry”, New Age International (Pvt. Ltd.).

Reference Books:

1. Veoet O, voet G,Biochemistry, Second Edition, John Wiley and Sor1s,1994.
2. Murray R.K. and others (Eds). Harper’s Biochemistry, 25 Edn. Appleton and Lange Stanford

Intellectual Property Rights & Entrepreneurship					
COURSE OUTLINE					
Course Title:	*Intellectual Property Rights & Entrepreneurship*	**Short Title:**	*IPR&E*	**Course Code:**	

Course description:

This course is introduced for learning the basic fundamentals of Intellectual property rights and Entrepreneurship to undergraduate students. The goals of the course are to understand the basic knowledge of Intellectual property rights, trademarks, and entrepreneurship.

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	03	14	42	03

Prerequisite course(s):

Course objectives:

The objective of the course is to provide the basic knowledge of IPR and Entrepreneurship, Intellectual property, trademarks, biosafety & bioethics and entrepreneurship.

Course outcomes:

After successful completion of this course the student will be able to:

1. Choose which type of IPR they should apply for.
2. Adopt environment friendly approach industrially.
3. Understand entrepreneurial aspects.
4. Understand the basics of marketing management.
5. Apply project Management Techniques to real life industrial problems

COURSE CONTENT

IPR & Entrepreneurship		**Semester:**	IV
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Entrepreneurship:

Concept, knowledge and skills requirement; characteristic of successful entrepreneurs; role of entrepreneurship in economic development, From Business Idea to Business Model: Innovative Business Idea, Benefit to the customer, Unique Selling Proposition (USP), Market and competitors, Profitability scenario, Protecting your idea, Formal presentation of the business idea

Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**

Business Plan:

Introduction: Management team, Implementation of Plan, Finance and Financial Planning, Opportunities & Risks, business ethics, performance appraisal, and (SWOT) analysis.

Unit–III:	No. of Lectures: 08 Hours	Marks: 12
Marketing and Distribution: Elements of Marketing and Sales Management, Analysis of the market; Customers and competition, Marketing Plan, Marketing tools, Pricing techniques. **Project Management Techniques:** Critical Path Method (CPM) and Project Evaluation Review Techniques (PERT)		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
IPR, Patents and copyright General Overview of Intellectual Property Rights, WIPO, WTO, Trade Related Intellectual Property Rights. Patent- Basic requirements of Patentability, Patentable Subject Matter, Procedure for Obtaining Patent, Provisional and Complete Specification. Copyright-Objectives of copyright, Rights conferred by registration of copyright, Infringement of copyright.		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Trademarks, GI and other types of IPR Trademarks-Basic Principles of Trademark, Rights conferred by Registration of Trademark, Infringement of Trademark. Geographical Indications-Objectives of Geographical Indications, Rights conferred, Infringement of Geographical Indications, International Position, Indian Position, Bioprespecting and Biopiracy. GATT Farmers rights, plant breeders right.		
Text Books:		
1. Entrepreneurship: New Venture Creation, David H. Holt. 2. Patterns of Entrepreneurship: Jack M. Kaplan.		
Reference Books:		
1. Entrepreneurship and Small Business Management: C.B. Gupta, S.S. Khanka,Sultan Chand.		

Lab Process Heat Transfer					
LAB COURSE OUTLINE					
Course Title:	*Lab Process Heat Transfer*	**Short Title:**	*Lab PHT*	**Course Code:**	
Course description:					
In this laboratory course emphasis is on the understanding of basics of Process heat transfer					

Laboratory	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	02	14	28	01

End Semester Exam (ESE) Pattern: ---

Prerequisite course(s):

Engineering Physics, Chemistry and Mathematics.

Course objectives:

The objective of the laboratory is to impart the fundamental knowledge of Process heat transfer to the students and develop their ability to apply the specific procedures to analyze the experimental results.

Course outcomes:

Upon successful completion of lab Course, student will be able to:

1. Demonstrate general applications and use of heat exchange equipments in industries.
2. Control the different parameters which are required for various processes industries .
3. Apply their knowledge to condensate and boiling the various types of fluids used in industries.
4. Determine emissivity of test plate.
5. Determine thermal conductivity of metals and insulators.

LAB COURSE CONTENT			
Lab Process Heat Transfer		**Semester:**	IV
Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**	**End semester exam (ESE):**	--
		Internal Continuous Assessment (ICA):	***25 marks***

***List of Experiments*(Note: Minimum Eight Experiments from the following)**

1. Conductivity of metals and / or insulator.
2. Experiment on Pin fins.
3. Experiment on forced convection apparatus.
4. Experiment on natural convection apparatus.
5. Determination of emissivity of test plate.
6. Stefan Boltzmann apparatus .

7. Parallel / counter flow heat exchanger.
8. Study of pool boiling phenomenon and critical heat flux.
9. Study of heat transfer in evaporator .
10. Temperature profile in a rod .
11. Study of evaporators .
12. Drop wise and film wise condensation .

Text Books:

2. K.A.Gavhane, Nirali Prakashan. Nagpur
3. Dawande S.D. Principals of Heat Transfer and Mass Transfer. Central Techno Publications, Nagpur.

Reference Books:

1. W.L.Mc Cabe and J.C.Smith , Unit operations in chemical engineering. McGraw Hill Ltd.
2. Coulson & Richardson , Chemical engineering. – Volume. I, Pergamon Press
3. Kern D.Q. Process Heat Transfer, McGraw Hill Book 1NC New York, 1950
4. Pauline M. Doran, Bioprocess Engineering Principles, Academic Press an Imprint of Elsevier

Guide lines for ICA:

Students must submit ICA in the form of journal. Each practical should be well documented. Faculty in charge will assess the practical continuously and grade or mark each practical on completion date declared for each practical.

Guidelines for ESE: ESE will be based on the oral examination of Laboratory experiments submitted by the students in the form of journal.

Lab Immunology

LAB COURSE OUTLINE

Course Title:	*Lab Immunology*	**Short Title:**	*Lab IMM*	**Course Code:**	

Course description:

Course emphasis is on the understanding of basic concepts in immunology. The learner here can use this knowledge and apply in allied branches of Biotechnology as required. The course is also helps for the study of antigen antibody interaction.

Laboratory	Hours/week	No. of weeks	Total hours	Semester credits
	02	14	28	01

End Semester Exam (ESE) Pattern:	**Practical (PR)**

Prerequisite course(s):

12th STD Zoology

Course objectives:

1) To study the antigen antibody interaction.
2) To study the analytical techniques such as ELISA, Ouchterlony diffusion.
3) To study the advanced techniques of the antigen antibody interactions such as Precipitin reaction, Antibody titer test, Agglutination reaction.

Course outcomes:

Upon successful completion of lab Course, student will be able to:

1) Apply the basic fundamentals in antigen antibody reaction for designing the experiment.
2) Perform the analytical techniques in immunology in the industry.

LAB COURSE CONTENT

Lab Immunology		**Semester:**	IV
Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**	**End semester exam (ESE):**	***25 marks***
		Internal Continuous Assessment (ICA):	***25 marks***

List of Experiments(Note: Minimum Eight Experiments from the following)

1. Immunoelectrophoresis.
2. Radial immunodiffusion.
3. Antigen –Antibody interaction: The Ouchterlony procedure
4. Introduction to ELISA reactions
5. Western Blot Analysis – demo.
6. Immunology of pregnancy test – demo.
7. Latex agglutination test

8. Precipitin reaction

9. Antibody titer test

10. Agglutination reaction.

Text Books:

1. Harlow and David Lane Antibodies A laboratory Manual: (1988), Cold spring harbor laboratory.
2. Talwar G.R. and Gupta S.K. (Eds.). A Handbook of Practical and Clinical Immunology, Vol. 1 and 2 (2^{nd} Edn.). CBS Publishers and Distributors.

Guide lines for ICA:

Students must submit ICA in the form of journal. Each practical should be well documented. Faculty in charge will assess the practical continuously and grade or mark each practical on completion date declared for each practical.

Guidelines for ESE:

ESE will be based on the practical examination of laboratory experiments submitted by the students in the form of journal.

Lab Biochemistry					
LAB COURSE OUTLINE					
Course Title:	*Lab Biochemistry*	**Short Title:**	*Lab BCH*	**Course Code:**	

Course description:

In this laboratory course emphasis is on the understanding of basics of qualitative and quantitative identification and estimation of biomolecules from the enormous diversity of source in environment. The learner here can use this knowledge and apply in allied branches of Biotechnology as required.

Laboratory	Hours/week	No. of weeks	Total hours	Semester credits
	02	14	28	01

End Semester Exam (ESE) Pattern:	***Practical (PR)***

Prerequisite course(s):

Biology

Course objectives:

The objective of the laboratory is to impart the fundamental knowledge of chemical basis of biology at the research level to the students and develop their ability to apply the specific procedures to analyze the experimental results.

In this lab, students will be familiar with the use and application of biomolecules in laboratory and various equipments which they can apply in research and Development in the field of Biotechnology

Course outcomes:

Upon successful completion of lab Course, student will be able to:

1. Estimate the amount of different biomolecules like carbohydrates, proteins, nucleic acids from various sources.
2. Understand the basic principle of isoelectric precipitation.
3. Apply the basic properties of biomolecules for their separation from mixture.
4. Extract the lipids from various biological sources.
5. Understand the basic principles of thin layer chromatography and gel electrophoresis.

LAB COURSE CONTENT

Lab Biochemistry		**Semester:**	IV
Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**	**End semester exam (ESE):**	***25 marks***
		Internal Continuous Assessment (ICA):	***25 marks***

List of Experiments (Note: Minimum Eight Experiments from the following)
Estimation of carbohydrates. a. Estimation of reducing sugars by Dinitrosalicylic acid method. 2. Estimation of proteins. a. Estimation of proteins by Lowry method. 3. Estimation of nucleic acids: 4. Isoelectric precipitation. 5. Separation of amino acids by paper chromatography. 6. Separation of sugars by paper chromatography. 7. Extraction of Lipids. 8. Thin layer Chromatography. 9. Gel Electrophoresis. 10. Assay of enzyme activity 11. Assay of enzyme kinetics. 12. Identification and estimation of an intermediate of EMP pathway. 13. Cell fractionation. 14. Vitamin Assay.
Text Books:
1. Plummer David T. "An Introduction to Practical Biochemistry", Tata McGraw-Hill Pubblishing Co. Ltd., New Delhi. 2. Jayraman J. A Laboratory Manual in Biochemistry. New Age International Publishers. 3. Sadasivan S. and Manikam K. Methods in Agricultural Biochemistry. Wiley Eastern Ltd., New Delhi. 4. S. Harisha. An Introduction to Practical Biotechnology. Laxmi Publications (P) Ltd. New Delhi.
Guide lines for ICA:
Students must submit ICA in the form of journal. Each practical should be well documented. Faculty in charge will assess the practical continuously and grade or mark each practical on completion date declared for each practical.
Guidelines for ESE:
ESE will be based on the practical examination of laboratory experiments submitted by the students in the form of journal.

Lab Environmental Biotechnology					
LAB COURSE OUTLINE					
Course Title:	*Lab Environmental Biotechnology*	**Short Title:**	*Lab EBT*	**Course Code:**	
Course description:					
In this laboratory, course emphasis is on the understanding of basics environmental engineering. The learner can use this knowledge and apply in allied branches of Biotechnology as required.					

Laboratory	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	2	14	28	2

End Semester Exam (ESE) Pattern:	***Oral (OR)***

Prerequisite course(s):

Biochemistry and Microbiology

Course objectives:

1. The objective of the laboratory is to impart the fundamental knowledge of environmental engineering at the research level to the students
2. To develop their ability to apply the various techniques for developing the new technology for waste management.

Course outcomes:

Upon successful completion of lab Course, student will be able to:

1. Design and execute new environmental science experiments.
2. Communicate their understanding of environmental science to a lay audience.
3. Demonstrate through presentation an understanding of the global character of environmental problems and ways of solving them, including collaborative efforts spanning local to global scale.
4. Use the techniques, skill and modern engineering tools necessary for engineering practice.
5. Apply the knowledge of engineering principles to living entities for societal welfare.
6. Work in multidisciplinary stream.
7. Explore the options for environmental biotechnology in higher study.

LAB COURSE CONTENT			
Lab Environmental Biotechnology		**Semester:**	IV
Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**	**End semester exam (ESE):**	***25 marks***
		Internal Continuous Assessment (ICA):	***25 marks***

List of Experiments (Note: Minimum Eight Experiments from the following)

1. Analysis of water for colour, turbidity, solids, hardness, alkalinity, acidity, iron, sulphate, chloride, fluoride, nitrate etc.
2. Physical analysis of wastewater sample
3. Analysis of samples for DO.
4. Analysis of samples for BOD of waste water.
5. To determine the COD of waste water.
6. To determine the nitrogen contents of waste water.
7. Biological examination of water: Algae, bacteria and Protozoa
8. Bacterial water quality: Measuring quality of water by using coli form organisms (MPN method and membrane filter).
9. Biochemical activities of bacteria: hydrolysis of polysaccharides, Bacteria in waste water.
10. Determination of Biodiversity index.

Text Books:

1. Mathur: Water and Wastewater Testing.
2. Sawyer, Mc Carty & Parkin Chemistry for Environmental Engg. Standard Methods P.A, H.A New York.
3. Sirockin and Cullimore: Practical Microbiology.

Guide lines for ICA:

Students must submit ICA in the form of journal. Each practical should be well documented. Faculty in charge will assess the practical continuously and grade or mark each practical on completion date declared for each practical.

Guidelines for ESE:

ESE will be based on the oral examination of laboratory experiments submitted by the students in the form of journal.

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Second Year Engineering

(Chemical Engineering)

Faculty of Science and Technology

'A' Grade
NAAC Re-Accredited
(3rd Cycle)

COURSE OUTLINE

Semester - III

W.E.F. 2018 – 19

Syllabus Structure for Second Year Engineering (Semester – III) Chemical Engineering
(With effect from 2018-19)

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Industrial Chemistry	B	3	1	-	4	40	60	-	-	100	4
Thermodynamics-I	C	3	-	-	3	40	60	-	-	100	3
Chemical Engineering Materials	C	3	-	-	3	40	60	-	-	100	3
Fluid Mechanics	D	3	-	-	3	40	60	-	-	100	3
Industrial Organization and Management	A	3	-	-	3	40	60	-	-	100	3
Thermodynamics-I Lab	C	-	-	2	2	-	-	25	25 (OR)	50	1
Fluid Mechanics Lab	D	-	-	2	2			25	25 (OR)	50	1
Chemical Engineering Lab-I	D	1	-	2	3	-	-	25	25 (PR)	50	2
		16	**1**	**6**	**23**	**200**	**300**	**75**	**75**	**650**	**20**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA: Internal Continuous Assessment**

Syllabus Structure for Second Year Engineering (Semester – IV) Chemical Engineering
(With effect from 2018-19)

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Biology	B	3	1	-	4	40	60	-	-	100	4
Material Science	C	3	-	-	3	40	60	-	-	100	3
Thermodynamics - II	D	3	-	-	3	40	60	-	-	100	3
Material and Energy Balance Computations	D	3	-	-	3	40	60	-	-	100	3
Project Management and Entrepreneurship	A	3	-	-	3	40	60	-	-	100	3
Material Science Lab	C	-	-	2	2	-	-	-	-	-	1
Thermodynamics – II Lab	D	-	-	2	2	-	-	25	25 (OR)	50	1
Material and Energy Balance Computations Lab	D	-	-	2	2	-	-	25	25 (OR)	50	1
Chemical Engineering Lab-II	D	1	-	2	3	-	-	25	25 (PR)	50	2
*Environmental Studies	H	-	-	-	-	-	-	-	-	-	-
		16	**1**	**8**	**25**	**200**	**300**	**75**	**75**	**650**	**21**

*Environmental Studies will be applicable to the Direct Second Year Admitted Students Only

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA: Internal Continuous Assessment**

Industrial Chemistry					
COURSE OUTLINE					
Course Title:	**Industrial Chemistry**	**Short Title:**	**IC**	**Course Code:**	
Course description:					
The objective of the course is to strengthen the fundamentals of basic industrial chemistry to undergraduate engineering students, so that they can apply the knowledge in the manufacturing of different types of industrially important chemical products. It is designed to provide students with the skills, knowledge and learning tools required to carry out professional research& development for the production activities in chemical industries.					

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	3	14	42	3
Tutorial	1	14	14	1

Prerequisite course(s):
Applied Chemistry-I&II
Course objectives:
1.To introduce the basics of chemistry and its significance in chemical process industry. 2.To study the basic mechanism of electrophilic substitution reactions and its significance in industrially important products preparations. 3.To know the basics of manufacturing of chemicals and work of chemical engineer in chemical process industries. 4.To learn the unit processes and unit operations with symbols involved in manufacturing of useful chemical products. 5.To study the techniques of drawing of flow diagram for the conversion of reactants into finished valuable products.
Course outcomes:
After successful completion of this course the student will be able to:
1. Draw symbols and flow diagrams for the manufacturing of chemical products. 2. Understand the importance of unit operations and unit processes in chemical process industries. 3. Understand the basics of conversion of raw materials into finished products.

COURSE CONTENT			
Industrial Chemistry		**Semester:**	**III**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**
General Aspects of industrial Chemistry **:** Introduction, chemical processing, chemical conversion & yield, characteristics of chemical conversions, unit process and unit operations, flowcharts, batch and continuous processes, role of chemical engineer in chemical process industries. Petroleum: Origin and composition , Petroleum mining, refining, compositions and uses of main petroleum fractions., Cracking & its importance in chemical industries, Octane number , Improving octane number, Chemicals from petroleum.		

Unit–II:	No. of Lectures: 08 Hours	Marks: 12
Industrial Synthesis from Petroleum: Manufacture of methanol from synthesis gas, Isopropanol from propylene, Glycerol from propylene via allyl chloride, Acetone by catalytic dehydrogenation of isopropanol. Alkylation & Acylation, alkylation of benzene, phenol, hydrogenation and reductive alkylations, hydrogenation of nitrobenzene, reductive alkylation		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Oxidation: Types of oxidative reactions, oxidation of acetylene, oxidation of toluene, oxidation of xylene, oxidation of methanol. Nitration: Nitrating agents, Mechanism of nitration of benzene, working of Schmidnitrator, Biazzinitrator, Typical industrial nitration processes: Nitration of benzene with HNO_3-fortified spent acid, Manufacture of p-nitroacetanilide, Manufacture of α-nitronaphthalene		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Sulphonation: Mechanism of sulphonation of benzene, working of batch sulfonation kettle, ball-mill sulfonator. Technical indusrial sulphonation processes: Continuous partial pressure sulphonation of benzene ,Sulfation of lauryl alcohol, dimethyl ether. Halogenation: mechanism of halogenation. Manufacture of chloral, monochloroacetic acid, chlorination of toluene, vinyl chloride from acetylene.		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Manufacturing of Industrial Gases: Hydrogen, Oxygen, Nitrogen, Carbon Dioxide, Acetylene. Manufacturing of Fuels and Fuel gases: Producer gas, Water gas, Natural gas, Synthesis gas		
Text Books:		
1. George T. Austin, Shreve's Chemical Process Industries 5 th Edition 2. C.E. Dryden, Outline of Chemical Technology, Affiliated East WestPress.1973 3. P. H. Groggins, Unit Processes in Organic Synthesis- , Tata McGraw-Hill 4. ArunBahl & B.S.Bahl, Textbook of organic chemistry: S.Chand &Co.Ltd. New Delhi		
Reference Book:		
1.Chris A Clausen III and Guy Mattson, Principles of Industrial Chemistry, A Wiley –Inter Science Publication .John Wiley and sons, New York 2. B.K.Sharma, Industrial Chemistry, GOEL Publishing House 3. Satyaprakash, Engineering Chemistry, Khanna Book Publishing, Delhi 4. ShashiChawla, A Text Book of Engg. Chemistry, Dhanpat Rai& Co. (P) Ltd.		

<table>
<tr><th colspan="6">Thermodynamics-I</th></tr>
<tr><th colspan="6">COURSE OUTLINE</th></tr>
<tr><td>Course Title:</td><td>Thermodynamics-I</td><td>Short Title:</td><td>THD-I</td><td>Course Code:</td><td></td></tr>
<tr><td colspan="6">Course description:</td></tr>
<tr><td colspan="6">The purpose of this course is to introduce thermodynamics – I and its importance to study the phase behavior of fluids with applications. The course covers the application of the first and second law of thermodynamics.</td></tr>
</table>

<table>
<tr><td rowspan="2">Lecture</td><td>Hours/week</td><td>No. of weeks</td><td>Total hours</td><td>Semester credits</td></tr>
<tr><td>3</td><td>14</td><td>42</td><td>3</td></tr>
<tr><td colspan="5">Prerequisite course(s):</td></tr>
<tr><td colspan="5">Applied Chemistry I and II</td></tr>
<tr><td colspan="5">Course objectives:</td></tr>
<tr><td colspan="5">1.To study principles and application of first and second law of thermodynamics.
2.To study the thermodynamic properties of fluids and phase equilibria.</td></tr>
<tr><td colspan="5">Course outcomes:</td></tr>
<tr><td colspan="5">After successful completion of this course the student will be able to:</td></tr>
<tr><td colspan="5">1.Apply mass and energy balances to closed and open systems.
2.Evaluate the properties of non-ideal gases.
3.Solve problems involving liquefaction, refrigeration.</td></tr>
<tr><th colspan="5">COURSE CONTENT</th></tr>
</table>

<table>
<tr><td colspan="2">Thermodynamics-I</td><td>Semester:</td><td>III</td></tr>
<tr><td colspan="2">Teaching Scheme:</td><td colspan="2">Examination scheme</td></tr>
<tr><td>Lectures:</td><td>3 hours/week</td><td>End semester exam (ESE):</td><td>60 marks</td></tr>
<tr><td colspan="2" rowspan="2"></td><td>Duration of ESE:</td><td>03 hours</td></tr>
<tr><td>Internal Sessional Exams (ISE):</td><td>40 marks</td></tr>
</table>

<table>
<tr><td>Unit–I:</td><td>No. of Lectures: 08 Hours</td><td>Marks: 12</td></tr>
<tr><td colspan="3">Introduction- scope of thermodynamics, Dimensions and Units, Temperature, Pressure, Work,Energy, Heat Energy conservation & first law of thermodynamics; State functions; Equilibrium; Reversible process; Constant P,V, T processes; Mass and energy balances for open systems</td></tr>
<tr><td>Unit–II:</td><td>No. of Lectures: 08 Hours</td><td>Marks: 12</td></tr>
<tr><td colspan="3">Phase Rule; Phases, single component water system, 2-phase systems, phase transitions, PVT behavior, Ideal gas law, Vander Waals virial and cubic equations of state; Reduced conditions & corresponding states theories, Heat effects-latent heat, sensible heat, standard heats of formation</td></tr>
<tr><td>Unit–III:</td><td>No. of Lectures: 08 Hours</td><td>Marks: 12</td></tr>
<tr><td colspan="3">Limitations of first law, Statements of the second law, significance of entropy, Mathematical statement of the second law; Carnot's cycle, Entropy; Entropy changes of an ideal gas. Entropy balance for open systems, Calculation of ideal work, Lost work.</td></tr>
<tr><td>Unit–IV:</td><td>No. of Lectures: 08 Hours</td><td>Marks: 12</td></tr>
<tr><td colspan="3">Thermodynamic property of fluids, graphs and tables of thermodynamic properties, Application of thermodynamics to flow processes-pumps, compressors and turbines,Rankine cycle, Enthalpy & free energy, Effect of temperature on enthalpy change, Gibbs Helmholtz equation. Chemical equilibrium, criteria, characteristics, Le-Chateliers principle & its applications in manufacture of ammonia, sulphuric acid & nitric acid.</td></tr>
</table>

Unit–V:	No. of Lectures: 08 Hours	Marks: 12
Carnot Cycle, Vapor-compression cycle; Absorption refrigeration; Heat pump, compressibility factor, critical constants, Liquefaction processes, liquefaction of gases, Heat capacity of gases: C_p & C_v problems. Differentiating features between thermodynamics & kinetics.		
Text Books:		
1. B.S.Bahl, G.D.Tuli, ArunBehl, Essentials of Physical Chemistry: S.Chand & Co. Ltd. Delhi. 2. Puri, Sharma, Pathania,Principles of Physical Chemistry, Vishal Publishing Company		
Reference Books:		
1.M.J. Moran, H.N. Shapiro, D.D. Boettner and M.B. Bailey, Principles of Engineering Thermodynamics, 8^{th} Edition, Wiley. 2. Peter Atkins, Physical Chemistry, Oxford University Publication 3. Rao, An Introduction to Thermodynamics, John Wiley		

<table>
<tr><th colspan="6">Chemical Engineering Materials</th></tr>
<tr><th colspan="6">COURSE OUTLINE</th></tr>
<tr><td>Course Title:</td><td>Chemical Engineering Materials</td><td>Short Title:</td><td>CEM</td><td>Course Code:</td><td></td></tr>
<tr><td colspan="6">Course description:</td></tr>
<tr><td colspan="6">This course provides the knowledge of materials to undergraduate engineering students, and is designed to strengthen the fundamentals so that they can build their own interface of material selection in chemical industries with their industrial applications in the branch of chemical engineering.</td></tr>
</table>

<table>
<tr><td rowspan="2">Lecture</td><td>Hours/week</td><td>No. of weeks</td><td>Total hours</td><td>Semester credits</td></tr>
<tr><td>3</td><td>14</td><td>42</td><td>3</td></tr>
<tr><td colspan="5">Prerequisite course(s):</td></tr>
<tr><td colspan="5">Applied Chemistry-I&II</td></tr>
<tr><td colspan="5">Course objectives:</td></tr>
<tr><td colspan="5">1.To introduce the basics of material science and its significance in chemical process industry.
2.To study the metallurgical & mechanical properties of materials in chemical process industry.
3.To study industrially important materials.</td></tr>
<tr><td colspan="5">Course outcomes:</td></tr>
<tr><td colspan="5">After successful completion of this course the student will be able to:</td></tr>
<tr><td colspan="5">1. To know sources and importance of materials in context to chemical process industries.
2. Identify technique of selection of linings to be used in chemical process industries.
3. Recognize industrially important materials on the basis of their mechanical, physical and chemical properties.</td></tr>
</table>

<table>
<tr><th colspan="4">COURSE CONTENT</th></tr>
<tr><td colspan="2">Chemical Engineering Material</td><td>Semester:</td><td>III</td></tr>
<tr><td colspan="2">Teaching Scheme:</td><td colspan="2">Examination scheme</td></tr>
<tr><td>Lectures:</td><td>3 hours/week</td><td>End semester exam (ESE):</td><td>60 marks</td></tr>
<tr><td colspan="2" rowspan="2"></td><td>Duration of ESE:</td><td>03 hours</td></tr>
<tr><td>Internal Sessional Exams (ISE):</td><td>40 marks</td></tr>
</table>

<table>
<tr><td>Unit–I:</td><td>No. of Lectures: 08 Hours</td><td>Marks: 12</td></tr>
<tr><td colspan="3">Introduction to materials and their properties:
Simple stresses and strains, Concept of stress, strain, shear stress, shear strain, Hooks law, Elastic limit, stress-strain curve for mild steel and elastomeric materials, factor of safety, Poisson’s ratio, Strain energy due to axial load and impact. Introduction to determination of mechanical properties of materials ASTM methods.</td></tr>
<tr><td>Unit–II:</td><td>No. of Lectures: 08 Hours</td><td>Marks: 12</td></tr>
<tr><td colspan="3">Metallic Materials:
Cast iron, Wrought iron and steel, effect of addition of elements such as Si, C,P, Mn,N to Iron. Elastic and plastic deformation, heat treatments alloys such as stainless steel, brass, bronze, duralumin, alnico, Nichrome, solder material.</td></tr>
</table>

Unit–III:	No. of Lectures: 08 Hours	Marks: 12
Selection of materials for fabrication and erection of chemical plant: Testing of materials, destructive and nondestructive tests, structure of atom and chemical bonds, crystal structures and their influence on material properties, Deformation and slip processes		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Electrical and Magnetic Materials: Factors affecting the resistivity of conductors, properties of materials such as Ag, Cu, Al, Nichrome and Ca as dielectric characteristics, insulating materials such as mineral oil, PVC, Mica fibers, glass and asbestos, Magnetisation, soft and hard magnetic materials such as a silicon iron, Alnico types alloys and ferrites.		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Selection of materials and linings: 1. Selection of Material of Construction a) Selection materials of construction for sulfuric acid, Nitric acid, phosphate fertilizers, hydrogen, ammonia plants. b) Selection of materials for Urea synthesis by reactors and CO_2 absorption systems. 2. Linings for process equipments Metal lining, glass linings, ceramic linings, plastic linings, glass steel for process equipment, thermomechanical properties of glass lined equipments. Membrane linings for vessels holding corrosive liquids		
Text Books:		
1 R.B. Gupta, Material Science, Satya Prakashan, 1981 2. V.K. Manchanda, A text book of Material Science. New India Publishing House 3. V. Raghavan, Material science and engineering, Prentice Hall of India 4. James F. Shacketford, Introduction to material science, McMillan publishing company, New York ISBN 1990.		
Reference Books:		
1. D.Z. Jestrazebaski, Properties of Engg. Materials, 3rd Ed. Toppers. Co. Ltd. 2. J.L.Lee & Evans “Selecting Engineering materials for chemical & process plants” Business Works 1978. 3.KenneinMcNaughton and staff , Materials Engineering-II-Controlling corrosion in process equipments, McGraw Hill Publication Co. ,New York		

Fluid Mechanics					
COURSE OUTLINE					
Course Title:	**Fluid Mechanics**	**Short Title:**	**FM**	**Course Code:**	

Course description:

This course provides the students basic understanding of fluids (liquids and gases) and the forces on them. Fluid mechanics can be divided into fluid statics, the study of fluids at rest; fluid kinematics, the study of fluids in motion; and fluid dynamics, the study of the effect of forces on fluid motion. It includes fluids transportation, filtration and solids fluidization.

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	3	14	42	3

Prerequisite course(s):

Introduction to Civil Engineering & Engineering Mechanics, Applied Mathematics I & II

Course objectives:

1. To study fluid properties
2.To study velocity concept, the continuity equation, Eulers equation of motion a long streamline, Bernoullis equations for different conditions.
3. To study flow through pipeline system: Reynolds experiment, Laws of friction, Major and minor losses, friction factor chart, effect of heat transfer on friction factor, distribution of flowing fluids through branched pipes, hydraulic gradient line and total energy line.
4. To understand flow of compressible fluids, Continuity equation, energy balance, ideal gas equations, flow past immersed bodies, drag coefficient, Boundary layer theory:
5. To study flow and pressure measurement
6. To understand pumping of fluids

Course outcomes:

After successful completion of this course the student will be able to:

1.Understand the role of mechanical and hydro dynamical unit operations in the field of chemical engineering.
2.Understand key concepts and fundamental principles, together with the assumptions made in their development, pertaining to fluid behavior, both in static and flowing conditions.
3.Learn to deal effectively with practical engineering situations, including analysis and design of engineering systems and devices involving fluids and flow.
4.Understand the knowledge of piping & pumping system important in chemical industries

COURSE CONTENT

Fluid Mechanics		**Semester:**	**III**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Fundamental concepts of fluid flow, mechanism of compressible and non compressible fluid flow, equation of continuity, Reynolds number, significance, Bernoulli's theorem, distribution of velocities and fluid flow profiles, friction factor and friction losses in pipes, roughness factor and its significance, pipe fittings, equivalent length of fittings etc. Energy losses due to sudden contraction and expansion.

Unit–II:	No. of Lectures: 08 Hours	Marks: 12
Boundary layer theory, Velocity profile and boundary layer growth along a flat plate, thickness of boundary layer (definition and formulae only), separation of boundary, boundary layer calculations for turbulent flows. Dimensional analysis and model studies: Dimensional analysis, Buckingham's PI theorem, dimensionless numbers, application to fluid flow problem.		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Flow measuring devices for incompressible and compressible fluids: orificemeter, venturimeter, pitot tube, rotameters, notches and weirs, gas flow meters, coefficient of discharge and calculations.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Transportation of fluids, reciprocating and centrifugal pumps, pump characteristics, Diaphragm pumps, rotary pumps, screw pumps, gear pumps, pump power calculations, pump selection and trouble shooting of pumps, priming, cavitation , NPSH of pumps.		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Fluidization, aggregate and particulate fluidization, minimum fluidization velocity, entrainment in fluidization. Packed Bed, pressure drop in packed beds, packing materials and their selection criteria, Loading and flooding in packed beds, Kazenger karma equation,- Industrial application.		
Text Books:		
1. Dr.R.K. Bansal, Fluid Mechanics: Laxmi Publications, New Delhi. 2.Coulson J.M. and Richardson J.F.; Backhurst J.R. and Harker J.H.; Chemical Engineering, Vol. I , II & IV, Publishers: Butterworth - Heinmann, 2001-2002. 3.R.P.VyasFluid Mechanics, Denett Publication. 4.W.L. McCabe & J.C. Smith, Unit operations in chemical engineering: McGraw Hill/Kogakusha Ltd 5.I P. Chattopadhyay Unit operations of chemical engineering-volume I: Khanna Publication New Delhi, 2nd edition 1996.		
Reference Books:		
1.M.White Fluid Mechanics Eighth Edition Tata McGraw Hill, 2016 2. Perry's Handbook of chemical engineers McGraw-Hill: New York 3. R.L.Panton, Incompressible Flow, Third Edition, Wiley – India 2005 4. Sadhu Singh, Fluid Mechanics, Khanna Book Publishing 5. Som & Biswas, Introduction to Fluid Mechanics and Fluid Machines, TMH		

Industrial Organization and Management

COURSE OUTLINE

Course Title:	**Industrial Organization and Management**	**Short Title:**	**IOM**	**Course Code:**	

Course description:

This course provides basic understanding and importance of organization and organization structure and different management aspects and the importance of different management types in industrial development. The course intents to develop ability to create lead and coordinate different section of Organization among students using managerial skills.

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	3	14	42	3

Prerequisite course(s):

Communicative English

Course objectives:

1. To understand Management and Administration, types and structure of organization.
2. To study concepts of personnel management, importance of communication.
3. To study concepts of sales management and marketing management.
4. To study importance of Inventory Control, purchasing and materials management.
5. To study importance of plant maintenance, leadership, importance of motivation.

Course outcomes:

After successful completion of this course the student will be able to:

1. Understand and apply the principles of management with scientific view, and will contribute to the profitable growth of industry.
2. Study various managerial skills which will help them to share responsibilities and will make them able to work effectively in diverse, multicultural environments.
3. Demonstrate ability to work in multidisciplinary team and will display communication skills.
4. Design, develop, implement, and improve integrated systems that include people, materials, information, equipment, and energy and will provide engineering solutions in a global, economic, environmental, and societal context.

COURSE CONTENT

Industrial Organization and Management		**Semester:**	**III**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Management, its growth, concepts of Administration, Management and Organization. Definition of management, importance and characteristics and functions of Management, authority and responsibility, unity of command and direction decision making in management by objectives.

Business organization, Different forms of organization, their formation and working, different organization structure- line organization, functional organization, line and staff organization.

<table>
<tr><th>Unit–II:</th><th>No. of Lectures: 08 Hours</th><th>Marks: 12</th></tr>
<tr><td colspan="3">Personnel Management, Manpower Planning, Recruitment, Selection & Training, Job Evaluation Methods, Merit Rating, Industrial Safety.
Communication: Principles, Types, Characteristics and Role of Communication in Management</td></tr>
<tr><th>Unit–III:</th><th>No. of Lectures: 08 Hours</th><th>Marks: 12</th></tr>
<tr><td colspan="3">Sales and Marketing Management, Sales Management and functions of sales Manager, Salesman’s quota. Selling Vs Marketing Concept, Principle and Functions of Marketing. Management, Marketing Research and Techniques, The Marketing Mix, Channels of Distribution, Advertising</td></tr>
<tr><th>Unit–IV:</th><th>No. of Lectures: 08 Hours</th><th>Marks: 12</th></tr>
<tr><td colspan="3">Inventory Control and Management, Objectives, Functions of Inventories, Inventory Models. Materials Management and its Functions, Importance of Materials Management, Purchasing Techniques and Purchasing Cycle.</td></tr>
<tr><th>Unit–V:</th><th>No. of Lectures: 08 Hours</th><th>Marks: 12</th></tr>
<tr><td colspan="3">Plant Maintenance, Objective and Importance of Plant Maintenance, Duties, Functions and Responsibilities of Maintenance Department, Types of Maintenance.
Leadership in Business and Qualities, Morale, Motivation: Definition, Need, Principle, Factors. Industrial fatigue.</td></tr>
<tr><td colspan="3">Text Books:</td></tr>
<tr><td colspan="3">1. O.P.Khanna, Industrial Engineering & Management, Dhanpat Rai Publications (P) Ltd New Delhi
2. Banga& Sharma, Industrial Engineering Science & Management, Khanna Publishers New Delhi.
3. C.R.Basu, Business Organisation and Management, Tata McGraw Hill Publishing CompanyLtd. New Delhi.</td></tr>
<tr><td colspan="3">Reference Books:
1. L.M.Prasad, Principles of Management , Himalaya Publications Ltd
2. Philip Kotler, Marketing Management, Tata McGraw Hill
3. SK Sharma, Industrial Engineering & Operations Management</td></tr>
</table>

<table>
<tr><td colspan="9">Thermodynamics-I Lab</td></tr>
<tr><td colspan="9">LAB COURSE OUTLINE</td></tr>
<tr><td>Course Title:</td><td colspan="3">Thermodynamics-I Lab</td><td>Short Title:</td><td>THD-I Lab</td><td>Course Code:</td><td colspan="2"></td></tr>
<tr><td colspan="9">Course description:</td></tr>
<tr><td colspan="9">This laboratory course is intended to develop understanding of fundamental aspects of first and second laws of thermodynamics and basic themochemistry principles.</td></tr>
<tr><td rowspan="2">Laboratory</td><td>Hours/week</td><td>No. of weeks</td><td colspan="2">Total hours</td><td colspan="4">Semester credits</td></tr>
<tr><td>2</td><td>14</td><td colspan="2">28</td><td colspan="4">1</td></tr>
<tr><td colspan="3">End Semester Exam (ESE) Pattern:</td><td colspan="6">Oral (OR)</td></tr>
<tr><td colspan="9">Prerequisite course(s):</td></tr>
<tr><td colspan="9">Applied Chemistry I & II, Applied Physics I&II</td></tr>
<tr><td colspan="9">Course objectives:</td></tr>
<tr><td colspan="9">1.To induce knowledge of fundamental principles of first & second law of thermodynamics through experimentation.
2.To impart practical knowledge of heat, work & energy conversion & themochemistry principles
3.To train the students for applying the practical knowledge of thermodynamics in Chemical industries.</td></tr>
<tr><td colspan="9">Course outcomes:</td></tr>
<tr><td colspan="9">Upon successful completion of lab Course, student will be able to:</td></tr>
<tr><td colspan="9">1.Understand concepts of heat, work, and energy, basic thermodynamic properties and units.
2.Apply the knowledge of fundamental thermodynamic properties & thermochemistry principles in chemical industries.</td></tr>
<tr><td colspan="9">LAB COURSE CONTENT</td></tr>
<tr><td colspan="3">Thermodynamics-I Lab</td><td colspan="3">Semester:</td><td colspan="3">III</td></tr>
<tr><td colspan="3">Teaching Scheme:</td><td colspan="6">Examination scheme</td></tr>
<tr><td>Practical:</td><td colspan="2">2 hours/week</td><td colspan="4">End semester exam (ESE):</td><td colspan="2">25 marks</td></tr>
<tr><td colspan="3"></td><td colspan="4">Internal Continuous Assessment (ICA):</td><td colspan="2">25 marks</td></tr>
<tr><td colspan="9">(Amongst the following any eight experiments / assignments are to be performed)
1. Determination of heat of solution of KNO_3./NH_4Cl
2. Determination of water equivalent of copper calorimeter
3. To determine heat of neutralization of strong acid & strong base by calorimeter.
4. To determine the gas constant R by Eudiometer method.
5. To determine the heat of hydration of $CuSO_4$
6. Determination of critical solution temperature of phenol-water system.
7. Determine the integral heat of dilution of H_2SO_4 starting with solution of different concentration.
8. To determine ΔH, ΔG, ΔS of a reaction.
9. Determination of ΔG, ΔH, ΔS of silver benzoate by solubility product and by Conductometery
10.Determination of partial molar volume of ethanol in dilute aqueous solutions.
11.To study first law of thermodynamics
12.To study second law of thermodynamics</td></tr>
</table>

Text Books:
1.J.B.Yadav , Advanced Practical Physical Chemistry, Goel publishing House Meerut. 2.Rajbhoj&Chondekar, Systematic experimental Physical Chemistry, Anjali Publication. 3.R.C. Das &B.Behhra, Experimental Physical Chemistry, Tata McGraw Hill.
Reference Books:
1. Wilson, Experiments of Physical Chemistry by, NewCombe, Denaro Pergaman Press Rickett. 2. Anupma Rajput, Laboratory Manual Engg. Chemistry, Dhanpat Rai& Co.
Guide lines for ICA:
Internal Continuous Assessment shall be based on continuous evaluation of Student performance throughout semester and practical / assignments submitted by the student in the form of journal
Guidelines for ESE: End Semester Examination shall be based on practical / oral evaluation of Student performance and practical / assignments submitted by the student in the form of journal.

Fluid Mechanics Lab

LAB COURSE OUTLINE

Course Title:	**Fluid Mechanics Lab**	**Short Title:**	**FM Lab**	**Course Code:**	

Course description: This course intended to fulfill the need for comprehensive laboratory course in. Fluid Mechanics

Laboratory	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	2	14	28	1

End Semester Exam (ESE) Pattern:	**Oral (OR)**

Prerequisite course(s):

Applied Physics I & II

Course objectives:

1.To induce knowledge of flow of fluids through experimentation.
2.To impart practical knowledge of study of measurement of flow of fluids

Course outcomes:

Upon successful completion of lab Course, student will be able to:

1.Apply the knowledge of fluid flow for controlling heat and mass transfer.
2.Get knowledge about properties of fluids, designing piping, pumping systems.
3.Measure the flow rate of fluids which is important in chemical industries.

LAB COURSE CONTENT

Fluid Mechanics Lab		**Semester:**	**III**
Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**	**End semester exam (ESE):**	**25 marks**
		Internal Continuous Assessment (ICA):	**25 marks**

(Amongst the following any eight experiments / assignments are to be performed)

1.Study of Bernouillis theorem
2.Measurement of coefficient of discharge for venturimeter
3.Measurement of coefficient of discharge for orificemeter
4.Measurement of coefficient of discharge for nozzlemeter
5.Study of Rotameter
6.Study of manometers
7.Study of Reynolds experiment
8.Study of characteristics of centrifugal pump
9.Study of characteristics of reciprocating pump
10.Study of characteristics of diaphragm pump

Text Books:

R.K.Bansal "A textbook of fluid mechanics and hydraulic machines "Firewall Media, 2005

Reference Books:

Perry's Handbook of Chemical Engineers

Guide lines for ICA:

Internal Continuous Assessment shall be based on continuous evaluation of Student performance throughout semester and practical / assignments submitted by the student in the form of journal.

Guidelines for ESE: End Semester Examination shall be based on practical / oral evaluation of Student performance and practical / assignments submitted by the student in the form of journal.

Chemical Engineering Lab-I					
LAB COURSE OUTLINE					
Course Title:	**Chemical Engineering Lab-I**	**Short Title:**	**CEL – I**	**Course Code:**	

Course description:

This course applies theoretical principles, learnt in earlier and concurrent chemical engineering course, in a laboratory programme. The laboratory covers most aspects of analysis, estimations & purification techniques which are the backbone of chemical process industries.

Laboratory	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	2	14	28	1
Theory	1	14	14	1

End Semester Exam (ESE) Pattern:	**Practical (PR)**

Prerequisite course(s):

Applied Chemistry-I & II(PR)

Course objectives:

1.To provide firsthand experience of verifying various theoretical concepts learnt in theory courses.
2.To study laboratory techniques of analysis, estimations & purification.

Course outcomes:

Upon successful completion of lab Course, student will be able to:

1. Learn how to experimentally verify various theoretical principles.
2. Apply experimental skills in purification, estimations,& analysis.

LAB COURSE CONTENT

Chemical Engineering Lab-I		**Semester:**	**III**
Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**	**End semester exam (ESE):**	**25 marks**
		Internal Continuous Assessment (ICA):	**25 marks**

(Amongst the following any eight experiments / assignments are to be performed)

1. 2– 3 experiments on purification techniques for solid & liquid substances by crystallization & distillation.
2. 3-4 experiments on sample analysis by volumetric estimations methods.
3. 2-3 experiments on analysis of petroleum products / oil samples.

Text Book:

S.K.Bhasin, Laboratory manual on engg. Chemistry: Dhanpat RaiPub.New Delhi

Reference Books:

1.Vogel’s,Text book of Quantitative Chemical Analysis : ELBS with Longman
2. Practical Chemistry : ManaliPublications, Pune

Guide lines for ICA:

Internal Continuous Assessment shall be based on continuous evaluation of Student performance throughout semester and practical / assignments submitted by the student in the form of journal.

Guidelines for ESE:

End Semester Examination shall be based on practical / oral evaluation of Student performance and practical / assignments submitted by the student in the form of journal.

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Second Year Engineering

(Chemical Engineering)

Faculty of Science and Technology

'A' Grade

NAAC Re-Accredited

(3rd Cycle)

COURSE OUTLINE

Semester - IV

W.E.F. 2018 – 19

Biology					
COURSE OUTLINE					
Course Title:	**Biology**	**Short Title:**	**BIO**	**Course Code:**	
Course description:					
This course is introduced for learning the basic fundamentals of Lifesciences (zoology &Botany) to undergraduate students. The prospectus includes a prior knowledge of Biotechnology. The goals of the course are to understand the basic principles of Biology and its applications in the field of Engineering.					

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
Lecture	03	14	42	04
Tutorial	01	14	14	

Prerequisite course(s):

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Course objectives:

1.Students will understand the structures and characteristics or functions of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles.
2.Students will learn the basic principles of inheritance at the molecular, cellular and Organism levels.
3.Students will test and deepen their mastery of genetics by applying this knowledge in a variety of problem-solving situations.

Course outcomes:

After successful completion of this course the student will be able to:

1.Use current techniques and analysis methods in molecular biology and genetics.
2.Understand the current concepts in Cell Biology, Stem Cell Biology and Development.
3.Know the structure/function of the basic components of prokaryotic and eukaryotic cells including macromolecules and organelles.
4.Demonstrate proficiency with at least one instrument commonly used in biological research (microscope, etc).

COURSE CONTENT

Biology		**Semester:**	**IV**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Diversity of Organism and Cell Biology
Introduction: Living systems, Bio-mimicry, Metabolism, Taxonomy, Concept of species, Structural organization of life, Concepts of modern cell, history of cell, Cell theory, Structure of cell:- Cell shape, size and cell number, Types of cells:- Prokaryotic cells and Eukaryotic cells, Chemistry of cells.
Cell Division: Cell cycle, mitosis, meiosis, mitotic cell division, cell cycle check points, meiotic cell division, embryonic cell division, cell death.

Unit–II:	No. of Lectures: 08 Hours	Marks: 12
Plant and Animal Kingdom Plant Kingdom: Introduction to plants, Salient features of major plant groups: Bryophyta, Pteridophyta, Gymnospermae, Angiospermae, Plant Growth & Development: Introduction, Seed Dormancy, Seed Germination, Phases of growth, Plant growth hormones. Animal Kingdom:Animal Classification, Salient features of non-chordates upto phylum level: Phylum porifera, phylum Cnidaria, Phylum Ctenophora, Phylum Platyhelminthes.		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Plant Cell and Animal cell culture and Applications Plant Cell Culture: Brief introduction to cell culture with respect to the properties of plant cells, Media requirements, Typical media used, Classification of tissue culture, callus culture, cell suspension culture, Application of callus culture and cell suspension culture, Plant cell cultivation Bioreactors Animal Cell Culture: Brief introduction to animal cell culture, Culture medium: Natural and Artificial media, introduction to balanced salt solutions and simple growth medium, Brief discussion on the chemical, physical and metabolic functions of different constituents of culture medium, Animal Bioreactors.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Microbial Culture and Applications: Introduction, Microbial Culture Techniques, growth curve, Pure culture techniques – microbial culture media, isolation, identification and maintenance of cultures, incidences of microorganisms in soil, water, air, food and sewage, food spoilage organisms, Applications of Microbial Culture Technology.		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Biotechnology and its Applications: Definitions, scope of Biotechnology, Recombinant DNA Technology: Making Recombinant DNA, Tools in Genetic Engineering, Polymerase Chain reaction (PCR). Applications of Biotechnology: Bioinformatics, Biomechanics, Biotechnology of waste treatment, Biosensors, Forensic science, Food Biotechnology, Fermentation Technology.		
Text Books:		
1.B.D. Singh " Genetics" Kalyani Publications Third Edition. 2.C.B. Pawar"Cell Biology" Himalaya Publications, Third Edition. 3.C.B. Pawar"Cell and Molecular Biology" Himalaya Publications. 4.V.K. Agrawal, Text book of Zoology,S. Chand Publication. 5.Dr. B.P. Pandey, Text book of Botany, S. Chand Publication. 6.R.C. Dubey,Text book of Biotechnology, S. Chand Publications.		
Reference Books:		
1.P. K Gupta, Introduction to Biotechnology, Rastogi Publications. 2.B.D.Singh, Biotechnology: Expanding Horizons, Kalyani Publishers, New Delhi, Second Revised Edition, 2008. 3.S.S.Purohit, Biotechnology: Fundamentals and Applications, Agrobios (India), 4th Edition, 2005.		

Material Science					
COURSE OUTLINE					
Course Title:	**Material Science**	**Short Title:**	**MS**	**Course Code:**	

Course description:

The objective of the course will be to give the students a basic introduction to the different classes of materials relevant to engineering in general, and Chemical Engineering in particular. The intent of the course will be to relate the underlying molecular structure of the materials to their physical and chemical properties, and their processing and performance characteristics.

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	3	14	42	3

Prerequisite course(s):

Applied Chemistry I & II, Industrial Chemistry

Course objectives:

1.To differentiate between the essential features and properties of covalent, ionic and metallic bonding.
2.To understand structure-properties relationship.
3.Manipulate atomic/micro structural processes to create desired structure & properties.
4.To study the inorganic engineering materials & composites.
5.Learn to use the experimental, analytical, statistical, and computational tools for engineering practice in the materials discipline
6.Learn the fundamental principles underlying and connecting the structure, processing, properties, and performance of materials systems.

Course outcomes:

After successful completion of this course the student will be able to:

1. Learn contemporary issues relevant to materials science.
2. Apply core concepts to solve engineering problems.
3. Possess the skills and techniques necessary for modern materials engineering practice.

COURSE CONTENT

Material Science		**Semester:**	**IV**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Introduction to materials, classification of engineering materials, bonding between atoms: metallic bonding, electron sea model, ionic bonding, Born-Haber cycle, covalent bonding, Vander Waals bond, variation in bonding character & properties, thermal expansion, melting point, elasticity of materials. Factors affecting the selection of materials for engineering purposes, levels of structure, space lattices & crystal structure, miller indices, close packing structures.

Unit–II:	No. of Lectures: 08 Hours	Marks: 12
Imperfections in solids: vacancies, equilibrium concentration of vacancies, interstitial and substitutional impurities in solids, dislocations, types and characteristics of dislocations, interfacial defects, stacking faults. Structure of materials and Strength of Materials: Yield strength, tensile strength and ductility of materials: stress strain behaviour of metals, ceramics and polymers, tensile test, plastic deformation, necking, creep behaviour and fatigue.		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Semi-crystalline materials, Ceramics: classification, basic raw materials, chemical conversion, glazing, whitewares, structural clay products. Polymers: Basic concept, classification, types of polymerization, effect of polymer structure on properties, mechanical properties of polymers, Plastics: properties &applications. copolymers, liquid crystals and amphiphiles, silicates.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Composites: Introduction & constituents, Types of composites, Processing of fiber-reinforced composites. Polymer nano-composite materials, role of reinforcement-matrix interface strength on composite behavior. Glass: Introduction, Manufacture of glass, Types of glasses & their applications. Abrasives: Introduction, Natural abrasives & synthetic abrasives		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Corrosion: Dry & wet corrosion, Pilling & Bedworth rule, formation & growth of films, pitting corrosion, hydrogen embrittelement, hydrogen evolution, oxygen absorption, corrosion control by proper selection of materials, proper design & fabrication procedures. Introduction to experimental techniques: XRD, NMR,IR etc. for material characterization		
Text Books:		
1.V. Raghavan, Materials Science and Engineering: A First Course, 5 th Edition Prentice Hall India, 2004. Jain & Jain, Engineering Chemistry :Dhanpat Rai& Sons, New Delhi. 2. S. Upadhyaya and A. Upadhyaya, Material Science and Engineering, Anshan Publications, 2007. 3.V.D.Kotgire,S.V.Kotgire, Material Science and Metallurgy for Engineers, , Everest Publishing House 4.Jain&Jain, Engineering Chemistry, Dhanpat Rai Publishing Compony		
Reference Book:		
1.William D. ,Callister, David G. Rethwisch, Material Science and Engineering: An Introduction,Wiley Publisher. 2. Suryanarayanan, A.V.K., Testing of Metallic Materials, Tata McGraw		

Thermodynamics - II					
COURSE OUTLINE					
Course Title:	**Thermodynamics - II**	**Short Title:**	**THD-II**	**Course Code:**	

Course description:

The purpose of this course is to introduce thermodynamics – II and its importance to study the phase behavior and properties of pure fluids with applications. The course covers the application of the first and second law of thermodynamics to non-flow and steady-flow processes.

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	3	14	42	3

Prerequisite course(s):

Applied Physics- I & II, Applied Chemistry-I & II, Thermodynamics-I

Course objectives:

1.To study the laws of thermodynamics.
2.To study equations of state.
3.To study concept of entropy.
4.To study Vapour-Liquid Equilibria (VLE) and test of VLE data.
5.To study phase equilibria for single component system.
6.To study the determination of partial molar quantities, fugacity and fugacity coefficient.
7.To study properties of solutions.
8.To study phase equilibrium.
9.To study chemical reaction equilibria.
10.To study and construct pressure-composition & boiling point diagrams.

Course outcomes:

After successful completion of this course the student will be able to:

1. Execute knowledge of basic science and engineering after study of the laws of thermodynamics and state functions.
2. Capable of identifying, formulating, designing and providing the solution to chemical engineering problems by study of calculations of entropy changes, Vant' Hoff equation.
3. Display the research ability by designing, conducting, interpreting and analyzing to experimental data for preparing reports by study of the thermodynamic consistency test of VLE data.

COURSE CONTENT

Thermodynamics - II		**Semester:**	**IV**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Introduction to the subject, The laws of Thermodynamics, Cyclic rule, Coefficient of Thermal Expansion, Compressibility Coefficient ,First Law of Thermodynamics : Basic Laws, Law of corresponding state, Heat Capacities, Enthalpy as a function of Temperature & Pressure, Joule-Thomson Coefficient , Relation between C_p and C_v, Thermodynamic relations, Generalized Equation of State, Redlich-kwong equation of state, Soave-Redlich-Kwong equation of state.

Unit–II:	No. of Lectures: 08 Hours	Marks: 12
The Second Law of Thermodynamics, Mathematical Treatment of Entropy Concept, Combined form of First and Second Law of Thermodynamics, Thermodynamic Relations based on Second Law of Thermodynamics, Calculations of Entropy Changes, Third Law of Thermodynamics.		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Partial Molar Quantities: General Aspects, Determination of Partial Molar Volume and Enthalpy, Fugacity and Fugacity Coefficient, Fugacity coefficient through equation of state, Fugacity coefficient through virial coefficient correlation. Ideal solution: General Aspects, Phase equilibrium: General Aspects, Gibbs-Duhem Equation, Gibbs-Duhem-Margules Equation, Application of Gibbs-Duhem Equation.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Vapour-Liquid Equilibria (VLE): Basic equations for VLE, Reduction of VLE data, Excess Gibbs free energy Model, Margules Equation & Van Laar Equation, Thermodynamic consistency test of VLE data Phase Equilibria for Single Component System: Gibbs-Helmholtz Equation, The Clapeyron Equation, Clausious-Clapeyron Equation, Application of Clapeyron Equation.		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Chemical Reaction Equilibria: The criteria for chemical equilibrium, Equilibrium constant, Law of chemical equilibrium, Relations between equilibrium constant, Homogeneous gaseous equilibria, Temperature dependence of the equilibrium constant (The Van't Hoff Equation), Integrated form of the Van't Hoff equation, Pressure dependence of the equilibrium constant. Applications of Phase Equilibrium in Ideal Solutions: To construct pressure-composition and boiling point diagrams.		
Text Books:		
1.K.V. Narayanan, A Text book of Chemical Engineering Thermodynamic, Prentice Hall India Pvt. Ltd., New Delhi. 2.R.R.Rastogi and R.R.Mishra, An Introduction to Chemical Thermodynamics, Vikas Publishing House Pvt.Ltd, New Delhi 3.J.M.Smith,H.C.Van Ness, M.M.Abbott, Introduction to Chemical Engineering Thermodynamics, Fifth Edition, McGrow-Hill Companies Inc.		
Reference Books:		
1.B.G.Kyle, Chemical and Process Thermodynamics, Prentice Hall India Pvt. Ltd., New Delhi. 2.G.N. Pandey and J.C.Chaudhari, Chemical Engineering Thermodynamics, Khanna Publishers, Delhi. 3.Y.V.C. Rao, Chemical Engineering Thermodynamics, University Press (INDIA) Ltd., Orient Longman Ltd., Hyderabad.		

Material and Energy Balance Computations					
COURSE OUTLINE					
Course Title:	**Material and Energy Balance Computations**	**Short Title:**	**MEBC**	**Course Code:**	

Course description:

This course provide the students basic understanding of Material and Energy Balance Computations of Industrial Processes and to apply this in designing the various chemical process equipments.

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	3	14	42	3

Prerequisite course(s):

Applied Physics- I & II, Applied Chemistry-I & II, Industrial Chemistry , Thermodynamics-I

Course objectives:

1.To present fundamentals of chemical engineering in a simple manner.

2.To provide broad background for applying principles to industrial and theoretical problems.

Course outcomes:

After successful completion of this course the student will be able to:

1.Analyze a particular process in whole or part.
2. Evaluate the economics of the various processes, design the various equipments and help in identifying the losses in processes.
3.Apply the techniques for increasing the efficiency of the chemical processes.

COURSE CONTENT

Material and Energy Balance Computations		**Semester:**	**IV**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Properties of Gases ,liquid and solids:

Units their dimensions and conversions , Mass and volume relations, Stoichiometric and composition relations, Excess reactants, Degree of completion, Conversion, selectivity and yield.

Ideal gas law, Dalton’s Law, Amagat’s Law, and Average molecular weight of gaseous mixtures.

Effect of temperature on vapour pressure, Vapour pressure plot (Cox chart), Vapour pressures of miscible and immiscible liquids and solutions, Raoult’s Law and Henry’s Law

Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**

Humidity

Humidity and saturation, Relative Humidity and percent saturation, Dew point, Dry and Wet bulb temperatures, Use of humidity charts for engineering calculations, problems on psychometric chart.

Unit–III:	No. of Lectures: 08 Hours	Marks: 12
Stoichiometry & Material Balance Material balance for systems without chemical reactions, species and elemental balance. Analysis of systems with by-pass, recycle and purge.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Fuels & Combustion Material balance with chemical reactions, Heating value of fuels, calculations involving theoretical and excess air. Heat & material balances of combustion processes. Chemical , metallurgical and petrochemical processes.		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Energy balance Energy capacity of gases, liquids and solutions, Heat of fusion and vaporization, Steady state energy balance for systems with and without chemical reactions. Calculations and application of heat of reaction, combustion, formation, neutralization and solution. Enthalpy-concentration charts. Combustion of solids, liquids and gaseous fuels, Calculation of theoretical and actual flame temperatures.		
Text Books:		
1.Bhatt., B.I. and Vora S.M.“Stoichiometry” IInd edition, Tata McGraw Hill (1984) 2.O.A. Hougen, K.M. Watson and R.A. Ragatz “Chemical Process Principles” Part-I,CBS Publishers & distributors ,New Delhi. 3.K.A.Gavhane “Introduction to process calculations” Nirali Publications		
Reference Books:		
1. Perry’s Handbook of chemical engineers McGraw-Hill: New York 2. Felder, R.M. &Rousseau, R.W. “Elementary Principles of Chemical Processes “, 3rd edition. JohnWiley. (1999). 3. Narayanan &Lakshmikutty, “Stoichiometry and Process Calculations” , PHI 4. Richard M. Felde,Ronald W. Rousseau, John Wiley & sons, New Delhi 5. S. N. Ghosh, BidishaKhatua “A textbook of Chemical Calculations” Dhanpat Rai& C0., Delhi 6. Himmelblau, D.M. "Basic Principles and Calculations in Chemical Engineering", 6th edition. Prentice Hall . 7. Durga Prasad Rao and V.S.Murthy, “Process Calculation for Chemical Engineers” McMilan Education Publication.		

Project Management and Entrepreneurship					
COURSE OUTLINE					
Course Title:	**Project Management and Entrepreneurship**	**Short Title:**	**PME**	**Course Code:**	

Course description:

This course aims to provide entrepreneurs for systematic management of various projects and ventures. The course intents to develop entrepreneurs to take special challenges starting new projects and ventures for overall societal development.

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	3	14	42	3

Prerequisite course(s):

Industrial Organization & Management

Course objectives:

1. To understand Conceptualizing the Project, Project Planning and Project Management.
2. To study Project Planning and Design, preparation of Project Report.
3. To study Theories and Models of entrepreneurship, characteristics of successful entrepreneur.
4. To study Financial requirements of a new Enterprise, study and identify sources of finance.
5. To study Challenges of small Enterprises.
6. To study Industrial policies for development of Enterprise.

Course outcomes:

After successful completion of this course the student will be able to:

1. Understand the importance of project planning and management of the project to become successful entrepreneur.
2. Display ability to design and develop newer products.
3. Demonstrate ability to work in multidisciplinary teams and understand the impact of engineering solutions in a global, economic, environmental, and societal context.

COURSE CONTENT

Project Management and Entrepreneurship		**Semester:**	**IV**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Meaning of Projects, Product Planning and Development, Concepts of Projects, Importance, Dimensions and Aspects of Project, Project Classification, Conceptualizing the Project, Project Life Cycle, Characteristics of Project, Project Identification, Project formulation, Feasibility Report.

Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**

Project Analysis, Project Risks, Project Planning: Selection, Infrastructure, Machinery, Raw Materials, Finance, Marketing, Incentives, Project Design and Network Analysis, Project Report, Project Appraisal, Location of an Enterprise

Unit–III:	No. of Lectures: 08 Hours	Marks: 12
Introduction, Concept of entrepreneurship: Significance of entrepreneurship, Theories of entrepreneurship, Models of entrepreneurship development, Definition of entrepreneur: Traits and characteristics of successful entrepreneur , Functions of an entrepreneur, Types of entrepreneurs, Factors influencing entrepreneur, Professional vs. family entrepreneurs, Entrepreneurial leaders vs. managers, Entrepreneurial process: Entrepreneurial motivation, Entrepreneurial barriers, Women as entrepreneur, Role of woman entrepreneurs in society, Barriers to women entrepreneurs, Myths of entrepreneurship, Problems faced by entrepreneurs and capacity building for entrepreneurship, Profiles of successful entrepreneurs.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Financial requirements of a new Enterprise: Estimating financial requirements, Estimation of fix capital requirements, Estimation of working capital requirements Identifying the sources of finance –sources of long-term financing: Sources of medium term financing , Sources of short-term financing Institutions providing financial assistance: Venture capital funding-venture capital funding in the Indian scenario, Venture capital funding process, Importance of financial management, Working capital management, Accounting and book keeping, Financial statement, Financial ration analysis.		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Challenges for small Enterprises Problem faced by small enterprises: Managerial problems, Marketing management, Human resource, Production management, Technological problems Role of central and state governments in promoting small enterprises: Fiscal and tax concessions for small enterprises, Industrial policies for small enterprises, Importance of marketing, Customer relationship management (CRM), Marketing services		
Text Books:		
1. Vasant Desai, Project Management, Himalaya Publishing House, New Delhi. 2. AlpanaTrehan, Entrepreneurship, Dreamtech Press. 3. O.P.Khanna, Industrial Engineering & Management, DhanpatRai Publications (P) Ltd New Delhi 4. Poornima M. Charantimath, Entrepreneurship Development –Small Business Enterprises, Pearson Publication.		
Reference Books:		
1. Jack M. Kaplan, Patterns of Entrepreneurship, Wiley. 2. K. Nagarajan, Project Management, New Age International Pvt. Ltd.		

Thermodynamics - II Lab

LAB COURSE OUTLINE

Course Title:	**Thermodynamics - II Lab**	**Short Title:**	**THD-II Lab**	**Course Code:**	

Course description:

The purpose of this course is to study the phase behavior and properties of pure fluids with applications.

Laboratory	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	2	14	28	1

End Semester Exam (ESE) Pattern:	**Oral (OR)**

Prerequisite course(s):

Applied Physics- I & II, Applied Chemistry-I & II, Thermodynamics-I

Course objectives:

1. To study the laws of thermodynamics.
2. To study equations of state.
3. To study concept of entropy.
4. To study Vapour-Liquid Equilibria (VLE) and test of VLE data.
5. To study phase equilibria for single component system.
6. To study the determination of partial molar quantities, fugacity and fugacity coefficient.
7. To study properties of solutions.
8. To study and construct pressure-composition & boiling point diagrams.

Course outcomes:

Upon successful completion of lab Course, student will be able to:

1. Understand the Laws of thermodynamics,.
2. Understand Vapour-Liquid Equilibrium, partial molar properties, activity coefficient and the equilibrium constant of a chemical reaction.

LAB COURSE CONTENT

Thermodynamics - II Lab		**Semester:**	**IV**
Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**	**End semester exam (ESE):**	**25 marks**
		Internal Continuous Assessment (ICA):	**25 marks**

(Amongst the following any eight experiments / assignments are to be performed)

1. To study Joule Thompson experiment.
2. To study second law of thermodynamics.
3. To study Vapour-Liquid Equilibrium
4. To determine partial molar enthalpy
5. To determine activity coefficient of liquid
6. To study Van’t Hoff Equation
7. To determine the equilibrium constant of a chemical reaction
8.To determine the entropy changes in physical process
9. To construct Boiling Point diagram
10. To construct pressure composition diagram.

Text Books:
1. R.R. Rastogi and R.R. Mishra, An introduction to Chemical Thermodynamics, Vikas Publishing House Pvt. Ltd. New Delhi 2. J.M. Smith, H.C. Van Ness, M.M. Abbott Introduction to Chemical Engineering Thermodynamics, Fifth Edition Tata McGraw-Hill Companies Inc.
Reference Book:
Perry's Handbook of Chemical Engineers
Guide lines for ICA:
Internal Continuous Assessment shall be based on continuous evaluation of Student performance throughout semester and practical / assignments submitted by the student in the form of journal
Guidelines for ESE:
End Semester Examination shall be based on practical / oral evaluation of Student performance and practical / assignments submitted by the student in the form of journal.

<table>
<tr><th colspan="6">Material and Energy Balance Computations Lab</th></tr>
<tr><th colspan="6">LAB COURSE OUTLINE</th></tr>
<tr><td>Course Title:</td><td>Material and Energy Balance Computations Lab</td><td>Short Title:</td><td>MEBC Lab</td><td>Course Code:</td><td></td></tr>
<tr><td colspan="6">Course description:</td></tr>
<tr><td colspan="6">This course provide the students basic understanding of Material and Energy Balance Computations of Industrial Processes.</td></tr>
</table>

<table>
<tr><td rowspan="2">Laboratory</td><td>Hours/week</td><td>No. of weeks</td><td>Total hours</td><td>Semester credits</td></tr>
<tr><td>2</td><td>14</td><td>28</td><td>1</td></tr>
</table>

<table>
<tr><td>End Semester Exam (ESE) Pattern:</td><td>Oral (OR)</td></tr>
<tr><td colspan="2">Prerequisite course(s):</td></tr>
<tr><td colspan="2">Applied Physics- I & II, Applied Chemistry-I & II, Industrial Chemistry , Thermodynamics-I</td></tr>
<tr><td colspan="2">Course objectives:</td></tr>
<tr><td colspan="2">1. To study fundamentals of chemical engineering.
2. To provide broad background for applying principles to industrial and theoretical problems.</td></tr>
<tr><td colspan="2">Course outcomes:</td></tr>
<tr><td colspan="2">Upon successful completion of lab Course, student will be able to:</td></tr>
<tr><td colspan="2">1.Perform the material balance and energy balance calculations.
2.Know the use of humidity charts.
3. Calculate various heats such as heat of reaction, combustion, formation, neutralization and solution.</td></tr>
<tr><th colspan="2">LAB COURSE CONTENT</th></tr>
</table>

<table>
<tr><td colspan="2">Material and Energy Balance Computations Lab</td><td>Semester:</td><td>IV</td></tr>
<tr><td colspan="2">Teaching Scheme:</td><td colspan="2">Examination scheme</td></tr>
<tr><td>Practical:</td><td>2 hours/week</td><td>End semester exam (ESE):</td><td>25 marks</td></tr>
<tr><td colspan="2"></td><td>Internal Continuous Assessment (ICA):</td><td>25 marks</td></tr>
<tr><td colspan="4">(Amongst the following any eight experiments / assignments are to be performed)
1. Solving material balance problems without chemical reaction
2.Material balances for systems with chemical reactions
3. Use of humidity charts for engineering calculations
4. Heat of fusion and vaporization
5. Analysis of systems with by-pass, recycle and purge
6. Calculations and application of heat of reaction, combustion, formation.
7. Calculations and application of heat of neutralization and solution.
8. Calorific Value of Coal.
9. Energy capacity of gases, liquids and solutions
10. Heat of fusion and vaporization</td></tr>
<tr><td colspan="4">Text Book:</td></tr>
<tr><td colspan="4">Himmelblau D.M. “Basic Principles and Calculations in Chemical Engineering” VIth edition, Prentice Hall.</td></tr>
<tr><td colspan="4">Reference Book:</td></tr>
<tr><td colspan="4">Perry’s Handbook of Chemical Engineers</td></tr>
</table>

Guide lines for ICA:
Internal Continuous Assessment shall be based on continuous evaluation of Student performance throughout semester and practical / assignments submitted by the student in the form of journal
Guidelines for ESE:
End Semester Examination shall be based on practical / oral evaluation of Student performance and practical / assignments submitted by the student in the form of journal.

Chemical Engineering Lab-II					
LAB COURSE OUTLINE					
Course Title:	**Chemical Engineering Lab-II**	**Short Title:**	**CEL-II**	**Course Code:**	

Course description:

This course gives the students basic knowledge about the analysis of chemical reaction rates. The course also applies earlier learned knowledge for the preparation of chemical compounds on laboratory scale through single stage preparations.

Laboratory	Hours/week	No. of weeks	Total hours	Semester credits
	2	14	28	1
Theory	1	14	14	1

End Semester Exam (ESE) Pattern:	**Practical (PR)**

Prerequisite course(s):

(LAB) Chemical Engineering Lab-I

Course objectives:

1.To provides students the first hand experience of verifying various theoretical concepts learnt in theory courses.
2. To learn single stage preparations in stepwise manner.
3. To become familiar with laboratory techniques for determination of rate constants for Reactions.

Course outcomes:

Upon successful completion of lab Course, student will be able to:

1. Learn how to experimentally verify various theoretical principles
2.Develop experimental skills
3.Visualize practical implementation of proper techniques for the conversion of raw materials into finished products.

LAB COURSE CONTENT

Chemical Engineering Lab-II		**Semester:**	**IV**
Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**	**End semester exam (ESE):**	**25 marks**
		Internal Continuous Assessment (ICA):	**25 marks**

(Amongst the following any eight experiments / assignments are to be performed)

1. 2–3 experiments on investigation of reaction rates for elementary reaction.
2. 5-6 experiments on single stage preparations.

Text Book:

F.G.Mann&B.C.Saunders, Practical Organic Chemistry, Orient Longman

Reference Books:

1.S.K.Bhasin, Laboratory manual on engg. Chemistry: DhanpatRaiPub.New Delhi
2. Practical chemistry : Manali publications, Pune

Guide lines for ICA:
Internal Continuous Assessment shall be based on continuous evaluation of Student performance throughout semester and practical / assignments submitted by the student in the form of journal
Guidelines for ESE:
End Semester Examinationshall be based on practical / oral evaluation of Student performance and practical / assignments submitted by the student in the form of journal.

Environmental Studies					
COURSE OUTLINE					
Course Title:	**Environmental Studies**	**Short Title:**	**EVS**	**Course Code:**	**Non Credit**

Course description:

The course aims to percolate the importance of environmental science and environmental studies.

COURSE CONTENT

Environmental Studies	**Semester:**	**IV**
	Examination scheme	
	End Semester Exam (ESE):	**80 marks**
	Duration of ESE:	**03 hours**
	Internal Continuous Assessment (ICA):	**20 marks**

Unit–I:	**No. of Lectures: 02 Hours**	

Multidisciplinary nature of environmental studies
Definition, scope and importance
Need for public awareness.

Unit–II:	**No. of Lectures: 08 Hours**	

Natural Resources :
Renewable and non-renewable resources
Natural resources and associated problems.

a. Forest resources : Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.
b. Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
c. Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
d. Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
e. Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.
f. Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

• Role of an individual in conservation of natural resources.
• Equitable use of resources for sustainable lifestyles.

Unit–III:	**No. of Lectures: 06 Hours**	

Ecosystems

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following ecosystem :-
  a. Forest ecosystem
  b. Grassland ecosystem

c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)		
Unit–IV:	**No. of Lectures: 08 Hours**	
Biodiversity and its conservation • Introduction – Definition : genetic, species and ecosystem diversity. • Biogeographic classification of India • Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values • Biodiversity at global, National and local levels. • India as a mega-diversity nation • Hot-sports of biodiversity. • Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts. • Endangered and endemic species of India • Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.		
Unit–V:	**No. of Lectures: 08 Hours**	
Environmental Pollution Definition • Cause, effects and control measures of :- a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards • Solid waste Management : Causes, effects and control measures of urban and industrial wastes. • Role of an individual in prevention of pollution. • Pollution case studies. • Disaster management : floods, earthquake, cyclone and landslides.		
Unit–VI:	**No. of Lectures: 07 Hours**	
Social Issues and the Environment • From Unsustainable to Sustainable development • Urban problems related to energy • Water conservation, rain water harvesting, watershed management • Resettlement and rehabilitation of people; its problems and concerns. Case Studies • Environmental ethics : Issues and possible solutions. • Climate change, global warming, acid rain, ozone layer depletion, nuclear • accidents and holocaust. Case Studies. • Wasteland reclamation. • Consumerism and waste products. • Environment Protection Act. • Air (Prevention and Control of Pollution) Act. • Water (Prevention and control of Pollution) Act • Wildlife Protection Act • Forest Conservation Act • Issues involved in enforcement of environmental legislation. • Public awareness.		

Unit–VII:	No. of Lectures: 06 Hours	

Human Population and the Environment

- Population growth, variation among nations.
- Population explosion – Family Welfare Program
- Environment and human health.
- Human Rights.
- Value Education.
- HIV/AIDS.
- Women and Child Welfare.
- Role of Information Technology in Environment and human health.
- Case Studies.

Unit–VIII:	No. of Lectures:	

Field work

- Visit to a local area to document environmental assets, river / forest / grassland / hill / mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc. (Field work Equal to 5 lecture hours)

Guide lines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Reference Books:

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. BharuchaErach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India, Email:mapin@icenet.net (R)
3. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
4. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
5. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
6. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
7. Down to Earth, Centre for Science and Environment (R)
8. Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
9. Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)
10. Heywood, V.H &Waston, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.
11. Jadhav, H &Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284 p.
12. Mckinney, M.L. & School, R.M. 1996. Environmental Science systems & Solutions, Web enhanced edition. 639p.
13. Mhaskar A.K., Matter Hazardous, Techno-Science Publication (TB)
14. Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB)
15. Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574p
16. Rao M N. & Datta, A.K. 1987. Waste Water treatment. Oxford & IBH Publ. Co. Pvt. Ltd. 345p.
17. Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut
18. Survey of the Environment, The Hindu (M)

19. Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science (TB)
20. ErachBharucha, Textbook of Environmental Studies, University Press
21. MP Poonia& SC Sharma, Environmental Studies, Khanna Publishing House
22. Rajagopalan, Environmental Studies, Oxford University Press

As per AICTE guidelines

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Second Year Engineering

(Civil Engineering)

Faculty of Science and Technology

‘A’ Grade
NAAC Re-Accredited
(3rd Cycle)

COURSE OUTLINE

Semester - III

W.E.F. 2018 – 19

As per AICTE guidelines

Syllabus Structure for Second Year Engineering (Semester – III) (Civil)

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical /Oral		Total	
		Theory Hrs/week	Tutorial Hrs/ week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Biology	B	3	1	-	4	40	60	-	-	100	4
Basic Electronics	C	3	-	-	3	40	60	-	-	100	3
Energy Science and Engineering	C	3	-	-	3	40	60	-	-	100	3
Surveying & Geomatics	D	3	-	-	3	40	60	-	-	100	3
Introduction to Civil Engineering	A	3	-	-	3	40	60	-	-	100	3
Basic Electronics Lab	C	-	-	2	2	-	-	25	25 OR	50	1
Surveying and Geomatics Lab	D	-	-	2	2	-	-	25	25 PR	50	1
Material, Testing & Evaluation Lab I	D	1	-	2	3	-	-	25	25 OR	50	2
		16	**1**	**6**	**23**	**200**	**300**	75	**75**	**650**	**20**

<table>
<tr><td colspan="8" align="center">Biology</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td colspan="8" align="center">COURSE OUTLINE</td></tr>
<tr><td>Course Title:</td><td colspan="3">Biology</td><td>Short Title:</td><td>Biology</td><td>Course Code:</td><td></td></tr>
<tr><td colspan="8">Course description:</td></tr>
<tr><td colspan="8">This course is introduced for learning the basic fundamentals of Life sciences (zoology & Botany) to undergraduate students. The prospectus includes a prior knowledge of Biotechnology. The goals of the course are to understand the basic principles of Biology and its applications in the field of Engineering.</td></tr>
<tr><td rowspan="2">Lecture</td><td>Hours/week</td><td>Tutorial</td><td>No. of weeks</td><td colspan="2">Total hours</td><td colspan="2">Semester credits</td></tr>
<tr><td>03</td><td>01</td><td>14</td><td colspan="2">42</td><td colspan="2">04</td></tr>
<tr><td colspan="8">Prerequisite course(s):</td></tr>
<tr><td colspan="8">-</td></tr>
<tr><td colspan="8">Course objectives:</td></tr>
<tr><td colspan="8">Students will understand the structures and characteristics or functions of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles.
Students will learn the basic principles of inheritance at the molecular, cellular and Organism levels.
Students will test and deepen their mastery of genetics by applying this knowledge in a variety of problem-solving situations.</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td colspan="8">Course outcomes:</td></tr>
<tr><td colspan="8">After successful completion of this course the student will be able to:</td></tr>
<tr><td colspan="8">Use current techniques and analysis methods in molecular biology and genetics.
Understand the current concepts in Cell Biology, Stem Cell Biology and Development.
Know the structure/function of the basic components of prokaryotic and eukaryotic</td></tr>
</table>

cells including macromolecules and organelles.

- Demonstrate proficiency with at least one instrument commonly used in biological research (microscope, etc).

COURSE CONTENT

Name of the Subject: Biology		**Semester:**	*IIIrd*
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Diversity of Organism and Cell Biology

Introduction: Living systems, Bio-mimicry, Metabolism, Taxonomy, Concept of species, Structural organization of life, Concepts of modern cell, history of cell, Cell theory, Structure of cell:- Cell shape, size and cell number, Types of cells:- Prokaryotic cells and Eukaryotic cells, Chemistry of cells.

Cell Division: Cell cycle, mitosis, meiosis, mitotic cell division, cell cycle check points, meiotic cell division, embryonic cell division, cell death.

Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**

Plant and Animal Kingdom

Plant Kingdom:

Introduction to plants, Salient features of major plant groups: Bryophyta, Pteridophyta, Gymnospermae, Angiospermae,

Plant Growth & Development: Introduction, Seed Dormancy, Seed Germination, Phases of growth, Plant growth hormones.

Animal Kingdom:

Animal Classification, Salient features of non-chordates upto phylum level: Phylum porifera, phylum Cnidaria, Phylum Ctenophora, Phylum Platyhelminthes.

Unit–III:	No. of Lectures: 08 Hours	Marks: 12

Plant Cell and Animal cell culture and Applications

Plant Cell Culture:

Brief introduction to cell culture with respect to the properties of plant cells, Media requirements, Typical media used, Classification of tissue culture, callus culture, cell suspension culture, Application of callus culture and cell suspension culture, Plant cell cultivation Bioreactors

Animal Cell Culture:

Brief introduction to animal cell culture, Culture medium: Natural and Artificial media, introduction to balanced salt solutions and simple growth medium, Brief discussion on the chemical, physical and metabolic functions of different constituents of culture medium, Animal Bioreactors.

Unit–IV:	No. of Lectures: 08 Hours	Marks: 12

Microbial Culture and Applications:

Introduction, Microbial Culture Techniques, growth curve, Pure culture techniques – microbial culture media, isolation, identification and maintenance of cultures, incidences of microorganisms in soil, water, air, food and sewage, food spoilage organisms, Applications of Microbial Culture Technology.

Unit–V:	No. of Lectures: 08 Hours	Marks: 12

Biotechnology and its Applications:

Definitions, scope of Biotechnology, Recombinant DNA Technology: Making Recombinant DNA, Tools in Genetic Engineering, Polymerase Chain reaction (PCR).

Applications of Biotechnology:

Bioinformatics, Biomechanics, Biotechnology of waste treatment, Biosensors, Forensic science, Food Biotechnology, Fermentation Technology.

As per AICTE guidelines

Text Books:
• B.D. Singh " Genetics" Kalyani Publications Third Edition. • C.B. Pawar"Cell Biology" Himalaya Publications, Third Edition. • C.B. Pawar"Cell and Molecular Biology" Himalaya Publications. • Text book of Zoology by V.K. Agrawal, S. Chand Publication. • Text book of Botany by Dr. B.P. Pandey S. Chand Publication. • Text book of Biotechnology by R.C. Dubey, S. Chand Publications.
Reference Books:
• P. K Gupta, Introduction to Biotechnology, Rastogi Publications. • B.D.Singh, Biotechnology: Expanding Horizons, Kalyani Publishers, New Delhi, Second Revised Edition, 2008. • S.S.Purohit, Biotechnology: Fundamentals and Applications, Agrobios (India), 4th Edition, 2005.

<table>
<tr><th colspan="6">Basic Electronics</th></tr>
<tr><th colspan="6">COURSE OUTLINE</th></tr>
<tr><td>Course Title</td><td>Basic Electronics</td><td>Short Title</td><td>BE</td><td>Corse Code</td><td></td></tr>
<tr><td colspan="6">Course Description: Second Year III Semester Civil Engineering</td></tr>
<tr><td colspan="6">The objective of this Course is to provide the students with an introductory and broad treatment of the field of Electronics Engineering to facilitate better understanding of the devices, instruments and sensors used in Civil Engineering applications.</td></tr>
<tr><td rowspan="2">Lecture</td><td>Hours/week</td><td>No. of weeks</td><td>Total Hours</td><td colspan="2">Semester Credit</td></tr>
<tr><td>3</td><td>14</td><td>42</td><td colspan="2">3</td></tr>
<tr><td colspan="6">Prerequisite course(s):</td></tr>
<tr><td colspan="6">Physics</td></tr>
<tr><td colspan="6">Course objective:</td></tr>
<tr><td colspan="6">To make aware the student about the concepts and functionalities of the electronic devices, tools and instruments
To make student familiar with uses, general specifications and deployabilities of the electronic devices, and assemblies.</td></tr>
<tr><td colspan="6">Course Outcomes:</td></tr>
<tr><td colspan="6">After successful completion of this course this student will be able to
Appreciate the concepts and functionalities of the electronic devices, tools and instruments
Understand use, general specifications and deployabilities of the electronic devices, and assemblies</td></tr>
</table>

<table>
<tr><th colspan="4">COURSE CONTENT</th></tr>
<tr><td colspan="2">Basic Electronics</td><td>Semester</td><td>III</td></tr>
<tr><td colspan="2">Teaching Scheme</td><td colspan="2">Examination Scheme</td></tr>
<tr><td>Lectures:</td><td>3 hours/week</td><td>End Semester Exam (ESE):</td><td>60 Marks</td></tr>
<tr><td colspan="2" rowspan="2"></td><td>Duration of (ESE):</td><td>03 Hours</td></tr>
<tr><td>Internal Sessional Exam (ISE):</td><td>40 Marks</td></tr>
</table>

As per AICTE guidelines

Unit I	**No. of Lectures:** 08 Hours	**Marks:**12
Diodes and Applications covering, Semiconductor Diode - Ideal versus Practical, Diode Equivalent Circuits, Load Line Analysis; Diode as a Switch, Diode as a Rectifier, Half Wave and Full Wave bridge Rectifiers,Capacitor filter, Breakdown Mechanisms, Zener Diode, Opto-Electronic Devices – LEDs, Photo Diode, Silicon Controlled Rectifier (SCR) – Operation, Construction, Characteristics.		
Unit II	**No. of Lectures:** 08 Hours	**Marks:**12
Basic Structural Analysis: *Transistor Characteristics* covering, Bipolar Junction Transistor (BJT) – Different configurations, their dc current gains and regions of operation, Operating Point, Voltage Divider Bias Configuration; Field Effect Transistor (FET) – Construction, Characteristics of Junction FET, Depletion and Enhancement type Metal Oxide Semiconductor (MOS) FETs, Introduction to CMOS circuits.		
Unit III	**No. of Lectures:** 08 Hours	**Marks:**12
Transistor Amplifiers and Oscillators covering, Classification, Small Signal Amplifier Analysis of CE,CB,CC configurations using h-parameters, Oscillators – Classification, RC Phase Shift, Wien Bridge, LC Oscillators.		
Unit IV	**No. of Lectures:** 08 Hours	**Marks:**12
Operational Amplifiers and Applications covering, Introduction to Op-Amp, Differential Amplifier Configurations-DC & AC Analysis, Block Diagram, Pin Configuration of 741 Op-Amp, Characteristics of Ideal OpAmp, Concept of Virtual Ground;OPAMP Applications-Inverting, Non-Inverting, Adder,Subtractor		
Unit V	**No. of Lectures:** 08 Hours	**Marks:**12
Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Switches (SPDT, DPDT and DIP), Bread Boards and Printed Circuit Boards (PCBs); Identification, Specifications, Testing of Active Devices – Diodes, BJTs, JFETs, MOSFETs, Power Transistors, SCRs and LEDs;.		

As per AICTE guidelines

Text Books:
• David. A. Bell (2003), *Laboratory Manual for Electronic Devices and Circuits*, Prentice Hall, India • Santiram Kal (2002), Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India • Thomas L. Floyd and R. P. Jain (2009), *Digital Fundamentals* by Pearson Education, • Paul B. Zbar, A.P. Malvino and M.A. Miller (2009), *Basic Electronics – A Text-Lab. Manual,* TMH • R. T. Paynter (2009), *Introductory Electronic Devices & Circuits, Conventional Flow Version,* Pearson
Reference Book:
• Basic Electronics by D P Kothari, Tata McGraw Hills Publications. • Basic Electronics by Ghatak and De, Pearson Publications.

<table>
<tr><td colspan="6">Energy Science and Engineering</td></tr>
<tr><td colspan="6"></td></tr>
<tr><td colspan="6">COURSE OUTLINE</td></tr>
<tr><td>Course Title:</td><td>Energy Science and Engineering</td><td>Short Title:</td><td>ESE</td><td>Course Code:</td><td></td></tr>
<tr><td colspan="6">Course description:</td></tr>
<tr><td colspan="6">This course provides an introduction to energy systems and renewable energy resources, with a scientific examination of the energy field and an emphasis on alternative energy sources and their technology and application. It includes exploration of society’s present needs and future energy demands, examine conventional energy sources and systems, including fossil fuels and nuclear energy, and then focus on alternatives, renewable energy sources such as solar, biomass (conversions), wind power, waves and tidal, geothermal, ocean thermal, hydro and nuclear. It emphasizes Energy conservation methods from Civil Engineering perspective. The knowledge acquired will lay a good foundation for design of various civil engineering systems/ projects dealing with these energy generation paradigms in an efficient manner.</td></tr>
<tr><td rowspan="2">Lecture</td><td>Hours/week</td><td>No. of weeks</td><td>Total hours</td><td colspan="2">Semester credits</td></tr>
<tr><td>3</td><td>14</td><td>42</td><td colspan="2">3</td></tr>
<tr><td colspan="6">Prerequisite course(s):</td></tr>
<tr><td colspan="6">-</td></tr>
<tr><td colspan="6">Course objectives:</td></tr>
<tr><td colspan="6">The objective of this Course is:
• To provide an introduction to energy systems and renewable energy resources, with a scientific examination of the energy field and an emphasis on alternative energy sources and their technology and application.
• To enable the student to explore society’s present needs and future energy demands, examine conventional energy sources and systems, including fossil fuels and nuclear energy, and then focus on alternatives, renewable energy sources such as solar, biomass (conversions), wind power, waves and tidal, geothermal, ocean thermal, hydro and nuclear.
• To appreciate the Energy conservation methods with emphasis from Civil Engineering</td></tr>
</table>

<table>
<tr><td colspan="6">perspective.
• To acquire a knowledge base for design of various civil engineering systems/projects dealing with these energy generation paradigms in an efficient manner.</td></tr>
<tr><td colspan="6"></td></tr>
<tr><td colspan="6">Course outcomes:</td></tr>
<tr><td colspan="6">After successful completion of this course the student will be able to:
• The student will be able to understand the importance of energy resources.
• The student will appreciate the impact of global energy crises.
• The student will recognize the role of engineers in energy management.
• The student will understand the concept of energy efficiency, importance of alternative energy sources, applications of energy efficiency in civil engineering perspective and energy efficient buildings.</td></tr>
<tr><td colspan="6"></td></tr>
<tr><td colspan="6" align="center">COURSE CONTENT</td></tr>
<tr><td colspan="3">Name of the Subject: Energy Science and Engineering</td><td colspan="2">Semester:</td><td>III</td></tr>
<tr><td colspan="3">Teaching Scheme:</td><td colspan="3">Examination scheme</td></tr>
<tr><td>Lectures:</td><td colspan="2">3 hours/week</td><td colspan="2">End semester exam (ESE):</td><td>60 marks</td></tr>
<tr><td colspan="3" rowspan="2"></td><td colspan="2">Duration of ESE:</td><td>03 hours</td></tr>
<tr><td colspan="2">Internal Sessional Exams (ISE):</td><td>40 marks</td></tr>
<tr><td colspan="2" align="center">Unit–I:</td><td colspan="2" align="center">No. of Lectures: 08 Hours</td><td colspan="2" align="center">Marks: 12</td></tr>
<tr><td colspan="6">Introduction to Energy Science: Scientific principles and historical interpretation to place energy use in the context of pressing societal, environmental and climate issues; Introduction to energy systems and resources; Introduction to Energy, sustainability & the environment</td></tr>
<tr><td colspan="6"></td></tr>
<tr><td colspan="2" align="center">Unit–II:</td><td colspan="2" align="center">No. of Lectures: 08 Hours</td><td colspan="2" align="center">Marks: 12</td></tr>
<tr><td colspan="6">Energy Sources: Overview of energy systems, sources, transformations, efficiency, and storage. Fossil fuels (coal, oil, oil-bearing shale and sands, coal gasification) - past, present & future, Remedies & alternatives for fossil fuels - biomass, wind, solar, nuclear, wave, tidal and hydrogen; Sustainability and environmental trade-offs of different energy systems;</td></tr>
</table>

possibilities for energy storage or regeneration (Ex. Pumped storage hydro power projects, superconductor-based energy storages, high efficiency batteries)		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Civil Engineering Projects connected with the Energy Sources: Coal mining technologies, Oil exploration offshore platforms, Underground and under-sea oil pipelines, solar chimney project, wave energy caissons, coastal installations for tidal power, wind mill towers; hydro power stations above-ground and underground along with associated dams, tunnels, penstocks, etc.; Nuclear reactor containment buildings and associated buildings, design and construction constraints and testing procedures for reactor containment buildings; Spent Nuclear fuel storage and disposal systems		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Engineering for Energy conservation: Concept of Green Building and Green Architecture;Green building concepts (Green building encompasses everything from the choice of building materials to where a building is located, how it is designed and operated); *LEED ratings;* Identification of energy related enterprises that represent the breath of the industry and prioritizing these as candidates; Embodied energy analysis and use as a tool for measuring sustainability. Energy Audit of Facilities and optimization of energy consumption		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Energy & Environment: Energy efficiency and conservation; introduction to clean energy technologies and its importance in sustainable development; Carbon footprint, energy consumption and sustainability; introduction to the economics of energy; How the economic system determines production and consumption; linkages between economic and environmental outcomes; How future energy use can be influenced by economic, environmental, trade, and research policy.		

As per AICTE guidelines

Text Books:
• Boyle, Godfrey (2004), Renewable Energy (2nd edition). Oxford University Press • Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press • Schaeffer, John (2007), Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living, Gaiam
Reference Books:
• Jean-Philippe; Zaccour, Georges (Eds.), (2005), Energy and Environment Set: Mathematics of Decision Making, Loulou, Richard; Waaub, XVIII, • Ristinen, Robert A. Kraushaar, Jack J. AKraushaar, Jack P. Ristinen, Robert A. (2006) Energy and the Environment, 2nd Edition, John Wiley • UNDP (2000), Energy and the Challenge of Sustainability, World Energy assessment • E H Thorndike (1976), Energy & Environment: A Primer for Scientists and Engineers, Addison-Wesley Publishing Company

<table>
<tr><td colspan="7">Surveying & Geomatics</td></tr>
<tr><td colspan="7"></td></tr>
<tr><td colspan="7">COURSE OUTLINE</td></tr>
<tr><td>Course Title:</td><td colspan="2">Surveying and Geomatics</td><td>Short Title:</td><td>SUR &G</td><td>Course Code:</td><td></td></tr>
<tr><td colspan="7">Course description:</td></tr>
<tr><td colspan="7">This course is set keeping in mind the requirements of undergraduate students of engineering .This course provides the fundamental knowledge of surveying and leveling which includes

Basic principles of surveying and important aspect of leveling.
Engineering surveys such as profile leveling and cross sectioning
Measurement of horizontal and vertical angle ,magnetic bearings, deflection angle by using theodolite
Traverse computation- consecutive and independent coordinates.
Tachometric surveying- measurement of horizontal and vertical distances,tacheometric
contouring
Plane table survey
Photogrammetry and remote sensing
</td></tr>
<tr><td rowspan="2">Lecture</td><td>Hours/week</td><td>No. of weeks</td><td colspan="2">Total hours</td><td colspan="2">Semester credits</td></tr>
<tr><td>3</td><td>14</td><td colspan="2">42</td><td colspan="2">3</td></tr>
<tr><td colspan="7">Prerequisite course(s):</td></tr>
<tr><td colspan="7">-</td></tr>
<tr><td colspan="7">Course objectives:</td></tr>
<tr><td colspan="7">With the successful completion of the course, the student should have the capability to:

To describe the function of surveying in civil engineering construction,
Work with survey observations, and perform calculations,
Customary units of measure. Identify the sources of measurement errors and mistakes; understand the difference between accuracy and precision as it relates to distance, differential leveling, and angular measurements
Be familiar with the principals of recording accurate, orderly, complete, and logical field notes from surveying operations, whether recorded manually or with automatic data
</td></tr>
</table>

collection methods,

- Identify and calculate the errors in measurements and to develop corrected values for differential level circuits, horizontal distances and angles for open or closed-loop traverses,
- Operate an automatic level to perform differential and profile leveling; properly record notes; mathematically reduce and check levelling measurements,
- Effectively communicate with team members during field activities; identify appropriate safety procedures for personal protection; properly handle and use measurement instruments. Be able to identify hazardous environments and take measures to insure one's personal and team safety,
- Measure horizontal, vertical, and zenith angles with a transit, theodolite, total station or survey grade GNSS instruments,
- Calculate azimuths, latitudes and departures, error of closure; adjust latitudes and departures and determine coordinates for a closed traverse,

Course outcomes:

After successful completion of this course the student will be able to:

- Apply the knowledge, techniques, skills, and applicable tools of the discipline to engineering and surveying activities
- Translate the knowledge gained for the implementation of Civil infrastructure facilities
- Relate the knowledge on Surveying to the new frontiers of science like Hydrographic surveying, Electronic Distance Measurement, Global Positioning System, Photogrammetry and Remote Sensing

Surveying and Geomatics

COURSE CONTENT

		Semester:	**III**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
Practical : 2 hours/week		**Duration of ESE:**	**03 hours**

		Internal Sessional Exams (ISE):	**40 marks**
Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**	
Introduction to surveying • Surveying- Definition, principle of surveying, various types of surveying Steps in survey, chain and offset. Ranging, compass, bearing, local attraction, bearings, chain and compass traversing, errors, elimination of error.			
Unit–II:	**No. of Lectures: 06 Hours**	**Marks: 12**	
Part [B] Leveling • Instruments used in leveling, dumpy level, automatic level, types of leveling staves. • Principal axes of dumpy level, reciprocal leveling curvature and refraction correction, distance to the visible horizon. • Bench mark and its types, reduced level, rise and fall method, height of instrument method. • Profile leveling: L - section and cross -sections. • Numerical on leveling			
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**	
Theodoloite • Principal axes and temporary adjustments of transit theodolite. • Uses of theodolite: measurement of horizontal angles, vertical Angles, magnetic bearings, measuring deflection angles. • Theodolite Traversing: Computation of consecutive and independent co-ordinates, adjustments of closed traverse, Gales traverse by co-ordinate method, Numerical on Theodolit			

Unit–IV:	No. of Lectures: 08 Hours	Marks: 12

Tachometry

- Principle of stadia method, fixed hair method with vertical staff to determine horizontal distances and elevations of the points.
- Use of tachometry in surveying, contour, characteristics and uses, methods of interpolation, tachometric contour survey.
- Numerical on **Tachometry**

Unit–V:	No. of Lectures: 08 Hours	Marks: 12

Plane Table Survey

- Objective and equipment required for plane table survey.
- Methods of plane tabling - radiation, intersection, traversing and resection.
- Advantages, disadvantages, limitations and errors of plane Table surveying, .three point problem
- Minor instruments: Study and use of abney level, box sextant, digital planimeter.
- Introduction to triangulation, photo-grametry and remote sensing.

Text Books:

- Madhu, N, Sathikumar, R and Satheesh Gobi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson India, 2006.
- Manoj, K. Arora and Badjatia, Geomatics Engineering, Nem Chand & Bros, 2011
- Bhavikatti, S.S., Surveying and Levelling, Vol. I and II, I.K. International, 2010
- Chandra, A.M., Higher Surveying, Third Edition, New Age International (P) Limited, 2002.
- Anji Reddy, M., Remote sensing and Geographical information system, B.S. Publications, 2001.
- Arora, K.R., Surveying, Vol-I, II and III, Standard Book House, 2015

Reference Books:

- Surveying and Leveling (Vol – I & II) by T. P. Kanitkar, & S.V. Kulkarni, Pune Vidarthi Griha Prakashan, Pune.

- Surveying Vol. I and Vol. II by B. C. Punmia, Laxmi Publication (P) New Delhi.
- Principles of surveying by Cliver and Clendening
- Advance surveying, Vol. I & II, Handbook by P.B. Shahani
- A handbook of accurate surveying methods by S. P. Collins

Introduction To Civil Engineering					
COURSE OUTLINE					
Course Title:	**Introduction To Civil Engineering**	**Short Title:**	**ICE**	**Course Code:**	
Course description:					
This course introduces the student with various aspects of civil engineering, importance, scope and role of civil engineering in societal development, responsibilities of civil engineer and impact of civil engineering in the development of society and environment.					

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	3	14	42	3
Prerequisite course(s):				
-				
Course objectives:				

- To give an understanding to the students of the vast breadth and numerous areas of engagement available in the overall field of Civil Engineering
- To motivate the student to pursue a career in one of the many areas of Civil Engineering with deep interest and keenness.
- To expose the students to the various avenues available for doing creative and innovative work in this field by showcasing the many monuments and inspiring projects of public utility.

Course outcomes:

After successful completion of this course the student will be able to:

The course outcomes can be summarized as follows:

- Introduction to what constitutes Civil Engineering
- Identifying the various areas available to pursue and specialize within the overall field of Civil Engineering
- Highlighting the depth of engagement possible within each of these areas
- Exploration of the various possibilities of a career in this field
- Understanding the vast interfaces this field has with the society at large
- Providing inspiration for doing creative and innovative work
- Showcasing the many monuments, heritage structures, nationally important infrastructure, and impressive projects to serve as sources of inspiration
- Highlighting possibilities for taking up entrepreneurial activities in this field
- Providing a foundation for the student to launch off upon an inspired academic pursuit into this branch of engineering

COURSE CONTENT

Introduction to Civil Engineering		**Semester:**	*IV*
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Basic Understanding: What is Civil Engineering/Infrastructure? Basics of Engineering and Civil Engineering; Broad disciplines of Civil Engineering; Importance of Civil Engineering, Possible scopes for a career.

History of Civil engineering: Early constructions and developments over time; Ancient monuments & Modern marvels; Development of various materials of construction and methods of construction; Works of Eminent civil engineers

Overview of National Planning for Construction and Infrastructure Development; five year plan outlays.		
Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**
Fundamentals of Architecture & Town Planning: Hierarchy in construction industry, role of different agencies involved in construction, fundamentals of town planning. Role of architect, Green Buildings and LEED ratings; Development of Smart cities Type of structures, classification based upon function, load transfer mechanism, material of construction etc. Components of building structures.		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Fundamentals of Building Materials: General properties of Stones, bricks, mortars, cement, Plain, Reinforced & Prestressed Concrete, Structural Steel, High Tensile Steel, Carbon Composites. Their occurrence in nature/manufacturing. Plastics in Construction; Recycling of Construction & Demolition wastes Basics of Construction Management & Contracts Management, Temporary Structures in Construction; Major Construction equipment; Automation & Robotics in Construction; Importance of Contracts.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Environmental Engineering & Sustainability: Water treatment systems; Effluent treatment systems; Solid waste management; sanitation. Sustainability in Construction; **Geotechnical Engineering**: Soil mechanics, scope,importance, soil: a 3phase system, B.C. definition, basic methods of determinstion of BC. Broad classification of foundations. **Fluid mechanics and Water Resources Engineering**: Fundamentals of fluid mechanics. Applications of FM, Multi-purpose reservoir projects, conventional water harvesting systems. Socio economic aspects.		

<table>
<tr><th>Unit–V:</th><th>No. of Lectures: 08 Hours</th><th>Marks: 12</th></tr>
<tr><td colspan="3">Ocean Engineering: Ports & Harbours and other marine structures.
Power Plant Structures: Chimneys, Natural & Induced Draught Colling towers, coal handling systems, ash handling systems; nuclear containment structures
types of bridges and tunnels.
Repairs & Rehabilitation of Structures: Basics of corrosion phenomena and other structural distress mechanisms; some simple systems of rehabilitation of structures; Non-Destructive testing systems; Use of carbon fibre wrapping and carbon composites in repairs.
common software used in civil engineering.</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td colspan="3">Text Books:</td></tr>
<tr><td colspan="3">1. Basic Civil Engineering, by Sathish Gopi, Pearson Publication.
2. A Basic Concept in Civil Engineering, Sunder Narayan, Atlantic Publishers and Distributors Pvt Ltd.
3. Basic Civil Engineering, B C Punmia and Ashok Kumar Jain, Laxmi Publications.</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td colspan="3">Reference Books:</td></tr>
<tr><td colspan="3">1. An Elementary Course Of Civil Engineering by and Dennis Hart Mahan, Howards Press Publication.
2. Elementary Course of Civil Engineering by Joseph Mathieu Sganzin, Nabu Press.</td></tr>
</table>

<table>
<tr><td colspan="6">Basic Electronics Lab</td></tr>
<tr><td colspan="6">LAB COURSE OUTLINE</td></tr>
<tr><td>Course Title</td><td>Basic Electronics</td><td>Short Title</td><td>BE</td><td>Corse Code</td><td>ESC202</td></tr>
<tr><td colspan="6">Course Description: Second Year III Semester Civil Engineering</td></tr>
<tr><td colspan="6">The objective of this course is to provide the students with an introductory and broad treatment with the working of electronic devices used in civil engineering practices, their uses, their applications and their limitations.</td></tr>
<tr><td rowspan="2">Laboratory</td><td>Hours/week</td><td>No. of weeks</td><td colspan="2">Total Hours</td><td>Semester Credit</td></tr>
<tr><td>2</td><td>14</td><td colspan="2">28</td><td>1</td></tr>
<tr><td>end Semester Examination Pattern (ESE)</td><td colspan="5">Oral</td></tr>
<tr><td colspan="6">Prerequisite course(s):</td></tr>
<tr><td colspan="6">Physics</td></tr>
<tr><td colspan="6">Course objective:</td></tr>
<tr><td colspan="6">To make aware the student about the concepts and functionalities of the electronic devices, tools and instruments
To make student familiar with uses, general specifications and deployabilities of the electronic devices, and assemblies.
To develop confidence in handling and usage of electronic devices, tools and instruments in engineering applications</td></tr>
</table>

Course Outcomes:

After successful completion of this course this student will be able to

- Appreciate the concepts and functionalities of the electronic devices, tools and instruments
- Understand use, general specifications and deployabilities of the electronic devices, and assemblies
- Have confidence in handling and usage of electronic devices, tools and instruments in engineering applications

LAB COURSE CONTENT			
Basic Electronics		**Semester**	III
Teaching Scheme		**Examination Scheme**	
Practical:	2 hours/week	**End Semester Exam (ESE):**	25 Marks
		Internal Continuous Assessment	25 Marks

List of Practicals:

- Identification and testing of R,L,C, Diode, BJT & FET.
- Study of operation of DMM, Function generator, CRO & Power supply.
- V-I characteristics of P-N Junction diode.
- V-I characteristics of zener diode.
- Input & Output characteristics of CE configuration.
- Drain & Transfer characteristics of CS-JFET.

Text Books:
• David. A. Bell (2003), *Laboratory Manual for Electronic Devices and Circuits*, Prentice Hall, India • Santiram Kal (2002), Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India • Thomas L. Floyd and R. P. Jain (2009), *Digital Fundamentals* by Pearson Education, • Paul B. Zbar, A.P. Malvino and M.A. Miller (2009), *Basic Electronics – A Text-Lab. Manual,* TMH • R. T. Paynter (2009), *Introductory Electronic Devices & Circuits, Conventional Flow Version,* Pearson
Reference Book:
-
Guidelines for ICA
The ICA should be a continuous assessment throughout the semester based upon the list of experiments the student has to perform in the laboratory.
Guide lines for ESE
The ESE should be an Oral exam based upon the term work submitted by the student.

Surveying and Geomatics LAB

LAB COURSE OUTLINE

Course Title:	**Surveying and Geomatics Lab**	**Short Title:**	*SUR &G*	**Course Code:**	

Course description:

- Measurement of horizontal and vertical angle ,magnetic bearings, deflection angle by using theodolite.
- Traverse computation- consecutive and independent coordinates.
- Tachometric surveying- measurement of horizontal and vertical distances, tacheometric contouring
- Plane table survey

Laboratory	Hours/week	No. of weeks	Total hours	Semester credits
	2	*14*	*28*	*1*

Prerequisite course(s):

-

Course objectives:

With the successful completion of the course, the student should have the capability to:

- Operate variety of survey instruments including total station to measure distance, angles, and to calculate differences in elevation.
- Work as a team member on a surveying party to achieve a common goal of accurate and timely project completion,
- Able to plan a full scale survey project.

Course outcomes:

After successful completion of this course the student will be able to:

- Apply the knowledge, techniques, skills, and applicable tools of the discipline to engineering and surveying activities
- Translate the knowledge gained for the implementation of Civil infrastructure facilities

- Relate the knowledge on Surveying to the new frontiers of science like Hydrographic surveying, Electronic Distance Measurement, Global Positioning System, Photogrammetry and Remote Sensing

LAB COURSE CONTENT				
Surveying and Geomatics LAB		**Semester:**	**III**	
Teaching Scheme:		**Examination scheme**		
Practical:	**2 hours/week**	**End semester exam (ESE):**		**25 marks**
		Internal Sessional Exams (ISE):		**25 marks**
List of Practical				

Group A (Practical exercise)

- Use and Study of Dumpy level for finding the levels by various methods.
- Measurements of horizontal and vertical angles by transit Theodolite
- Measurements of horizontal angles of a triangle by repetition method
- Computation of horizontal distances and elevations by Tachometry for horizontal and inclined sights.
- Radiation and intersection method in plane Table survey.
- Use of box sextant, Abney level and digital plan meter.

Group B (Projects)

Project-1:- Theodolite Traverse survey project of a closed traverse with at least four sides.
Project-2:- Tachometric contouring project with at least two instrument stations at 60 m apart.
Project-3:- Road project for minimum length of 200m, including fixing of alignment, profile leveling, and cross sectioning.
Project-4:- Plane table survey project of a closed traverse of minimum four sides

As per AICTE guidelines

Text Books
• Surveying I Laboratory Manual, AURORA'S TECHNOLOGICAL AND RESEARCH INSTITUTE, available on http://www.atri.edu.in/images/pdf/departments/Survey-I%20Lab%20Manual%20Final.pdf.
Reference Books
• The practical surveyor, or, the art of land-measuring, made easy. ... To which is added, an appendix, ... By Samuel Wyld, Gent, Gale ECCO, Print Editions (May 27, 2010). • Practical Surveying and Computations, Second Edition 2nd Edition by A L Allan, Butterworth-Heinemann; 2 edition (October 8, 1997). • Practical Marine Surveying by Harry Phelps (Author) BiblioLife (March 19, 2009). • A Practical Guide to Aerial Photography with an Introduction to Surveying, Ciciarelli, J.A. Springer US, 1991.
Guide lines for ICA
The Term Work will consist of: • Field book containing record of all exercises and projects listed above. • File of full imperial size drawing sheets as mentioned below • Theodolite Traverse survey project. 1 sheet • Tachometric contouring project………..1 sheet • Road project showing L- section, plan of road and typical cross -section…….Min -1 sheet • Plane Table Traverse survey project…..1 sheet
Guide lines for ESE
ESE will be based on laboratory field book and sheets submitted by the student. In ESE the student may asked to answer questions based on experiments/assignments. Evaluation will be based on performance in Oral examination

<table>
<tr><td colspan="8" align="center">Materials, Testing & Evaluation I Lab</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td colspan="8" align="center">LAB COURSE OUTLINE</td></tr>
<tr><td>Course Title:</td><td colspan="3">Materials, Testing & Evaluation I Lab</td><td>Short Title:</td><td>MTE I</td><td>Course Code:</td><td></td></tr>
<tr><td colspan="8">Course description:</td></tr>
<tr><td colspan="8">Civil engineering is a material intensive industry. It uses a variety of materials. For a civil engineer to learn about the basic engineering properties of civil engineering materials. So that the civil engineer could use these materials efficiently. The main focus is on testing of materials used in concrete.
The course reviews the current testing technology and examines force applications systems, force measurement, strain measurement, important instrument considerations, equipment for environmental testing, and computers applications for materials testing provide an introductory treatment of basic skills in material engineering towards (i) selecting material for the design, and (ii) evaluating the mechanical and structural properties of material, as well as the knowledge necessary for a civil engineer. The knowledge acquired lays a good foundation for analysis and design of various civil engineering structures/systems in a reliable manner</td></tr>
<tr><td></td><td>Hours/week</td><td>No. of weeks</td><td>Total hours</td><td colspan="4">Semester credits</td></tr>
<tr><td>Theory</td><td>1</td><td>14</td><td>14</td><td colspan="4" rowspan="2">2</td></tr>
<tr><td>Laboratory</td><td>2</td><td>14</td><td>28</td></tr>
<tr><td colspan="8">Prerequisite course(s):</td></tr>
<tr><td colspan="8">-</td></tr>
<tr><td colspan="8">Course objectives:</td></tr>
<tr><td colspan="8">To train the student to characterize the civil engineering materials.
To enable the student to confirm the material suitability for variety of construction works as per relevant IS specifications.</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td colspan="8">Course outcomes:</td></tr>
<tr><td colspan="8"></td></tr>
</table>

The student will:

- Know the relevant IS specifications for various construction materials.
- Will be able to characterize variety of civil engineering material as per IS specifications.

Guidelines for ICA

The ICA should be a continuous assessment throughout the semester based upon the list of experiments the student has to perform in the laboratory.

Guidelines for ESE

There must be Oral examination based upon the experimental work done by the student.

LAB COURSE CONTENT

Materials, Testing & Evaluation I Lab		**Semester:**	*III*
Teaching Scheme:		**Examination scheme**	
Theory	**1 hours/week**	**End semester exam (ESE):**	**25**
Practical	**2 hours/week**	**Internal Continuous Assessment (ICA)**	**25**

Introduction to Engineering Materials covering, What is the “Material Engineering”?; Cements, M-Sand, Concrete (plain, reinforced and steel fibre/ glass fibre-reinforced, light-weight concrete, High Performance Concrete, Polymer Concrete) Ceramics, and Refractories, Bitumen and asphaltic materials, Timbers, Glass and Plastics, Structural Steel and other Metals, Paints and Varnishes, Acoustical material and geo-textiles, rubber and asbestos, laminates and adhesives, Graphene, Carbon composites and other engineering materials including properties and uses of these. Mechanical behavior and mechanical characteristics; Elasticity – principle and characteristics; Plastic deformation of metals; Tensile test – standards for different material (brittle, quasi-brittle, elastic and so on) True stress – strain interpretation of tensile test; hardness tests; Bending and torsion test; strength of ceramic; Internal friction, creep – fundaments and characteristics; Brittle fracture of steel – temperature transition approach; Background of fracture mechanics; Discussion of fracture toughness testing – different materials; concept of fatigue of materials; Structural integrity assessment procedure and fracture mechanics

Standard Testing & Evaluation Procedures covering, Laboratory for mechanical testing;

Discussion about mechanical testing; Naming systems for various irons, steels and nonferrous metals; Discussion about elastic deformation; Plastic deformation; Impact test and transition temperatures; Fracture mechanics – background; Fracture toughness – different materials; Fatigue of material; Creep

List of Practical

1. Testing of cement: fineness, consistency, soundness, Initial Setting Time, Final Setting Time.
2. Compressive strength of cement.
3. Fineness modulus of sand.
4. Moisture content of sand.
5. Aggregate impact value
6. Crushing value of aggregate
7. Specific gravity of aggregate.
8. Flakiness and elongation index of aggregate.
9. Los Angeles Method of aggregate abrasion value.
10. Testing of bricks: size, moisture content, crushing strength, efflorescence.
11. Testing of tile/paver block.
12. Compressive strength of concrete (28 days).
13. Spilt tensile strength of concrete.
14. Plotting of Stress Strain Curve of steel

Visit to a brick making site, sand query and cement factory is recommended.
students must do an assignment on concrete mix design using IS method.

Text Books

- Concrete Technology by M S Shetty, S Chand Publication.
- Building Materials by S C Rangwala, Charotar Publishing House, India.

Reference Books:

- Chudley, R., Greeno (2006), 'Building Construction Handbook' (6th ed.),R. Butterworth-Heinemann
- Khanna, S.K., Justo, C.E.G and Veeraragavan, A, ' Highway Materials and Pavement Testing', Nem Chand& Bros, Fifth Edition

- Various related updated & recent standards of BIS, IRC, ASTM, RILEM, AASHTO, etc. corresponding to materialsused for Civil Engineering applications
- Kyriakos Komvopoulos (2011), Mechanical Testing of Engineering Materials, Cognella
- E.N. Dowling (1993), Mechanical Behaviour of Materials,Prentice Hall International Edition
- American Society for Testing and Materials (ASTM), *Annual Book of ASTM Standards* (post 2000)

Guidelines for ICA

The student must perform all the above mentioned practical and submit in the form of journal.
Site visit is desirable.
assignment: Students must learn concrete mix design by IS method.

Guidelines for ESE

the ESE must be in the form of oral examination. The student must be able to answer questions based upon the journal submitted by him/her, site visit report and the assignment.

As per AICTE guidelines

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Second Year Engineering

(Civil Engineering)

Faculty of Science and Technology

'A' Grade
NAAC Re-Accredited
(3rd Cycle)

COURSE OUTLINE

Semester - IV

W.E.F. 2018 – 19

Syllabus Structure for Second Year Engineering (Semester – IV) (Civil)

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical/Oral		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Mathematic III	B	3	1	-	4	40	60	-	-	100	4
Computer Aided Civil Engineering Drawing	C	3	-	-	3	40	60	-	-	100	3
Introduction to Fluid Mechanics	D	3	-	-	3	40	60	-	-	100	3
Introduction to Solid Mechanics	D	3	-	-	3	40	60	-	-	100	3
Civil Engineering – Societal & Global Impact	A	3	-	-	3	40	60	-	-	100	3
Computer Aided Civil Engineering Drawing Lab	C	-	-	2	2	-	-	-	-	-	1
Introduction to Fluid Mechanics Lab	D	-	-	2	2	-	-	25	25 OR	50	1
Material, Testing & Evaluation Lab II	D	-	-	2	2	-	-	25	25 OR	50	1
Engineering Geology	D	1	-	2	3	-	-	25	25 PR	50	2
Environmental Science*	H	-	-	-	-	20	80	-	-	100	-
		16	**1**	**8**	**25**	**200**	**300**	**75**	**75**	**650**	**21**

* Only for students coming laterally (after diploma)

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA: Internal Continuous Assessment**

MATHEMATICS-III					
COURSE OUTLINE					
Course Title:	**Mathematics –III**	**Short Title:**	**M-III**	**Course Code:**	BSC201

Course description:

This course is aimed at introducing the fundamentals of basic Mathematics to undergraduate students. The background expected includes a prior knowledge of Mathematics from first year engineering or diploma and familiarity with various laws, principles and theories of probability and statistics. The goals of the course are to understand the basic principle of Transforms, probability, statistics and its application in Engineering Field.

Lecture 03	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	4	10	40	3
Tutorial 01	1	14	14	1

Prerequisite course(s): 11^{th}& 12^{th} mathematics

Course objectives:

The objective of this course is to familiarize the prospective engineers with techniques in Laplace Transform , Fourier and Z-transform. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their discipline

Course outcomes:

After successful completion of this course, Students will be able to solve field problems in engineering involving ordinary differential equations using Laplace Transform. They can also formulate and solve problems involving random variables and apply statistical methods for analyzing experimental data.

COURSE CONTENT			
Mathematics -II1		**Semester:**	**IV**
Teaching Scheme:		**Examination scheme**	
Lectures:03	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
Tutorial:01		**Duration of ESE:**	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Laplace Transform: Properties of Laplace Transform, Inverse Laplace transform, Convolution theorem. Evaluation of integrals by Laplace transform, solving ordinary differential equations by Laplace Transform.

Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**

Fourier Transform and Z-transform

Fourier sine and cosine integrals, Fourier sine transform, Fourier cosine transform, Inverse Fourier transform.

Z – Transform**:** Definition, Region of convergence, Properties of Z-Transform, Inverse Z-Transform.

Unit–III:	**No. of Lectures:08 Hours**	**Marks: 12**

Basic Statistics:

Introduction to measures of central tendency, Moments, skewness and Kurtosis, Correlation and regression, Binomial, Poisson and Normal distributions.

Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**

Applied Statistics:

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and exponential curves,

Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means.

Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**

Small samples:

Small sample test for single mean, difference of means , test for ratio of variances, F-test for equality of population variances, Chi-square test for goodness of fit and independence of attributes.

Text Books

(i) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010,2016

(ii) H.K.DASS "Advance Engineering Mathematics" S. Chand publications. Fifteenth revised edition 2006.

(iii) S. C. Gupta "Fundamentals of Statistics", Himalaya Publishing House ,sixth revised edition 2008.

(iv) Debashis Datta "Textbook of Engineering Mathematics'' 'New Age International Publication. Revised second edition

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Reference Books :

(i) G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.

(ii) Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006..

(iii) Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

(iv) Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

(v) B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.

<table>
<tr><td colspan="7">Computer-aided Civil Engineering Drawing</td></tr>
<tr><td colspan="7"></td></tr>
<tr><td colspan="7">COURSE OUTLINE</td></tr>
<tr><td>Course Title:</td><td colspan="2">Computer-aided Civil Engineering Drawing</td><td>Short Title:</td><td>CAED</td><td>Course Code:</td><td></td></tr>
<tr><td></td><td colspan="2">Course description:</td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="7">This course introduces the student about concepts in building design and drawing such as building definition, types of building, principle of planning, building rules, regulations. The student also learns a graphic software, preferable Auto CAD to draw his ideas using computers.</td></tr>
<tr><td rowspan="2">Lecture</td><td>Hours/week</td><td>No. of weeks</td><td>Total hours</td><td colspan="3">Semester credits</td></tr>
<tr><td>03</td><td>14</td><td>42</td><td colspan="3">03</td></tr>
<tr><td colspan="7">Prerequisite course(s):</td></tr>
<tr><td colspan="7">Engineering graphics</td></tr>
<tr><td colspan="7">Course objectives:</td></tr>
<tr><td colspan="7">To introduce the student with the basics of computer graphics.
To introduce the students with the basics of building planning and construction.</td></tr>
<tr><td colspan="7"></td></tr>
<tr><td colspan="7">Course outcomes:</td></tr>
<tr><td colspan="7">The student will be able to work with a graphic assisting software student will also be able to develop a building plan, elevation, side view, site view and working drawing using software for a given set of specifications.</td></tr>
</table>

COURSE CONTENT				
		Semester:	*IV*	
Teaching Scheme:		**Examination scheme**		
Lectures:	**3 hours/week**	**End semester exam (ESE):**		**60 marks**
		Duration of ESE:		**03 hours**
		Internal Sessional Exams (ISE):		**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**
Building definition and types of building as per occupancy, principles of planning of residential buildings, building bye laws & its necessity. Ventilation: -Necessity of ventilation, systems of ventilation, Air conditioning: - Classification, comfort and comfort conditions, Fire protection: - Fire load, fire safety, fire escape elements. Building services: Its importance, constructional requirements for different building services-like electrical, Tele communication service & plumbing services : Layout of water supply and drainage system, one pipe and two pipe system, septic tank		
Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**
BUILDING DRAWING- Terms, Elements of planning building drawing, Methods of making line drawing and detailed drawing. Site plan, floor plan, elevation and section drawing of small residential buildings. Foundation plan. (load bearing or frame Structure)		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Planning and designing of Educational buildings, hostel buildings, library buildings, Hotels buildings, hospitals commercial complex buildings, bank buildings, post office buildings, (frame Structure only)		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**

Planning and designing of apartment houses(flats) (framed Structure only) Perspective view of building: one point and two point perspective drawings

Unit–V:	No. of Lectures: 08 Hours	Marks: 12
Introduction to concept of drawings, Interpretation of typical drawings, Planning drawings to show information concisely and comprehensively; optimal layout of drawings and Scales; Introduction to computer aided drawing, co-ordinate systems, reference planes. Commands: Initial settings, Drawing aids, Drawing basic entities, Modify commands, Layers, Text and Dimensioning, Blocks. Drawing presentation norms and standards. *SYMBOLS AND SIGN CONVENTIONS*: Materials, Architectural, Structural, Electrical and Plumbing symbols. Rebar drawings and structural steel		

Text Books:

- Building Drawing - M.G. Shah, C.M. Kale, S.Y. Patki - Tata Mcgraw Hills pvt. Ltd.New Delhi.
- Y.S.Sane - Planning & Designing Building.
- Building Science and Planning by S. V. Deodhar, Khanna Publihsers
- National building Codes.

Reference Books:

- Subhash C Sharma & Gurucharan Singh, “Civil Engineering Drawing”, Standard Publishers
- Ajeet Singh, “Working with Auto CAD”, Tata- Mc Graw-Hill Company Limited, New Delhi
- Sham Tickoo Swapna D, “AUTOCAD for Engineers and Designers”, Pearson Education,
- Venugopal, “Engineering Drawing and Graphics + AUTOCAD”, New Age International Pvt. Ltd.,
- Balagopal and Prabhu, “Building Drawing and Detailing”, Spades publishing KDR building, Calicut, (Corresponding set of) CAD Software Theory and User Manuals.
- Malik R.S., Meo, G.S. Civil Engineering Drawing, Computech Publication Ltd New Asian.
- Sikka, V.B., A Course in Civil Engineering Drawing, S.K.Kataria& Sons,

Introduction to Fluid Mechanics

COURSE OUTLINE

Course Title:	**Introduction to Fluid Mechanics**	**Short Title:**	*IFM*	**Course Code:**	

Course description:

This course provides the elementary level knowledge of fluid mechanics which includes Study of fluid properties, Fluid Statics and Kinematics and Dynamics of fluid flow. The course deals with theoretical concepts as well introduces with numerical approaches also.

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	3	14	42	3

Prerequisite course(s):

Mathematics

Course objectives:

- To learn fluid and flow properties
- To analyze and solve fluid problems under static and dynamic conditions.
- To know about measurement of pressure, computations of hydrostatic forces on structural components and the concepts of Buoyancy and find useful applications in many engineering problems.

Course outcomes:

After successful completion of this course the student will be able to:

- Understand the broad principles of fluid statics, kinematics and dynamics
- Understand definitions of the basic terms used in fluid mechanic
- Understand classifications of fluid flow

Introduction to Fluid Mechanics

COURSE CONTENT

		Semester:	**IV**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Basic Concepts and Definitions – fluid, scope and applications of fluid mechanics;Properties of fluid- Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity with temperature, Newton law of viscosity; vapour pressure, boiling point, cavitation; surface tension, capillarity, Bulk modulus of elasticity, compressibility

Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**

Fluid Statics - Fluid Pressure: Pressure at a point, Pascals law, pressure variation with temperature,. Piezometer, U-Tube Manometer, Single Column Manometer, U-Tube Differential Manometer, Micromanometers. pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Introduction to Buoyancy and stability of floating bodies only.(No mathematical treatment)

Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**

Fluid Kinematics- Classification of fluid flow : steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one, two and three dimensional flows; Stream line, path line, streak line and stream tube; stream function, velocity potential function. One and three -dimensional continuity equations in Cartesian coordinates

As per AICTE guidelines

Unit–IV:	No. of Lectures: 08 Hours	Marks: 12
Fluid Dynamics- forces acting on fluid in motion; Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; Practical applications of Bernoulli's equation : venturimeter and pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend; Dimensional Analysis and Dynamic Similitude - Definitions of Reynolds Number, Froude Number, Mach Number, Weber *Number and Euler Number; Buckingham's π-*Theorem.		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Flow through opening – Orifices-type,coefficient of velocity,contraction and discharge,small and large orifice ***Mouthpieces* –** Types,external cylindrical mouthpiece **Flows over notches and weirs(No Mathematical Treatment) –** Rectangular, triangular and trapezoidal notches and weirs,Cipolletti weir, empirical formulae for discharge over rectangular weirs, correction for velocity of approach and end contractions(**No Mathematical Treatment)**		
Text Books:		
• A Textbook of Fluid Mechanics and Hydraulic Machine by Dr. R K. Bansal,Laxmi Publication • A Textbook of Fluid Mechanics by P.V.Shrotri,Nirali Publication.		
Reference Books:		
• Hydraulics and Fluid Mechanics, P M Modi and S M Seth, Standard Book House • Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill • Fluid Mechanics by Dr. A. K. Jain, Khanna Publishers, Delhi		

INTRODUCTION TO SOLIDS MECHANICS					
COURSE OUTLINE					
Course Title:	**INTRODUCTION TO SOLIDS MECHANICS**	**Short Title:**	*ISM*	**Course Code:**	
Course description:					
Civil engineering is responsible for providing basic infra structure for various activities. Any infra structural facility is subjected to load. The role of an engineer is to provide the geometric section of the facility to sustain the load. For this, the engineer must know the behavior of the material under given load. This is studied under this subject.					
Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**	
	3	14	42	3	
Prerequisite course(s):					
-					
Course objectives:					
• To introduce to continuum mechanics and material modeling of engineering materials. • To appraise with first energy principles: deformation and strain; momentum balance, stress and stress states; elasticity and elasticity bounds; plasticity and yield design. • To introduce with the unified mechanistic language using thermodynamics, which allows understanding, modeling and design of a large range of engineering materials. • To understand the behavior of a member under equilibrium of forces.					

As per AICTE guidelines

<table>
<tr><td colspan="6">Course outcomes:</td></tr>
<tr><td colspan="6">On completion of the course, the student will be able to:
Describe the concepts and principles, understand the theory of elasticity including strain/displacement and Hooke’s law relationships; and perform calculations, relative to the strength and stability of structures and mechanical components;
Define the characteristics and calculate the magnitude of combined stresses in individual members and complete structures; analyze solid mechanics problems using classical methods and energy methods;
Analyze various situations involving structural members subjected to combined stresses by application of Mohr’s circle of stress; locate the shear center of thin wall beams;and
Calculate the deflection at any point on a beam subjected to a combination of loads; solve for stresses and deflections of beams under unsymmetrical loading; apply various failure criteria for general stress states at points; solve torsion problems in bars and thin walled members;</td></tr>
<tr><td colspan="6">Introduction to Solid Mechanics</td></tr>
<tr><td colspan="6" align="center">COURSE CONTENT</td></tr>
<tr><td colspan="2"></td><td colspan="2">Semester:</td><td colspan="2">IV</td></tr>
<tr><td colspan="2">Teaching Scheme:</td><td colspan="4">Examination scheme</td></tr>
<tr><td>Lectures:</td><td>3 hours/week</td><td colspan="3">End semester exam (ESE):</td><td>60 marks</td></tr>
<tr><td colspan="2" rowspan="2"></td><td colspan="3">Duration of ESE:</td><td>03 hours</td></tr>
<tr><td colspan="3">Internal Sessional Exams (ISE):</td><td>40 marks</td></tr>
<tr><td colspan="2" align="center">Unit–I:</td><td colspan="2" align="center">No. of Lectures: 08 Hours</td><td colspan="2" align="center">Marks: 12</td></tr>
<tr><td colspan="6">Simple Stresses and Strains- Concept of stress and strain, , Types of stresses and strains, Hooke’s law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson’s ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of varying section – composite bars – Temperature stresses. Strain Energy – Resilience – Gradual, sudden, impact loadings.</td></tr>
<tr><td colspan="2" align="center">Unit–II:</td><td colspan="2" align="center">No. of Lectures: 08 Hours</td><td colspan="2" align="center">Marks: 12</td></tr>
<tr><td colspan="6">Compound Stresses and Strains- Two dimensional system, stress at a point on a plane, principal</td></tr>
</table>

stresses and principal planes, Mohr circle of stress, ellipse of stress and their applications. Two dimensional stress-strain system, principal strains and principal axis of strain, circle of strain and ellipse of strain. Relationship between elastic constants		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Bending moment and Shear Force Diagrams- Bending moment (BM) and shear force (SF) diagrams.BM and SF diagrams for cantilevers simply supported and fixed beams with or without overhangs. Calculation of maximum BM and SF and the point of contra flexure under concentrated loads, uniformly distributed loads over the whole span or part of span, combination of concentrated loads (two or three) and uniformly distributed loads, uniformly varying loads, application of moments. Slope and deflection- Relationship between moment, slope and deflection, Moment area method, Macaulay's method. Use of these methods to calculate slope and deflection for determinant beams.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Flexural Stresses-Theory of simple bending – Assumptions – Derivation of bending equation: M/I = f/y = E/R - Neutral axis – Determination of bending stresses – Section modulus of rectangular and circular sections (Solid and Hollow), I section,T section, Angle and Channel sections – Design of simple beam sections. *Shear Stresses- Derivation of formula* – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Torsion- Derivation of torsion equation and its assumptions. Applications of the equation of the hollow and solid circular shafts, torsional rigidity, Combined torsion and bending of circular shafts, principal stress and maximum shear stresses under combined loading of bending and torsion. Analysis of close-coiled-helical springs. Thin Cylinders and Spheres- Derivation of formulae and calculations of hoop stress, longitudinal stress in a cylinder, and sphere subjected to internal pressures.		

Text Books:

- Kazmi, S. M. A., "Solid Mechanics" TMH, Delhi, India.
- Hibbeler, R. C. Mechanics of Materials. 6th ed. East Rutherford, NJ: Pearson Prentice Hall, 2004
- Crandall, S. H., N. C. Dahl, and T. J. Lardner. An Introduction to the Mechanics of Solids. 2nd ed. New York, NY: McGraw Hill, 1979
- Laboratory Manual of Testing Materials - William Kendrick Hall
- Mechanics of Materials - Ferdinand P. Beer, E. Russel Jhonston Jr., John T. DEwolf
  - TMH 2002.
- Strength of Materials by R. Subramanian, Oxford University Press,New Delhi.
- E. P .Popov - Mechanics of Solids
- V.L.Shah - Strength of Materials
- Ramamrutham - Strength of Materials

Reference Books:

- Timoshenko, S. and Young, D. H., "Elements of Strength of Materials", DVNC, New York, USA.

<table>
<tr><td colspan="6">CIVIL ENGINEERING- SOCIETAL AND GLOBAL IMPACT</td></tr>
<tr><td colspan="6"></td></tr>
<tr><td colspan="6">COURSE OUTLINE</td></tr>
<tr><td>Course Title:</td><td>Civil Engineering- societal and global impact</td><td>Short Title:</td><td>CESGI</td><td></td><td></td></tr>
<tr><td colspan="6">Course description:</td></tr>
<tr><td colspan="6">The course is designed to provide a better understanding of the impact which Civil Engineering has on the Society at large and on the global arena. Civil Engineering projects have an impact on the Infrastructure, Energy consumption and generation, Sustainability of the Environment, Aesthetics of the environment, Employment creation, Contribution to the GDP, and on a more perceptible level, the Quality of Life. It is important for the civil engineers to realise the impact which this field has and take appropriate precautions to ensure that the impact is not adverse but beneficial.</td></tr>
<tr><td rowspan="2">Lecture</td><td>Hours/week</td><td>No. of weeks</td><td>Total hours</td><td colspan="2">Semester credits</td></tr>
<tr><td>03</td><td>14</td><td>42</td><td colspan="2">3</td></tr>
<tr><td colspan="6">Prerequisite course(s):</td></tr>
<tr><td colspan="6">-</td></tr>
<tr><td colspan="6">Course objectives:</td></tr>
<tr><td colspan="6">To appreciate the student with the impact of development of civil engineering on the changing lifestyle, environmental degradation, resource depletion, economic stresses etc.
To appraise the students about the significance of sustainability.</td></tr>
<tr><td colspan="6"></td></tr>
</table>

Course outcomes:

- After successful completion of this course the student will be able to know:
- The impact which Civil Engineering projects have on the Society at large and on the global arena and using resources efficiently and effectively.
- The extent of Infrastructure, its requirements for energy and how they are met: past, present and future
- The Sustainability of the Environment, including its Aesthetics,
- The potentials of Civil Engineering for Employment creation and its Contribution to the GDP
- The Built Environment and factors impacting the Quality of Life.
- The precautions to be taken to ensure that the above-mentioned impacts are not adverse but beneficial.
- Applying professional and responsible judgment and take a leadership role;

COURSE CONTENT

Civil Engineering- societal and global impact		**Semester:**	**IV**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Introduction to Course and Overview; Understanding the past to look into the future: Pre-

industrial revolution days, Agricultural revolution, first and second industrial revolutions, IT revolution; Recent major Civil Engineering breakthroughs and innovations; Present day world and future projections, Ecosystems in Society and in Nature; the steady erosion in Sustainability; Global warming, its impact and possible causes; Evaluating future requirements for various resources; GIS and applications for monitoring systems; Human Development Index and Ecological Footprint of India Vs other countries and analysis;		
Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**
Understanding the importance of Civil Engineering in shaping and impacting the world; The ancient and modern Marvels and Wonders in the field of Civil Engineering; Future Vision for Civil Engineering Infrastructure - Habitats, Megacities, Smart Cities, futuristic visions; Transportation (Roads, Railways & Metros, Airports, Seaports, River ways, Sea canals, Tunnels (below ground, under water); Futuristic systems (ex, Hyper Loop)); Energy generation (Hydro, Solar (Photovoltaic, Solar Chimney), Wind, Wave, Tidal, Geothermal, Thermal energy); Water provisioning; Telecommunication needs (towers, above-ground and underground cabling); Awareness of various Codes & Standards governing Infrastructure development; Innovations and methodologies for ensuring Sustainability;		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Environment- Traditional & futuristic methods; Solid waste management, Water purification, Wastewater treatment & Recycling, Hazardous waste treatment; Flood control (Dams, Canals, River interlinking), Multi-purpose water projects, Atmospheric pollution; Global warming phenomena and Pollution Mitigation measures, Environmental Metrics & Monitoring; Other Sustainability measures; Innovations and methodologies for ensuring Sustainability.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Built environment – Facilities management, Climate control; Energy efficient built environments and LEED ratings, Recycling, Temperature/ Sound control in built environment, Security systems; Intelligent/ Smart Buildings; Aesthetics of built environment, Role of Urban Arts Commissions; Conservation, Repairs & Rehabilitation of Structures & Heritage structures;		

Innovations and methodologies for ensuring Sustainability		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Civil Engineering Projects – Environmental Impact Analysis procedures; Waste (materials, manpower, equipment) avoidance/ Efficiency increase; Advanced construction techniques for better sustainability; Techniques for reduction of Green House Gas emissions in various aspects of Civil Engineering Projects; New Project Management paradigms & Systems (Ex. Lean Construction), contribution of Civil Engineering to GDP, Contribution to employment(projects, facilities management), Quality of products, Health & Safety aspects for stakeholders; Innovations and methodologies for ensuring Sustainability during Project development		
Text Books:		
Reference Books:		

- *Ž iga* Turk (2014), Global Challenges and the Role of Civil Engineering, Chapter 3 in: Fischinger M. (eds) Performance-Based Seismic Engineering: Vision for an Earthquake Resilient Society. Geotechnical, Geological and Earthquake Engineering, Vol. 32. Springer, Dordrecht
- Brito, Ciampi, Vasconcelos, Amarol, Barros (2013) Engineering impacting Social, Economical and Working Environment, 120th ASEE Annual Conference and Exposition
- NAE Grand Challenges for Engineering (2006), Engineering for the Developing World, The Bridge, Vol 34, No.2, Summer 2004.
- Allen M. (2008) Cleansing the city. Ohio University Press. Athens Ohio.
- Ashley R., Stovin V., Moore S., Hurley L., Lewis L., Saul A. (2010). London Tideway Tunnels Programme – Thames Tunnel Project Needs Report – Potential source control and SUDS applications: Land use and retrofit options
- http://www.thamestunnelconsultation.co.uk/consultation-documents.aspx
- Ashley R M., Nowell R., Gersonius B., Walker L. (2011). Surface Water Management and Urban Green Infrastructure. Review of Current Knowledge. Foundation for Water

Research FR/R0014

- Barry M. (2003) Corporate social responsibility – unworkable paradox or sustainable paradigm? Proc ICE Engineering Sustainability 156. Sept Issue ES3 paper 13550. p 129-130
- Blackmore J M., Plant R A J. (2008). Risk and resilience to enhance sustainability with application to urban water systems. J. Water Resources Planning and Management. ASCE. Vol. 134, No. 3, May.

  - Bogle D. (2010) UK's engineering Council guidance on sustainability. Proc ICE Engineering Sustainability 163. June Issue ES2 p61-63
  - Brown R R., Ashley R M., Farrelly M. (2011). Political and Professional Agency Entrapment: An Agenda for Urban Water Research. Water Resources Management. Vol. 23, No.4. European Water Resources Association (EWRA) ISSN 0920-4741.

<table>
<tr><td colspan="6">Computer-aided Civil Engineering Drawing Lab</td></tr>
<tr><td colspan="6"></td></tr>
<tr><td colspan="6">LAB COURSE OUTLINE</td></tr>
<tr><td>Course Title:</td><td>Computer-aided Civil Engineering Drawing Lab</td><td>Short Title:</td><td>CAED</td><td>Course Code:</td><td></td></tr>
<tr><td colspan="6">Course description:</td></tr>
<tr><td colspan="6">This course gives a practical exposure to the student regarding use of building palling principles in actual drawing of variety of residential buildings. It also trains the students regarding use of drafting assisting software.</td></tr>
</table>

<table>
<tr><td rowspan="2">Laboratory</td><td>Hours/week</td><td>No. of weeks</td><td>Total hours</td><td>Semester credits</td></tr>
<tr><td>02</td><td>14</td><td>28</td><td>1</td></tr>
<tr><td colspan="5">Prerequisite course(s):</td></tr>
<tr><td colspan="5">Engineering graphics</td></tr>
<tr><td colspan="5">Course objectives:</td></tr>
<tr><td colspan="5">• To train the student in drafting assisting software.
• To enable the student to use the elements of building planning to draw a residential building</td></tr>
<tr><td colspan="5"></td></tr>
<tr><td colspan="5">Course outcomes:</td></tr>
<tr><td colspan="5">• To develop graphical skills for communicating concepts, ideas and designs of engineering products.
• To have ability to understand another person’s designs.
• To get exposure to national standards relating to technical drawings.
• To have practice of using Computer Aided Drafting using popular software.</td></tr>
</table>

LAB COURSE CONTENT			
Computer-aided Civil Engineering Drawing Lab		**Semester:**	*IV*
Teaching Scheme:		**Examination scheme**	
Practical	**2 hours/week**	**End semester exam (ESE):**	**25 marks**
		Internal Sessional Exams (ISE):	**25 marks**

List of Drawing Experiments –

1. Sketching a simple residential house with given specifications. Sketch should include plan, elevation, side view, and site plan.
2. Drawing the above-mentioned plan using CAD software, showing furniture detials.
3. Showing electricity supply lines and plumbing lines in the plan using CAD software.
4. Developing foundation/column plan of the building CAD software.
5. Preparing working drawing of the building CAD software.
6. Preparing perspective drawing of the building CAD software.

Preparing line plans of one of the public building like school, college, hospital, bank, etc.

Students should learn some open source software to develop 3D structural model and do an assignment on it.

Text Books:

- Building Drawing - M.G. Shah, C.M. Kale, S.Y. Patki - Tata Mcgraw Hills pvt. Ltd.New Delhi.
- Y.S.Sane - Planning & Designing Building.
- Building Science and Planning by S. V. Deodhar, Khanna Publihsers
- National building Code

Reference Books:
• Subhash C Sharma & Gurucharan Singh, "Civil Engineering Drawing", Standard Publishers • Ajeet Singh, "Working with Auto CAD", Tata- Mc Graw-Hill Company Limited, New Delhi • Sham Tickoo Swapna D, "AUTOCAD for Engineers and Designers", Pearson Education, • Venugopal, "Engineering Drawing and Graphics + AUTOCAD", New Age International Pvt. Ltd., • Balagopal and Prabhu, "Building Drawing and Detailing", Spades publishing KDR building, Calicut, (Corresponding set of) CAD Software Theory and User Manuals. • Malik R.S., Meo, G.S. Civil Engineering Drawing, Computech Publication Ltd New Asian. • Sikka, V.B., A Course in Civil Engineering Drawing, S.K.Kataria& Sons,
Guidelines for ICA
The ICA should be a continuous assessment throughout the semester based upon the list of experiments the student has to perform in the laboratory.
Guidelines for ISE
There must be a Oral exam based upon the list of experiments the student has performed in the laboratory.

<table>
<tr><td colspan="6">Introduction to Fluid Mechanics Lab</td></tr>
<tr><td colspan="6"></td></tr>
<tr><td colspan="6">LAB COURSE OUTLINE</td></tr>
<tr><td>Course Title:</td><td>Introduction to Fluid Mechanics Lab</td><td>Short Title:</td><td>IFML</td><td>Course Code:</td><td></td></tr>
<tr><td colspan="6">Course description:</td></tr>
<tr><td colspan="6">This course provides an exposure to laboratory set up required for fluid characterization. It introduces with the methods of determination of basic properties of fluids required from civil engineering perspective.</td></tr>
</table>

<table>
<tr><td rowspan="2">Lecture</td><td>Hours/week</td><td>No. of weeks</td><td>Total hours</td><td>Semester credits</td></tr>
<tr><td>2</td><td>14</td><td>28</td><td>1</td></tr>
<tr><td colspan="5">Prerequisite course(s):</td></tr>
<tr><td colspan="5">Mathematics</td></tr>
<tr><td colspan="5">Course objectives:</td></tr>
<tr><td colspan="5">• To enable the student dealing with fluids in laboratory
• To characterize fluids and to determine their important civil engineering properties.</td></tr>
<tr><td colspan="5"></td></tr>
<tr><td colspan="5">Course outcomes:</td></tr>
<tr><td colspan="5">After successful completion of this course the student will be able to:
o Understand the basic instrumental techniques used in fluid mechanics.
o Understand how to characterize fluids
o Be able to determine basic engineering properties of fluids.</td></tr>
</table>

LAB COURSE CONTENT			
Introduction to Fluid Mechanics Lab		**Semester:**	**IV**
Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**	**End semester exam (ESE):**	**25 marks**
		Internal Continuous assessment (ICA)	**25 marks**

LIST OF PRACTICAL- Any seven experiments should be performed.

- Measurement of viscosity
- Study of Pressure Measuring Devices
- Stability of Floating Body
- Hydrostatics Force on Flat Surfaces/Curved Surfaces
- Verification of Bernoulli's Theorem
- Venturimeter
- Orifice meter
- Impacts of jets

Text Books:

- http://geeta.edu.in/Mechanical_Data/labmanual/Fluid%20Mechanics%20lab%20manual.pdf

Reference Books:

- -

Guide lines for ICA

The ICA work shall include the list of experiments to be performed in the laboratory. The students may be asked to do suitable assignments also specially for practicing on

numerical problems.
Guide lines for ESE
The ESE shall be Oral examination, based upon the ICA submission file submitted by the students.

Materials, Testing & Evaluation II Lab					
LAB COURSE OUTLINE					
Course Title:	**Materials, Testing & Evaluation II Lab**	**Short Title:**	**MTE II**	**Course Code:**	
Course description:					
Civil engineering uses a variety of materials for a variety of construction works. Testing of soil is very crucial in civil engineering as it assists in deciding the foundation design. The testing of highway payment materials is also an important aspect include in this syllabus.					

	Hours/week	**No. of weeks**	**Total hours**	**Semester credits**
Laboratory	2	14	28	1

Prerequisite course(s):
-
Course objectives:
• To train the student to characterize the civil engineering materials. • To confirm the material suitability for variety of construction works as per relevant IS specifications; with special focus on soil testing and flexible pavement material testing.
Course outcomes:
The student must: • Know the relevant IS specifications for soils and flexible pavement materials. • Must be able to characterize variety of soils and flexible pavement materials.

<table>
<tr><td colspan="4"></td></tr>
<tr><td colspan="4"></td></tr>
<tr><td colspan="4" align="center">LAB COURSE CONTENT</td></tr>
<tr><td colspan="2">Materials, Testing & Evaluation II Lab</td><td>Semester:</td><td>IV</td></tr>
<tr><td colspan="2">Teaching Scheme:</td><td colspan="2">Examination scheme</td></tr>
<tr><td rowspan="2">Practical</td><td rowspan="2">2 hours/week</td><td>End semester exam (ESE):</td><td>25</td></tr>
<tr><td>Internal Continuous Assessment (ICA)</td><td>25</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td colspan="4" align="center">List of Practical</td></tr>
<tr><td colspan="4">Tests on bitumen:
• Penetration test, ductility of bitumen test, softening point test, flash and fire point test, viscosity of bitumen, specific gravity of bitumen, bitumen extraction test on premix sample.
• Bitumen mix design.
• Assignment on design on flexible pavement and rigid pavement.
• Visit to hot mix plant, or/and road construction site.
Tests on soil (any five):
• Sieve analysis, plastic limit, liquid limit, shrinkage limit
• Permeability test,
• Vane shear test.
• Determination of BC by Terzaghi’s Method.
• Study of Plate Load Test/SPT Test.
• Soil consolidation test.</td></tr>
<tr><td colspan="4">Text Books</td></tr>
<tr><td colspan="4">• Basic and Applied Soil Mechanics, A S R Rao, Wiley Eastern Publication.
• Soil Mechanics and Foundation, P N Modi, Standard Book House publications.</td></tr>
</table>

• Highway Engineering: Pavements, Materials and Control of Quality, Athanassios Nikolaides, CRC publications.
Reference Books:
-
Guidelines for ICA
The student must perform all the above mentioned practical and submit in the form of journal. Site visit is desirable.
Guidelines for ESE
The ESE must be in the form of oral examination. The student must be able to answer questions based upon the journal submitted by him/her, site visit report and the assignment.

Engineering Geology Lab					
LAB COURSE OUTLINE					
Course Title:	**Engineering Geology Lab**	**Short Title:**	*EG*	**Course Code:**	
Course description:					
This course is designed to enable students to evaluate, apply and to analyze the relevant geological principles. In this course the related topics on rock type, classification, geological structures and geological processes are covered .The principles of structural geology are introduced mainly to highlight the relevancy of engineering properties of geological materials in designing rock engineering projects. At the end of the course students ,acquainted with related knowledge and principles in geology and can be able to apply these knowledge and principle in designing safe and economic engineering structures in rock masses.					

	Hours/week	No. of weeks	Total hours	Semester credits
Theory	01	14	14	02
Laboratory	*02*	*14*	*28*	2

Prerequisite course(s):
-
Course objectives:

- To focus on the core activities of engineering geologists – site characterization and geologic hazard identification and mitigation.
- To be able to couple geologic expertise with the engineering properties of rock and unconsolidated materials.
- To be able to explore geologic sites for civil work projects and the quantification of

processes such as rock slides, soil-slope stability, settlement, and liquefaction.

- To understand the collection, analysis, and interpretation of geological data and information required for the safe development of civil works.
- To be able in assessment and mitigation of geologic hazards such earthquakes, landslides, flooding; the assessment of timber harvesting impacts; and groundwater remediation and resource evaluation.

Course outcomes:

After successful completion of this course the student will be able to:

- Site characterization and how to collect, analyze, and report geologic data using standards in engineering practice
- The fundamentals of the engineering properties of Earth materials and fluids.
- Rock mass characterization and the mechanics of planar rock slides and topples.
- Soil characterization and the Unified Soil Classification System.
- The mechanics of soils and fluids and their influence on settlement, liquefaction, and soil slope stability.

LAB COURSE CONTENT

Engineering Geology Lab		**Semester:**	*IV*
Teaching Scheme:		**Examination scheme**	
Theory:	**1 hours/week**	**End semester exam (ESE):**	**25**
Practical:	**2 hours/week**	**Internal Sessional Exams (ICA:**	**25**

Mineralogy- Mineral, Origin and composition. Physical properties of minerals, Rock forming minerals, megascopic identification of common primary & secondary minerals. Felic and mafic , essentional and accessories minerals.

Petrology-Rock forming processes.. Chemical and Mineralogical Composition. Texture and structures , classification. Sedimentary petrology- mode of formation, Mineralogical Composition. Texture and its types, Structures, Gradation of Clastic rocks. Classification of sedimentary rocks and their characteristics., Metamorphic petrology- Agents and types of metamorphism, metamorphic grades, Mineralogical composition, structures in metamorphic rocks. Important Distinguishing features of rocks as Rock cleavage, Schistosity, Foliation. Classification.

Physical Geology- Weathering. Erosion and Denudation. Factors affecting weathering and product of weathering: Geological action of river , river stages and its characters , Water fall and Gorges, River meandering, river rejuvenation.

Structural Geology Dip and Strike. Outcrop and width of outcrop. Inliers and Outliers. Main types of discontinuities according to size. Fold- Types and nomenclature, Criteria for their recognition in field. Faults: Classification, recognition in field, effects on outcrops. Joints & Unconformity; Types, geotechnical importance. Importance of structural elements in engineering operations. Consequences of failure as land sliding, Earthquake and Subsidence. Strength of Igneous rock structures.

Geology of dam and reservoir site- Required geological consideration for selecting dam and reservoir site. Failure of Reservoir. Favorable & unfavorable conditions in different types of rocks in presence of various structural features, precautions to be taken to counteract unsuitable conditions, significance of discontinuities on the dam site and treatment giving to such structures. Dams on various rocks and geological structures and its engineering imporantance .

Geological Hazards- Rock Instability and Slope movement: Concept of sliding blocks. Different controlling factors. Instability in vertical rock structures and measures to prevent collapse. . Types of landslide. Prevention by surface drainage, slope reinforcement by Rock bolting and Rock anchoring, retaining wall, Slope treatment

. **Following experiments are to be performed. Term works shall consist of journal giving details of the experiments performed.**

- Identification of following minerals in hand specimens.

  Quartz and its varieties, common varieties of cryptocrystalline and amorphous silica, orthoclase, plagioclase, muscovite, biotite, zeolites, calcite, gypsum, fluorite, barites, tourmaline, beryl, asbestos, talc, kyanite, garnet, galena, magnetite, haematite, limonite, iron pyrites, chromite, bauxite.

a. To know chemical composition of mineral.
b. To know Mohs Scale of Hardness of standard minerals.
c. To identify color, streak, cleavage, fracture, luster, hardness, crystal form etc.

d. To identify special property of mineral

e. Identify mineral name based on physical properties.

- Identification of following different rock types in hand specimens.

  Granites, Syenites, Diorites, Gabbros, Rhyolites, Trachytes, Andesites, Basalts, Varieties of Deccan Trap rock, Volcanic breccias, Pegmatites, Dolerites, Graphic granites, Laterites, Bauxites, Conglomrates, Breccias, Sand stones, Quatzites, Grits, Arkose, Shales, Chemical and organic lime stone. Marbles, Quartzites, Varieties of Gneisses, Slates, Phyllites and varieties of Schists.

  a. To know colour, texture/structure of rock specimen
  b. To identify mineral composition of rock specimen
  c. Based on mineral composition classify rock specimen.
  d. Identify rock name based on properties.

- Construction of geological section from contoured geological maps.
  a. To draw geological section from geological contour map.
  b. To identify various structural features such faults, folds, joints, dykes etc. from the section.
  c. To identify the nature of topography below the ground level.
- Interpreting geological features without drawing section
  a. To identify geological features without drawing section
  b. Identifying faults, folds, joints, divisional planes etc.
- Solution of engineering geological problems such as alignment of dam, tunnels, roads, canals, bridges, etc. based on geological maps.
  a. To draw the geological section from contour geological map
  b. To find out the solution of geological problems based on geological maps.
  c. To find the alternative solution or exact solution related to geological problems.

- Logging of drill core and interpretation of drilling data with graphical representation of core log.
  a. To represent the Core-Box data in the form of Core-log & representing the same in the form of Graph by using Litholog OR
  b. To solve Numerical based on core data with graphical representation of core-log.

- One site visit is desirable to study geology and its engineering applications, submission of field report.

Text Books:

- .Engineering and General Geology, Parbin Singh, 8th Edition (2010), S K Kataria & Sons.
- Text Book of Engineering Geology, N. Chenna Kesavulu, 2^{nd} Edition (2009), Macmillan Publishers India.
- Geology for Geotechnical Engineers, J.C.Harvey, Cambridge University Press (1982).

Reference Books:

- R.B. Gupte : A Text Book of Engineering Geology -P.V.G. Publications, Pune.
- M. Anji Reddy : A Text Book of Remote Sensing and Geographical Information Systems by 2nd Edition B S Publication.
- R.Legget : Geology and Engineering - McGraw Hill Book Co., London.
- Arthur Holmes : Physical Geology -ELBS Publication.
- Tony Waltham : Fundamentals of Engineering Geology, SPON Press.
- J.M. Treteth : Geology of Engineers, Princeton, Von. Nostrand.
- K V G K Gokhale : Text Book of Engineering Geology, B S Publication

Guidelines for ICA

The ICA should be a continuous assessment throughout the semester based upon the list of experiments the student has to perform in the laboratory.

Guidelines for ISE

There must be a Oral examination based upon the list of experiments the student has performed during the session.

<table>
<tr><td colspan="6" align="center">Environmental Sciences</td></tr>
<tr><td colspan="6"></td></tr>
<tr><td colspan="6" align="center">COURSE OUTLINE</td></tr>
<tr><td>Course Title:</td><td>Environmental Studies</td><td>Short Title:</td><td>EVS</td><td>Course Code:</td><td>Non Credit</td></tr>
<tr><td colspan="6">Course description:</td></tr>
<tr><td colspan="6">The course aims to percolate the importance of environmental science and environmental studies.</td></tr>
</table>

<table>
<tr><td colspan="3" align="center">COURSE CONTENT</td></tr>
<tr><td>Environmental Studies</td><td>Semester:</td><td>IV</td></tr>
<tr><td rowspan="4"></td><td colspan="2">Examination scheme</td></tr>
<tr><td>End Semester Exam (ESE):</td><td>80 marks</td></tr>
<tr><td>Duration of ESE:</td><td>03 hours</td></tr>
<tr><td>Internal Continuous Assessment (ICA):</td><td>20 marks</td></tr>
</table>

<table>
<tr><td align="center">Unit–I:</td><td align="center">No. of Lectures: 02 Hours</td><td></td></tr>
<tr><td colspan="3">Multidisciplinary nature of environmental studies
Definition, scope and importance Need for public awareness.</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td align="center">Unit–II:</td><td align="center">No. of Lectures: 08 Hours</td><td></td></tr>
<tr><td colspan="3">Natural Resources :
Renewable and non-renewable resources
Natural resources and associated problems.
a. Forest resources : Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.</td></tr>
</table>

b. Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c. Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d. Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. e. Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies. f. Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification. • Role of an individual in conservation of natural resources. • Equitable use of resources for sustainable lifestyles.		
Unit–III:	**No. of Lectures: 06 Hours**	
Ecosystems • Concept of an ecosystem. • Structure and function of an ecosystem. • Producers, consumers and decomposers. • Energy flow in the ecosystem. • Ecological succession. • Food chains, food webs and ecological pyramids. • Introduction, types, characteristic features, structure and function of thefollowing ecosystem :- a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)		
Unit–IV:	**No. of Lectures: 08 Hours**	
Biodiversity and its conservation		

- Introduction – Definition : genetic, species and ecosystem diversity.
- Biogeographic classification of India
- Value of biodiversity : consumptive use, productive use, social, ethical, aestheticand option values
- Biodiversity at global, National and local levels.
- India as a mega-diversity nation
- Hot-sports of biodiversity.
- Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India
- Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.

Unit–V:	**No. of Lectures: 08 Hours**	

Environmental Pollution

Definition

- Cause, effects and control measures of :-
  a. Air pollution
  b. Water pollution
  c. Soil pollution
  d. Marine pollution
  e. Noise pollution
  f. Thermal pollution
  g. Nuclear hazards
- Solid waste Management : Causes, effects and control measures of urban andindustrial wastes.
- Role of an individual in prevention of pollution.
- Pollution case studies.
- Disastermanagement : floods, earthquake, cyclone and landslides.

Unit–VI:	**No. of Lectures: 07 Hours**	

Social Issues and the Environment

- From Unsustainable to Sustainable development

- Urban problems related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. CaseStudies
- Environmental ethics : Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear
- accidents and holocaust. Case Studies.
- Wasteland reclamation.
- Consumerism and waste products.
- Environment Protection Act.
- Air (Prevention and Control of Pollution) Act.
- Water (Prevention and control of Pollution) Act
- Wildlife Protection Act
- Forest Conservation Act
- Issues involved in enforcement of environmental legislation.
- Public awareness.

Unit–VII:	No. of Lectures: 06 Hours	

Human Population and the Environment

- Population growth, variation among nations.
- Population explosion – Family Welfare Program
- Environment and human health.
- Human Rights.
- Value Education.
- HIV/AIDS.
- Women and Child Welfare.
- Role of Information Technology in Environment and human health.
- Case Studies.

Unit–VIII:	No. of Lectures:	

Field work

- Visit to a local area to document environmental assets, river/forest/grassland/hill/mountain

- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc. (Field work Equal to 5lecture hours)

Guide lines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Reference Books:

- Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
- BharuchaErach, The Biodiversity of India, Mapin Publishing Pvt. Ltd.,Ahmedabad – 380 013, India, Email:mapin@icenet.net (R)
- Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
- Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
- Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001,Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
- De A.K., Environmental Chemistry, Wiley Eastern Ltd.
- Down to Earth, Centre for Science and Environment (R)
- Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev.,Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
- Hawkins R.E., Encyclopedia of Indian Natural History, Bombay NaturalHistory Society, Bombay (R)
- Heywood, V.H &Waston, R.T. 1995. Global Biodiversity Assessment.Cambridge Univ. Press 1140p.
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NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Second Year Engineering

(Computer Engineering / Information Technology)

Faculty of Science and Technology

'A' Grade
NAAC Re-Accredited
(3rd Cycle)

SYLLABUS STRUCTURE

Semester – III & IV

W.E.F. 2018 – 19

Syllabus Structure for Second Year Engineering (Semester – III) (Computer Engineering and Information Technology)

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Mathematics – III	B	3	1	-	4	40	60	-	-	100	4
Signals and Systems	C	3	-	-	3	40	60	-	-	100	3
Analog Electronic Circuits	C	3	-	-	3	40	60	-	-	100	3
Discrete Mathematics	D	3	-	-	3	40	60	-	-	100	3
Organizational Behavior	A	3	-	-	3	40	60	-	-	100	3
Analog Electronic Circuits Lab	C	-	-	2	2	-	-	25	25 (PR)	50	1
Discrete Mathematics Lab	D	-	-	2	2			25	25 (PR)	50	1
Object Oriented Programming Lab	D	1	-	2	3	-	-	25	25 (PR)	50	2
		16	**1**	**6**	**23**	**200**	**300**	**75**	**75**	**650**	**20**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA: Internal Continuous Assessment**

Syllabus Structure for Second Year Engineering (Semester – IV) (Computer Engineering and Information Technology)

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Biology	B	3	1	-	4	40	60	-	-	100	4
Digital Electronics	C	3	-	-	3	40	60	-	-	100	3
Data structure & Algorithms	D	3	-	-	3	40	60	-	-	100	3
Computer Organization & Architecture	D	3	-	-	3	40	60	-	-	100	3
Finance & Accounting	A	3	-	-	3	40	60	-	-	100	3
Digital Electronics Lab	C	-	-	2	2	-	-	-	-	-	1
Data structure & Algorithms Lab	D	-	-	2	2	-	-	25	25 (PR)	50	1
Computer Organization & Architecture Lab	D	-	-	2	2	-	-	25	25 (PR)	50	1
IT Workshop	D	1	-	2	3	-	-	25	25 (PR)	50	2
Environmental Studies*	H	-	-	-	-	-	80	20	-	-	-
		16	**1**	**8**	**25**	**200**	**300**	**75**	**75**	**650**	**21**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA: Internal Continuous Assessment**

* Only for Direct S.E. Admitted Students

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Second Year Engineering

(Computer Engineering / Information Technology)

Faculty of Science and Technology

'A' Grade
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(3rd Cycle)

COURSE OUTLINE

Semester - III

W.E.F. 2018 – 19

MATHEMATICS-III

COURSE OUTLINE

Course Title:	**MATHEMATICS-III**	**Short Title:**	**M-III**	**Course Code:**	

Course description:

This course is aimed at introducing the fundamentals of basic Mathematics to undergraduate students. The background expected includes a prior knowledge of Mathematics from first year engineering or diploma and familiarity with various laws, principles and theories of probability and statistics. The goals of the course are to understand the basic principle of Transforms, probability, statistics and its application in Engineering Field.

	Hours/week	**No. of weeks**	**Total hours**	**Semester credits**
Lecture	3	14	42	4
Tutorial	1	14	14	

Prerequisite course(s):

Mathematics –I , Mathematics –II

Course objectives:

1. To familiarize the prospective engineers with techniques in Basic Transforms.
2. To equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines

Course outcomes:

After successful completion of this course the students should be able to

1. Solve field problems in engineering involving Ordinary differential equations using Laplace Transform.
2. To formulate and solve problems involving random variables
3. To statistical methods for analyzing experimental data.

COURSE CONTENT

Mathematics -III		**Semester:**	**III**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
Tutorial:	**1 hours/week**	**Duration of ESE:**	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Laplace Transform: Properties of Laplace Transform, Laplace transform of some important functions. Initial value theorem, final value theorem. Finding inverse Laplace transform by different methods, convolution theorem, Evaluation of integrals, solving Ordinary differential equations. by Laplace transform.

Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**

Fourier Transform:

Fourier sine and cosine integrals, Fourier sine Transform, Fourier cosine Transform, Inverse Fourier transform. Discrete Fourier Transform (DFT). Properties of DFT.		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Z – Transform:		
Introduction, Definition, Region of convergence, Properties of Z-Transform, Inverse Z-Transform, Difference equation using Z-Transform.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Basic Probability:		
Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables ,Addition Law of probability, Multiplication Law of probability, Expectation of Discrete Random Variables, Correlation coefficient. Binomial, Poisson and Normal distributions.		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Test of significance:		
Testing of Hypothesis, Null Hypothesis and Alternative Hypothesis. Level of Significance. Test of Significance of large sample, Small sample test for mean, testing for difference between means of two samples.		
Text Books :		
1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2016. 2. H.K.DASS "Advance Engineering Mathematics" S. Chand publications, 5th revised Edition 3. S. C. Gupta "Fundamentals of Statistics", Himalaya Publishing House, 6th revised Edition 4. Debashis Datta "Textbook of Engineering Mathematics'' New Age International Publication, revised 2ndEdition		
Reference Books:		
1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002. 2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006. 3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008. 4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010. 5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010. 6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000. 7. Chandrika Prasasd, Advanced Engineering Mathematics, (ISBN: 9789386173522) Khanna Book Publishing Co. (P) Ltd., Delhi 8. Sashtry, Advanced Engineering Mathematics (ISBN:9788120336094), PHI 9. S. Chakraborty & B.K. Sarkar, Discrete Mathematics and Its Applications, Oxford		

Signals & Systems					
COURSE OUTLINE					
Course Title:	**Signals & Systems**	**Short Title:**	**S&S**	**Course Code:**	

Course description:

Signals play a major role in our life and it can be represented in a number of ways. Signal processing is a method of extracting information from the signal which in turn depends on type of signal and the nature of information it carries.

This course describes the various signals with the help of mathematical tools such as Fourier Transform, Laplace Transform and Z-Transform. It also introduces the state space approach of system.

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	3	14	42	3

Prerequisite course(s):

Mathematics - II

Course objectives:

1. To introduce the students to the various signals.
2. Study and understanding of representation of signals and systems.
3. To learn and understand different Transforms for Digital Signal Processing
4. Analysis of Discrete Time signals and systems

Course outcomes:

After successful completion of this course the student will be able to:

1. Develop the ability for generating proper solution to signal processing problems.
2. Understanding Digital Signal Processing and analysis.
3. Understand the mathematical concepts of signal representation and transformations with their analysis.
4. Understand Digital Signal Processing Applications and implementation of signal processing to various applications

COURSE CONTENT

Signals & Systems		**Semester:**	**III**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Classifications of Signals and Systems (only Introduction)

Classifications of Signals-Deterministic and non-deterministic signals, periodic and aperiodic signals, even and odd signals, energy and power signals.

Singularity functions-unit impulse function, unit step function, unit ramp function, unit pulse function, representation of signals**.**

Classifications of Systems-Static and dynamic systems, linear and non-linear systems, time

variant and time invariant systems, stable and unstable systems. **Simple manipulations of discrete time signals**-shifting, folding, time scaling. Representations of systems, Linear differential equations, Impulse response of a system. Analog to digital conversion of signals-sampling of continuous time signals, signal reconstruction.		
Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**
Fourier Transform		
Introduction - Trigonometric Fourier series, complex or exponential form of Fourier series, Parseval's identity for Fourier series. **Fourier Transform-** energy spectrum for non-periodic function, properties of Fourier Transform. **Discrete Fourier Transforms (DT)-** discrete convolution, properties of convolution, circular convolution (numerical), Discrete -Time Fourier Transform (DTFT),properties of DFT (numerical)		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Laplace Transforms		
Definition, Region of Convergence (ROC), LT of some important function and numerical. Initial value theorem , Final value theorem. Convolution integral numerical. Application of LT only in series R-L circuit and series R-C circuit.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
z- Transforms		
Introduction, definition, Region of Convergence (ROC), properties of the ROC for the z-transform and numerical. Properties of z-transform such as Linearity, Time Reversal, Time Shifting, Scaling, Differentiation, Convolution and numerical based on these properties.		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
State space analysis		
Concept of state (State variable and state model). State model of linear system. Eigen Values of Matrix A. Solution of state equation. Properties of State Transition Matrix and numerical.		
Text Books:		
1. S. Salivahanan, C. Gnanpriya, Digital Signal processing, McGraw Hill, 4th Edition 2. I..J. Nagrath and M. Gopal , Control system Engineering- New Age 5thEdition		
Reference Books:		
1. John G. Proakis, Dimitris G. Manolakis, Digital Signal Processing Principles, algorithms and applications, Pearson Prentice Hall, Fourth edition 2. I.J. Nagrath, S.N. Sharan, R.Ranjan,S.Kumar, Signals and Systems, TMH, 2nd Edition 3. Katsuhiko Ogata, Modern Control Engineering, Pearson, 4th edition. 4. A. Anand Kumar, Signals and Systems, PHI 5. Rishabh Anand, Signals and Systems, Khanna Book Publishing Co., Delhi 6. Tarun Rawat, Signals and Systems, Oxford University Press 7. B.P. Lathi, Signal Processing and Linear Systems, Oxford University Press		

Analog Electronic Circuits					
COURSE OUTLINE					
Course Title:	**Analog Electronic Circuits**	**Short Title:**	**AEC**	**Course Code:**	

Course description:
This course provides the students with comprehensive study of basic components and circuits of Analog Electronics. It deals with BJT, FET, OpAmp, DAC and ADC.

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	3	14	42	3

Prerequisite course(s):
Basic knowledge of Electronics
Course objectives:
1. To give the brief idea about basics of transistor configurations. 2. To familiarize the students to perform the frequency analysis of any Analog electronics circuit. 3. To empower students to understand the design and working of BJT / FET amplifiers, oscillators and Operational Amplifier. 4. To prepare the students for operational amplifier, DAC, ADC Circuit Design.
Course outcomes:
After successful completion of this course the student will be able to:
1. Acquire basic knowledge of physical and electrical conducting properties of transistor. 2. Develop the ability to understand the design and working of BJT / FET amplifiers. 3. Able to design amplifier circuits using BJT s And FET's and observe the amplitude and frequency responses of common amplifier circuits 4. Observe the effect of negative feedback on different parameters of an Amplifier and different types of negative feedback topology. 5. Observe the effect of positive feedback and able to design and working of different Oscillators using BJTS. 6. Develop the skill to build, and troubleshoot Analog circuits.
COURSE CONTENT

Analog Electronic Circuits		**Semester:**	**III**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**
Transistor		
BJT &FET voltage divider biasing, Q point & Stability factor analysis, BJT - h parameter analysis for CE,CB, CC, Miller theorem and its dual Cascade configuration- CE-CE, CE-CB, CE-CC, Darlington configuration		
Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**
Frequency Response and power amplifiers		

Frequency response of single & cascade stages, High frequency model of CE & short circuit current gain, Class A series fed & transformer coupled amplifier, Class B complementary symmetry configuration, Power relation & efficiency, Harmonic distortion analysis		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Feedback amplifiers		
Negative feedback- Classification, characteristics of negative feedback, analysis of all the four topologies-voltage series, current series, voltage shunt, current shunt Positive feedback- Barkhausen Criterion, R-C phase shift & Wein bridge oscillator, Hartley, Colpitt & Clapp oscillator		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Operational Amplifier		
Differential Amplifier- Ad, Ac & CMRR, OPAMP Applications-Inverting and Non inverting amplifier, Adder Subtractor, Integrator , Differentiator, Instrumentation amplifier ,log amplifier, antilog amplifier, Schmitt trigger		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Filters and Convertors		
OPAMP active filters – Low pass ,high pass ,band pass ,band stop ,Design guidelines, DAC-Weighted registor,R2R ladder ,ADC-Single slope , Dual slope and Successive approximation Switched capacitors circuit, basic concept and practical configuration		
Text Books:		
1. Millman and Halkais, Integrated Electronics TMH Publication, 2nd Edition 2. J.V. Wait, L P. Huelsman & G.A. Korn Introduction to Operational Amplifier- Theory and Applications, Mcgraw Hills, 2nd Edition 3. R. A. Gaikwad , OpAmp & Linear Integrated Circuits, Pearson Edition, 4th Edition		
Reference Books:		
1. Louis Nashelsky & Robert Boylestad, Electronics Devices and Cercuits Theory, , Pearson Publication, 10th Edition 2. Dr. R. S. Sedha, Electronics Circuits by, S Chand Publication,4th Edition 3. L.K. Maheshwari, Analog Electronics, Laxmi Publications 4. A.K. Maini, Analog Electronics, Khanna Publishing House 5. I.G. Nagrath, Analog Electronics, PHI		

Discrete Mathematics

COURSE OUTLINE

Course Title:	**Discrete Mathematics**	**Short Title:**	**DM**	**Course Code:**	

Course description:

Basic set theory and symbolic logic. Methods of proofs, including mathematical induction. Relations, functions, and partitions; modular arithmetic. Graph and Trees

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	3	14	42	3

Prerequisite course(s):

Basic Mathematics Concepts

Course objectives:

1. Learn the use of set, proof techniques and determine logical possibilities in a given situation.
2. Learn relations, functions among various entities in real world.
3. Learn to apply relations and functions in real life.
4. Learn to formulate problem mathematically using graph theory and trees.

Course outcomes:

After successful completion of this course the student will be able to:

1. Express given logic sentence it in terms of predicates, quantifiers, and logical connectives
2. Derive the solution using deductive logic and prove the solution based on logical inference for given problem
3. Classify given a mathematical problem according to its algebraic structure
4. Develop the given problem as graph networks and solve with techniques of graph theory.

COURSE CONTENT

Discrete Mathematics		**Semester:**	**III**
Teaching Scheme:		**Examination scheme:**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Set, Relation and Function:

Operations and Laws of Sets, Cartesian Products, Cantor's diagonal argument and The Power Set theorem, Schroeder-Bernstein theorem. Binary Relation, Partial Ordering Relation, Equivalence Relation, Functions, Bijective functions, Inverse and Composite Function

Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**

Mathematical Induction, Counting

The Well-Ordering Principle, Recursive definition, The Division algorithm: Prime Numbers, The Greatest Common Divisor: Euclidean Algorithm, The Fundamental Theorem of Arithmetic.
Basic counting techniques-inclusion and exclusion, pigeon-hole principle, permutation and combination. Number system and Inter conversion of number system.

Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**

Propositional Logic		
Syntax, Semantics, Validity and Satisfiability, Basic Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implication, Rules of Inference, The use of Quantifiers. **Proof Techniques:** Some Terminology, Proof Methods and Strategies, Forward Proof, Proof by Contradiction, Proof by Contraposition, Proof of Necessity and Sufficiency.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Algebraic Structures and Morphism		
Algebraic Structures with one Binary Operation, Semi Groups, Monoids, Groups, Algebraic Structures with two Binary Operation, Rings, Integral Domain and Fields. Boolean Algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Graphs and Trees		
Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Isomorphism, Eulerian and Hamiltonian Walks, Graph Coloring, Coloring maps and Planar Graphs, Dijkstra's shortest path Algorithm, Perfect Graph, definition properties and Example, rooted trees, trees and sorting, weighted trees and prefix codes, Kruskal's and Prim's algorithm for minimum spanning tree		
Text Books:		
1. Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw – Hill, 7th Edition 2. Susanna S. Epp, Discrete Mathematics with Applications, Wadsworth Publishing Co. Inc., 4th edition 3. C L Liu and D P Mohapatra, Elements of Discrete Mathematics A Computer Oriented Approach, Tata McGraw – Hill, 3rd Edition,		
Reference Books:		
1. J.P. Tremblay and R. Manohar, Discrete Mathematical Structure and It's Application to Computer Science, Tata Mcgraw-Hill, 1st Edition 2. Norman L. Biggs, Discrete Mathematics, Oxford University Press, 2nd Edition 3. Seymour Lipschutz, Marc Lipson Discrete Mathematics Schaum's Outlines Series,Tata McGraw – Hill ,2nd Edition. 4. Chakraborty & Sarkar, Discrete Mathematics and Its Applications, Oxford 5. S.B. Singh, Discrete Structures, Khanna Book Publishing, Delhi 6. T. Veerarajan, Discrete Mathematics, Tata McGraw-Hill		

Organizational Behavior					
COURSE OUTLINE					
Course Title:	**Organizational Behavior**	**Short Title:**	**OB**	**Course Code:**	

Course description:

This course includes the behavior of people in the work environment. Students develop a basic understanding of individual behavior and explore issues of personality, attitude, motivation, communication, leadership, job satisfaction, group dynamics and work stress.

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	3	14	42	3

Prerequisite course(s):

Basic knowledge of the organization and human behavior.

Course objectives:

1. To study Human behavior at work
2. To obtain knowledge of Individual and Group Perspective
3. To get in depth knowledge about Motivation and Leadership theories

Course outcomes:

After successful completion of this course the student will be able to:

1. Analyze the behavior of individuals and groups in organizations.
2. Understand the basic knowledge of individual and group perspective.
3. Understand theories of motivation and leadership.
4. To understand how to deal with work stress.

COURSE CONTENT

Organizational Behavior		**Semester:**	**III**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Introduction to Organization Behavior

- Meaning and Definition of Organization Behavior (O.B)
- Key Elements of Organization Behavior
- Nature and Scope of Organization Behavior
- Importance of Organization Behavior
- Disciplines Contributing to O.B
- Emerging Challenges and Opportunities for O.B.

Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**

Individual Perspective / Foundation of Individual Behavior

(a) Personality:

- Meaning and Definition of Personality
- Factors/Key Determinants of Personality

- Personality Traits

(b) Attitudes:

- Meaning & Nature of Attitude
- Types of Job Attitude
- Components of Attitude
- Functions of Attitude
- Ways to change Attitude

(c) Job Satisfaction:

- Meaning and Definition of Job Satisfaction
- Factors affecting Job Satisfaction
- Ways of measuring Job Satisfaction
- Impact of Job Satisfaction on Work Performance

Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**

Group Dynamics:

- Meaning of Group, Group Dynamics
- Why do people join groups
- Types of Groups
- The Five Stage Model of Group Development
- Group Properties: Group Norms, Group Size, Group Cohesiveness,
- Concept: Group Think, Group Shift

Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**

Motivation and Leadership:

Motivation:

- Meaning and Definition of Motivation
- Types of Motivation: Financial and Non-Financial
- Theories of Motivation
  - a) Maslow's Hierarchy of needs Theory
  - b) Theory X and Theory Y
  - c) Goal Setting Theory

Leadership:

- Meaning & Importance of Leadership
- Styles of Leadership
- Theories of Leadership
  - a) Likert's system of 4
  - b) Path Goal Theory
  - c) Charismatic Leadership Theory

Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**

Work Stress:

- Meaning, Nature of Stress
- Factors causing Stress
- Consequences of Stress
- Management of Stress

Text Books:

1.Suja R. Nair , Organizational Behavior-Text & Cases, Himalaya Publishing House, 2009 Reprint

2.K.Aswathappa, Organizational Behavior-Text, Cases & Games, , Himalaya Publishing House, 12th Revised Edition
Reference Books:
1. 1.Margie Paraikh, Rajen Gupta, Organizational Behaviour-, Tata McGraw Hill Publishing, 2010 Edition 2. Stephen Robbins, Organizational Behaviour, Vohra-Pearson , 15th Edition 3. P.Subba Rao , Organizational Behaviour Text , Caves and Games , Himalaya Publishing House, 2017 Edition 4. S.S.Khanka , Organizational Behaviour, S.Chand Publishing House, 4th Edition 5. C. B. Gupta, A Textbook of Organizational Behaviour, S.Chand Publications 6. L. M Prasad, Sultan , Organizational Behaviour Chand and Sons

Analog Electronic Circuits Lab

LAB COURSE OUTLINE

Cours e Title:	**Analog Electronic Circuits Lab**	**Short Title:**	**AECL**	**Course Code:**	

Course description:

This course provides the students with comprehensive study of basic components and circuits of Analog Electronics. It deals with BJT, FET, OpAmp, DAC and ADC.

Laboratory	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	2	14	28	1

End Semester Exam (ESE) Pattern:	**Practical (PR)**

Prerequisite course(s):

Basic knowledge of Electronics

Course objectives:

1. To give the brief idea about basics of transistor configurations.
2. To familiarize the students to perform the frequency analysis of any Analog electronics circuit.
3. To empower students to understand the design and working of BJT / FET amplifiers, oscillators and Operational Amplifier.
4. To prepare the students for operational amplifier, DAC, ADC Circuit Design.

Course outcomes:

Upon successful completion of lab Course, student will be able to:

1. Acquire basic knowledge of physical and electrical conducting properties of transistor.
2. Develop the ability to understand the design and working of BJT / FET amplifiers.
3. Able to design amplifier circuits using BJT s And FET’s and observe the amplitude and frequency responses of common amplifier circuits
4. Observe the effect of negative feedback on different parameters of an Amplifier and different types of negative feedback topologies.
5. Observe the effect of positive feedback and able to design and working of different Oscillators using BJTS.
6. Develop the skill to build, and troubleshoot Analog circuits.

LAB COURSE CONTENT

Analog Electronic Circuits Lab		**Semester:**	**III**
Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**	**End semester exam (ESE):**	**25 marks**
		Internal Continuous Assessment (ICA):	**25 marks**

Concerned faculty member should suitably frame FIVE laboratory assignments from the following list.

1. BJT/FET Q point & load line.

OR

Frequency Response of CE-CE cascade

2. Effect of Emitter Bypass Capacitor (CE Configuration).

   OR

   Cross over distribution & its elimination.

3. Effect of partial feedback for voltage shunt configuration.

   OR

   Output and Frequency of RC Phase Shift Oscillator.

4. OP-AMP as an Integrator & Differentiator.

   OR

   OP-AMP Instrumentation Amplifier.

5. OP-AMP Low Pass Filter.

   OR

   OP-AMP High Pass Filter

Text Books:

1. Millman and Halkais, Integrated Electronics, TMH Publication, 2nd Edition
2. J.V. Wait, L P. Huelsman & G.A. Korn Introduction to Operational Amplifier- Theory and Applications,, Mcgraw Hill, 2nd Edition
3. R. A. Gaikwad, OpAmp and Liner Integrated Circuits, Pearson, 4th Edition

Reference Books:

1. Louis Nashelsky & Robert Boylestad, Electronics Devices and Cercuits Theory, , Pearson Publication, 10th Edition
2. Dr. R. S. Sedha, Electronics Circuits by, S Chand Publication,4th Edition
3. L.K. Maheshwari, Analog Electronics, Laxmi Publications
4. A.K. Maini, Analog Electronics, Khanna Publishing House
5. I.G. Nagrath, Analog Electronics, PHI

Guide lines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guidelines for ESE:

ESE will be based on the laboratory assignments submitted by the students in the form of journal. Evaluation will be based on the understanding and execution.

<table>
<tr><td colspan="8">Discrete Mathematics Lab</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td colspan="8">LAB COURSE OUTLINE</td></tr>
<tr><td>Course Title:</td><td colspan="3">Discrete Mathematics Lab</td><td>Short Title:</td><td>DML</td><td>Course Code:</td><td></td></tr>
<tr><td colspan="8">Course description:</td></tr>
<tr><td colspan="8">This course provides students with a comprehensive study of Discrete Mathematics concepts. Introduction to program design and problem solving using the C/ C++ programming language. Programming topics include set operations such as: union, intersection, difference, power set, graph theory: Dijikstra Algorithm and tree concepts: Prims algorithm, Kruskal’s algorithm.</td></tr>
<tr><td rowspan="2">Laboratory</td><td>Hours/week</td><td>No. of weeks</td><td colspan="2">Total hours</td><td colspan="3">Semester credits</td></tr>
<tr><td>2</td><td>14</td><td colspan="2">28</td><td colspan="3">1</td></tr>
<tr><td colspan="3">End Semester Exam (ESE) Pattern:</td><td colspan="5">Practical (PR)</td></tr>
<tr><td colspan="8">Prerequisite course(s):</td></tr>
<tr><td colspan="8">Basic Math concept, Basic C concepts</td></tr>
<tr><td colspan="8">Course objectives:</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td colspan="8">1. Learn the fundamentals, structure of Discrete Mathematics.
2. Write programs in C/C++ Language to implement Discrete Mathematics concepts.</td></tr>
<tr><td colspan="8">Course outcomes:</td></tr>
<tr><td colspan="8">Upon successful completion of lab Course, student will be able to:</td></tr>
<tr><td colspan="8">1. Understand the fundamentals of Discrete Mathematics.
2. Design solution to problems in Discrete Mathematics
3. Implement Discrete Mathematics basic concepts</td></tr>
<tr><td colspan="8"></td></tr>
</table>

<table>
<tr><td colspan="4">LAB COURSE CONTENT</td></tr>
<tr><td colspan="2">Discrete Mathematics (Lab)</td><td>Semester:</td><td>III</td></tr>
<tr><td colspan="2">Teaching Scheme:</td><td colspan="2">Examination scheme</td></tr>
<tr><td>Practical:</td><td>2 hours/week</td><td>End semester exam (ESE):</td><td>25 marks</td></tr>
<tr><td colspan="2"></td><td>Internal Continuous Assessment (ICA):</td><td>25 marks</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td colspan="4">Concerned faculty member should suitably frame at least FIVE Laboratory assignments from Group - A and FIVE Laboratory assignments from Group – B, using C/C++ programming language from the following list.

Group: A
1. A program for logical operations using bitwise operators.
2. A program for set operations: Union, Intersection, Difference, Symmetric difference.
3. A program for generation of Power set of a given set.
4. A program for inter conversion of number system.</td></tr>
</table>

5. A program for producing permutation set for given input set.
6. A program for producing combination set for given input set.

Group: B

1. A Program for Greatest Common Divisor using Euclidean Algorithm.
2. A Program for Binary search.
3. A Program for Shortest Path algorithm using Dijkstra's.
4. A program for implementation of Kruskal's algorithm.
5. A program for implementation of Prim's algorithm.
6. A Program to Construct a Tree & Perform Insertion, Deletion, Display

Note: Use of Open Source Software/Tool/Technology is recommended for laboratory assignments of concern subject.

Text Books:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw – Hill, 7th Edition
2. Susanna S. Epp, Discrete Mathematics with Applications, Wadsworth Publishing Co. Inc., 4th edition
3. C L Liu and D P Mohapatra, Elements of Discrete Mathematics A Computer Oriented Approach, Tata McGraw – Hill, 3rd Edition,

Reference Books:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson,
2. Reprint, 2002.
3. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,
4. 2006.
5. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
6. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
7. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
8. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
9. Chandrika Prasasd, Advanced Engineering Mathematics, (ISBN: 9789386173522) Khanna Book Publishing Co. (P) Ltd., Delhi
10. Sashtry, Advanced Engineering Mathematics (ISBN:9788120336094), PHI
11. S. Chakraborty & B.K. Sarkar, Discrete Mathematics and Its Applications, Oxford

Guide lines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented.

Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.
Guidelines for ESE:
ESE will be based on the Laboratory assignments submitted by the students in the form of journal. In the ESE(PR), the students may be asked to perform the practical assignment with minor modification. Evaluation will be based on the paper work of algorithm, understanding of the logic and the syntax, quality of the program, execution of the program, type of input and output for the program.

Object Oriented Programming Lab					
LAB COURSE OUTLINE					
Course Title:	**Object Oriented Programming Lab**	**Short Title:**	**OOPL**	**Course Code:**	
Course description:					
This course provides students with a comprehensive study of the C++ programming Language. C++ programming provides students with the means of writing efficient, maintainable, and portable code..					

Laboratory	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
Theory	1	14	14	2
Practical	2	14	28	
End Semester Exam (ESE) Pattern:		**Practical (PR)**		

Prerequisite course(s):

Fundamental knowledge of Computers and C programming

Course objectives:

1. To understand the Class and Object concept to solve real world Problem.
2. To write well-drafted programs in C++ using object-oriented techniques.
3. To understand the Concept of inheritance to solve real world problem.
4. To employ good programming team, standards and Practices, during program development.

Course outcomes:

Upon successful completion of lab Course, student will be able to:

1. To Create Class & Object
2. To Apply concept of Polymorphism
3. To Apply data sharing using friend function.
4. To Apply concept of inheritance for different problem solving
5. To Create and Demonstrate operator Overloading
6. To Implement Class & Function Template.

LAB COURSE CONTENT			
Object Oriented Programming Lab		**Semester:**	**III**
Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**	**End semester exam (ESE):**	***25 marks***
		Internal Continuous Assessment (ICA):	***25 marks***

LAB COURSE CONTENT

Introduction to Object Oriented Programming

a. Introduction to procedural, modular and object-oriented programming techniques.

b. Limitations of procedural programming.
c. Need of object-oriented programming. Advantages, disadvantages and applications of OOP.
d. Class, objects, abstraction, encapsulation, data hiding, inheritance, polymorphism and message passing.
e. The basics of C++
f. Expressions

Classes and Objects, Function and Operator Overloading

a. Class and objects
b. Constructors and destructors
c. Functions in C++
d. Function Overloading
e. Operator overloading

Pointers and Arrays

a. Introduction, pointer declaration, voids pointers.
b. Pointers to class objects, this pointer.
c. Pointers to members, accessing private members with pointers.
d. Characteristics of arrays, initialization of arrays.
e. Arrays within a class, arrays of objects.
f. Dynamic memory allocation using new and delete operators.
g. One dimensional and two dimensional arrays using pointers.

Inheritance, Virtual functions and Polymorphism

a. Introduction, base and derived classes. Inheritance types, access modifiers.
b. Single inheritance, multiple and multilevel inheritance, hybrid, hierarchical, multipath Inheritance and virtual base classes.
c. Overriding base class members. Constructors and inheritance, calling base class constructor.
d. Static and dynamic binding. Pointers to base and derived classes.
e. Virtual functions, rules for virtual functions, working of virtual functions, pure virtual functions.
f. Virtual base classes

Files and Streams, Managing Console I/O Operations and Templates

a. Concept of a file, file stream operations.
b. Opening a file using constructor and open function, closing a file, detecting end-of-file, file modes, file pointers.
c. Introduction to C++ streams, stream classes, unformatted and formatted I/O.
d. ios class functions and flags, manipulators.
e. Introduction to function template and class template.

Concern faculty member should suitably frame at least SIX Lab assignments from group A and FOUR from group B using C++ programming language from the following list.

Group A

1. Write a program for a simple class and object.
Performing simple arithmetic operations using C++ class and object like,
a. Addition,
b. Subtraction,
c. Multiplication,

d. Division.

2. Write a program for parameterized constructor. Demonstrate the use parameterized constructor by passing different types of parameters to the constructor.
3. Write a program for overloading constructors.
   Demonstrate the concept of overloading constructor functions using class and object.
4. Write a program to find the area of rectangle, triangle and sphere using function overloading.
   To calculate the area of rectangle, triangle and sphere using function overloading and class and object.
5. Write a program to overload unary operator using member function.
6. Write a program to overload binary operator using member function.
7. Write a program for arrays of pointers to objects.
   Declaring an array of pointers to objects using suitable example.
8. Write a program using single inheritance, multiple inheritance and hierarchical inheritance
9. Write a program using multilevel inheritance and hybrid inheritance.
10. Write a program for addition of two matrices using friend function.
11. Write a program to read and write class objects from files.
    Writing/reading class object to/from file.
12. Write a program to format output using ios class functions and flags.
13. Write a program to format output using manipulators.
14. Write a program using class template.
15. Write a program for overloading of template functions.

Group B

1. Write a program for the copy constructor.
2. Write a program to overload unary operator using friend function.
3. Write a program to overload binary + operator using member function for concatenation of two strings.
4. Write a program for matrix multiplication using new and delete dynamic memory allocation operators.
5. Write a program to convert class type data to basic type data.
6. Write a program for run time polymorphism using virtual functions.
7. Write a program for bubble sort using template functions.

Note: Use of Open Source Software/Tool/Technology is recommended for laboratory assignments of concern subject.

Text Books:

1. E. Balagurusamy, Object Oriented Programming with C++, TataMcGraw Hill, 2011, Sixth Edition
2. Robert Lafore, “Object Oriented Programming in C++”, Pearson Education, 2002, Fourth Edition
3. Ashok N. Kamthane, “Object-Oriented Programming with ANSI and Turbo C++”,Pearson Education, 2006, 1st Edition
4. Rajesh K. Shukla, “Object-Oriented Programming in C++”, Wiley India, 2008, 1st Edition

Reference Books:

1. Yashavant P. Kanetkar, "Let Us C++", BPB Publications, 3rd Edition
2. Venugopal K.R., "Mastering C++", TMH, 2nd Edition.
3. Mahesh Bhave, Sunil Patekar, "Object Oriented Programming with C++", Second Edition, 2012.
4. Herbert Schildt, "The Complete Reference C++", TMH , Fourth Edition, , 2003.
5. R.S. Salaria, Mastering Object-Oriented Programming with C++, Khanna Book Publishing, N.Delhi
6. Balaguruswamy, Programming with Java, TMH
7. D.Samantha, Object Oriented Programming in C++ and Java, PHI
8. Tanweer Alam, Internet and Java Programming, Khanna Publishing House

Guide lines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guidelines for ESE:

ESE will be based on the Laboratory assignments submitted by the students in the form of journal. In the ESE(PR), the students may be asked to perform the practical assignment with minor modification.

Evaluation will be based on the paper work of algorithm, understanding of the logic and the syntax, quality of the program, execution of the program, type of input and output for the program.

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Second Year Engineering

(Computer Engineering / Information Technology)

Faculty of Science and Technology

'A' Grade
NAAC Re-Accredited
(3rd Cycle)

COURSE OUTLINE

Semester - IV

W.E.F. 2018 – 19

Biology					
COURSE OUTLINE					
Course Title:	**Biology**	**Short Title:**	**BIO**	**Course Code:**	

Course description:

This course is introduced for learning the basic fundamentals of Life sciences (zoology & Botany) to undergraduate students. The goals of the course are to understand the basic principles of Biology and its applications in the field of Engineering.

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
Lecture	3	14	42	4
Tutorial	1	14	14	

Prerequisite course(s):

Course objectives:

1. Students will understand the structures and characteristics or functions of basic components of prokaryotic and eukaryotic cells, especially macro-molecules, membranes, and organelles.
2. Students will learn the basic principles of inheritance at the molecular, cellular and Organism levels.
3. Students will test and deepen their mastery of genetics by applying this knowledge in a variety of problem-solving situations.

Course outcomes:

After successful completion of this course the student will be able to:

1. Use current techniques and analysis methods in molecular biology and genetics.
2. Understand the current concepts in Cell Biology, Stem Cell Biology and Development.
3. Know the structure/function of the basic components of prokaryotic and eukaryotic cells including macro-molecules and organelles.
4. Demonstrate proficiency with at least one instrument commonly used in biological research (microscope, etc).

COURSE CONTENT

Biology		**Semester:**	**IV**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
Tutorial	**1 hours/week**	**Duration of ESE:**	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Diversity of Organism and Cell Biology

Introduction: Living systems, Bio-mimicry, Metabolism, Taxonomy, Concept of species, Structural organization of life, Concepts of modern cell, history of cell, Cell theory, Structure of cell:- Cell shape, size and cell number, Types of cells:- Prokaryotic cells and Eukaryotic cells, Chemistry of cells.

Cell Division: Cell cycle, mitosis, meiosis, mitotic cell division, cell cycle check points, meiotic cell division, embryonic cell division, cell death.		
Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**
Plant and Animal Kingdom		
Plant Kingdom: Introduction to plants, Salient features of major plant groups: Bryophyta, Pteridophyta, Gymnospermae, Angiospermae, **Plant Growth & Development:** Introduction, Seed Dormancy, Seed Germination, Phases of growth, Plant growth hormones. **Animal Kingdom:** Animal Classification, Salient features of non-chordates upto phylum level: Phylum porifera, phylum cindaria, phylum ctenophore, phylum platyhelminthes.		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Plant Cell and Animal cell culture and Applications		
Plant Cell Culture: Brief introduction to cell culture with respect to the properties of plant cells, Media requirements, Typical media used, Classification of tissue culture, callus culture, cell suspension culture, Application of callus culture and cell suspension culture, Plant cell cultivation Bioreactors **Animal Cell Culture:** Brief introduction to animal cell culture, Culture medium: Natural and Artificial media, introduction to balanced salt solutions and simple growth medium, Brief discussion on the chemical, physical and metabolic functions of different constituents of culture medium, Animal Bioreactors.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Microbial Culture and Applications:		
Introduction, Microbial Culture Techniques, growth curve, Pure culture techniques – microbial culture media, isolation, identification and maintenance of cultures, incidences of microorganisms in soil, water, air, food and sewage, food spoilage organisms, Applications of Microbial Culture Technology.		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Biotechnology and its Applications:		
Definitions, scope of Biotechnology, Recombinant DNA Technology: Making Recombinant DNA, Tools in Genetic Engineering, Polymerase Chain reaction (PCR). **Applications of Biotechnology:** Bioinformatics, Biomechanics, Biotechnology of waste treatment, Biosensors, Forensic science, Food Biotechnology, Fermentation Technology.		
Text Books:		
1. B.D. Singh " Genetics" Kalyani Publications 2. C.B. Pawar"Cell Biology" Himalaya Publications, Third Edition. 3. C.B. Pawar"Cell and Molecular Biology" Himalaya Publications. 4. Text book of Zoology by V.K. Agrawal, S. Chand Publication. 5. Text book of Botany by Dr. B.P. Pandey S. Chand Publication. 6. Text book of Biotechnology by R.C. Dubey, S. Chand Publications		
Reference Books:		
1. P. K Gupta, Introduction to Biotechnology, Rastogi Publications. 2. B.D.Singh, Biotechnology: Expanding Horizons, Kalyani Publishers, New Delhi, Second		

Revised Edition, 2008.
3. S.S.Purohit, Biotechnology: Fundamentals and Applications, Agrobios (India), 4th Edition, 2005.
4. Andreas D. Boxevanis, Bioinformatics, Wiley International
5. David W. Mount, Bioinformatics: Sequence and Genome analysis, Cold Spring Harbour.
6. Bruce E Rittmann, Rurry L.Mc carty, Environmental Biotechnology:Principles and Applications, Mcgraw Hill international.
7. B. Sivashankar, Food Processing and Preservation, Prentice Hall ,India
8. Bhojwani, S.S.and Rajdan, Plant Tissue Culture: Theory and Practice, Revised Edition, Elsevier
9. Freshney, Culture of Animal Cells, 5th Edition, Wiley-Liss, 2005
10. M.J. Pelczar, Jr. E.C.S. Chan and N.R. Krieg, Microbiology 5th Ed., TMH Book Company.
11. Biology for Engineers (ISBN: 9781121439931), TMH

Digital Electronics

COURSE OUTLINE

Course Title:	**Digital Electronics**	**Short Title:**	**DE**	**Course Code:**	

Course description:

This course is designed to give a brief understanding of the principles of Digital Techniques and designing of several applications. This course covers different types of codes, Boolean laws, SOP & POS form, K-map optimization technique, arithmetic circuits, code converters, Multiplexer, De-multiplexer and their applications, different types of flip-flops and their applications, sequential circuits such as ripple counter, synchronous counter, Mod-n counter, shift resister and its applications.

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	3	14	42	3

Prerequisite course(s):

Physics

Course objectives:

1. To acquire the basic knowledge of digital logic levels and application of
2. Knowledge to understand digital electronics circuits.
3. To prepare students to perform the analysis and design of various digital electronics circuits

Course outcomes:

After successful completion of this course the student will be able to:

1. Understand working of logic gate
2. Understand and use of K-Map for simplification
3. Design and implementation of combinational Logic circuits
4. Design and implementation of sequential Logic circuits

COURSE CONTENT

Digital Electronics		**Semester:**	**IV**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Representation of signed numbers: fixed and floating point numbers. Binary Coded Decimal Code, Gray Code, Error detection and Correction Code –Hamming Code. Boolean Algebra, DeMorgan’s Theorem, Simplification of logical Expression using Boolean Algebra and DeMorgan’s Theorem.

Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**

Standard representation of logic functions- SOP and POS forms. Min term and Max term. Don’t care conditions. Simplification of logic functions-using Karnaugh Map (K- Map) for 2,3 and 4

variables. Quine-McCluskey tabular method -four variables.		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Introduction to combinational Logic circuits. Adders Subtractors-,-Half and Full adder and subtractor truth table and logic circuit.BCD arithmetic. Popular MSI Chips-Digital Comparator (2 and 4 Bits). Code Converters-Gray to Binary and vice versa. Multiplexer -2:1, 4:1 and 8:1.Demultiplexer-1:2,1:4 and 1:8.Decoders-1:2,2:4 and 3:8.Encoders 8:3 and Priority Encoder.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Introduction to sequential Logic circuits. A 1-Bit Memory cell. Bi-stable latch circuit properties. The clocked SR flip flop, J-K,T and D types flip flops. Preset and clear inputs. Registers-SISO, SIPO, PISO AND PIPO 4 –BIT REGISTER. Shift Register-Right shift, left shift and Bidirectional Register. Application of shift Register- Ring and Twisted Ring Counter.		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Counters- Modulus and recycling of counter .Types of counters- Asynchronous and Synchronous .Up, Down and Up-Down Counters Asynchronous Counter-2,3 and 4 Bit Up ,down and Up-Down Counters. Synchronous Counter-2, 3 and 4 Bit Up, down and Up-Down Counters.		
Text Books:		
1. R P Jain, Modern Digital Electronics, MCGraw Hill, 4th Edition 2. A Kumar, Fundamentals' of Digital Circuits" by, Prentice Hall India, 3rd Edition		
Reference Books:		
1. Thomas L Floyd, " Digital Fundamentals", Pearson Prentice Hall, 8th Edition 2. Jr. Charles H. Roth ,"Fundamentals of Logic Design", Thomson Brooks, 5th Edition 3. John F. Wakenly, Digital Design, Principles and Practics, Pearson Education , 4th Edition 4. A. Anand Kumar, Digital Electronics, PHI 5. R.Anand, Digital Electronics Khanna Publishing House		

Data Structure & Algorithms					
COURSE OUTLINE					
Course Title:	**Data Structure & Algorithms**	**Short Title:**	**DSA**	**Course Code:**	

Course description:

The objective of this course is to introduce the students to the fundamentals of Data Structure with concepts of the C/C++/JAVA programming language and enable them to apply these concepts for solving real world problems

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	3	14	42	4

Prerequisite course(s):

Discrete Mathematics

Course objectives:

1. To impart the basic concepts of data structures and algorithms.
2. To understand the basic concepts of searching and hashing
3. To understand the basic concepts of operations in data structures
4. To understand the time and space required for a given algorithm,

Course outcomes:

After successful completion of this course the student will be able to:

1. Apply suitable data structure for a given problem.
2. To design and implement basic data structures and to determine time and space complexity.
3. Apply suitable searching algorithm for a given problem.
4. Perform operations like insert, delete, traverse, search etc. in a given data structure.

COURSE CONTENT

Data Structure & Algorithms		**Semester:**	**IV**
Teaching Scheme:		**Examination scheme:**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Introduction to Data Structure

Basic Terminology: Data, Data Item, Data type, Data Structure
Data Structures: Classification, Operations
Linear Arrays: Traversing, Insertion and Deletion
Pointers and Structures.
Static and Dynamic Memory Management

Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**

Stacks and Queues

Introduction to Stacks and Queue
Stacks: Representation of Stack using Array
Applications of stack in Arithmetic expressions, recursion and Tower of Hanoi

Queue: Representation of Queue using Array Circular Queue and its implementation		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Linked List		
Concept of linked organization Representation of Linked List in Memory Singly, doubly and circular Linked List Operations on singly and Doubly Linked List such as creation, traversing, searching, insertion, deletion. Representation of Stack and Queue using Linked List		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Trees		
Basic terminology of Trees Binary trees and its representation in memory Binary Search Trees: Searching, Inserting, Deletion and Traversals using Stacks. Balanced Binary Trees: AVL Search Trees and Rotations Heap and Heap sort		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Algorithms and Searching		
Complexity of Algorithms: Asymptotic Notations Linear Search Algorithm with time complexity Binary Search Algorithm with time complexity Hashing: Hash table, hashing functions, Collision Resolution Techniques		
Text Books:		
1. Seymour Lipschutz, "Data Structures", Schaums Outlines, Tata McGraw Hill, 1st Edition. 2. Ellis Horowitz and Sartaj Sahani, "Fundamentals of Data Structures", Galgotia Publication, 1st Edition.		
Reference Books:		
1. G.S.Baluja, Data Structures through C, Dhanpatrai Publications, 2012 2. Ashok N. Kamthane, Introduction to Data structures in C", Person Publications, 2007 Edition 3. Aarom Tanenbaum, Yedidyah Langsam, Moshe Augenstein, Data structures using C, Pearson Publication, 2nd Edition 4. Alfred Aho, John Hopcroft, Jeffrey Ullman, Data Structures and Algorithms ,Pearson Publications. 5. E.Balagurusamy, Data Structures using C, Tata MacGraw Hill Publications. 6. P.S.Deshpande, O.G.Kakde,"C and Data Structures", dreamtech press Publications. 7. RS Salaria, Data Structures, Khanna Publishing House 8. Yashwant Kanetkar, Data Structures through C, BPB Publications 9. RB Patel, Expert Data Structures with C++, Khanna Publications		

Computer Organization and Architecture					
COURSE OUTLINE					
Course Title:	**Computer Organization and Architecture**	**Short Title:**	**COA**	**Course Code:**	
Course description:					
The aim of this course is to introduce the students to the fundamentals of microprocessor with its internal architecture and programming model, basic operational concept within a computer, main memory & cache memory concept and various arithmetic operations on data.					

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	3	14	42	3

Prerequisite course(s):

Fundamental Knowledge of Digital Electronics and Number System.

Course objectives:

1. How computer system works and basic principle (Architecture level working of computer system).
2. Instruction Set Architecture and Instruction Execution
3. Various types of the memory.
4. To provide the knowledge on assembly language programming.
5. To provide the basic knowledge of control unit design approaches.

Course outcomes:

After successful completion of this course the student will be able to:

1. Draw the functional block diagram of a single bus architecture of a computer and describe the instruction execution cycle.
2. Write assembly language programs in 8086 for multiplication and division.
3. Write assembly language programs in 8086 for macros and procedures.
4. Explain and solve arithmetic operations like multiplication using Booth's algorithm and using Bit pairing method.
5. Explain the memory hierarchy with various mapping functions in cache memory organization.

COURSE CONTENT

Computer Organization and Architecture		**Semester:**	**IV**
Teaching Scheme		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Functional blocks of a computer: CPU, memory, input-output subsystems, control unit
Instruction Set Architecture of a CPU (8086/ 8088) :-

- 8086 Internal Architecture
- 8086 Programming Model
- 8086 Register Organization

8086 Memory Segmentation
8086 Addressing modes
Difference between 8086 and 8088

Unit–II:	No. of Lectures: 08 Hours	Marks: 12

8086 Instruction Set
Macro and Procedure
8086 Assembler Directives (Basic Directives)
DOS/BIOS Interrupts
8086 Memory Banking

Unit–III:	No. of Lectures: 08 Hours	Marks: 12

Basic operational concepts – Connection between processor and main memory
Instruction formats - zero, one, two, three and One & half address instruction formats
Basic Processing Unit:- Some fundamental concepts, Instruction Execution, Hardwired and Micro-programmed Control Unit.
I/O device Interface – USB
RISC and CISC

Unit–IV:	No. of Lectures: 08 Hours	Marks: 12

Important characteristics of memory system
Memory Organization: Memory interleaving, Hierarchical memory organization
Cache memory, cache size vs. block size, mapping functions, Concepts of - replacement algorithms and write policies.
Introduction to – SRAM, DRAM, ROM,PROM, EPROM, Flash Memory

Unit–V:	No. of Lectures: 08 Hours	Marks: 12

Number representation: Signed & magnitude, 1s & 2s Compliment. Integer addition & subtraction, Overflow
Multiplication of numbers: Booth's algorithm, Bit pairing of multipliers
Division : Restoring and non-restoring Division Algorithms
Floating Point system: Normalization, Representation in IEEE Single & Double precision formats.

Text Books:

1. Douglas V Hall, Microprocessor and Interfacing, Programming and Hardware, Tata McGraw Hill, Revised 2nd Edition.
2. Yu-Cheng Liu and Glenn A. Gibson , Microcomputer Systems: The 8086/8088 Family. Architecture, Programming and Design, Prentice Hall of India, 2nd Edition
3. Carl Hamacher , Computer Organization and Embedded Systems, McGraw Hill Higher Education, , 6th Edition
4. David A. Patterson and John L. Hennessy , Computer Organization and Design: The Hardware/Software Interface , Elsevier, 5th Edition

Reference Books:

1. John P. Hayes , Computer Architecture and Organization, WCB/McGraw-Hill, 3rd

Edition
2. William Stallings, Computer Organization and Architecture: Designing for Performance, by Pearson Education, 10th Edition
3. Vincent P. Heuring and Harry F. Jordan, Computer System Design and Architecture, Pearson Education, 2nd Edition
4. Hamacher, Vransic, Zaky, Computer Organization, McGraw Hill International, 5th Edition
5. Peter Abel, IBM PC Assembly Language and Programming, Pearson,, 5th edition
6. John E. Uffenbeck, The 8086/ 8088 Family: Design, Programming and Interfacing, Pearson, 3rd Edition
7. A. Ray and K. Bhurchandi ,Advanced Microprocessors and Peripherals: Architecture, Programming & Interfacing", Tata McGraw Hill, 3rd Edition
8. B. Ram, Computer Fundamentals Architecture and Organization, New Age International
9. Rajaraman, Computer Organization & Architecture, PHI Learning

Finance & Accounting					
COURSE OUTLINE					
Course Title:	**Finance & Accounting**	**Short Title:**	**FA**	**Course Code:**	
Course description:					
The Accounting and Finance program is known for its excellent reputation for quality in the marketplace. As a student in Accounting and Finance, you'll develop excellent technical knowledge of financial accounting & financial management.					

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	3	14	42	3

Prerequisite course(s):

XI and XII mathematics

Course objectives:

1. To provide basic knowledge Business Accounting and Costing.
2. To study accounting concepts, conventions & standard.
3. The study fundamental concepts of Financial Management
4. To gain basic knowledge about Finance for planning & control.

Course outcomes:

After successful completion of this course the student will be able to:

1. Be a lifelong learner who stays current in his/her field so as to perform accounting functions according to the Financial Accounting Standards Board and other governing agencies.
2. Be a conscientious professional who practices within the legal and ethical parameters of accounting.
3. Be an effective communicator who is able to listen and respond appropriately while respecting the differences within and between groups in the community.
4. Be a paraprofessional accountant who will have a broad array of skills and knowledge to use effectively in the 21st century.

COURSE CONTENT

Finance & Accounting		**Semester:**	**IV**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Theoretical Framework

Meaning and Scope of Accounting
Accounting Concepts, Principles and Conventions
Accounting Standards –Concepts, Objectives, Benefits
Elementary study of AS- 1, 2, 3, 6, 9, 10
Users of Financial Accounting Information

Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**
Fundamentals of Double Entry Book Keeping System		
Study of Double Entry Book Keeping System Advantages of double Entry Book Keeping System Comparison of Double Entry Book Keeping System with Single Accounting System Types of Accounts- Personal – Impersonal: Real and Nominal 2.5. Rules for Passing Journal Entries for Different Types of Accounts		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Accounting Process		
Journal – Meaning Importance and Utility of Journal Specimen of Journal - Recording of Journal Entries Ledger –Meaning, Need of Ledger Specimen of Ledger -Ledger Posting -Balancing Trial Balance -Meaning and Utility Specimen of Trial Balance – Preparation of Trial Balance Final Accounts for Sole Proprietors Preparation of Trading, Profit And Loss Account and Balance Sheet		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Scope and Objectives of Financial Management		
Approaches to Financial Management: Traditional View-Modern View- Investment Decisions-Dividend Decisions- Liquidity and Profitability Comparison with Accounting and Economics Financial Management's Importance in Business: Significance of Financial Controller Finance Manager as a Facilitator- Organization Chart of Finance Function- Reason for Centralizing Finance Function Financial Objectives of Business Firm: Profit Maximization Wealth Maximization Value Maximization Other Maximization Objectives		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Raising Finance		
Short term Financing Introduction & Characteristics Sources of Short term Finance Long Term Financing Need for long term financing Sources of Long Term Finance Risk analysis in Capital Budgeting & Sensitivity analysis Primary & Secondary Markets Meaning, Importance & Role Market intermediaries: brokers, dealers, investment bankers Bid, Ask or Offer, bid-ask spread, Bull and bear, blue chips, day trading, stop loss,		

BSE/ NSE Indices
Text Books:
1. Ravi M. Kishore, Financial Management, Taxman Publication, 8th Edition
Reference Books:
1. P. V. Kulkarni B. G. Satyaprasad, Humalaya Publishing House, 3rd Edition 2. Ms. Taral Juthani Ms Urvi Mehta, Book keeping and Accountancy, Target Publication, 1st Edition

Digital Electronics Lab					
LAB COURSE OUTLINE					
Course Title:	**Digital Electronics Lab**	**Short Title:**	**DEL**	**Course Code:**	
Course description:					
This course is designed to give a brief understanding of the principles of Digital Techniques and designing of several applications. This course covers different types of codes, Boolean laws, SOP & POS form, K-map optimization technique, arithmetic circuits, code converters, Multiplexer, De-multiplexer and their applications, different types of flip-flops and their applications, sequential circuits such as ripple counter, synchronous counter, Mod-n counter, shift resister and its applications.					

Laboratory	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	2	14	28	1

End Semester Exam (ESE) Pattern:	
Prerequisite course(s):	
Physics	
Course objectives:	
1. To acquire the basic knowledge of digital logic levels and application of 2. Knowledge to understand digital electronics circuits. **3.** To prepare students to perform the analysis and design of various digital electronics circuits	
Course outcomes:	
Upon successful completion of lab Course, student will be able to:	
1. Understand working of logic gate 2. Understand and use of K-Map for simplification 3. Design and implementation of combinational Logic circuits 4. Design and implementation of sequential Logic circuits	

LAB COURSE CONTENT			
Digital Electronics Lab		**Semester:**	**IV**
Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**		

Concern faculty member should suitably frame at least FIVE laboratory assignments using any logic simulators like Atanua, Cedar logic etc. from the following list.

1. Verify the truth tables of logic gates OR, AND, NOT, NOR, NAND
2. Design of 4 bit Gray to binary Code Converter.
3. Realization of adders and substractor using IC 7486 and 7404.
4. Realization of 2:4 decoder using basic gates.
5. Realization of 8:1 Mux using basic gates.
6. Verify the truth table of J-K, T, and D Flip-flops using ICs.
7. Verify 4-bit register using IC 7495

8.Verify Decade counter using IC 7490

Note: Use of Open Source Software/Tool/Technology is recommended for laboratory assignments of concern subject.

Text Books:

1. R P Jain, ”Modern Digital Electronics “ , MCGraw Hill, 4th Edition

2. A Kumar, ”Fundamentales of Digital Circuits” by, Prentice Hall India, 3rd Edition

Reference Books:

1. Thomas L Floyd, ” Digital Fundamentals”, Pearson Prentice Hall, 8th Edition
2. Jr. Charles H. Roth ,”Fundamentals of Logic Design”, Thomson Brooks, 5th Edition
3. John F. Wakenly, Digital Design, Principles and Practics, Pearson Education , 4th Edition
   Anand Kumar, Digital Electronics, PHI
4. R.Anand, Digital Electronics Khanna Publishing House

Guide lines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

<table>
<tr><td colspan="6">Data Structure & Algorithms Lab</td></tr>
<tr><td colspan="6"></td></tr>
<tr><td colspan="6">LAB COURSE OUTLINE</td></tr>
<tr><td>Course Title:</td><td>Data Structure & Algorithms Lab</td><td>Short Title:</td><td>DSAL</td><td>Course Code:</td><td></td></tr>
<tr><td colspan="6">Course description:</td></tr>
<tr><td colspan="6">This laboratory provides students with a comprehensive study of the C/C++/JAVA programming language in data structures. Classroom lectures stress the strengths of C/C++/JAVA which provide students with the means of writing efficient codes for different data types and data structures.</td></tr>
</table>

<table>
<tr><td rowspan="2">Laboratory</td><td>Hours/week</td><td>No. of weeks</td><td>Total hours</td><td>Semester credits</td></tr>
<tr><td>2</td><td>12</td><td>24</td><td>1</td></tr>
<tr><td colspan="2">End Semester Exam (ESE) Pattern:</td><td colspan="3">Practical (PR)</td></tr>
<tr><td colspan="5">Prerequisite course(s):</td></tr>
<tr><td colspan="5">Discrete Mathematics</td></tr>
<tr><td colspan="5">Course objectives:</td></tr>
<tr><td colspan="5"></td></tr>
<tr><td colspan="5">1. To impart the basic concepts of data structures and algorithms.
2. To understand the basic concepts of searching and hashing
3. To understand the basic concepts of operations in data structures
4. To understand the time and space required for a given algorithm,</td></tr>
<tr><td colspan="5">Course outcomes:</td></tr>
<tr><td colspan="5">Upon successful completion of lab Course, student will be able to:</td></tr>
<tr><td colspan="5">1. Apply suitable data structure for a given problem.
2. To design and implement basic data structures and to determine time and space complexity.
3. Apply suitable searching algorithm for a given problem.
4. Perform operations like insert, delete, traverse, search etc. in a given data structure.</td></tr>
<tr><td colspan="5"></td></tr>
</table>

<table>
<tr><td colspan="4">LAB COURSE CONTENT</td></tr>
<tr><td colspan="2">Data Structure & Algorithms</td><td>Semester:</td><td>IV</td></tr>
<tr><td colspan="2">Teaching Scheme:</td><td colspan="2">Examination scheme</td></tr>
<tr><td>Practical:</td><td>2 hours/week</td><td>End semester exam (ESE):</td><td>25 marks</td></tr>
<tr><td colspan="2"></td><td>Internal Continuous Assessment (ICA):</td><td>25 marks</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td colspan="4">Concern faculty member should suitably frame at least FOUR laboratory assignments from the Group A and FOUR experiments from the Group B using C/C++/JAVA from the following list.

(Group A)
1. Implementation of stack using array or linked list.
Performing simple operations like push, pop and display with respect to stack.
2. Implementation of multi-stack / multi-queue in one array.
Performing simple operations like push, pop and display with respect to multi-stack.
3. Implementation of queue using array or linked list.
Performing simple operations like insertion and deletion of an element into the queue.</td></tr>
</table>

4. Implementation of circular queue using array or linked list.
Performing simple operations like insertion and deletion of an element into the circular queue.
5. Conversion of infix expression to postfix expression.
Performing simple conversions of given infix expression into postfix expression.
6. Conversion of postfix expression to infix expression.
Performing simple conversions of given postfix expression into infix expression.

(Group B)

1. Implementation of double linked list & perform insertion, deletion and searching.
Performing the operations on double linked list like insertion, deletion and searching.
2. Creation of binary tree & perform all non-recursive traversals.
Create the binary tree and perform the In-order, Preorder and Post-order traversal.
3. Creation of binary search tree & perform insertion, deletion and printing in tree shape.
Create the Binary Search tree performing the operations on BST like insertion, deletion and printing in tree shape.
4. Create a hash table and handle the collision using linear probing with or without replacement
Creation of hash Table and handle the collision using linear probing with or without replacement.
5. Write a program to construct an AVL tree for the given set of keys. Also write function for deleting a key from the given AVL tree.
6.Implementation of Heap sort algorithm Sort the input data using Max-heap/Min-heap algorithm

Note: Use of Open Source Software/Tool/Technology is recommended for laboratory assignments of concern subject.

Text Books:

1. Seymour Lipschutz, "Data Structures", Schaums Outlines, Tata McGraw Hill, 1st Edition.
2. Ellis Horowitz and Sartaj Sahani, "Fundamentals of Data Structures", Galgotia Publication, 1st Edition
3. Michael T. Goodrich and Roberto Tamassia, Data Structure and Algorithms in JAVA, John Willey and Sons, 4th Edition.

Reference Books:

1. G.S.Baluja, Data Structures through C, Dhanpatrai Publications, 2012
2. Ashok N. Kamthane, Introduction to Data structures in C", Person Publications, 2007 Edition
3. Aarom Tanenbaum, Yedidyah Langsam, Moshe Augenstein, Data structures using C, Pearson Publication, 2nd Edition
4. Alfred Aho, John Hopcroft, Jeffrey Ullman, Data Structures and Algorithms ,Pearson Publications.
5. E.Balagurusamy, Data Structures using C, Tata MacGraw Hill Publications.
6. P.S.Deshpande, O.G.Kakde,"C and Data Structures", dreamtech press Publications.
7. RS Salaria, Data Structures, Khanna Publishing House

8. Yashwant Kanetkar, Data Structures through C, BPB Publications
9. RB Patel, Expert Data Structures with C++, Khanna Publications

Guide lines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guidelines for ESE:

ESE will be based on the practical assignments submitted by the students in the form of journal. In the ESE (PR), the students may be asked to perform the practical assignment with minor modification.

Evaluation will be based on the paper work of algorithm, understanding of the logic and the syntax, quality of the program, execution of the program, type of input and output for the program.

Computer Organization and Architecture Lab					
LAB COURSE OUTLINE					
Course Title:	**Computer Organization and Architecture Lab**	**Short Title:**	**COAL**	**Course Code:**	
Course description:					
This laboratory provides students with a comprehensive study of the basic concepts of 8086 microprocessor and its programming. The lab provides the students with the means of writing efficient 8086 assembly language programs, use of software interrupts & their functions, and single step execution of a program.					

Laboratory	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	2	14	28	1

End Semester Exam (ESE) Pattern:	**Practical (PR)**
Prerequisite course(s):	
Fundamental knowledge of DOS/Windows Commands and 8086 Assembly Language Programming	
Course objectives:	

1. How to write algorithm and develop the logic of any program.
2. To assemble and execute 8086 assembly language program.
3. To debug the 8086 assembly language program in single step mode.
4. To use software interrupts in an 8086 assembly language program.

Course outcomes:

Upon successful completion of lab Course, student will be able to:

1. Apply DOS/BIOS interrupts and its functions for input and output operations.
2. Identify and apply 8086 assembly language macro.
3. Understand and apply 8086 assembly language NEAR and FAR procedure
4. Apply various string matching operations.

LAB COURSE CONTENT			
Computer Organization and Architecture Lab		**Semester:**	**IV**
Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**	**End semester exam (ESE):**	**25 marks**
		Internal Continuous Assessment (ICA):	**25 marks**
Concerned faculty member should suitably frame at least 10 laboratory assignments using 8086 Assembly Language Programming from the following list.			

1. Study of DOS and BIOS interrupts and 8086 Assembler Directives.
2. Program using MACRO: Display personal information using MACRO.
3. Program for Addition/Subtraction of 2 numbers using NEAR procedure.
4. Program for Addition/Subtraction of 2 numbers using FAR procedure.
5. Program for Multiplication/Division of 2 numbers using NEAR procedure.
6. Program for Multiplication/Division of 2 numbers using FAR procedure
7. Program to find out Factorial of any given number using recursive procedure.
8. Program for Password Verification
9. Program to add two BCD numbers.
10. Program for BCD to HEX conversion.
11. Program for HEX to BCD conversion.
12. Program to display System Date/Time.
13. Program using Structure.
14. Program to generate Fibonacci Series.
15. Program for block transfer from one segment to another segment
16. Program to sort the given array in ascending and descending order.

Note: Use of Open Source Software/Tool/Technology is recommended for laboratory assignments of concern subject.

Text Books:

1. Douglas V Hall, Microprocessor and Interfacing, Programming and Hardware, Tata McGraw Hill, Revised 2^{nd} edition.
2. “IBM PC Assembly Language and Programming”, 5^{th} edition by Peter Abel, Pearson.

Reference Books:

1. John E. Uffenbeck, The 8086/ 8088 Family: Design, Programming and Interfacing”, By Pearson.
2. A. Ray and K. Bhurchandi , Advanced Microprocessors and Peripherals: Architecture, Programming & Interfacing, Tata McGraw Hill, 3^{rd} Edition by
3. Barry B Bray, “The Intel Microprocessors-Architecture, Programming and Interfacing”, Pearson LPE/PHI, 7^{th} Edition.
4. B. Ram, Computer Fundamentals Architecture and Organization, New Age International
5. Rajaraman, Computer Organization & Architecture, PHI Learning

Guide lines for ICA:
Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.
Guidelines for ESE:
ESE will be based on the practical assignments submitted by the students in the form of journal. In the ESE (PR), the students may be asked to perform the practical assignment with minor modification. Evaluation will be based on the paper work of algorithm, understanding of the logic and the syntax, quality of the program, execution of the program, type of input and output for the program.

<table>
<tr><td colspan="8" align="center">IT Workshop</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td colspan="8" align="center">LAB COURSE OUTLINE</td></tr>
<tr><td>Course Title:</td><td colspan="3">IT Workshop</td><td>Short Title:</td><td>ITW</td><td>Course Code:</td><td></td></tr>
<tr><td colspan="8">Course description:</td></tr>
<tr><td colspan="8">This course deals with the basic simulation operations like one dimensional, two dimensional array, matrix manipulations, vectors, trigonometric functions like sine, tan , cosine with Matlab / Scilab simulation software.</td></tr>
<tr><td></td><td>Hours/week</td><td colspan="2">No. of weeks</td><td colspan="2">Total hours</td><td colspan="2">Semester credits</td></tr>
<tr><td>Theory</td><td>1</td><td colspan="2">14</td><td colspan="2">14</td><td colspan="2" rowspan="2">2</td></tr>
<tr><td>Laboratory</td><td>2</td><td colspan="2">14</td><td colspan="2">28</td></tr>
<tr><td colspan="3">End Semester Exam (ESE) Pattern:</td><td colspan="5">Practical (PR)</td></tr>
<tr><td colspan="8">Prerequisite course(s):</td></tr>
<tr><td colspan="8">Fundamental concepts of Mathematics</td></tr>
<tr><td colspan="8">Course objectives:</td></tr>
<tr><td colspan="8">1. To familiarize the students in introducing and exploring MATLAB/Scilab / Any other equivalent open source software.
2. To enable the students on how to approach for solving Engineering problems using simulation tools.
3. To prepare the students to use MATLAB/Scilab / Any other equivalent open source software in their project works.
4. To provide a foundation in use of this software for real time applications</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td colspan="8">Course outcomes:</td></tr>
<tr><td colspan="8">Upon successful completion of lab Course, student will be able to:</td></tr>
<tr><td colspan="8">1. Express procedure, algorithm, programming & simulation for engineering problems.
2. Find importance of MATLAB/Scilab / Any other equivalent open source software for Laboratory Experimentation.
3. Articulate importance of software in research by simulation work.
4. Write basic mathematical, electrical, electronic problems in MATLAB</td></tr>
<tr><td colspan="8"></td></tr>
</table>

<table>
<tr><td colspan="4" align="center">LAB COURSE CONTENT</td></tr>
<tr><td colspan="2">IT Workshop</td><td>Semester:</td><td>IV</td></tr>
<tr><td colspan="2">Teaching Scheme:</td><td colspan="2">Examination scheme</td></tr>
<tr><td>Theory</td><td>1 hour / week</td><td>End semester exam (ESE):</td><td>25 marks</td></tr>
<tr><td>Practical:</td><td>2 hours/week</td><td>Internal Continuous Assessment (ICA):</td><td>25 marks</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td colspan="4">Creating a One-Dimensional Array (Row / Column Vector) Exercise – Creatinga vector of even whole numbers between 31 and 75;
Creating a Two-Dimensional Array (Matrix of given size) and (A) Performing Arithmetic</td></tr>
</table>

Operations - Addition, Subtraction, Multiplication and Exponentiation. (B) Obtaining Modified Matrix - Inverse, Transpose, with Appended and Deleted Elements;

Performing Matrix Manipulations - Concatenating, Indexing, Sorting, Shifting,Reshaping, Resizing and Flipping about a Vertical Axis / Horizontal Axis;

Creating ArraysX & Y of given size (1 x N) and Performing
(A). Relational Operations - >, <, ==, <=, >=, ~=
(B). Logical Operations - ~, &, |, XOR

Generating a set of Commands on a given Vector (Example: X = [1 8 3 9 0 1]) to
(A). Add up the values of the elements (Check with **sum**)
(B). Compute the Running Sum (Check with **sum**), where Running Sum for element j = the sum of the elements from 1 to j, inclusive.
(C). Compute the Sine of the given X-values (should be a vector).
Also, Generating a Random Sequence using **rand() / randn()** functions and plotting them.

Evaluating a given expression and rounding it to the nearest integer value usingRound, Floor, Ceil and Fix functions; Also, generating and Plots of
(A) Trigonometric Functions - sin(t), cos(t), tan(t), sec(t), cosec(t) and cot(t) for a given duration
(B). Logarithmic and other Functions – log(A), log10(A), Square root of A, Real nth root of A.

Generating a Sinusoidal Signal of a given frequency (say, 100Hz) and Plottingwith Graphical Enhancements - Titling, Labelling, Adding Text, Adding Legends, Adding New Plots to Existing Plot, Printing Text in Greek Letters, Plotting as Multiple and Sub-Plots; Also, Making Non-Choppy and Smooth Plot of the functions,
$f(x) = \sin(1/x)$ for $0.01 < x < 0.1$ and $g(x) = (\sin x) / x$.

Concern faculty member should suitably frame at least FOUR laboratory assignments from the Group A and FOUR laboratory assignments from the Group B using MatLab / SciLab / any other equivalent open source software from the following list.

Group- A

Matrix operation

1. Create one/two Dimensional Array
2. Insertion and Deletion of element in array.
3. Perform arithmetic operations on array (Addition, Subtraction, Multiplication, Division, Exponentiation, Inverse, Transpose etc.)
4. Performing Matrix Manipulation-Concatenating, Indexing, Sorting, Shifting, Reshaping, Resizing and Flipping about a Vertical Axis/ Horizontal Axis.
5. Perform Relational and Logical operations on two matrix like

a. Relational Operations- >, <, ==, <=, >=, ~=.

b. Logical Operations- ~, &, |, XOR

Group - B

Write an expression and Perform Plot operation

1. Write a linear and differential expression and round it to the nearest integer value using Round, Floor, Ceil and Fix operations.
2. Using linear expression plot the

   a. Trigonometric functions-sin(t), cos(t), tan(t), cot(t), sec(t), cosec(t).

   b. Logarithmic functions- $\log(A)$, $\log_{10}(A)$, Square root of A, Real n'th root of A.

Generating a Sinusoidal Signal of a given frequency (say, 100Hz) and Plotting with Graphical Enhancements – Title, Labeling, Adding Text, Adding Legends.

3. Generating multiple and subplot for sine, cos, square, triangular etc.
4. Creating a vector X with elements, $X_n = \frac{(-1)^{n+1}}{(2n-1)}$ and adding up 100 elements of the vector, X; And, plotting the functions, x, x^3, e^x and $\exp(x^2)$ over the interval 0<x<4 on
   (A) A Rectangular Plot

   (B) A Semi log Plot

   (C) A log-log Plot

Note: Use of Open Source Software/Tool/Technology is recommended for laboratory assignments of concern subject.

Text Books:

1. Y. Kirani Singh and B.B. Chaudhari, "MATLAB Programming", PHI, 1st Edition, 2010

Reference Books:

1. Stephen J. Chapman, "MATLAB Programming for Engineers", Thomsan Learning, 3rd Edition, 2007
2. Amos Gilat, "MATLAB An Introduction with Applications", Wiley India, 1st Edition, 2010
3. 3.Rudra Pratap, " Getting Started with MATLAB 7", OXFORD, 1st Indian Edition,
4. 2006
5. www.scilab.org

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Environmental Studies					
COURSE OUTLINE					
Course Title:	**Environmental Studies**	**Short Title:**	**EVS**	**Course Code:**	**Non Credit**
Course description:					
The course aims to percolate the importance of environmental science and environmental studies.					

COURSE CONTENT		
Environmental Studies	**Semester:**	**IV**
	Examination scheme	
	End Semester Exam (ESE):	**80 marks**
	Duration of ESE:	**03 hours**
	Internal Continuous Assessment (ICA):	**20 marks**

Unit–I:	**No. of Lectures: 02 Hours**	

Multidisciplinary nature of environmental studies
Definition, scope and importance
Need for public awareness.

Unit–II:	**No. of Lectures: 08 Hours**	

Natural Resources :
Renewable and non-renewable resources
Natural resources and associated problems.

a. Forest resources : Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.
b. Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
c. Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
d. Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
e. Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.
f. Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

• Role of an individual in conservation of natural resources.
• Equitable use of resources for sustainable lifestyles.

Unit–III:	**No. of Lectures: 06 Hours**	

Ecosystems

- Concept of an ecosystem.

- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following ecosystem :-
  a. Forest ecosystem
  b. Grassland ecosystem
  c. Desert ecosystem
  d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit–IV:	No. of Lectures: 08 Hours	

Biodiversity and its conservation

- Introduction – Definition : genetic, species and ecosystem diversity.
- Biogeographic classification of India
- Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values
- Biodiversity at global, National and local levels.
- India as a mega-diversity nation
- Hot-sports of biodiversity.
- Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India
- Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.

Unit–V:	No. of Lectures: 08 Hours	

Environmental Pollution

Definition

- Cause, effects and control measures of :-
  a. Air pollution
  b. Water pollution
  c. Soil pollution
  d. Marine pollution
  e. Noise pollution
  f. Thermal pollution
  g. Nuclear hazards
- Solid waste Management : Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution.
- Pollution case studies.

- Disaster management : floods, earthquake, cyclone and landslides.

Unit–VI:	No. of Lectures: 07 Hours	

Social Issues and the Environment

- From Unsustainable to Sustainable development
- Urban problems related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. Case Studies
- Environmental ethics : Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear
- Accidents and holocaust. Case Studies.
- Wasteland reclamation.
- Consumerism and waste products.
- Environment Protection Act.
- Air (Prevention and Control of Pollution) Act.
- Water (Prevention and control of Pollution) Act
- Wildlife Protection Act
- Forest Conservation Act
- Issues involved in enforcement of environmental legislation.
- Public awareness.

Unit–VII:	No. of Lectures: 06 Hours	

Human Population and the Environment

- Population growth, variation among nations.
- Population explosion – Family Welfare Program
- Environment and human health.
- Human Rights.
- Value Education.
- HIV/AIDS.
- Women and Child Welfare.
- Role of Information Technology in Environment and human health.
- Case Studies.

Unit–VIII:	No. of Lectures:	

Field work

- Visit to a local area to document environmental assets, river / forest / grassland / hill / mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural

- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc. (Field work Equal to 5 lecture hours)

Guide lines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Reference Books:

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India, Email:mapin@icenet.net (R)
3. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
4. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
5. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
6. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
7. Down to Earth, Centre for Science and Environment (R)
8. Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
9. Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)
10. Heywood, V.H & Waston, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.
11. Jadhav, H & Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284 p.
12. Mckinney, M.L. & School, R.M. 1996. Environmental Science systems & Solutions, Web enhanced edition. 639p.
13. Mhaskar A.K., Matter Hazardous, Techno-Science Publication (TB)
14. Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB)
15. Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574p
16. Rao M N. & Datta, A.K. 1987. Waste Water treatment. Oxford & IBH Publ. Co. Pvt. Ltd. 345p.
17. Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut
18. Survey of the Environment, The Hindu (M) Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science (TB)
19. Erach Bharucha, Textbook of Environmental Studies, University Press
20. MP Poonia & SC Sharma, Environmental Studies, Khanna Publishing House
21. Rajagopalan, Environmental Studies, Oxford University Press

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Second Year Engineering

(Electronics and Telecommunication Engineering)

Faculty of Science and Technology

'A' Grade
NAAC Re-Accredited
(3rd Cycle)

COURSE OUTLINE

Semester - III

W.E.F. 2018 – 19

Syllabus Structure for Second Year Engineering (Semester – III) (E & TC) (w.e.f. 2018 – 19)

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Mathematics-III	B	3	1	-	4	40	60	-	-	100	4
Electrical Machines	C	3	-	-	3	40	60	-	-	100	3
Solid State Devices and Circuits	C	3	-	-	3	40	60	-	-	100	3
Digital System Design	D	3	-	-	3	40	60	-	-	100	3
Industrial Organization and Management	A	3	-	-	3	40	60	-	-	100	3
Programming Language Lab	C	-	-	2	2	-	-	25	25(PR)	50	1
Digital System Design Lab	D	-	-	2	2			25	25(PR)	50	1
Electronic Devices and Circuits Lab	D	1	-	2	3	-	-	25	25(PR)	50	2
		16	**1**	**6**	**23**	**200**	**300**	**75**	**75**	**650**	**20**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA: Internal Continuous Assessment**

Syllabus Structure for Second Year Engineering (Semester – IV) (E & TC) (w.e.f. 2018 – 19)

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Biology	B	3	1	-	4	40	60	-	-	100	4
Network and Lines	C	3	-	-	3	40	60	-	-	100	3
Analog and Digital Communication	D	3	-	-	3	40	60	-	-	100	3
Analog Circuits	D	3	-	-	3	40	60	-	-	100	3
Entrepreneurship Development Program	A	3	-	-	3	40	60	-	-	100	3
Electronics Workshop	C	-	-	2	2	-	-	-	-	-	1
Analog and Digital Communication Lab	D	-	-	2	2	-	-	25	25(PR)	50	1
Analog Circuit Lab	D	-	-	2	2	-	-	25	25(PR)	50	1
Electronics Network Lab	D	1	-	2	3	-	-	25	25(PR)	50	2
*Environment Studies	H	-	-	-	-	20	80	-	-	-	-
		16	**1**	**8**	**25**	**200**	**300**	**75**	**75**	**650**	**21**

***Only for directly admitted students for second year after Diploma.**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA: Internal Continuous Assessment**

MATHEMATICS-III					
COURSE OUTLINE					
Course Title:	**Mathematics III**	**Short Title:**	**M-III**	**Course Code:**	**BSC**

Course description: This course is aimed at introducing the fundamentals of basic Mathematics to undergraduate students. The background expected includes a prior knowledge of Mathematics from first year engineering or diploma and familiarity with various laws, principles and theories of probability and statistics. The goals of the course are to understand the basic principle of Transforms, probability, statistics and its application in Engineering Field.

Lecture 03	Hours/week	No. of weeks	Total hours	Semester credits
	3	14	40	3
Tutorial 01	1	14	14	1

Prerequisite course(s): 11^{th}& 12^{th} mathematics

Course objectives:

(1) To introduce the solution methodologies for Fourier transform, Z-Transform and Laplace transform with applications in engineering

(2) To provide an overview of probability and statistics to engineers.

Course outcomes:

Upon completion of this course, students will be able to solve field problems in engineering involving ordinary differential equations using Laplace Transform. They can also formulate and solve problems involving random variables and apply statistical methods for analyzing experimental data.

COURSE CONTENT			
Mathematicss -III		**Semester:**	III
Teaching Scheme:		**Examination scheme**	
Lectures:03	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
Tutorial:01	**1 hours/week**	**Duration of ESE:**	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	No. of Lectures: 8 Hours	Marks: 12

Laplace Transform : Properties of Laplace Transform. Inverse Laplace transform & Properties. Convolution theorem. Evaluation of integrals by Laplace transform. Solving ordinary differential equations by Laplace Transform.		
Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**
Fourier Transform: Fourier sine and cosine integrals, Fourier sine transform, Fourier cosine transform, Inverse Fourier transform. Discrete Fourier Transform (DFT), Properties of DFT(without proof).		
Unit–III	**No. of Lectures: 8 Hours**	**Marks: 12**
Z – Transform: Introduction, Definition, Region of convergence, Properties of Z-Transform, Inverse Z-Transform, Difference equation using Z-Transform.		
Unit–IV	**No. of Lectures: 08 Hours**	**Marks: 12**
Basic & Statistics Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, Addition Law of probability, Multiplication Law of probability, Expectation of Discrete Random Variables, Variance, Moments, skewness and kurtosis		
Unit–V:	**No. of Lectures: 8 Hours**	**Marks: 12**
Probability distributions and Sampling Binomial, Poisson and Normal distributions, Correlation and regression. Test of significance: Large sample test for single mean, difference of means for two samples and difference of standard deviations.		
Text Books:-		
(i) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010,2016 (ii) H.K.DASS "Advance Engineering Mathematics" S. Chand publications. Fifteenth revised edition 2006. (iii) S. C. Gupta "Fundamentals of Statistics",Himalaya Publishing House ,sixth revised edition 2008.		

(iv) Debashis Datta “Textbook of Engineering Mathematics’’ ‘New Age International Publication. Revised second edition **Reference Books** :
(i) G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002. (ii) Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.. (iii) Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008. (iv) Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010. (v) B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.

Electrical Machines					
COURSE OUTLINE					
Course Title:	**Electrical Machines**	**Short Title:**	**EM**	**Course Code:**	
Course description:					
The course considers the basic principles of electrical machines. In this course we will introduce some of the basic concepts and terminology that are used in modern electrical engineering. The students can use this knowledge to analyze electrical networks, D.C. machines, A.C. machines & transformer etc.					

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	03	14	40	3

Prerequisite course(s):

Knowledge of Basics of Electrical and Electronics Engineering.

Course objectives:

1. The objective of the course is to help the students to understand the basic concepts of electrical machines.
2. The students will be able to learn DC machines. It also helps to understand the single phase, three phase transformers & AC motors concepts.
3. Students are able to understand operation of special motors.

Course outcomes:

After successful completion of this course the student will be able to:

1. Apply knowledge of 3Ø system for measurement of 3Ø power & analysis of their parameters
2. Understand constructional details, principle of operation, performance, starters DC Machines.
3. Understand constructional details, principle of operation and working of transformers, AC machines, 3Ø, 1Ø induction motor & special purpose machines.
4. Analyze different parameters of transformer & also they are familiar with V-V connection, Scott connection, testing of transformer.
5. Understand different parameters, starting method and the effect of change of excitation on synchronous motor
6. Understand about EMF, torque & different starters of induction motor.

COURSE CONTENT

Electrical Machines		**Semister**	**III**
Teaching Schme:		**Examination Schme:**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**
Three Phase Circuits		
Three Phase Circuits: Generation of 3ϕ supply, Phase sequence, Necessity of 3ϕ supply, star & delta connection of three phase winding, Line & phase voltages & currents in star & delta		

connections, power in three phase circuit with balance load for star & delta connection, measurement of three phase power by Single watt meter, two watt meter method, calculation of Active, reactive, apparent power and power factor.		
Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**
DC machine		
DC machine: Working principle, Construction, types, generator action, EMF equation, significance of back emf, Torque equation and speed equation of motor, Characteristics of shunt, series motor, necessity of starter, 3-point starter, speed control method, theoretical treatment of losses and power stages of Dc machine		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Transformers		
1ϕ Transformers: Working Principle, Construction, EMF equation, transformer on no load & on load phasor diagram, equivalent circuit of transformer, Open circuit and short circuit tests, Efficiency and regulation **3ϕ Transformers:** Star-star, delta-delta, star-delta, delta-star connection, v-v connection, scott connection, Auto-transformer & C.T, P.T.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Synchronous Machines		
Alternator: Principle of operation, construction, EMF equation, winding factor, voltage regulation by synchronous impedance method. **Synchronous motor:** Principle of operation, synchronous motors on load phasor diagram, V curve, hunting.		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Induction Motors		
3ϕ Induction motor: Principle of working, construction, Slip, torque equation (Tst & Tmax), torque - slip characteristics, different types of starters (DOL, star-delta, auto-transformer). **1ϕ Induction motors:** Principle of operation, types and applications. **Special machines:** Working & application of stepper motor, servo motor, universal motors		
Text Books:		
1. B. Theraja, A. Theraja, "A Text book of Electrical Technology- Vol-I",S. Chand, 1st Edition, 2010. 2. B. Theraja, A. Theraja, "A Text book of Electrical Technology- Vol-II", S. Chand, 1st Edition, 2010.		
Reference Books:		
1. V N Mittle/ Arvind Mittal, "Basic Electrical Engineering", McGraw Hill Companies, 2nd Edition. 2. S. K. Bhattacharya, "Electrical Machine", Tata McGraw Hill 2nd Edition. 3. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.\ 4. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010 5. H. Cotton, "Electrical Technology", CBS Publication, 7th Edition		

<table>
<tr><td colspan="6">Solid State Devices and Circuits</td></tr>
<tr><td colspan="6"></td></tr>
<tr><td colspan="6">COURSE OUTLINE</td></tr>
<tr><td>Course Title:</td><td>Solid State Devices and Circuits</td><td>Short Title:</td><td>SSDC</td><td>Course Code:</td><td></td></tr>
<tr><td colspan="6">Course description:</td></tr>
<tr><td colspan="6">This course provides the students with comprehensive study of basic components and solid state circuits. It deals with BJT, FET.</td></tr>
</table>

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	03	14	40	3

Prerequisite course(s):

Basic knowledge of Electronics

Course objectives:

1. To give the brief idea about basics of Semiconductor Devices.
2. To familiarize the students to perform the frequency analysis of Solid State circuit.
3. To empower students to understand the working of BJT / FET amplifiers.

Course outcomes:

After successful completion of this course the student will be able to:

1. Understand the principles of semiconductor Physics and to acquire basic knowledge of physical and electrical conducting properties of transistor.
2. Develop the ability to understand the working of BJT / FET amplifiers.
3. Develop the skill to build, and troubleshoot solid state circuits.
4. Understand and utilize the mathematical models of semiconductor junctions and MOStransistors for circuits and systems.

<table>
<tr><td colspan="4">COURSE CONTENT</td></tr>
<tr><td colspan="2">Solid State Devices and Circuits</td><td>Semester:</td><td>III</td></tr>
<tr><td colspan="2">Teaching Scheme:</td><td colspan="2">Examination scheme</td></tr>
<tr><td>Lectures:</td><td>3 hours/week</td><td>End semester exam (ESE):</td><td>60 marks</td></tr>
<tr><td colspan="2" rowspan="2"></td><td>Duration of ESE:</td><td>03 hours</td></tr>
<tr><td>Internal Sessional Exams (ISE):</td><td>40 marks</td></tr>
</table>

Unit–I:	No. of Lectures: 08 Hours	Marks: 12

Semiconductor and Diode:

Intrinsic and Extrinsic Semiconductors, Conduction mechanism, mobility, drift and diffusion currents, Einstein equation, mass action law, PN junction diode, current equation, diode resistances, temperature dependence and zener diode.

Unit–II:	No. of Lectures: 08 Hours	Marks: 12

Transistors:

Bipolar Junction Transistor, I-V characteristics, determination of region of operation, Ebers-Moll Model, Load line and Q point, Stability,Methods of biasing, Bias compensation techniques and Thermal runaway.		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Small signal analysis of BJT :		
h-parameter analysis, CE,CB,CC configurations, CE-CC h parameter conversion, Miller theorem and its dual, CE-CE, CE-CB,CE-CC and Darlington configurations analysis. Frequency response of an amplifier –F_L,F_H,Gain.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Field Effect Transistor :		
JFET, MOSFET and their parameters, Transfer characteristics equations, Biasing analysis of FETs using analytical and graphical approach, Small signal analysis of FET for CS, CG,CD configurations,		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Integrated circuit fabrication process:		
Oxidation, diffusion, ion implantation, photolithography, etching, chemical vapor deposition, sputtering, twin-tub CMOS process.		
Text/ Reference Books:		
1. Millman and Halkais, Integrated Electronics TMH Publication, 2nd Edition 2. Louis Nashelsky & Robert Boylestad, Electronics Devices and Circuits Theory, Pearson Publication, 10th Edition 3. Dr. R. S. Sedha, Electronics Circuits by, S Chand Publication,4th Edition		

Digital System Design

COURSE OUTLINE

Course Title:	**Digital System Design**	**Short Title:**	**DSD**	**Course Code:**	

Course description:

This course is aimed at introducing the fundamentals of digital systems to undergraduate students. The goals of the course are to understand the basic principle of digital systems and application in different era.

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	03	**14**	**40**	**03**

Prerequisite course(s):

Knowledge of number system, logic gates, simplification and implementation of logic system and also knowledge about semiconductor devices of Electronics Engineering.

Course objectives:

1. This course provides an introduction to digital electronics & its applications in digital system design covering different types of code convertor, Boolean laws, SOP and POS form, k-map technique, arithmetic circuits, different types of flip-flops and their applications, sequential circuits and its applications.
2. Logic families TTL, MOS and its interfacing.
3. This course also provides the fundamental concept of VHDL language.

Course outcomes:

After successful completion of this course the student will be able to:

1. Use the basic logic gates and various reduction techniques of digital logic circuit in detail.
2. Design and analyze combinational logic circuits
3. Design & analyze modular combinational circuits with MUX/DEMUX, Decoder,Encoder
4. Design & analyze synchronous sequential logic circuits
5. Use HDL & appropriate EDA tools for digital logic design and simulation

COURSE CONTENT

Digital System Design		**Semester:**	**III**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Logic Simplification and Combinational logic Design/circuits

Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Karnaugh maps up to 6 variables, Binary codes, Code Conversion.

Unit–II:	No. of Lectures: 08 Hours	Marks: 12
MSI devices		
MSI devices like Comparators, Multiplexers, Encoder, Decoder, Driver & Multiplexed Display, Half andFull Adders, Subtractors, Serial and Parallel Adders, BCD Adder, ALU.		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Sequential Logic Design/Circuits		
Building blocks like S-R, JK and Master-Slave JK FF, Edge triggered FF, Rippleand Synchronous counters, Shift registers, Finite state machines, Design of synchronous FSM,Algorithmic State Machines charts. Designing synchronous circuits like Pulse train generator, PseudoRandom Binary Sequence generator, Clock generation.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Logic Families and Semiconductor Memories		
TTL NAND gate, Specifications, Noise margin, Propagation delay, fan-in, fan-out, Tristate TTL, ECL, CMOS families and their interfacing, Memory elements, Conceptof Programmable logic devices like FPGA. Logic implementation using Programmable Devices.		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
VLSI Design flow		
Design entry: Schematic, FSM & HDL, different modeling styles in VHDL, Data typesand objects, Dataflow, Behavioral and Structural Modeling, Synthesis and Simulation VHDL constructs and codes for combinational and sequential circuits.		
Text/ Reference Books:		
1.R.P. Jain, "Modern digital Electronics", Tata McGraw Hill, 4th edition, 2009. 2. Douglas Perry, "VHDL", Tata McGraw Hill, 4th edition, 2002. 3. W.H. Gothmann, "Digital Electronics- An introduction to theory and practice", PHI, 2nd edition 2006. 4. D.V. Hall, "Digital Circuits and Systems", Tata McGraw Hill, 1989 . 5. Charles Roth, "Digital System Design using VHDL", Tata McGraw Hill 2nd edition 2012.		

Industrial Organization and Management					
COURSE OUTLINE					
Course Title:	**Industrial Organization Management**	**Short Title:**	**IOM**	**Course Code:**	
Course description:					
This course provides an introduction to: basics of management their organizational structures with human resources development, financial management, quality management & industrial acts.					

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	03	**14**	**40**	**03**

Prerequisite course(s):

Basic knowledge of Management science and their concept.

Course objectives:

1. To study Management Administration Organization at work
2. To obtain knowledge of Individual and Group Perspective
3. To get in depth knowledge about Industrial legislation

Course outcomes:

After successful completion of this course the student will be able to:

1. Understand concept of management science, organizational structure.
2. Apply various forms of business ownership and finance.
3. Understand the utilization of available resources like men, material and machines etc.
4. Understand the knowledge regarding ISO standards, Industrial acts and accident avoidance.
5. Apply the concept of recruitment and get motivation for Entrepreneurship

COURSE CONTENT

Industrial Organization and Management		**Semester:**	**III**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Management and principles of Management:

Introduction to definition of management. Evolution of management, Introduction to scientific management by F.W Taylor, Administrative management by Fayol. Functions of management. Principles of management, management skills and roles. Relation between Administration Management and Organization.

Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**

Organizational structure:

Concept, Organization theories and forms of organizational structure. Types of ownership partnership, proprietorship. Joint stock company, private limited, public limited, co-operative organization. Public sector and Joint Venture.

Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**

Financial Management:

Definition and functions of financial management. Capital structure fixed and working capital.Sources of finance – external and internal sources, Loans from banks, Public deposits, Trade credit.Engineering Economics – wants ,utility, demand, Elasticity of demand and supply.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Human Resources Management:		
Factors affecting on human resource planning concept, need of human resource planning. Sources of recruitment, selection test. Objectives and benefit of training methods to workers, labour welfare Communication and discipline in industries. E-business and E-governance.		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Industrial Labour Legislation:		
Importance and necessity of labour act, industrial act: factories act Industrial Accidents and safety Quality- concept, quality control, ISO 9000 series standards in general		
Text Books:		
1. M.Mahajan: Industrial Engineering & Production Management, Dhanpat Rai & compony.		
Reference Books:		
1. O.P.Khanna:- Industrial Engineering & Management, Dhanpat Rai &Compony. 2. Koontz: Essential of Management, TMH6/edition. 3. M.Y.Khan & P.K.Jain :- Financial Management, TMH.		

Programming Language Lab

LAB COURSE OUTLINE

Course Title:	**Programming Language Lab**	**Short Title:**	**PL Lab**	**Course Code:**

Course description:

This course introduces C++ as an object-oriented programming language. C++ programming provides students with the means of writing efficient, maintainable, and portable code.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	02	**14**	**28**	**01**

End Semester Exam (ESE) Pattern:	**Practical (PR)**

Prerequisite course(s):

C programming

Course objectives:

1. To learn the characteristics of an object oriented programming language.
2. To learn and understand the syntax and semantics of the C++ programming language.
3. To learn and understand various object oriented concepts along with their applicability contexts.
4. To enhance problem solving and programming skills in C++.

Course outcomes:

Upon successful completion of lab Course, student will be able to:

1. Implements and understand the concept of function overloading and operator overloading.
2. Demonstrate the use of inheritance concepts with the help of programs.
3. Understand use of arrays and pointers in C++ programming.
4. Demonstrate the use of polymorphism, Binding and virtual functions.

LAB COURSE CONTENT

Programming Language Lab		**Semester:**	**III**
Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**	**End semester exam (ESE):**	25 Marks
		Internal Continuous Assessment (ICA):	25 Marks

- **Introduction to C++:** Difference between C and C++, Evolution of C++, Disadvantages of Conventional Programming, Programming Paradigms, Preface to Object Oriented Programming, Key concepts of Object Oriented Programming.
  Basics of C++: C++ Environments, Structure of C++ program.
- **Function in C++:** Parts of a function, Passing Arguments, Inline functions, Function Overloading.
- Class and Objects, Constructors and Destructors, Operator overloading.
- **Inheritance:** Single Inheritance, Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance, Hybrid Inheritance.
- **Arrays:** One dimensional array declaration and initialization, Characteristics of Arrays, Passing array elements to a function, Two-dimensional arrays, Three or Multi-dimensional array, Array of pointers, Array of classes.
- **Pointers:** Features of pointers, Pointers declaration, void pointers, Pointer to class, Pointer to object, this pointer, Pointer to members.
- **Binding, Polymorphism, virtual Functions:** Introduction, Binding in C++, Rules for virtual functions, Working of virtual function, Pure virtual functions.
- Function Templates, Class Templates

Concern faculty member should suitably frame at least **Eight** Laboratory assignments using C++ programming language from the following list.

1. Write a program to demonstrate use of simple class and object.
2. Write a program to demonstrate use of parameterized constructor.
3. Write a program to demonstrate use of overloading constructors.
4. Write a program to demonstrate use of function overloading.
5. Write a program to overload unary operator using member function.
6. Write a program to overload binary operator using member function.
7. Write a program to demonstrate use of single inheritance, multiple inheritances.
8. Write a program to demonstrate use of function templates.
9. Write a program to demonstrate use of array of pointers.
10. Write a program for the copy constructor.
11. Write a program to demonstrate use of multilevel inheritance and hybrid inheritance.
12. Write a program to demonstrate use of class templates.
13. Write a program to overload unary operator using friend function.
14. Write a program to demonstrate use of virtual functions.

Note: Use of Open Source Software/Tool/Technology is recommended for laboratory assignments of concern subject.

Text Books:

1. Ashok N. Kamthane, “Programming in C++”, Pearson Education, 2nd Edition, 2013.
2. E. Balagurusamy, “Object Oriented Programming with C++”, McGraw Hill, 6th Edition, 2013.

Reference Books:

1. Yashavant P. Kanetkar, “Let Us C++”, BPB Publications, 2nd Edition, 2003.
2. Robert Lafore, “Object Oriented Programming in C++”, Pearson Education, 4th Edition, 2002.
3. Mahesh Bhave, Sunil Patekar, “Object Oriented Programming with C++”, Pearson Education 2nd Edition, 2012.
4. Herbert Schildt, “The Complete Reference C++”, TMH, 4th Edition, 2003.

Guide lines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.
Guidelines for ESE:
ESE will be based on the Laboratory assignments submitted by the students in the form of journal. In the ESE (PR), the students may be asked to perform the practical assignment with minor modification. Evaluation will be based on the paper work of algorithm, understanding of the logic and the syntax, quality of the program, execution of the program, type of input and output for the program.

Digital System Design Lab					
LAB COURSE OUTLINE					
Course Title:	**Digital System Design Lab**	**Short Title:**	**DSDL**	**Course Code:**	
Course description:					
In this laboratory course emphasis is on the understanding of combinational and sequential circuits. The Students can use this knowledge to design and implement combinational and sequential circuits and also works on simulation technique on VHDL tool.					

Laboratory	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	2	**14**	**28**	**1**

End Semester Exam (ESE) Pattern:	
Prerequisite course(s):	
Basic concepts of Basic Electrical and Electronics Engineering.	
Course objectives:	

1. To Design and implement various combinational and sequential logic circuits.
2. To implement various sequential circuits like counter and shift registers.
3. To introduce students with new simulation VHDL tool.

Course outcomes:

Upon successful completion of lab Course, student will be able to:

1. Student will able to design combinational logic circuit like code converters, adder, subtractor etc
2. Student will able to design sequential logic circuit using FSM logic
3. Student will able to familiarize with VHDL Language.

LAB COURSE CONTENT

Digital System Design Lab		**Semester:**	**III**
Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**	**End semester exam (ESE):**	**25 Marks**
		Internal Continuous Assessment (ICA):	**25 Marks**

Concerned faculty member should suitably frame Eight laboratory assignments from the following list.

1. Realization of logic gates OR, AND, NOT, NOR, NAND gates using discrete components and verify their truth tables.
2. Design and implement 4-bit binary to Gray code converter
3. Implement 4-bit binary adder using IC 7483
4. Implement BCD to 7-segment decoder using IC 7447
5. Verify the truth table of multiplexer and Demultiplexer using IC
6. Study of Decade Counter
7. Study of JK, D type and T-Type flipflop using IC 7476
8. Study of ALU

9. Study of Shift Register 10. Study of Synchronous counter using IC 74191 11. Design 4-bit UP/DOWN synchronous counter using IC. 12. Realization of half and full Adder using VHDL.
Text/Reference Books:
1. R.P.Jain, M.M.S Anand , “Digital Electronics practice using Integrated circuits” , Tata McGraw Hill. 2. R.P. Jain, “Modern digital Electronics”, Tata McGraw Hill, 4th edition, 2009. 3. Douglas Perry, “VHDL”, Tata McGraw Hill, 4th edition, 2002. 4. W.H. Gothmann, “Digital Electronics- An introduction to theory and practice”, PHI, 2nd edition ,2006. 5. D.V. Hall, “Digital Circuits and Systems”, Tata McGraw Hill, 1989 6. Charles Roth, “Digital System Design using VHDL”, Tata McGraw Hill 2nd edition 2012.
Guide lines for ICA:
Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.
Guidelines for ESE:
ESE will be based on the laboratory assignments submitted by the students in the form of journal. Evaluation will be based on the understanding and execution.

Electronic Devices and Circuits Lab

LAB COURSE OUTLINE

Course Title:	**Electronic Devices and Circuits Lab**	**Short Title:**	**EDC**	**Course Code:**	

Course description:

In this laboratory course emphasis is on the understanding of basic Electronic Devices & circuits.

Laboratory	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	2	14	28	1

End Semester Exam (ESE) Pattern:	

Prerequisite course(s):

Basic concepts of Basic Electrical and Electronics Engineering.

Course objectives:

1. The objective of this laboratory is to understand the concepts, working and characteristics of Different Diodes, BJT and FET Transistors, amplifiers and compensation techniques of transistors.

Course outcomes:

Upon successful completion of lab Course, student will be able to:

1. Verify the working of different diodes, transistors, FET and measuring instruments. Identifying the procedure of doing the experiment.
2. Design the circuits with basic semiconductor devices (active & passive elements), measuring instruments & power supplies that serves many practical purposes.
3. Design and analyze the amplifier circuits using BJT and FET and study the frequency response.
4. Construct, analyze and troubleshoot the designed circuits.
5. Measure and record the experimental data, analyze the results, and prepare a formal laboratory report

LAB COURSE CONTENT

Electronic Devices and Circuits Lab		**Semester:**	**III**
Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**	**End semester exam (ESE):**	**25 marks**
		Internal Continuous Assessment (ICA):	**25 marks**

Concerned faculty member should suitably frame Eight laboratory assignments from the following list.

1. Determine Q- point and Stability factor of BJT for voltage divider biasing.
2. Determine Q- point of FET for self biasing.
3. To draw the input and output characteristics of transistor in CE Configuration & determine Input Resistance (Ri), Output Resistance (Ro) and Current amplification Factor (β) of the given transistor.
4. To draw the Drain and Transfer characteristics of FET in CS Configuration & determine the drain resistance (rd), amplification factor (μ) and Trans-Conductance (gm) of the given FET.
5. To determine h parameter for CE configuration.
6. Plot the transfer and drain characteristics of n-channel MOSFET and calculate its parameters, namely; drain resistance, mutual conductance and amplification factor.
7. To obtain the frequency response of the Common Emitter BJT Amplifier & measure the Voltage gain and Bandwidth.
8. To obtain the frequency response of the Common Source FET Amplifier & measure the Voltage gain and Bandwidth.
9. To measure the voltage gain and plot the frequency of response of CC amplifier.
10. To obtain the frequency response of the CE-CE BJT Amplifier & measure the Voltage gain and Bandwidth
11. To obtain the frequency response of the CE-CB BJT Amplifier & measure the Voltage gain and Bandwidth
12. Study of Integrated circuit fabrication process.

Reference Books:

1. Millman and Halkais, Integrated Electronics TMH Publication, 2nd Edition
2. Louis Nashelsky & Robert Boylestad, Electronics Devices and Circuits Theory, Pearson Publication, 10th Edition
3. Dr. R. S. Sedha, Electronics Circuits by, S Chand Publication,4th Edition

Guide lines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guidelines for ESE:

ESE will be based on the laboratory assignments submitted by the students in the form of journal.Evaluation will be based on the understanding and execution.

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Second Year Engineering

(Electronics and Telecommunication Engineering)

Faculty of Science and Technology

'A' Grade
NAAC Re-Accredited
(3rd Cycle)

COURSE OUTLINE

Semester - IV

W.E.F. 2018 – 19

Biology

COURSE OUTLINE

Course Title:	**Biology**	**Short Title:**	**BIO**	**Course Code:**	

Course description:

This course is introduced for learning the basic fundamentals of Life sciences (zoology & Botany) to undergraduate students. The goals of the course are to understand the basic principles of Biology and its applications in the field of Engineering.

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
Lecture	03	14	40	04
Tutorial	01	14	14	

Prerequisite course(s):

Course objectives:

1. Students will understand the structures and characteristics or functions of basic components of prokaryotic and eukaryotic cells, especially macro-molecules, membranes, and organelles.
2. Students will learn the basic principles of inheritance at the molecular, cellular and Organism levels.
3. Students will test and deepen their mastery of genetics by applying this knowledge in a variety of problem-solving situations.

Course outcomes:

After successful completion of this course the student will be able to:

1. Use current techniques and analysis methods in molecular biology and genetics.
2. Understand the current concepts in Cell Biology, Stem Cell Biology and Development.
3. Know the structure/function of the basic components of prokaryotic and eukaryotic cells including macro-molecules and organelles.
4. Demonstrate proficiency with at least one instrument commonly used in biological research (microscope, etc).

COURSE CONTENT

Biology		**Semester:**	**IV**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
Tutorial	**01 hours/week**	**Duration of ESE:**	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Diversity of Organism and Cell Biology

Introduction: Living systems, Bio-mimicry, Metabolism, Taxonomy, Concept of species, Structural organization of life, Concepts of modern cell, history of cell, Cell theory, Structure of cell:- Cell shape, size and cell number, Types of cells:- Prokaryotic cells and Eukaryotic cells, Chemistry of cells.

Cell Division: Cell cycle, mitosis, meiosis, mitotic cell division, cell cycle check points, meiotic cell division, embryonic cell division, cell death.		
Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**
Plant and Animal Kingdom		
Plant Kingdom: Introduction to plants, Salient features of major plant groups: Bryophyta, Pteridophyta, Gymnospermae, Angiospermae, **Plant Growth & Development:** Introduction, Seed Dormancy, Seed Germination, Phases of growth, Plant growth hormones. **Animal Kingdom:** Animal Classification, Salient features of non-chordates upto phylum level: Phylum porifera, phylum cindaria, phylum ctenophore, phylum platyhelminthes.		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Plant Cell and Animal cell culture and Applications		
Plant Cell Culture: Brief introduction to cell culture with respect to the properties of plant cells, Media requirements, Typical media used, Classification of tissue culture, callus culture, cell suspension culture, Application of callus culture and cell suspension culture, Plant cell cultivation Bioreactors **Animal Cell Culture:** Brief introduction to animal cell culture, Culture medium: Natural and Artificial media, introduction to balanced salt solutions and simple growth medium, Brief discussion on the chemical, physical and metabolic functions of different constituents of culture medium, Animal Bioreactors.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Microbial Culture and Applications:		
Introduction, Microbial Culture Techniques, growth curve, Pure culture techniques – microbial culture media, isolation, identification and maintenance of cultures, incidences of microorganisms in soil, water, air, food and sewage, food spoilage organisms, Applications of Microbial Culture Technology.		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Biotechnology and its Applications:		
Definitions, scope of Biotechnology, Recombinant DNA Technology: Making Recombinant DNA, Tools in Genetic Engineering, Polymerase Chain reaction (PCR). **Applications of Biotechnology:** Bioinformatics, Biomechanics, Biotechnology of waste treatment, Biosensors, Forensic science, Food Biotechnology, Fermentation Technology.		
Text Books:		
1. B.D. Singh “ Genetics” Kalyani Publications 2. C.B. Pawar“Cell Biology” Himalaya Publications, Third Edition. 3. C.B. Pawar“Cell and Molecular Biology” Himalaya Publications. 4. Text book of Zoology by V.K. Agrawal, S. Chand Publication. 5. Text book of Botany by Dr. B.P. Pandey S. Chand Publication. 6. Text book of Biotechnology by R.C. Dubey, S. Chand Publications		
Reference Books:		
1. P. K Gupta, Introduction to Biotechnology, Rastogi Publications. 2. B.D.Singh, Biotechnology: Expanding Horizons, Kalyani Publishers, New Delhi, Second		

Revised Edition, 2008.

3. S.S.Purohit, Biotechnology: Fundamentals and Applications, Agrobios (India), 4th Edition, 2005.
4. Andreas D. Boxevanis, Bioinformatics, Wiley International
5. David W. Mount, Bioinformatics: Sequence and Genome analysis, Cold Spring Harbour.
6. Bruce E Rittmann, Rurry L.Mc carty, Environmental Biotechnology:Principles and Applications, Mcgraw Hill international.
7. B. Sivashankar, Food Processing and Preservation, Prentice Hall ,India
8. Bhojwani, S.S.and Rajdan, Plant Tissue Culture: Theory and Practice, Revised Edition, Elsevier
9. Freshney, Culture of Animal Cells, 5th Edition, Wiley-Liss, 2005
10. M.J. Pelczar, Jr. E.C.S. Chan and N.R. Krieg, Microbiology 5^{th} Ed., TMH Book Company.

Network and Lines					
COURSE OUTLINE					
Course Title:	**Network and Lines**	**Short Title:**	**NL**	**Course Code:**	

Course description:

This course introduces the different techniques to analyze electric circuit to the students. They also enhance the ideas about types of network function & analysis of two port networks using Z, Y, h, ABCD parameters. Emphasis are given to the topics related to network analysis , complex frequency, frequency domain concept, properties of LC, RC, and RL., design of different types of filters and attenuators.

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	3	14	40	3

Prerequisite course(s):

Knowledge of Basic Electrical and Electronics Engineering and their concept.

Course objectives:

1. Study and understand the basic concepts and modern engineering methods of circuit analysis with passive and active elements.
2. To learn the importance of Laplace transform to network.
3. To understand the basic concept of two port network, resonance, attenuators and design of filters.

Course outcomes:

After successful completion of this course the student will be able to:

1. Understand basics electrical circuits with nodal and mesh analysis.
2. Appreciate electrical network theorems.
3. Apply Laplace Transform for steady state and transient analysis.
4. Determine different network functions.
5. Appreciate the frequency domain techniques.

COURSE CONTENT

Network and Lines		**Semester:**	**IV**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Network Thoerems :

Node and Mesh Analysis, Source transformation, Network theorems: Superposition, Thevenins, Norton's, Maximum power Transfer theorem as applied to AC. circuits.

Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**

Resonant Circuits:

Concept of resonance, types of resonance, Q-factor and their significance, Series resonance, resonance frequency with derivation, variation of impedance, current with frequency, bandwidth with derivation and selectivity, examples, Parallel resonance, resonance frequency, bandwidth and selectivity, examples.		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Laplace Transforms and Network Functions:		
Laplace Transforms : Partial fractions, Concept of complex frequency, Definition and Concept of Laplace transform, Laplace transform of basic R, L and C Component, Analysis of RC, RL and RLC networks using Laplace transform with and without initial condition & numerical. **Network Functions:** Driving point Immittance function, Transfer point impedance and admittance fuction, Voltage and current transfer function, Concept of pole and zero in network function, Necessary condition for transfer function.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Two Port Networks and interconnections:		
Introduction of two port network and their different parameters such as Z, Y, h, ABCD parameters and numerical, Concept of reciprocity and symmetry condition for two port network parameters, Inter connection of two port networks in series, parallel and cascade connection (only derivation).		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Attenuators and Filters:		
Attenuators : Concept of Neper and Decibel (dB) and their relation, Introduction of attenuator, types of attenuator, design of symmetrical 'T' and 'π' attenuator, examples. **Filters** : Filters fundamentals & Design of different types of filters such as constant K-type Low pass and high pass filter, examples, Design of m-derived low pass and high pass filter, examples. Basic concept of band pass, band stop filter (only block diagram).		
Text Books:		
1. D. Choudhary, "Network and system", New Age international Publication, 1st Edition, Reprint 2005. 2. A. Sudhakar, S. Palli, "Circuit & Networks Analysis and Synthesis", Tata MH 3rd Edition, 2009. 3. A. Chakraborti, "Circuit Theory (Analysis and synthesis)", Dhanpat Rai Publication, 6th Edition, .2012.		
Reference Books:		
1. John G. Proakis, Dimitris G. Manolakis, Digital Signal Processing Principles, algorithms and applications, Pearson Prentice Hall, Fourth edition 2. I.J. Nagrath, S.N. Sharan, R.Ranjan,S.Kumar, Signals and Systems,TMH, 2nd Edition		

Analog & Digital Communication					
COURSE OUTLINE					
Course Title:	**Analog & Digital Communication**	**Short Title:**	**ADC**	**Course Code:**	

Course description:

This course is aimed at introducing the fundamentals of analog & digital communication to undergraduate students. The goals of the course are to understand the basic principle of analog & digital communication and application in different era.

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	03	14	40	3

Prerequisite course(s):

Knowledge of analog & digital signal & fundamentals

Course objectives:

1. The objective of the course is to help the students to understand the basic concepts of communication.
2. The students will be able to learn Amplitude, frequency & phase modulation systems.
3. This course will help the students to understand effect of noise on communication system.
4. It also helps to understand waveform coding techniques as well as digital modulation technique.
5. Students are able to understand coding & decoding of information.

Course outcomes:

After successful completion of this course the student will be able to:

1. Analyze and compare different analog modulation schemes for their efficiency and bandwidth
2. Analyze the behavior of a communication system in presence of noise
3. Investigate pulsed modulation system and analyze their system performance
4. Analyze different digital modulation schemes and can compute the bit error performance

COURSE CONTENT			
Analog & Digital Communication		**Semester**	**IV**
Teaching Scheme:		**Examination Scheme:**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**
Fundamental of Modulation Systems		

Review of signals and systems, Frequency domain representation of signals, Principles of Amplitude Modulation Systems- DSB, SSB modulations. Angle Modulation, Representation of FM and PM signals, Spectral characteristics of angle modulated signals.		
Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**
Noise Analysis in modulation systems		
Review of probability and random process. Gaussian and white noise characteristics, Noise in amplitude modulation systems, Noise in Frequency modulation systems. Pre-emphasis and Deemphasis, Threshold effect in angle modulation.		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Waveform Coding and Baseband Shaping for Data Transmission		
Adaptive Delta modulation, Noise considerations in PCM, Time Division multiplexing, Digital Multiplexers. Discrete PAM Signals and Power Spectra of Discrete PAM Signals, ISI & Nyquist's Criterion for Distortion less Baseband Binary Transmission, Eye Pattern		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Digital Modulation Techniques		
Digital Modulation schemes- Phase Shift Keying, Frequency Shift Keying, Error probability, DPSK, Quadrature phase shift keying, Minimum Shift Keying, comparison FSK, PSK, QPSK, MSK, M-ary Modulation Techniques- M-ary PSK, QAM		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Information and Detection Theory		
Uncertainty, Information and Entropy, Source coding theory, Huffman coding and Discrete memory less channels, mutual information, channel capacity and channel coding theory, differential entropy and mutual information, channel capacity theorem, linear block codes		
Text Books:		
1. G. Kennedy, B. Davis, "Electronic Communication Systems", Tata McGraw Hill Edition, 4th Edition, 1999. 2. S. Kundu, "Analog and Digital Communication", Pearson, ISBN 978-81-317- 3187-1 3. Proakis J.G., ``Digital Communications", 4th Edition, McGraw Hill, 2000.		
Reference Books:		
1. D. Roddy, J. Coolen, "Electronic Communications", Pearson, 4th Edition, 2011 2. S. Haykin, "Digital Communications", Wiley Student Edition, ISBN 9971-51-205-X. 3. Wozencraft J. M. and Jacobs I. M., ``Principles of Communication Engineering",John Wiley, 1965. 4. Barry J. R., Lee E. A. and Messerschmitt D. G., ``Digital Communication", Kluwer Academic Publishers, 2004. 5. Ranjan Bose, "Information Theory, Coding & Cryptography", 2nd Edition, McGraw Hill, 2010.		

Analog Circuits					
COURSE OUTLINE					
Course Title:	**Analog Circuits**	**Short Title:**	**AC**	**Course Code:**	
Course description:					
This course provides the students with comprehensive study of basic components and circuits of Analog Electronics. It deals with BJT, FET, OpAmp, DAC and ADC.					

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	03	**14**	**40**	**3**

Prerequisite course(s):

Knowledge of Basics of Electronics.

Course objectives:

1. To give the brief idea about basics of transistor configurations.
2. To familiarize the students to perform the frequency analysis of any Analog electronics circuit.
3. To empower students to understand the design and working of BJT / FE amplifiers, oscillators and Operational Amplifier.
4. To prepare the students for operational amplifier, DAC, ADC Circuit Design

Course outcomes:

After successful completion of this course the student will be able to:

1. Acquire basic knowledge of physical and electrical conducting properties of transistor.
2. Develop the ability to understand the design and working of BJT / FET amplifiers.
3. Able to design amplifier circuits using BJT s And FET's and observe the amplitude and frequency responses of common amplifier circuits
4. Observe the effect of negative feedback on different parameters of an Amplifier and different types of negative feedback topologies.
5. Observe the effect of positive feedback and able to design and working of different Oscillators using BJTS.
6. Develop the skill to build, and troubleshoot Analog circuits.

COURSE CONTENT

Analog Circuits		**Semester**	**IV**
Teaching Scheme:		Examination Scheme:	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**
Diodes Circuits & BJT Amplifiers		

Diode Circuits, Basic clipper , clamper & multiplier Biasing schemes for BJT and FET amplifiers, bias stability various configurations (such as CE/CS, CB/CG, CC/CD) and their features, small signal analysis, low frequency transistor models, estimation of voltage gain, input resistance, output resistance etc.,		
Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**
Feedback amplifiers		
Feedback amplifiers: Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance amplifier. Oscillators: Review of the basic concept, Barkhausen criterion, RC oscillators(phase shift, Wien bridge etc.), LC oscillators (Hartley, Colpitt, Clapp etc.)		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Multistage & power amplifiers		
low frequency analysis of multistage amplifiers. High frequency transistor models, frequency response of single stage and multistage amplifiers, cascode amplifier. Various classes of operation (Class A, B, AB, C etc.), their power efficiency		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Operational Amplifier		
Differential amplifier: Basic structure and principle of operation, differential gain, common mode gain, CMRR . OP-AMP applications: review of inverting and non-inverting amplifiers, summing amplifier, substractor, integrator and differentiator, , Instrumentation amplifier using 3 opamp, log amplifier, antilog amplifier, Schmitt trigger, precision rectifier.		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Filters & Convertors		
Active filters: Design and frequency scaling of Ist & IInd order Low pass, high pass, band pass and band stop filters, Digital-to-analog converters (DAC): Weighted resistor, R-2R ladder, Inverted R-2R DAC, Analog to-digital converters (ADC): successive approximation, flash type, counter type & dual slop ADC.		
Text Books:		
1. Millman and Halkais, Integrated Electronics, TMH Publication, 2nd Edition 2. J.V. Wait, L P. Huelsman & G.A. Korn Introduction to Operational Amplifier- Theory and Applications,, Mcgraw Hill, 2nd Edition 3. R. A. Gaikwad, OpAmp and Liner Integrated Circuits, Pearson, 4th Edition 4. D. Roy Choudhari, S. Jain, “Linear Integrated Circuits”, New Age International (P) limited,4th Edition, 2010.		
Reference Books:		
1. Louis Nashelsky & Robert Boylestad, Electronics Devices and Cercuits Theory, Pearson Publication, 10th Edition 2. Dr. R. S. Sedha , Electronics Circuits, , S Chand Publication, 4th Edition 3. K. Botkar, “Integrated Circuits”, Khanna Publishers, 10th Edition, 2010		

<table>
<tr><td colspan="6">Entrepreneurship Development Program</td></tr>
<tr><td colspan="6"></td></tr>
<tr><td colspan="6">COURSE OUTLINE</td></tr>
<tr><td>Course Title:</td><td>Entrepreneurship Development Program</td><td>Short Title:</td><td>EDP</td><td>Course Code:</td><td></td></tr>
<tr><td colspan="6">Course description:</td></tr>
<tr><td colspan="6">Last few decades have seen the advent of various new disciplines in the area of management. One such discipline, Entrepreneurship has emerged quite recently. The syllabus explore the concept of entrepreneurship, financial requirements of a new enterprise, Expansion strategies of an enterprise, challenges for small enterprises and Institutional Support for small enterprises</td></tr>
</table>

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	03	14	40	03

Prerequisite course(s):

Basic knowledge of Industrial Organization and Management.

Course objectives:

1. The economic objectives of country, such as industrial development, regional growth, employment generation and development of small scale industries entirely depend on the growth of entrepreneurship.
2. As concept, Entrepreneurship poses a challenge for entrepreneurs to select and implement business strategies to tread the glorious path of success and growth. Successful entrepreneurship requires passion of an entrepreneur and thus, it is more than the money and luck.
3. In the contemporary world, the study of this discipline become of umpteen importance to understand the complexities of business environment at national and international levels.

Course outcomes:

After successful completion of this course the student will be able to:

1. Understand the concept of entrepreneurship and learn the procedure of setting up an enterprise.
2. Understand the concept of human resource management, Marketing management, financial management, Production and Operation management in a new enterprise.
3. Understand the importance of theories, models and management of the entrepreneurship to become successful entrepreneur.
4. Demonstrate ability to work in multidisciplinary teams and understand the impact of engineering solutions in a global, economic, environmental, and societal context.
5. Understand the role of small scale enterprises in economic development of a country and understand the linkage between small and large scale enterprises.
6. Understand the role of small scale enterprises in economic development of a country and understand the linkage between small and large scale enterprises.
7. Develop skills to become entrepreneurs in view of economic objectives of country ,such as industrial development ,regional growth, employment generation and development of small scale industries through technological developments.

COURSE CONTENT

	Semester:	IV

Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**
Introduction, Concept of entrepreneurship:		
Significance of entrepreneurship, Theories of entrepreneurship, Models of entrepreneurship development, Definition of entrepreneur: Traits and characteristics of successful entrepreneur , Functions of an entrepreneur, Types of entrepreneurs, Factors influencing entrepreneur, Professional vs. family entrepreneurs, Entrepreneurial leaders vs. managers, Entrepreneurial process: Entrepreneurial motivation, Entrepreneurial barriers, Women as entrepreneur, Role of woman entrepreneurs in society, Barriers to women entrepreneurs.		
Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**
Financial requirements of a new Enterprise:		
Estimating financial requirements, Estimation of fix capital requirements, Estimation of working capital requirements Identifying the sources of finance –sources of long-term financing: Sources of medium term financing , Sources of short-term financing Institutions providing financial assistance: Venture capital funding- venture capital funding in the Indian scenario, Venture capital funding process, Importance of financial management, Working capital management, Accounting and book keeping, Financial statement, Financial ration analysis		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Expansion strategies of an Enterprise:		
Expanding and enterprise: Expansion through concentration, Expansion through integration, Expansion through diversification , Expansion through cooperation, Expansion through internationalization, Expansion through digitalization , Organization life cycle, Strategic management, The essence of business ethics		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Challenges for small Enterprises:		
Problem faced by small enterprises: Managerial problems, Marketing management, Human resource, Production management, Technological problems Role of central and state governments in promoting small enterprises: Fiscal and tax concessions for small enterprises, Industrial policies for small enterprises, Importance of marketing, Customer relationship management (CRM), Marketing services		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Institutional Support for small enterprises and decision support system		
Institutions supporting small scale enterprises: Small scale industries (SSI) board, Khadi and village industries commission (KVIC), Micro, small and medium enterprises development organization (MSME-DO), National small industries corporation limited (NSIC), National institute for entrepreneurship and small business development (NIESBUD)‘ Indian institute of entrepreneurship (IIE), State industrial development / Investment Corporation (SIDCs/SIICs), State directorate of Industries (SDIs), District industry centers (DICs) ,Industry associations , Non-Governmental organization Institutions providing financial association: Small industries development bank of India (SIDBI), State financial corporation (SFCs) Technological up gradation and moderation of small enterprises:		

ISO 9000/14001 certification fee reimbursement scheme,
Text / Reference Books:
1. Alpana Trehan, “Entrepreneurship” Published –Dreamtech Press. 2. Jack M. Kaplan, “Patterns of Entrepreneurship” Published -WILEY. 3. Poornima M. Charantimath, “Entrepreneurship Development –Small Business Enterprises” Publisher –Pearson. 4. Thomas W. Zimmerer & Norman M. Scarborough, “Essential Of Entrepreneurship and Small Business Management” 4th Edition , Publisher –Pearson.

Electronics Workshop					
LAB COURSE OUTLINE					
Course Title:	**Electronic Workshop**	**Short Title:**	**EW**	**Course Code:**	
Course description:					
Also in this laboratory course emphasis is on the understanding of the CRO, Multimeter, Function generator, power supply. The students can use this knowledge to design PCB.					

	Hours/week	No. of weeks	Total hours	Semester credits
Laboratory	**02**	**14**	**28**	**01**

End Semester Exam (ESE) Pattern:	**Practical (PR)**
Prerequisite course(s):	
Fundamental concepts of Basic Electrical and Electronics Engineering .	
Course objectives:	
1. To familiarize the students in introducing different electronic instruments. 2. To enable the students how to solving layout designing problems 3. To prepare the students to use PCB design steps in their project works.	
Course outcomes:	
Upon successful completion of lab Course, student will be able to:	
1.Understand the functions of different instruments (multimeter, function generator, power supply, CRO etc.) and their handling. 2. Know the basic steps (artwork, etching, drilling, soldering, component mounting etc.)	

LAB COURSE CONTENT			
Electronics Workshop		**Semester:**	**IV**
Teaching Scheme:		**Examination scheme**	
Laboratory:	**2 hours/week**	**Internal Continuous Assessment (ICA):**	**25 marks**

List of laboratory assignments .

1. Study of Digital multimeters and power supply.
2. Study of Cathode Ray Osciloscope
3. Study of Signal Generator
4. Study of Hardware Components
5. To built and test any basic electronic circuit on bread board.
6. Preparation of artwork and Layout of above circuit.
7. Preparation of Etching and Drilling of Cu clad laminate.
8. Preparation of component mounting and soldering of above circuit and testing

Text/ Reference Books:
1. K. A. Krishnamurty, M. R. Raghuveer, "Electrical and Electronics Engineering for Scientists and Engineers," Willey Eastern Limited. 2. Bosschart, Printed circuit board-Design and Technology. 3. H.S.Kalsi, Electronics Inetrumentation, TMH Publication, 3rd Edition 4. Albert D.Helfrick,William D.Cooper ,Modern Electronics Instrumentation and Measurement Techniques,PHI.
Guide lines for ICA:
Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Analog and Digital Communication Laboratory

LAB COURSE OUTLINE

Course Title:	**Analog and Digital Communication Lab**	**Short Title:**	**ADCL**	**Course Code:**	

Course description:

This course is aimed at introducing the fundamentals of analog & digital communication to undergraduate students. The goals of the course are to understand the basic principle of analog & digital communication and application in different era.

Laboratory	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	02	**14**	**28**	**1**

End Semester Exam (ESE) Pattern:	**Practical (PR)**

Prerequisite course(s):

Knowledge of analog & digital signal & fundamentals

Course objectives:

1. The objective of the course is to help the students to understand the basic concepts of communication.
2. The students will be able to learn Amplitude& frequency modulation systems.
3. This course will help the students to understand effect of noise on communication system.
4. It also helps to understand waveform coding techniques as well as line coding
5. The students will be able to learn digital modulation technique.

Course outcomes:

Upon successful completion of lab Course, student will be able to:

1. Analyze and compare different analog modulation schemes for their efficiency and bandwidth
2. Analyze the behavior of a communication system in presence of noise
3. Investigate pulsed modulation system and analyze their system performance
4. Analyze different digital modulation schemes and can compute the bit error performance

LAB COURSE CONTENT

Analog and Digital Communication Lab		**Semester:**	**IV**
Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**	**End semester exam (ESE):**	**25 marks**
		Internal Continuous Assessment (ICA):	**25 marks**

Concerned faculty member should suitably frame Eight laboratory assignments from the following list. 1. Study of AM transmitter and calculate of modulation index of AM wave by envelope method 2. Analyze and generate A.M. Demodulation signal by diode detector 3. Study of FM and calculate of modulation index of FM wave 4. F.M. Demodulation (Phase discriminator/Ratio detector method.) 5. To Construct and Verify Pre-emphasis and De-emphasis and Plot the Waveforms. 6. DSB-SC signal generation using balanced modulator 7. To understand waveform of Delta Modulation and Demodulation 8. To understand waveform of Adaptive Delta Modulation and Demodulation. 9. To generation and detection of FSK i/p and o/p waveform. 10. To generation and detection of PSK i/p and o/p waveform 11. To generation and detection of QPSK/QAM i/p and o/pwaveform 12. To Study different line codes (NRZ, RZ, polar RZ, bipolar(AMI),Manchester
Text Books:
1. G. Kennedy, B. Davis, "Electronic Communication Systems", Tata McGraw Hill Edition, 4th Edition, 1999. 2. S. Kundu, "Analog and Digital Communication", Pearson, ISBN 978-81-317- 3187-1 3. Proakis J.G., ``Digital Communications'', 4th Edition, McGraw Hill, 2000.
Reference Books:
1. H. Taub, D. L. Schilling and G. Saha, "Principles of Communication Systems", Tata McGraw-Hill Edition, 3 rd Edition, 2011. 2. D. Roddy, J. Coolen, "Electronic Communications", Pearson, 4th Edition, 2011 3. S. Haykin, "Digital Communications", Wiley Student Edition, ISBN 9971-51-205-X. 4. Wozencraft J. M. and Jacobs I. M., ``Principles of Communication Engineering'', John Wiley, 1965.
Guide lines for ICA:
Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.
Guidelines for ESE:
ESE will be based on the laboratory assignments submitted by the students in the form of journal. Evaluation will be based on the understanding and execution.

Analog Circuits Lab					
LAB COURSE OUTLINE					
Course Title:	**Analog Circuits Lab**	**Short Title:**	**ACL**	**Course Code:**	
Course description:					
This course provides the students with comprehensive study of basic components and circuits of Analog Electronics. It deals with BJT, FET, OpAmp, DAC and ADC.					

Laboratory	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	02	14	28	1

End Semester Exam (ESE) Pattern:	**Practical (PR)**
Prerequisite course(s):	
Basic knowledge of Electronics	
Course objectives:	

1. To give the brief idea about basics of transistor configurations.
2. To familiarize the students to perform the frequency analysis of any Analog electronics circuit.
3. To empower students to understand the design and working of BJT / FET amplifiers, oscillators and Operational Amplifier.
4. To prepare the students for operational amplifier, DAC, ADC Circuit Design.

Course outcomes:

Upon successful completion of lab Course, student will be able to:

1. Acquire basic knowledge of physical and electrical conducting properties of transistor.
2. Develop the ability to understand the design and working of BJT / FET amplifiers.
3. Able to design amplifier circuits using BJT s And FET's and observe the amplitude and frequency responses of common amplifier circuits
4. Observe the effect of negative feedback on different parameters of an Amplifier and different types of negative feedback topologies.
5. Observe the effect of positive feedback and able to design and working of different Oscillators using BJTS.
6. Develop the skill to build, and troubleshoot Analog circuits.

LAB COURSE CONTENT			
Analog Circuits Lab		**Semester:**	**IV**
Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**	**End semester exam (ESE):**	**25 marks**
		Internal Continuous Assessment (ICA):	**25 marks**

Concerned faculty member should suitably frame Eight laboratory assignments from the following list.

1. BJT/FET Q point & load line.
2. Frequency Response of CE-CE cascade
3. Effect of Emitter Bypass Capacitor (CE Configuration).
4. Cross over distribution & its elimination.
5. Effect of partial feedback for voltage shunt configuration.
6. Effect of feedback for current series configuration.
7. Output and Frequency of RC Phase Shift Oscillator.
8. Output and Frequency of Collpit Oscillator
9. OP-AMP as an Integrator & Differentiator.
10. OP-AMP as an Schmitt trigger.
11. OP-AMP Low Pass Filter.
12. OP-AMP High Pass Filter.

Text Books:

1. Millman and Halkais, Integrated Electronics, TMH Publication, 2nd Edition
2. J.V. Wait, L P. Huelsman & G.A. Korn Introduction to Operational Amplifier- Theory and Applications,, Mcgraw Hill, 2nd Edition
3. R. A. Gaikwad, OpAmp and Liner Integrated Circuits, Pearson, 4th Edition

Reference Books:

1. Louis Nashelsky & Robert Boylestad, Electronics Devices and Cercuits Theory, Pearson Publication, 10th Edition
2. Dr. R. S. Sedha , Electronics Circuits, , S Chand Publication, 4th Edition

Guide lines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guidelines for ESE:

ESE will be based on the laboratory assignments submitted by the students in the form of journal. Evaluation will be based on the understanding and execution.

Electronics Network Lab					
LAB COURSE OUTLINE					
Course Title:	**Electronics Network Lab**	**Short Title:**	**ENL**	**Course Code:**	
Course description:					
In this laboratory course emphasis is on the understanding of basic electrical circuits. The Students can use this knowledge to analyze Electrical networks and Design of different filters and attenuators.					

Laboratory	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	2	**14**	**28**	**1**

End Semester Exam (ESE) Pattern:	

Prerequisite course(s):

Basic concepts of Basic Electrical and Electronics Engineering.

Course objectives:

1. To acquire the practical concepts in order to analyze the network
2. To prepare students to perform the analysis and design of various types of filters and attenuator circuits.

Course outcomes:

Upon successful completion of lab Course, student will be able to:

1. Determine driving and transfer functions of the network.
2. Calculate different parameters of two port network.
3. Calculate the resonance frequency and bandwidth of series circuit.
4. Determine the attenuation of resistive network.
5. Design different types of Filters.

LAB COURSE CONTENT

Electronics Network Lab		**Semester:**	**IV**
Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**	**End semester exam (ESE):**	**25 marks**
		Internal Continuous Assessment (ICA):	**25 marks**

Concerned faculty member should suitably frame Eight laboratory assignments from the following list.

1. Determine transfer / driving point Impedance function of given two port reactive network.
2. Determine Z parameter of two port network.
3. Determine Y parameter of two port networks.
4. Determine transmission parameter of two port networks.
5. Study of Series resonance, find BW and Q- factor.
6. Design, build and test symmetrical T or Π attenuator. Also find its attenuation in db.
7. Frequency response of constant k- low pass filters and find out cut

off frequency.

8. Frequency response of constant k- high pass filters and find out cut of frequency.
9. Frequency response of m- derived low pass filters and find out cut of frequency.
10. Frequency response of band pass filter and find out cut of frequency.

Text Books:

1. D. Choudhary, “Network and system”, New Age international Publication.
2. A. Sudhakar, S. Palli, “Circuit & Networks Analysis and Synthesis”, Tata MH 3rd Edition, 2009.
3. A. Chakraborti, “Circuit Theory (Analysis and synthesis)”,Dhanpat Rai Publication,2012.

Reference Books:

1. John G. Proakis, Dimitris G. Manolakis, Digital Signal Processing Principles, algorithms and applications, Pearson Prentice Hall, Fourth edition
2. I.J. Nagrath, S.N. Sharan, R.Ranjan,S.Kumar, Signals and Systems,TMH, 2nd Edition.

Guide lines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guidelines for ESE:

ESE will be based on the laboratory assignments submitted by the students in the form of journal. Evaluation will be based on the understanding and execution.

<table>
<tr><td colspan="6">Environment Studies</td></tr>
<tr><td colspan="6"></td></tr>
<tr><td colspan="6">COURSE OUTLINE</td></tr>
<tr><td>Course Title:</td><td>Environmental Studies</td><td>Short Title:</td><td>EVS</td><td>Course Code:</td><td>Non Credit</td></tr>
<tr><td colspan="6">Course description:</td></tr>
<tr><td colspan="6">The course aims to percolate the importance of environmental science and environmental studies.</td></tr>
<tr><td colspan="6">COURSE CONTENT</td></tr>
</table>

<table>
<tr><td>Environmental Studies</td><td>Semester:</td><td>IV</td></tr>
<tr><td rowspan="4"></td><td colspan="2">Examination scheme</td></tr>
<tr><td>End Semester Exam (ESE):</td><td>80 marks</td></tr>
<tr><td>Duration of ESE:</td><td>03 hours</td></tr>
<tr><td>Internal Continuous Assessment (ICA):</td><td>20 marks</td></tr>
</table>

<table>
<tr><td>Unit–I:</td><td>No. of Lectures: 02 Hours</td><td>Marks:16</td></tr>
<tr><td colspan="3">Multidisciplinary nature of environmental studies
Definition, scope and importance
Need for public awareness.</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td>Unit–II:</td><td>No. of Lectures: 08 Hours</td><td>Marks:16</td></tr>
<tr><td colspan="3">Natural Resources :
Renewable and non-renewable resources
Natural resources and associated problems.
a. Forest resources : Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.
b. Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
c. Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
d. Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
e. Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.
f. Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
• Role of an individual in conservation of natural resources.
• Equitable use of resources for sustainable lifestyles.</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td>Unit–III:</td><td>No. of Lectures: 06 Hours</td><td>Marks:16</td></tr>
<tr><td colspan="3">Ecosystems
• Concept of an ecosystem.</td></tr>
</table>

- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following ecosystem :-
  a. Forest ecosystem
  b. Grassland ecosystem
  c. Desert ecosystem
  d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit–IV:	No. of Lectures: 08 Hours	Marks:16

Biodiversity and its conservation

- Introduction – Definition : genetic, species and ecosystem diversity.
- Biogeographic classification of India
- Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values
- Biodiversity at global, National and local levels.
- India as a mega-diversity nation
- Hot-sports of biodiversity.
- Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India
- Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.

Unit–V:	No. of Lectures: 08 Hours	Marks:16

Environmental Pollution

Definition

- Cause, effects and control measures of :-
  a. Air pollution
  b. Water pollution
  c. Soil pollution
  d. Marine pollution
  e. Noise pollution
  f. Thermal pollution
  g. Nuclear hazards
- Solid waste Management : Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution.
- Pollution case studies.

- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc. (Field work Equal to 5 lecture hours)

Guide lines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Reference Books:

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India, Email:mapin@icenet.net (R)
3. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
4. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
5. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
6. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
7. Down to Earth, Centre for Science and Environment (R)
8. Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
9. Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)
10. Heywood, V.H & Waston, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.
11. Jadhav, H & Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284 p.
12. Mckinney, M.L. & School, R.M. 1996. Environmental Science systems & Solutions, Web enhanced edition. 639p.
13. Mhaskar A.K., Matter Hazardous, Techno-Science Publication (TB)
14. Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB)
15. Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574p
16. Rao M N. & Datta, A.K. 1987. Waste Water treatment. Oxford & IBH Publ. Co. Pvt. Ltd. 345p.
17. Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut
18. Survey of the Environment, The Hindu (M)
19. Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science (TB)

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Syllabus for

Second Year Electrical Engineering

Faculty of Science and Technology

'A' Grade
NAAC Re-Accredited
(3rd Cycle)

Course outline

Semester - III and IV

w. e. f. 2018 – 19

Syllabus Structure for Second Year Engineering (Semester – III) (Electrical)

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Mathematics – III	B	3	1	-	4	40	60	-	-	100	4
Numerical Techniques	C	3	-	-	3	40	60	-	-	100	3
Electrical Circuit Analysis	C	3	-	-	3	40	60	-	-	100	3
Electrical Machine-I	D	3	-	-	3	40	60	-	-	100	3
Industrial Organization and Management	A	3	-	-	3	40	60	-	-	100	3
Electrical Circuit Analysis Laboratory	C	-	-	2	2	-	-	25	25(PR)	50	1
Electrical Machine-I Laboratory	D	-	-	2	2			25	25(PR)	50	1
Electrical Workshop Laboratory	D	1	-	2	3	-	-	25	25(OR)	50	2
		16	**1**	**6**	**23**	**200**	**300**	**75**	**75**	**650**	**20**

ISE: Internal Sessional Examination, ESE: End Semester Examination, ICA: Internal Continuous Assessment

Syllabus Structure for Second Year Engineering (Semester – IV) (Electrical)

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Biology	B	3	1	-	4	40	60	-	-	100	4
Electrical Engineering Materials	C	3	-	-	3	40	60	-	-	100	3
Analog and Digital Electronics	D	3	-	-	3	40	60	-	-	100	3
Electrical Machine-II	D	3	-	-	3	40	60	-	-	100	3
Entrepreneurship Development	A	3	-	-	3	40	60	-	-	100	3
Electrical Engineering Materials Laboratory	C	-	-	2	2	-	-	-	-	-	1
Analog and Digital Electronics Laboratory	D	-	-	2	2	-	-	25	25(PR)	50	1
Electrical Machine-II Laboratory	D	-	-	2	2	-	-	25	25(PR)	50	1
Measurement and Instrumentation Laboratory	D	1	-	2	3	-	-	25	25(OR)	50	2
Environmental Studies*	H	-	-	-	-	-	80	20	-	100	-
		16	**1**	**8**	**25**	**200**	**300**	**75**	**75**	**650**	**21**

ISE: Internal Sessional Examination, ESE: End Semester Examination, ICA: Internal Continuous Assessment

*** Only for direct second year admitted students and these marks are not added in Total.**

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Syllabus for

Second Year Electrical Engineering

Faculty of Science and Technology

‘A’ Grade

NAAC Re-Accredited

(3rd Cycle)

COURSE OUTLINE

Semester – III

w. e. f. 2018 – 19

MATHEMATICS-III

COURSE OUTLINE

Course Title:	Mathematics III	Short Title:	M-III	Course Code:	

Course description:

This course is an advanced level Engineering Mathematics which will further strengthen the knowledge of the students who have completed Engineering Mathematics –I and II in their first year. The course coverage explores Basic Probability, Continuous Probability Distributions, Basic Statistics, Applied Statistics, Small samples and Bivariate Distributions. The goal of this course is to understand various functions of probability and statistics and their applications in engineering field.

	Hours/week	No. of weeks	Total hours	Semester credits
Lecture	03	14	42	04
Tutorial	01	14	14	

Prerequisite course (s):

Knowledge of HSC, Applied Mathematics - I & II subject of first year of engineering.

Course objectives:

1. To introduce the solution methodologies for second order Partial Differential Equations with applications in engineering.
2. To provide an overview of probability and statistics to engineers.

Course outcomes:

1. Upon completion of this course, students will be able to solve field problems in engineering involving PDEs.
2. They can also formulate and solve problems involving random variables and apply statistical methods for analyzing experimental data.

COURSE CONTENT

Mathematics-III		Semester:	III
Teaching Scheme:		**Examination scheme**	
Lectures:03	3 hours/week	End semester exam (ESE):	60 marks
Tutorial:01	1 hours/week	Duration of ESE:	03 hours
		Internal Sessional Exams (ISE):	40 marks

Unit–I:	No. of Lectures: 8 Hours	Marks: 12

Laplace Transform: Properties of Laplace Transform, Inverse Laplace transform, Convolution theorem. Evaluation of integrals by Laplace transform, solving ordinary differential equations by Laplace Transform.

Unit–II:	No. of Lectures: 08 Hours	Marks: 12

Fourier Transform and Z-transform

Fourier sine and cosine integrals, Fourier sine transform, Fourier cosine transform, Inverse

Fourier transform. Z – Transform**:** Definition, Region of convergence, Properties of Z-Transform, Inverse Z-Transform		
Unit–III	**No. of Lectures: 8 Hours**	**Marks: 12**
Basic Statistics Measures of Central tendency, Moments, skewness and Kurtosis,Binomial, Poisson and Normal distributions, Correlation and regression.		
Unit–IV	**No. of Lectures: 08 Hours**	**Marks: 12**
Applied Statistics Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.		
Unit–V:	**No. of Lectures: 8 Hours**	**Marks: 12**
Small samples : T-distribution for small sample -Test for single mean, difference of means and correlation coefficients, test for ratio of variances, F-test for equality of population variances. Chi-square test for goodness of fit and independence of attributes.		
Text Books:-		
1. H. K. Dass "Advance Engineering Mathematics" S. Chand publications. 2**.** N.P. Bali and M. Goyal, "A text book of Engineering Mathematics", Laxmi Publications, 2016. 3. S. C. Gupta "Fundamentals of Statistics", Himalaya Publishing House.		
Reference Books		
1. E. Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, 2006. 2. P. G. Hoel, S. C. Port and C. J. Stone, "Introduction to Probability Theory", Universal Book Stall, 2003. 3. S. Ross, "A First Course in Probability", Pearson Education India, 2002. 4. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 2000. 5. T. Veerarajan, "Engineering Mathematics", Tata McGraw-Hill, New Delhi, 2010.		

Numerical Techniques

COURSE OUTLINE

Course Title:	**Numerical Techniques**	**Short Title:**	**NT**	**Course Code:**	

Course description:

This course provides knowledge of numerical methods and optimization techniques

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	03	14	42	03

Prerequisite course(s):

Knowledge of mathematics and science at HSC & First Year Engineering.

Course objectives:

To familiarize with number system in computations, polynomial equations, concept of roots of an equation & methods to find the same. To study various differentiation & integration methods. To understand the tradeoff between programming ease, computation time, data storage, truncation and round off errors.

Course outcomes:

After successful completion of this course the student will be able to:

1. Solve polynomial and transcendental equations,
2. Solve linear algebraic equations, simultaneous equations.
3. Solve Interpolate by Lagrange's & Newton methods.
4. Solve ordinary differential equations by using Euler's method, Runge Kutta method, Taylor's Method and predictor - corrector method.
5. Develop computer program for above methods.
6. Do higher studies in power system such as load flow study and power system optimization.

COURSE CONTENT

Numerical Techniques		**Semester:**	**III**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 09 Hours**	**Marks: 12**

Number systems & errors in digital computations, Transcendental & polynomial equations, Concept of roots of an equation & methods to find the same.

Secant method, Newton- Raphson method, Regula-Falsi method.

Unit–II:	No. of Lectures: 09 Hours	Marks: 12

Linear algebraic simultaneous equations:
Method of matrix Inversion, Gauss method, Gauss Elimination, Gauss Jordan, Jacobi Iteration, Triangular Factorization (L-U Factorization), Gauss Seidal method

Unit–III:	No. of Lectures: 08 Hours	Marks: 12

Interpolation:
Newton's forward and backward interpolation formula, Gauss's forward and backward interpolation formula, Lagrange formula and inverse Lagrange formula, Newtons Divided difference formula, Least squares approximation.

Unit–IV:	No. of Lectures: 08 Hours	Marks: 12

Differentiation & Integration:
Central difference interpolation formula-Stirling's formula, Newton's forward and backward difference formulae for derivatives,
Integration using Simpson's rule (1/3^{rd} rule and 3/8^{th} Rule), Trapezoidal rule.

Unit–V:	No. of Lectures: 08 Hours	Marks: 12

Ordinary differential equations and their solutions: Taylor series method, Euler's method, Runge-Kutta methods, predictor-corrector methods.

Text Books:

1. Jain & Iyengar, "Numerical Methods for Scientific & Engineering Computation", New Age international, 3^{rd} edition.
2. S. K. Gupta, "Numerical Methods for Engineers", New Age international.
3. Anita, "Numerical Methods for Scientists & Engineers", Tata McGraw Hill.
4. S.S. Shashtry, "Introductory Methods of Numerical", Tata McGraw Hill, 5^{th} edition.
5. Rajaraman, "Numerical Methods & Computations", Tata McGraw Hill, 3^{rd} edition.
6. Kanti Swarup, P. K. Gupta, Man Mohan, "Operation Research", Sultan Chand & Son, 13^{th} edition.
7. Yashwant Kanitkar., "Let us C", BPP Publication, 15^{th} edition.
8. Kandasamy P. Thilagavathy K. and Gunavathy K., " Numerical Methodes", S. Chand Co. Ltd., 2003.

Reference Books:

1. Dr. B. S. Grewal, "Numerical Methods in Engineering and Science", Khanna Publishers

Electrical Circuit Analysis

COURSE OUTLINE

Course Title:	**Electrical Circuit Analysis**	**Short Title:**	**ECA**	**Course Code:**	

Course description:

Introducing the topic and illustrating its importance for electrical engineering field. The concept of magnetic coupling– Analysis of magnetic coupled circuits– Linear transformers– Ideal transformers– Two-port networks and it's different equation forms– Evaluation of its parameter– Analysis of terminated two-port circuits– Interconnected two-port networks– Revision and a set of solved examples. Understanding of different types of network theorems. Getting familiar with steady state and transient responses for different types of circuits. Laplace transform and relation between current and voltage for resistance, capacitance and inductance– Laplace transform and electric circuit sources. Understanding the concepts of two port network.

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	03	14	42	03

Prerequisite course(s):

Magnetic Coupling, Resonant Circuits, Network Theorems, Series-Parallel Circuit, Laplace Transform

Course objectives:

1. To make the students capable of analyzing any given electrical network.
2. To make the students learn how to synthesize an electrical network from a given impedance/admittance function.
3. To relate various two port parameters and transform them.

Course outcomes:

After successful completion of this course the student will be able to:

1. Study of magnetic coupling and resonance.
2. Apply network theorems for the analysis of electrical circuits.
3. Obtain the transient and steady-state response of electrical circuits.
4. Analyze circuits using Laplace transform.
5. Analyze two port circuit behaviors.

COURSE CONTENT

Electrical Circuit Analysis		**Semester:**	**III**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Magnetic Coupling and Resonance Coupled Circuits: Self inductance and Mutual inductance, Coefficient of coupling, dot convention, Ideal Transformer, Analysis of multi winding coupled circuits, Analysis of single tuned and double tuned coupled circuits. Resonant Circuits: Series and parallel resonance, frequency- response of series and Parallel circuits, Q–Factor, Bandwidth.		
Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**
Network Theorems Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Reciprocity theorem, Compensation theorem. Analysis with dependent current and voltage sources. Node and Mesh Analysis, Super Mesh and Node analysis, Millmans Theorem.		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Solution of First and Second order networks Solution of first and second order differential equations for Series and parallel R-L, R-C, RL-C circuits, initial and final conditions in network elements, forced and free response, time constants, steady state and transient state response.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Electrical Circuit Analysis Using Laplace Transforms Review of Laplace Transform, Analysis of electrical circuits using Laplace Transform for standard inputs, convolution integral, inverse Laplace transform, transformed network with initial conditions. Fourier Series and Fourier Transform of Standard Signals.		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Two Port Network and Network Functions Two Port Networks, terminal pairs, relationship of two port variables, impedance parameters, admittance parameters, transmission parameters and hybrid parameters, relationship between parameters, interconnections of two port networks.		
Text Books:		
1. M. E. Van Valkenburg, "Network Analysis", Prentice Hall, 2006. 2. D. Roy Choudhury, "Networks and Systems", New Age International Publications. 3. A. Charaborthy, "Circuit Theory (Analysis and Synthesis)", Dhanpat Rai and Co. 4. W. H. Hayt and J. E. Kemmerly, "Engineering Circuit Analysis", McGraw Hill Education, 2013. 5. K. V. V. Murthy and M. S. Kamath, "Basic Circuit Analysis", Jaico Publishers.		
Reference Books:		
1. Kuo F. F., "Network Analysis and Synthesis", Wiley India, 2nd Edition, 2008. 2. C. K. Alexander and M. N. O. Sadiku, "Electric Circuits", McGraw Hill Education, 2004.		

Electrical Machines-I					
COURSE OUTLINE					
Course Title:	**Electrical Machines-I**	**Short Title:**	**EMC-I**	**Course Code:**	
Course description:					
This course provides knowledge about D. C. machines and transformers to familiarize students with construction, their working, operation, performance and applications of Dc machines and Transformer.					

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	03	14	42	03

Prerequisite course(s):

Knowledge of subject Introduction to Electrical Engineering at first year.

Course objectives:

The course aimed at acquiring an understanding on basic principles, operation, performance and control of dc machine and transformer. The subject is helpful in the studies of technological aspects such as utilization of electrical energy, switch gear & protection, manufacturing processes & testing & maintenance of electrical machines. The subject provides scope for higher study and able to use updated software.

Course outcomes:

After successful completion of this course the student will be able to:

1. Apply basic knowledge of science and engineering for understanding the concept of magnetic circuit, electrical machines and transformer.
2. Explain construction, concepts, principles of operation & testing of dc machines and transformers.
3. Analyze data for qualitative and quantitative parameters to determine characteristics of machines.
4. Apply knowledge of electrical machines for technological subjects such as utilization of electrical energy, switch gear & protection, manufacturing processes and safety precautions.
5. Perform professional duties in team of manufacturing, testing, operation and maintenance with the sense of safety precautions.
6. Do higher studies and able to use updated software for continuous updating of knowledge.

COURSE CONTENT			
Electrical Machines-I		**Semester:**	**III**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Magnetic fields and magnetic circuits

Review of magnetic circuits - MMF, flux, reluctance, inductance; review of Ampere Law and

Biot Savart Law; influence of highly permeable materials on the magnetic flux lines.

Electromagnetic force and torque

B-H curve of magnetic materials; flux-linkage Vs current characteristic of magnetic circuits; linear and nonlinear magnetic circuits; energy stored in the magnetic circuit; Principle of energy conversion, single excite magnetic system, physical concept of torque production, electromagnetic torque

Unit–II:	No. of Lectures: 08 Hours	Marks: 12

DC machines

Basic construction of a DC machine, magnetic structure - stator yoke, stator poles, pole-faces or shoes, air gap and armature core, visualization of magnetic field produced by the field winding excitation with armature winding open, air gap flux density distribution, flux per pole, induced EMF in an armature coil. Armature winding and commutation - Elementary armature coil and commutator, lap and wave windings, construction of commutator, linear commutation Derivation of back EMF equation, armature MMF wave, derivation of torque equation, armature reaction, air gap flux density distribution with armature reaction.

Unit–III:	No. of Lectures: 08 Hours	Marks: 12

DC machine - motoring and generating

Armature circuit equation for motoring and generation, Types of field excitations - separately excited, shunt and series. Open circuit characteristic of separately excited DC generator, back EMF with armature reaction, voltage build-up in a shunt generator, critical field resistance and critical speed. V-I characteristics and torque-speed characteristics of separately excited, shunt and series motors. Speed control through armature voltage. Losses, No load test Swinburne's test load testing and back-to-back testing of DC machines.

Unit–IV:	No. of Lectures: 08 Hours	Marks: 12

Transformers –Single Phase

Principle, construction and operation of single-phase transformers, equivalent circuit, phasor diagram, voltage regulation, losses and efficiency Testing - open circuit and short circuit tests, polarity test, back-to-back test, separation of hysteresis and eddy current losses. Parallel operation of single-phase Autotransformers - construction, principle, applications and comparison with two winding transformer

Unit–V:	No. of Lectures: 08 Hours	Marks: 12

Transformers –Three Phase

Three-phase transformer - construction, types of connection and their comparative features, Parallel operation of three-phase transformers, Autotransformers - construction, principle, applications and comparison with two winding transformer, Magnetizing current, effect of nonlinear B-H curve of magnetic core material, harmonics in magnetization current, Phase conversion - Scott connection, three-phase to six-phase conversion, Tap-changing transformers - No-load and on-load tap-changing of transformers, Three-winding transformers. Cooling of transformers.

Text Books:

1. Ashfaq Husain, “Electrical Machines”, Dhanpat Rai & Co. 2. B. L. Theraja, “Electrical Technology”, Vol –I and II, S. Chand Publication.
Reference Books:
1. E. Fitzgerald and C. Kingsley, "Electric Machinery”, New York, McGraw Hill Education, 2013. 2. E. Clayton and N. N. Hancock, “Performance and design of DC machines”, CBS Publishers, 2004. 3. M. G. Say, “Performance and design of AC machines”, CBS Publishers, 2002. 4. P. S. Bimbhra, “Electrical Machinery”, Khanna Publishers, 2011. 5. J. Nagrath and D. P. Kothari, “Electric Machines”, McGraw Hill Education, 2010. 6. P. C. Sen. “D.C. Machines”, Tata McGraw Hill.

Industrial Organization & Management					
COURSE OUTLINE					
Course Title:	**Industrial Organization & Management**	**Short Title:**	**IOM**	**Course Code:**	

Course description:

The course explores concepts of management and functioning of organizations. It introduces both theoretical concepts and empirical applications, focusing particularly on production industries. Management studies have influenced every aspect of business thinking and planning. Apart from this, it also influenced our day-today lives in the form of technological advancements. The syllabus explores the knowledge of principle of management, financial management, human resource management, operational management and marketing management.

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	03	**14**	**42**	**3**

Prerequisite course(s):

Knowledge of HSC and First year Engineering.

Course objectives:

This subject is designed to expose the students to fundamental concepts of management, its processes and behavioral dynamics in organizations. It will also look at recent developments in business in the context of economic theory. It also aims at making students understand concepts, philosophies, and processes of managing the marketing & financial operations of a firm.

Course outcomes:

After successful completion of this course the student will be able to:

1. Understand various aspects of management.
2. Understand the concepts of human resource management, marketing management, financial management, production and operation management
3. Estimate the financial feasibility of business and identify the various sources of financing Understand different industrial laws in views of safety, pollutions and societal developments.
4. Discharge professional duties in field of manufacturing and operational management.
5. Function on multidisciplinary teams and able to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
6. Does higher study in various new disciplines in the area of management like entrepreneurs in view of economic objectives of country, such as industrial development, regional growth, employment generation and development.

COURSE CONTENT

Industrial Organization & Management	**Semester:**	**III**

Teaching Scheme:		Examination scheme	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	No. of Lectures: 08 Hours	Marks: 12

Principles of Management

Basic Concepts: Definition, Nature, Importance, Management: Art and Science & as a Profession, Management Vs Administration, Evolution of Management: Introduction to Scientific Management by Taylor, Administrative, Management by Fayol, Contribution of Peter Drucker, Levels & Functions of Management, Forms of Business Organization.

Approaches to Management: Decision Theory Approach, Contingency Approach, Systems Approach.

Organization: Formal & Informal, Line & Staff relationship, Centralization vs. Decentralization, Span of Management, Departmentation, MBO.

Unit–II:	No. of Lectures: 08 Hours	Marks: 12

Managerial Economics

Introduction: Meaning & Scope of Economics, Basic Theories, Law of Demand & Supply, Elasticity of Demand & Supply.

Consumer Theories: Meaning of Utility & Law of Diminishing Utility.Cost Concepts: Opportunity Costs, Sunk Costs, Marginal Cost, Total & Variable Costs, Fixed Costs, Contribution, Law of Diminishing Return.

Unit–III:	No. of Lectures: 08 Hours	Marks: 12

Operational Management

Plant location and layout: Factor affecting plant location, different type of plant layout, CPM PERT, quality control manufacturing system, store and inventory control

Work study – techniques of work study method study, work measurement, different charts and diagrams used in method study.

Unit–IV:	No. of Lectures: 08 Hours	Marks: 12

Human Resource Management

Human resource planning, Recruitment, Selection, Placement & Induction, Performance Appraisal & Development, Employee Training, Internal & External Mobility & Retention Management, Wage & Salary Administration, Fringe Benefits & Incentives Payments, Collective Bargaining, Performance appraisal , compensation

Industrial Laws: The factories Act 1947, The Workmen's Compensation Act 1923, Maternity Benefit Act The Payment of Wages Act 1936, The Apprentices Act 1961, industrial safety, prevention of accidents pollution control act

Unit–V:	No. of Lectures: 08 Hours	Marks: 12
Marketing Management & Financial Management Introduction to Marketing: Concept of Market, Types of Market, Definition, Nature & Scope of Marketing, Marketing Approaches, Marketing Process, Functions of Marketing Management, 7 P's of Marketing. Advertising media of advertising market forecasting. New trends in Marketing: Green Marketing, e- marketing & Viral Marketing. Introduction to Financial Management: Meaning, Nature & Scope of Financial Management, Capital Structure, Types & Sources of Finance, Money Market & Capital Market, Role of Financial Institutions in Industry.		
Text Books:		
1. P. Khanna, "Industrial Engineering Managements" 2. S. Chand by S. S. Khanka "Human resource Management" (Text & Cases)		
Reference Books:		
1. L. M. Prasad, "Principles of Management", Himalaya Publications Ltd 2. D. N. Dwivedi, "Managerial Economics", Vikas Publications 3. P. Subba Rao "Essentials of HRM & IR" (Text, Cases & Games), Himalaya Publishing House, 5th edition. 4. R. S. N. Pillai, Bhagavathi, "Legal Aspects of Business" (Mercantile Laws including Industrial & Company Laws) 5. Philip Kotler, "Marketing Management", Tata McGraw Hill, 12th edition. 6. Ravi M. Kishor, "Financial Management", Taxmann Publication, 5th edition.		

Electrical Circuit Analysis Laboratory

LAB COURSE OUTLINE

Course Title:	**Electrical Circuit Analysis Laboratory**	**Short Title:**	**ECA Lab.**	**Course Code:**	

Course description:

Introducing the topic and illustrating its importance for electrical engineering field. The concept of magnetic coupling – Analysis of magnetic coupled circuits – Linear transformers – Ideal transformers – Two-port networks and it's different equation forms – Evaluation of its parameter – Analysis of terminated two-port circuits– Interconnected two-port networks– Revision and a set of solved examples. Understanding of different types of network theorems. Getting familiar with steady state and transient responses for different types of circuits. Laplace transform and relation between current and voltage for resistance, capacitance and inductance – Laplace transform and electric circuit sources. Understanding the concepts of two port network.

Laboratory	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	02	14	28	01

End Semester Exam (ESE) Pattern:	**Practical (PR)**

Prerequisite course(s):

Introduction to Electronics Engineering at First Year

Course objectives:

Students should be able to do hands on and get familiar with the practical aspects of various network theorems, various parameters such as Z- Parameters, Y- parameters, ABCD Parameters and H- Parameters, Filters.

Course outcomes:

Upon successful completion of lab Course, student will be able to:

1. Apply network theorems for the analysis of electrical circuits.
2. Obtain the transient and steady-state response of electrical circuits.
3. Analyze two port circuit behaviors.
4. Analyze filter circuits.

LAB COURSE CONTENT

Electrical Circuit Analysis Laboratory		**Semester:**	**III**
Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**	**End semester exam (ESE):**	**25 marks**
		Internal Continuous Assessment (ICA):	**25 marks**

Teacher should facilitate learning following lab experiments:

1. Verifications of Thevenin’s Theorem.
2. Verification of Maximum Power Transfer Theorem.
3. Verification of Superposition Theorem.
4. Verification of Nortons Theorem
5. Pole and Zero plot of one port network.
6. Measurement of hybrid parameter of two port network.
7. Measurement of ABCD parameter of two port network.
8. Measurement of Y parameter of two port network.
9. Measurement of Z parameter of two port network.
10. Frequency response, quality factor and bandwidth of Series Resonance Circuit
11. Frequency response of Parallel Resonance Circuit.

Note: Lab file should consist of minimum **Eight** experiments.

Text Books:

1. M. E. Van Valkenburg, “Network Analysis”, Prentice Hall, 2006.
2. D. Roy Choudhury, “Networks and Systems”, New Age International Publications, 1998.
3. A. Chakraborthy, “Circuit Theory (Analysis and Synthesis), Dhanpat Rai and Co.
4. W. H. Hayt and J. E. Kemmerly, “Engineering Circuit Analysis”, McGraw Hill Education, 2013.
5. K. V. V. Murthy and M. S. Kamath, “Basic Circuit Analysis”, Jaico Publishers, 1999.

Reference Books:

1. Kuo F. F., “Network Analysis and Synthesis”, 2nd Ed., Wiley India. 2008.
2. C. K. Alexander and M. N. O. Sadiku, “Electric Circuits”, McGraw Hill Education, 2004.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guidelines for ESE:

In ESE the student may be asked to perform any one practical. Evaluation will be based on paper work, performance and oral in the practical examination.

<table>
<tr><td colspan="8">Electrical Machines-I Laboratory</td></tr>
<tr><td colspan="8">LAB COURSE OUTLINE</td></tr>
<tr><td>Course Title:</td><td colspan="2">Electrical Machines-I Laboratory</td><td>Short Title:</td><td>EMC-I Lab</td><td>Course Code:</td><td colspan="2"></td></tr>
<tr><td colspan="8">Course description:</td></tr>
<tr><td colspan="8">In this laboratory, course emphasis on imparting the practical knowledge and understanding of basic principles, characteristic , performance and testing of DC Machines, Speed control DC Motor and use of other measuring equipment their class of accuracy. It also gives the platform to understand construction, working, performance, testing and selection of transformer.</td></tr>
</table>

Laboratory	Hours/week	No. of weeks	Total hours	Semester credits
	02	14	28	01

<table>
<tr><td>End Semester Exam (ESE) Pattern:</td><td>Practical (PR)</td></tr>
<tr><td colspan="2">Prerequisite course(s):</td></tr>
<tr><td colspan="2">Knowledge of HSC and First year Engineering.</td></tr>
<tr><td colspan="2">Course objectives:</td></tr>
<tr><td colspan="2">The objective of the laboratory is to impart the fundamental knowledge of Machines and transformers. Students will able to develop their ability to apply the specific procedures for analyze the experimental results. The students will able to understand the characteristic of DC machines and application in process and manufacturing. Application of transformer in power system. In this lab course, students will be familiar with the use of different equipments, safety precautions on work place. This makes bridge on theoretical knowledge and practical practices.</td></tr>
<tr><td colspan="2">Course outcomes:</td></tr>
<tr><td colspan="2">Upon successful completion of lab Course, student will be able to:</td></tr>
<tr><td colspan="2">1. Select suitable DC machines and transformers for industrial application.
2. Determine characteristics of different type of generator, motors and transformers.
3. Analyze the test data for practical for applications, design and manufacturing processes.
4. Control dc motors as per industrial applications.
5. Able to adopt safety precautions in industries.
6. Do professional duties in technical field for economical development.</td></tr>
<tr><td colspan="2"></td></tr>
</table>

<table>
<tr><td colspan="4">LAB COURSE CONTENT</td></tr>
<tr><td colspan="2">Electrical Machines-I Lab</td><td>Semester:</td><td>III</td></tr>
<tr><td colspan="2">Teaching Scheme:</td><td colspan="2">Examination scheme</td></tr>
<tr><td>Practical:</td><td>2 hours/week</td><td>End semester exam (ESE):</td><td>25 marks</td></tr>
<tr><td colspan="2"></td><td>Internal Continuous Assessment (ICA):</td><td>25 marks</td></tr>
<tr><td colspan="4">Teacher should facilitate learning following lab experiments:
1. Determination of magnetization, external , internal characteristics and critical field resistance of d. c. shunt generator
2. Determination of external characteristics of d.c. compound generator as i) differential compound, ii) cumulative compound generator.
3. Speed control of D.C shunt motor by armature and field control.</td></tr>
</table>

4. i) Starting of DC motors using 3 and 4 point starters. ii) Reversal of motor rotation of D. C. motor.
5. Determination of performance characteristic of DC series motor by direct load.
6. Swinburne's tests on DC shunt Motor: Determination of losses & efficiency.
7. Polarity and Ratio test on single phase transformer/three phase transformer.
8. Determination of performance of single phase transformer by direct load test.
9. Determination of performance of single phase transformer by conducting Open circuit and short circuit test.
10. Parallel operation of two single phase transformer.
11. Study of phaser and vector group of three phase transformer.
12. Scott connection of two single phase transformer on no load and at balanced load.

Note: Lab file should consist of minimum **Eight** experiments.

Text Books:

1. Ashfaq Husain, "Electrical Machines", Dhanpat Rai & Co.
2. B. L. Theraja "Electrical Technology" Vol –I and II, S Chand Publication.

Reference Books:

1. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education,
2. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers,
3. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
4. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
5. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guidelines for ESE:

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical. Evaluation will be based on paper work and performance in the practical.

Electrical Workshop Laboratory

LAB COURSE OUTLINE

Course Title:	**Electrical Workshop Laboratory**	**Short Title:**	**EWL**	**Course Code:**	

Course description:

This course provides the basic practical knowledge about the electrical electronics engineering. The course includes the study of different electrical symbols, electrical shocks and safety precautions, equipments used for the measurement and testing of electrical and electronics devices, different types of electronic circuits, The course may includes visit to the electrical industries or power plant for the enhancement of practical knowledge.

	Hours/week	No. of weeks	Total hours	Semester credits
Lecture	**01**	**14**	**14**	**02**
Laboratory	**02**	**14**	**28**	

End Semester Exam (ESE) Pattern:	**Oral (OR)**

Prerequisite course(s):

Knowledge of H.S.C. and Introduction to Electrical Engineering and Introduction to Electronics Engineering.

Course objectives:

The objective of the course is to provide knowledge about practical practices used in electrical engineering. This course will help students to use various tools for measurement and testing of electrical apparatus. The subject provides scope for practical applications of electrical engineering. The course will also help students to use and implement efficient and techno commercial aspect of maintenance and installation.

Course outcomes:

Upon successful completion of lab Course, student will be able to:

1. Understand various electrical symbols and their use in electrical electronics drawing.
2. Familiar with the safety precautions and practices while working in industrial and domestic premises.
3. Understand various maintenance schemes such as preventive, breakdown maintenance.
4. Select correct size and type of cables and wires for different applications.
5. Use different types of measuring instrument and instrumentation and testing equipments.
6. Select correct rating of fuse and MCB for protection scheme and safety.
7. Discharge the professional duties in technical field of maintenance and installation.
8. Practical exposure to different fabrication techniques.
9. Creation of simple components using different materials.
10. Acquire a minimum practical skill with respect to the different manufacturing methods

LAB COURSE CONTENT

Electrical Workshop Laboratory		**Semester:**	**III**	
Teaching Scheme:		**Examination scheme**		
Lectures:	**1 hour/week**	**End semester exam (ESE):**		**25 marks**
Practical:	**2 hours/week**	**Internal Continuous Assessment (ICA):**		**25 marks**

Theory:

Unit–I: Different types of electrical and electronics materials, Definition, properties and difference of conductor, insulator and semiconductor , Resistors, Capacitors and Inductors, DC/AC voltmeter and ammeter, Analog and digital multi-meter for the measurement of electrical quantities, CRO, Function Generator, Megger, Clip-on meter, Power factor meter, Lux meter.

Unit–II: Cables: Classification of cable, Cables, Connectors and Switches, Cable standards and specifications, Insulating materials for cables, Cable joining, Coaxial cable, twisted pair cable, Flat ribbon cable Different wires, Size selection of wires, Standard wires TRC and CTS wires, Weather proof wires, Flexible wires.

Unit–III: wiring accessories: Types of switches, Types of lamp holders, ceiling rose, mounting blocks, socket outlets plugs, wooden boards, Main switches, Junction boxes, Distribution boxes, fuse boards Domestic wiring and Lamp circuits: Simple circuit, series and parallel circuit, Fluorescent lamp circuits, domestic switch board wiring. Details and Layout of DC and AC Armature Windings.

Unit–IV: Substation equipment: Classification and use of Lightening arrester, Different type of isolators. Substation earthing, Transformer: Standard rating, vector group of power transformer, Standard rating of instrument transformer, Class of accuracy for instrument transformer.

Unit–IV: Starters: Three phase induction motor starter, Study of three phase induction motor reverse forward starter, Contactor, relay and timer circuit, Electronic ballast and fan regulator, Applications of electrical and electronic circuits for domestic and commercial purpose.

Teacher should facilitate learning following lab experiments:

1. Study and use of
   a. DC/AC voltmeter and ammeter.
   b. Analog and digital multi-meter for the measurement of electrical quantities.
   c. CRO, Function Generator
   d. Megger, Clip-on meter.
   e. Power factor meter.
   f. Lux meter
2. Identify and find the value using colour code chart and test different types of resistors.
3. Study of different Cables
   a. Classification of cable, types of three phase cable
   b. Cable standards and specifications
   c. Insulating materials for cables, cable joining

d. Coaxial cable, twisted pair cable, flat ribbon cable.

4. Study of different wires
   a. Size selection of wires
   b. Standard wires TRC and CTS wires
   c. Weather proof wires, flexible wires.
5. Study of wiring accessories
   a. Types of switches
   b. Types of lamp holders, ceiling rose, mounting blocks, socket outlets plugs, wooden board.
   c. Main switches (ICDP/ICTP/MCB), Junction boxes, Distribution boxes, fuse boards.
6. Study of domestic wiring and Lamp circuits
   a. Simple circuit, series and parallel circuit,
   b. Fluorescent lamp circuits, domestic switch board wiring.
7. Study and layout of AC and DC armature windings
8. Study of substation equipment
   a. Classification and use of Lightening arrester
   b. Different type of isolators.
   c. Substation earthing
9. Study of transformers
   a. Standard rating, vector group of power transformer.
   b. Standard rating of instrument transformer
   c. Class of accuracy for instrument transformer.
10. Study of Starters:
    a. Three phase induction motor starter.
    b. Study of three phase induction motor reverse forward starter.
11. Study of different contactor, relay and timer with switching demonstration.
12. Study of electronic ballast and fan regulator
13. Fabrication of any small electrical/electronic circuit for domestic and commercial application.

Note: Lab file should consist of minimum **Eight** experiments.

Text Books:

1. S. P. Seth , “A course in Electrical Engineering Materials”, Dhanpatrai and Sons, 1984

Reference Books:

1. S. L. Uppal, G. C. Garg, “Electrical Wiring, Estimating and Costing” Khanna Publishers 6th Edition 2012
2. B. D. Arora , “Electrical wiring, Estimation and Costing” New Heights, New Delhi, 1984
3. P. P. Gupta, “Maintenance of Electrical Equipments” Dhanpatrai and Sons, 1984.
4. A. K. Sawney. “Electrical & Electronic Measurement and Instrumentation” Danpant Rai & Co.

Guide lines for ICA:
ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.
Guidelines for ESE:
In ESE the student may be asked questions on practical. Evaluation will be based on answers given by student in oral examination.

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Syllabus for

Second Year Electrical Engineering

Faculty of Science and Technology

'A' Grade
NAAC Re-Accredited
(3rd Cycle)

COURSE OUTLINE

Semester – IV

w. e. f. 2018 – 19

Biology

COURSE OUTLINE

Course Title:	**Biology**	**Short Title:**	**Bio**	**Course Code:**	

Course description:

This course is introduced for learning the basic fundamentals of Life sciences (zoology & Botany) to undergraduate students. The prospectus includes a prior knowledge of Biotechnology. The goals of the course are to understand the basic principles of Biology and its applications in the field of Engineering.

	Hours/week	No. of weeks	Total hours	Semester credits
Lecture	**03**	**14**	**42**	**04**
Tutorial	**01**	**14**	**14**	

Prerequisite course(s):

Course objectives:

1. Students will understand the structures and characteristics or functions of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles.
2. Students will learn the basic principles of inheritance at the molecular, cellular and Organism levels.
3. Students will test and deepen their mastery of genetics by applying this knowledge in a variety of problem-solving situations.

Course outcomes:

After successful completion of this course the student will be able to:

1. Use current techniques and analysis methods in molecular biology and genetics.
2. Understand the current concepts in Cell Biology, Stem Cell Biology and Development.
3. Know the structure/function of the basic components of prokaryotic and eukaryotic cells including macromolecules and organelles.
4. Demonstrate proficiency with at least one instrument commonly used in biological research (microscope, etc).

COURSE CONTENT

Name of the Subject: Biology		**Semester:**	**IV**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I	**No. of Lectures: 08 Hours**	**Marks: 12**

Diversity of Organism and Cell Biology

Introduction: Living systems, Bio-mimicry, Metabolism, Taxonomy, Concept of species, Structural organization of life, Concepts of modern cell, history of cell, Cell theory, Structure of cell:- Cell shape, size and cell number, Types of cells:- Prokaryotic cells and Eukaryotic cells, Chemistry of cells. **Cell Division:** Cell cycle, mitosis, meiosis, mitotic cell division, cell cycle check points, meiotic cell division, embryonic cell division, cell death.		
Unit–II	**No. of Lectures: 08 Hours**	**Marks: 12**
Plant and Animal Kingdom **Plant Kingdom:** Introduction to plants, Salient features of major plant groups: Bryophyta, Pteridophyta, Gymnospermae, Angiospermae, **Plant Growth & Development:** Introduction, Seed Dormancy, Seed Germination, Phases of growth, Plant growth hormones. **Animal Kingdom:** Animal Classification, Salient features of non-chordates upto phylum level: Phylum porifera, phylum cindaria, phylum ctenophore, phylum platyhelminthes.		
Unit–III	**No. of Lectures: 08 Hours**	**Marks: 12**
Plant Cell and Animal cell culture and Applications **Plant Cell Culture:** Brief introduction to cell culture with respect to the properties of plant cells, Media requirements, Typical media used, Classification of tissue culture, callus culture, cell suspension culture, Application of callus culture and cell suspension culture, Plant cell cultivation Bioreactors **Animal Cell Culture:** Brief introduction to animal cell culture, Culture medium: Natural and Artificial media, introduction to balanced salt solutions and simple growth medium, Brief discussion on the chemical, physical and metabolic functions of different constituents of culture medium, Animal Bioreactors.		
Unit–IV	**No. of Lectures: 08 Hours**	**Marks: 12**
Microbial Culture and Applications: Introduction, Microbial Culture Techniques, growth curve, Pure culture techniques – microbial culture media, isolation, identification and maintenance of cultures, incidences of microorganisms in soil, water, air, food and sewage, food spoilage organisms, Applications of Microbial Culture Technology.		
Unit–V	**No. of Lectures: 08 Hours**	**Marks: 12**
Biotechnology and its Applications: Definitions, scope of Biotechnology, Recombinant DNA Technology: Making Recombinant		

DNA, Tools in Genetic Engineering, Polymerase Chain reaction (PCR).

Applications of Biotechnology:

Bioinformatics, Biomechanics, Biotechnology of waste treatment, Biosensors, Forensic science, Food Biotechnology, Fermentation Technology.

Text Books:

1. B.D. Singh “Genetics” Kalyani Publications Third Edition.
2. C.B. Pawar “Cell Biology” Himalaya Publications, Third Edition.
3. C.B. Pawar “Cell and Molecular Biology” Himalaya Publications.
4. Text book of Zoology by V.K. Agrawal, S. Chand Publication.
5. Text book of Botany by Dr. B.P. Pandey S. Chand Publication.
6. Text book of Biotechnology by R.C. Dubey, S. Chand Publications.

Reference Books:

1. P. K. Gupta, Introduction to Biotechnology, Rastogi Publications.
2. B. D. Singh, Biotechnology: Expanding Horizons, Kalyani Publishers, New Delhi, Second Revised Edition, 2008.
3. S. S. Purohit, Biotechnology: Fundamentals and Applications, Agrobios (India), 2005, 4^{th} Edition.

Electrical Engineering Materials					
COURSE OUTLINE					
Course Title:	**Electrical Engineering Materials**	**Short Title:**	**EEM**	**Course Code:**	

Course description:
The objective of this course is to introduce the students to the fundamental knowledge of various materials used in electrical engineering. The course provides the essential knowledge for the selection of different conducting and insulating materials. This course includes the classification and application of electrical engineering materials. Applications of modern electrical engineering materials for nanotechnology and solar photovoltaic systems.

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	03	**14**	**42**	**04**

Prerequisite course(s):
Knowledge of H.S.C. and first year subject Introduction to Electrical & Electronics Engineering.
Course objectives:
The objective of the course is to provide the knowledge of different electrical engineering materials and their applications in designing electrical equipments. The course also provides the study of thermal properties for the efficient design and long life cycle of electrical equipments
Course outcomes:
After successful completion of this course the student will be able to:

1. Classify different electrical engineering materials and testing of various electrical engineering materials.
2. Understand the electrical and thermal characteristics of conducting, semiconducting, insulating and magnetic materials for the manufacturing of electrical machines and electronic components.
3. Understand and plot the B-H curve of different magnetic materials, their suitability in manufacturing of energy efficient electrical machines.
4. Understand dielectric properties of insulating materials in static and alternating fields.
5. Recognize the materials used for solar photovoltaic systems and nanotechnology.
6. Do higher studies in solar photovoltaic material for green and clean power generation in view of sustainable development through environmental and safety aspects.

COURSE CONTENT			
Electrical Engineering Materials		**Semester:**	**IV**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	No. of Lectures: 09 Hours	Marks: 12
Conductors **Classification:** High conductivity, high resistivity materials, Fundamental requirements of high conductivity materials and high resistivity materials, Mobility of electron in metals, Factors affecting conductivity and resistivity of electrical material. **Thermoelectric Effect:** See back effect, Peltier effect, Thomson effect. Commonly used high conducting materials, properties, characteristics and applications of copper, aluminum, bronze, brass, High resistive materials, Constantan, platinum, nichrome, properties, characteristics, Materials used for AC and DC machines.		
Unit–II:	**No. of Lectures: 09 Hours**	**Marks: 12**
Semi-Conductors and Superconductors General concepts, energy bands, Types of semiconductors: intrinsic Semi-conductors, extrinsic Semi-conductors. Compound semiconductor, amorphous semiconductor. Hall effect, drift, mobility, diffusion in Semiconductors. Semi-conductors and their applications. **Superconductors:** Superconductivity, Properties of Superconductors, Critical field, Meissner effect, Type-I and type-II Superconductors.		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Dielectrics and Insulators Properties of gaseous, liquid and solid dielectric, dielectric as a field medium, Electric conduction in gaseous, liquid and solid dielectric, Breakdown in dielectric materials, mechanical and electrical properties of dielectric materials, Effect of temperature on dielectric materials, polarization, loss angle and dielectric loss. Petroleum based insulating oils, transformer oil, capacitor oils, and properties. Classification of insulation (Solid) and application in AC and DC machines. Solid electrical insulating materials, fibrous, paper boards, yarns, cloth tapes, sleeving wood, impregnation, plastics, filling and bounding materials, fibrous, film, mica, rubber, mica based materials, ceramic materials.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Magnetic Materials Basic terms, Classification of magnetic material, diamagnetic, paramagnetic, ferromagnetic, anti-ferromagnetic and amorphous material. Hysteresis loop, magnetic susceptibility, coercive force, curie temperature. Magneto-striction, factors affecting permeability and hysteresis loss. Common magnetic materials, Soft and hard magnetic materials. Electric steel, sheet steel, cold rolled grain oriented silicon steel, hot rolled grain oriented silicon steel, hot rolled silicon steel sheet		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Modern Engineering Materials		

Materials for Electronic Components - Resistors, Capacitors, Inductors, Relays, Bipolar transistors, Field effect transistor (FET), Integrated circuits, Power devices

Nanotechnology – Introduction, Nano-devices, applications

Solar/Photovoltaic Cell- Introduction, Photo generation of charge carriers, p-n junction, Light absorbing materials: Silicon thin films, concentrating photovoltaic.

Text Books:

1. A. J. Dekker, "Electrical Engineering Materials". PHI Pvt. Ltd.
2. C. S. Indulkar and S.Thiruvengadam, "Electrical Engineering Materials", S Chand Publication, 1st edition.
3. S. P. Chhaiotra and B. K. Bhat, "Electrical Engineering Materials", Khanna Publication
4. Electrical Engineering Materials: T.T.T.I. Chennai, TMH, 34th edition.

Reference Books:

1. S. P. Seth and P. V. Gupta, "A course in Electrical Engineering Materials", Dhanpat Rai Publication, 3rd edition.
2. R. K. Rajput, "Electrical Engineering Materials", Laxmi Publication, 2nd edition.

Analog and Digital Electronics					
COURSE OUTLINE					
Course Title:	**Analog and Digital Electronics**	**Short Title:**	**ADE**	**Course Code:**	

Course description:

This course provides an introduction to solid state devices, power semiconductor devices, linear integrated circuits and voltage regulator ICs which includes over view of semiconductor devices, integrated circuits, their characteristics and applications, digital electronics, combinational circuits, sequential circuits.

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	03	**14**	**42**	**03**

Prerequisite course(s):

Basics of diodes, BJT, OPAMP, Logic Gates, Number System and Boolean algebra.

Course objectives:

1. To introduction to BJT and diode rectifier.
2. To develop the concept of basics of operational Amplifier and its applications.
3. To understand the behavior of semiconductor devices operated as power switches.
4. This course provides an introduction to digital electronics SOP and POS form, k-map technique, flip-flops, sequential circuits such as ripple counter, synchronous counter, Mod-n counter, shift resister and its applications.

Course outcomes:

After successful completion of this course the student will be able to:

1. Apply basic knowledge of science and engineering to understand electronic devices and circuits.
2. Understand the construction and working principles of different electronic devices.
3. Analyze the circuit for determination of circuit parameters and response of electronic devices.
4. Understand the use of different electronic devices such as BJT, FET, Op-amp, IC 555, and PLL.
5. Use the basic logic gates and various reduction techniques of digital logic circuit in detail.
6. Gain the basic concept of combinational and sequential circuits with the help of basic building blocks. Able to design combinational and sequential circuits using excitation and state table.

COURSE CONTENT

Analog and Digital Electronics	**Semester:**	**IV**
Teaching Scheme:	**Examination scheme**	

<table>
<tr><td>Lectures:</td><td>3 hours/week</td><td>End semester exam (ESE):</td><td>60 marks</td></tr>
<tr><td colspan="2" rowspan="2"></td><td>Duration of ESE:</td><td>03 hours</td></tr>
<tr><td>Internal Sessional Exams (ISE):</td><td>40 marks</td></tr>
</table>

<table>
<tr><td>Unit–I:</td><td>No. of Lectures: 08 Hours</td><td>Marks: 12</td></tr>
<tr><td colspan="3">Diode and BJT Applications: DC Power supplies, types, Diode rectifier: Introduction, half wave rectifier, full wave rectifier-Center tap and bridge rectifier With capacitor filter and its analysis for ripple factor and efficiency. Comparison of rectifiers.
BJT amplifier: Single stage common emitter, common base and common collector amplifier, Multistage amplifier, direct coupled, RC coupled and transformer coupled, Darlington pair, Push-Pull amplifier, FET amplifiers and comparison.</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td>Unit–II:</td><td>No. of Lectures: 08 Hours</td><td>Marks: 12</td></tr>
<tr><td colspan="3">Operational amplifier: Op-amp parameters such as CMRR, slew rate, frequency response and gain limitations. Inverting, non inverting amplifier. Summer and substractor. Op-amp applications: Integrator, differentiator. Op-amp as Comparator, Schmitt trigger, Instrumentation amplifier, log and antilog amplifier, precision rectifiers, Waveform generation using Op-amp – sine, square and triangular.</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td>Unit–III:</td><td>No. of Lectures: 08 Hours</td><td>Marks: 12</td></tr>
<tr><td colspan="3">Timer and Voltage Regulators: IC 555 Timer: Functional block diagram, modes of operation-Astable, Monostable, Study of VCO and PLL, Types of voltage regulators, Series and shunt voltage regulators, Protection circuits for voltage regulators, Fixed and variable voltage regulators using ICs Viz 78xx,79xx,LM723, LM317.</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td>Unit–IV:</td><td>No. of Lectures: 08 Hours</td><td>Marks: 12</td></tr>
<tr><td colspan="3">Combinational Circuits: Standard representation of logic functions: SOP and POS forms, K-map (for 2, 3 & 4 variables): representation of logic functions, simplification of logic functions and minimization of logic functions, don’t care conditions. Classification of combinational circuits-Arithmetic and logical functions : adders and subtractor (Half and Full), Comparator Data transmission: Multiplexers, Demultiplexers, Encoders, decoders, Code converters binary to gray and gray to binary, BCD - to - 7 segment decoder, look ahead carry, Arithmetic and logic unit (ALU).</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td>Unit–V:</td><td>No. of Lectures: 08 Hours</td><td>Marks: 12</td></tr>
<tr><td colspan="3">Flip-Flops and Sequential Circuits: A 1-Bit Memory Cell, Clocked S-R flip-flop, Edged triggered J-K flip-flop, Race around condition, J-K master slave flip-flop, Edged triggered D-type flip-flop, T-type flip-flop.
Classification of sequential circuits-synchronous and asynchronous, Registers, application of shift registers, ring counter, twisted ring counter. Asynchronous and synchronous counter, 4 bit UP/DOWN ripple counter. Introduction to finite state machine (mealy and more type).</td></tr>
</table>

Text Books:

1. S. Salivahanan, N. Suresh Kumar, “Electronic devices and circuit”, McGraw hill education (India) private limited, Chennai, 4th edition, 2017.
2. Ramakant A. Gaikwad, “Op- Amp and Linear Integrated Circuits”, PHI Learning Pvt. Ltd, Delhi, 2014
3. R. P. Jain, “Modern Digital Electronics” McGraw Hill Education (India) Private Limited, Fourth Edition, 2017.

Reference Books:

1. David A. Bell, “Electronics devices and circuit”, Oxford University Press, 3rd edition, 2015.
2. K. R. Botkar, “Integrated Circuit”, Khanna Publication, New Delhi
3. Stephen Broown, Zvonko Vranesic, “Fundamental of Digital Logic with VHDL Design”, McGraw Hill Publication, 3rd edition, 6th reprint, 2015.
4. David J. Comer, “Digital Logic and State Machine Design”, Oxford University Press, 3rd edition, 2014.

Electrical Machines-II					
COURSE OUTLINE					
Course Title:	**Electrical Machines-II**	**Short Title:**	**EMC-II**	**Course Code:**	

Course description:

This course is an advanced level Electrical Machines-I which will further strengthen the knowledge of the students. The course explores on understanding of construction, basic principles underlying the operation of electrical machines, performance, characteristic and testing of AC Machines, Voltage regulation of synchronous alternator, parallel operation and salient features and characteristic of synchronous motor. It also gives the platform to understand construction, working, performance and application of three phase and single phase motors.

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	03	**14**	**42**	**03**

Prerequisite course(s):

Knowledge of Electrical Machine-I at III Semester of Engineering.

Course objectives:

The object of syllabus to impart the fundamental knowledge of Synchronous machines. Students will be able to develop their ability to apply the specific procedures for comprehensive treatment of rotating machines. In the earlier stage the machine worked in isolation and its simple analysis was sufficient. Now the electric machines form an integral part of large system comprising of other components as well. The object is not great depth, but enough to give theory at a level that can be understood by undergraduate. With this beginning, the students will have the foundation to continue his education and able to do better in professional duties in the field of manufacturing, testing, operation and control.

Course outcomes:

After successful completion of this course the student will be able to:

1. Apply basic knowledge of science and engineering to understand electrical machines.
2. Explain construction, concepts, principles of operation, testing and application of synchronous machines, induction motor and special function motors.
3. Explain the behavior of synchronous machine on infinite bus and analyze data for qualitative and quantitative parameters to determine characteristics of machines by performing practical.
4. Perform professional duties in team of manufacturing, testing, operation and maintenance with the sense of safety precautions.
5. Apply knowledge for technological subjects such as utilization of electrical energy, switch gear and machine design for economical and sustainable developments.
6. Do higher studies and able to use updated software and tools for continuous updating of knowledge.

COURSE CONTENT

Electrical Machines-II		Semester:	IV
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**

	Duration of ESE:	**03 hours**
	Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**

Fundamentals of AC machine

Concept and general terms pertaining to rotating machine, emf generation in AC machines. Generated emf in full pitch and short pitch winding, Physical arrangement of windings in stator and cylindrical rotor; slots for windings; single turn coil - active portion and overhang; full-pitch coils, concentrated winding, distributed winding, concentrated and distributed, Sinusoidally distributed winding, winding distribution factor.

Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**

Synchronous Alternator

Principle of generator, construction, excitation system, E.M.F. equation, Alternator on- load, effect of armature current; armature reaction; resistance drop; Concept leakage reactance, synchronous reactance and synchronous impedance. Voltage regulation of non salient pole alternator by direct load testing, synchronous impedance method and m.m.f. method.

Two reaction theory for salient pole machines, direct axis and quadrature axis reactance, power angle relation for non salient pole machines and salient pole Parallel operation of alternator: need, conditions and method of parallel operation, Two alternators working in parallel, Effect of changing mechanical torque and excitation. Load sharing between two parallel connected alternators. Alternator on an infinite bus.

Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**

Induction Machines

Construction, Types (squirrel cage and slip-ring), Torque Slip Characteristics, Starting and Maximum Torque. Equivalent circuit. Phasor Diagram, Losses and Efficiency. Effect of parameter variation on torque speed characteristics (variation of rotor and stator resistances, stator voltage, frequency). Methods of starting, braking and speed control for induction motors. Generator operation. Self-excitation. Doubly-Fed Induction Machines.

Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**

Synchronous Motor

Motor action, phasor diagram on the basis of synchronous impedance, expression for gross mechanical power developed; power flow. Operation with constant load and variable excitation : locus of tip of current phasor under the above condition and v curve

Operation with const. excitation and variable load: locus of tip of current phasor circle phasor. Starting method, hunting and it causes and remedies

Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**

Pulsating and revolving magnetic fields

Pulsating magnetic field - alternating current in windings with spatial displacement, Magnetic field produced by a single winding, Windings spatially shifted by 90 degrees, torque of pulsating magnetic fields, revolving magnetic field.

Single-phase induction motors

Constructional features, principle of operation for single phase induction motor, capacitor start motor, split phase motor and shaded pole motor induction motor, development of torque, torque slip characteristic, starting characteristic. Construction, working operation, characteristic of repulsion and universal motor.
Text Books:
1. Ashfaq Husain, "Electrical Machines", Dhanpat Rai & Co., 3rd edition. 2. B. L. Theraja, "Electrical Technology" Vol –I and II, S Chand Publication, 1st edition.
Reference Books:
1. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013. 2. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2004. 3. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002. 4. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011. 5. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010. 6. P. C. Sen. "D.C. Machines", Tata McGraw Hill.

Entrepreneurship Development					
COURSE OUTLINE					
Course Title:	**Entrepreneurship Development**	**Short Title:**	**ED**	**Course Code:**	
Course description:					
Last few decades have seen the advent of various new disciplines in the area of management. One such discipline, Entrepreneurship has emerged quite recently. The syllabus explore the concept of entrepreneurship, financial requirements of a new enterprise, Expansion strategies of an enterprise, challenges for small enterprises and Institutional Support for small enterprises					

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	03	**14**	**42**	**3**

Prerequisite course(s):

Knowledge of subject Industrial Organization And Management.

Course objectives:

The economic objectives of country, such as industrial development, regional growth, employment generation and development of small scale industries entirely depend on the growth of entrepreneurship. As concept, Entrepreneurship poses a challenge for entrepreneurs to select and implement business strategies to tread the glorious path of success and growth. Successful entrepreneurship requires passion of an entrepreneur and thus, it is more than the money and luck. In the contemporary world, the study of this discipline become of umpteen importance to understand the complexities of business environment at national and international levels.

Course outcomes:

After successful completion of this course the student will be able to:

1. Understand the various new disciplines in the area of management.
2. Understand concept of entrepreneurship and learn the procedure of setting up an enterprise.
3. Understand the concepts of human resource management, marketing management, financial management, production and operation management in a new enterprise.
4. Function on multidisciplinary teams and understand the impact of engineering solutions in a global, economic, environmental, and societal context.
5. Estimate the financial feasibility of business and identify the various sources of financing.
6. Understand the role of small scale enterprises in economic development of a country and understand the linkage between small and large scale enterprises.
7. Develop skills to become entrepreneurs in view of economic objectives of country, such as industrial development, regional growth, employment generation and development of small scale industries through technological developments.

<table>
<tr><td colspan="6" align="center">COURSE CONTENT</td></tr>
<tr><td colspan="3">Entrepreneurship Development</td><td colspan="2">Semester:</td><td>IV</td></tr>
<tr><td colspan="3">Teaching Scheme:</td><td colspan="3">Examination scheme</td></tr>
<tr><td>Lectures:</td><td colspan="2">3 hours/week</td><td colspan="2">End semester exam (ESE):</td><td>60 marks</td></tr>
<tr><td colspan="3" rowspan="2"></td><td colspan="2">Duration of ESE:</td><td>03 hours</td></tr>
<tr><td colspan="2">Internal Sessional Exams (ISE):</td><td>40 marks</td></tr>
<tr><td colspan="2" align="center">Unit–I:</td><td colspan="2" align="center">No. of Lectures: 08 Hours</td><td colspan="2" align="center">Marks: 12</td></tr>
<tr><td colspan="6">Introduction to Entrepreneurship
Introduction, Concept of entrepreneurship: Significance of entrepreneurship, Theories of entrepreneurship, Models of entrepreneurship development
Definition of entrepreneur: Traits and characteristics of successful entrepreneur , Functions of an entrepreneur , Types of entrepreneurs, Factors influencing entrepreneur, Professional vs. family entrepreneurs, Entrepreneurial leaders vs. managers,
Entrepreneurial process: Entrepreneurial motivation, Entrepreneurial barriers, Women as entrepreneur , Role of woman entrepreneurs in society, Barriers to women entrepreneurs , Myths of entrepreneurship, Problems faced by entrepreneurs and capacity building for entrepreneurship, Profiles of successful entrepreneurs.</td></tr>
<tr><td colspan="6"></td></tr>
<tr><td colspan="2" align="center">Unit–II:</td><td colspan="2" align="center">No. of Lectures: 08 Hours</td><td colspan="2" align="center">Marks: 12</td></tr>
<tr><td colspan="6">Financial requirements of a new Enterprise
Estimating financial requirements, Estimation of fix capital requirements, Estimation of working capital requirements
Identifying the sources of finance –sources of long-term financing: Sources of medium term financing , Sources of short-term financing
Institutions providing financial assistance: Venture capital funding- venture capital funding in the Indian scenario, Venture capital funding process, Importance of financial management, Working capital management, Accounting and book keeping, Financial statement, Financial ration analysis</td></tr>
<tr><td colspan="6"></td></tr>
<tr><td colspan="2" align="center">Unit–III:</td><td colspan="2" align="center">No. of Lectures: 08 Hours</td><td colspan="2" align="center">Marks: 12</td></tr>
<tr><td colspan="6">Expansion strategies of an Enterprise
Expanding and enterprise: Expansion through concentration, Expansion through integration, Expansion through diversification , Expansion through cooperation,
Expansion through internationalization, Expansion through digitalization , Organization life cycle, Strategic management, The essence of business ethics</td></tr>
<tr><td colspan="6"></td></tr>
<tr><td colspan="2" align="center">Unit–IV:</td><td colspan="2" align="center">No. of Lectures: 08 Hours</td><td colspan="2" align="center">Marks: 12</td></tr>
<tr><td colspan="6">Challenges for small Enterprises
Problem faced by small enterprises: Managerial problems, Marketing management, Human resource, Production management, Technological problems</td></tr>
</table>

Role of central and state governments in promoting small enterprises: Fiscal and tax concessions for small enterprises, Industrial policies for small enterprises, Importance of marketing, Customer relationship management (CRM), Marketing services		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Institutional Support for small enterprises and decision support system Institutions supporting small scale enterprises: Small scale industries (SSI) board, Khadi and village industries commission (KVIC), Micro, small and medium enterprises development organization (MSME-DO), National small industries corporation limited (NSIC), National institute for entrepreneurship and small business development (NIESBUD)‘ Indian institute of entrepreneurship (IIE), State industrial development / Investment Corporation (SIDCs/SIICs), State directorate of Industries (SDIs), District industry centers (DICs) ,Industry associations , Non-Governmental organization Institutions providing financial association: Small industries development bank of India (SIDBI), State financial corporation (SFCs) Technological up gradation and moderation of small enterprises: ISO 9000/14001 certification fee reimbursement scheme,		
Text Books:		
1. Alpana Trehan, “Entrepreneurship” Published –Dreamtech Press 2. Jack M. Kaplan, “Patterns of Entrepreneurship” Wiley.		
Reference Books:		
1. Poornima M. Charantimath, “Entrepreneurship Development - Small Business Enterprises” Pearson. 2. Thomas W. Zimmerer & Norman M. Scarborough, “Essential of Entrepreneurship and Small Business Management” 4th Edition, Pearson.		

<table>
<tr><td colspan="8">Electrical Engineering Materials Laboratory</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td colspan="8">LAB COURSE OUTLINE</td></tr>
<tr><td>Course Title:</td><td colspan="3">Electrical Engineering Materials Laboratory</td><td>Short Title:</td><td>EEM Lab.</td><td>Course Code:</td><td></td></tr>
<tr><td colspan="8">Course description:</td></tr>
<tr><td colspan="8">The objective of this course is to introduce the students to the fundamental knowledge of various materials used in electrical engineering. Testing of electrical engineering material and application. Testing of insulation oil as per IS.</td></tr>
<tr><td rowspan="2">Laboratory</td><td>Hours/week</td><td>No. of weeks</td><td colspan="2">Total hours</td><td colspan="3">Semester credits</td></tr>
<tr><td>02</td><td>14</td><td colspan="2">28</td><td colspan="3">01</td></tr>
<tr><td colspan="3">End Semester Exam (ESE) Pattern:</td><td colspan="5"></td></tr>
<tr><td colspan="8">Prerequisite course(s):</td></tr>
<tr><td colspan="8">Knowledge of HSC and First year Engineering.</td></tr>
<tr><td colspan="8">Course objectives:</td></tr>
<tr><td colspan="8">The objective of the course is to provide students with the essential knowledge of different electrical engineering materials and their applications in designing electrical equipments. The students will able to carry different test on electrical engineering materials to find characteristic and applications. The students will able to select the material for different applications. This course also provides a platform for further studies in solar electric power generation.</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td colspan="8">Course outcomes:</td></tr>
<tr><td colspan="8">Upon successful completion of lab Course, student will be able to:</td></tr>
<tr><td colspan="8">1. Apply basic knowledge of science and understand the characteristic of conducting material and their applications.
2. Analyze the practical data for determination of properties of materials.
3. Understand break down mechanisms for insulating materials.
4. Do testing of transformer oil as per IS.
5. Recognize the materials used for solar photovoltaic systems and nanotechnology.
6. Do higher studies in solar photovoltaic material for green, clean power generation in view of development through environmental aspects.</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td colspan="8">LAB COURSE CONTENT</td></tr>
<tr><td colspan="3">Electrical Engineering Materials Lab</td><td colspan="2">Semester:</td><td colspan="3">IV</td></tr>
<tr><td colspan="3">Teaching Scheme:</td><td colspan="5">Examination scheme</td></tr>
<tr><td>Practical:</td><td colspan="2">2 hours/week</td><td colspan="4"></td><td></td></tr>
<tr><td colspan="8"></td></tr>
<tr><td colspan="8">Teacher should facilitate learning following lab experiments:
1. Testing of insulating oil as per IS
2. Testing of solid insulating materials as per IS</td></tr>
</table>

3. Testing of power capacitors as per IS
4. Measurements of resistivity of conducting materials.
5. Measurements of resistivity of resistive material.
6. Study and use of Gauss meter.
7. Use of spark gap for high voltage testings for air.
8. To study See back and Peltier effects.
9. Study of hysteresis loop of ferromagnetic materials.
10. Study of various insulating materials.

Note: Lab file should consist of minimum **Eight** experiments.

Evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Text Books:

1. A. J. Dekker, "Electrical Engineering Materials". PHI pvt. ltd.
2. C. S. Indulkar and S.Thiruvengadam, "Electrical Engineering Materials", S Chand Publication, 1st edition.
3. S. P. Chhaiotra and B.K.Bhat, "Electrical Engineering Materials", Khanna Publication.
4. Electrical Engineering Materials: T.T.T.I. Chennai, TMH, 34th edition.

Reference Books:

1. S. P. Seth and P. V. Gupta, "A course in Electrical Engineering Materials", Dhanpat Rai Publication, 3rd edition.
2. R. K. Rajput, "Electrical Engineering Materials", Laxmi Publication, 2nd edition.

<table>
<tr><td colspan="10">Analog and Digital Electronics Laboratory</td></tr>
<tr><td colspan="10"></td></tr>
<tr><td colspan="10">LAB COURSE OUTLINE</td></tr>
<tr><td>Course Title:</td><td colspan="4">Analog and Digital Electronics Laboratory</td><td>Short Title:</td><td>ADE Lab.</td><td colspan="2">Course Code:</td><td></td></tr>
<tr><td colspan="10">Course description:</td></tr>
<tr><td colspan="10">This course provides an introduction to solid state devices, power semiconductor devices, linear integrated circuits and voltage regulator ICs which includes over view of semiconductor devices, integrated circuits, their characteristics and applications, digital electronics, combinational circuits, sequential circuits.</td></tr>
<tr><td colspan="2" rowspan="2">Laboratory</td><td>Hours/week</td><td colspan="2">No. of weeks</td><td colspan="2">Total hours</td><td colspan="3">Semester credits</td></tr>
<tr><td>02</td><td colspan="2">14</td><td colspan="2">28</td><td colspan="3">01</td></tr>
<tr><td colspan="4">End Semester Exam (ESE) Pattern:</td><td colspan="6">Practical (PR)</td></tr>
<tr><td colspan="10">Prerequisite course(s):</td></tr>
<tr><td colspan="10">Basics of diodes, BJT, OP-AMP, Logic Gates, Number System and Boolean Algebra.</td></tr>
<tr><td colspan="10">Course objectives:</td></tr>
<tr><td colspan="10">1. To introduction to BJT and diode rectifier.
2. To develop the concept of basics of operational Amplifier and its applications.
3. To understand the behavior of semiconductor devices operated as power switches.
4. This course provides an introduction to digital electronics SOP and POS form, k-map technique, flip-flops, sequential circuits such as ripple counter, synchronous counter, Mod-n counter, shift resister and its applications.</td></tr>
<tr><td colspan="10"></td></tr>
<tr><td colspan="10">Course outcomes:</td></tr>
<tr><td colspan="10">Upon successful completion of lab Course, student will be able to:</td></tr>
<tr><td colspan="10">1. Apply basic knowledge of science and engineering to understand electronic devices and circuits.
2. Understand the construction and working principles of different electronic devices.
3. Analyze the circuit for determination of circuit parameters and response of electronic devices.
4. Understand the use of different electronic devices such as BJT, FET, Op-amp, IC 555, and PLL.
5. Use the basic logic gates and various reduction techniques of digital logic circuit in detail.
6. Gain the basic concept of combinational and sequential circuits with the help of basic building blocks. Able to design combinational and sequential circuits using excitation and state table.</td></tr>
<tr><td colspan="10"></td></tr>
<tr><td colspan="10">LAB COURSE CONTENT</td></tr>
<tr><td colspan="4">Analog and Digital Electronics Laboratory</td><td colspan="3">Semester:</td><td colspan="3">IV</td></tr>
</table>

Teaching Scheme:		Examination scheme	
Practical:	**2 hours/week**	**End semester exam (ESE):**	**25 marks**
		Internal Continuous Assessment (ICA):	**25 marks**

Teacher should facilitate learning following lab experiments:

1. Observe the input and output voltage of half wave rectifier.
2. Observe the input and output voltage of full wave -Center tap rectifier.
3. Observe the input and output voltage of full wave bridge rectifier.
4. Op-amp as square wave generator using IC 741.
5. Op-amp as sine wave generator using IC 741.
6. Op-amp as comparator using IC 741
7. Op-amp as Schmitt trigger using IC 741.
8. IC 555 applications – Astable & Monostable Multivibrator.
9. Low voltage regulator using IC 723.
10. High voltage regulator using IC 723.
11. IC 78XX used as Positive voltage regulator.
12. IC 79XX used as Negative voltage regulator.
13. Design and verify operation of half adder and full adder.
14. Design and verify operation of half substractor.
15. Design and construct basic flip-flops.
16. Design and verify the 4-bit synchronous counter.
17. Design and verify the 4-bit asynchronous counter.

Note: Lab file should consist of minimum **Eight** experiments.

Text Books:

1. S. Salivahanan, N. Suresh Kumar, "Electronic devices and circuit", McGraw Hill education (India) private limited, Chennai, 4th edition, 2017.
2. Ramakant A. Gaikwad, "Op- Amp and Linear Integrated Circuits", PHI Learning Pvt. Ltd, Delhi, 2014
3. R. P. Jain, "Modern Digital Electronics" McGraw Hill Education (India) Private Limited, Fourth Edition, 2017.

Reference Books:

1. David A. Bell, "Electronics devices and circuit", 3rd edition, Oxford University Press, 2015.
2. K. R. Botkar, "Integrated Circuit", Khanna Publication, New Delhi
3. Stephen Broown, Zvonko Vranesic, "Fundamental of Digital Logic with VHDL Design", McGraw Hill Publication, 3rd edition, 6th reprint, 2015.
4. David J. Comer, "Digital Logic and State Machine Design", Oxford University Press, 3rd

edition, 2014.
Guide lines for ICA:
ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.
Guidelines for ESE:
In ESE the student may be asked to perform any one practical. Evaluation will be based on paper work, performance and oral in the practical examination.

Electrical Machines-II Laboratory					
LAB COURSE OUTLINE					
Course Title:	**Electrical Machines-II Laboratory**	**Short Title:**	**EMC-II Lab.**	**Course Code:**	

Course description:

In this laboratory course emphasis on imparting the practical knowledge and understanding of basic principles, determination of characteristic , performance and testing of AC Machines, Voltage regulation of synchronous alternator. Application of single phase motors

Laboratory	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	02	**14**	**28**	**01**

End Semester Exam (ESE) Pattern:	**Practical (PR)**

Prerequisite course(s):

Knowledge of Electrical Machine-I.

Course objectives:

The objective of the laboratory is to impart the fundamental knowledge of Synchronous machine and AC motors. Students will able to develop their ability to apply the specific procedures for analyze the experimental results. The students will able to understand the characteristic of Synchronous alternator and motor, application in process and manufacturing. Application of different methods to find voltage regulation of synchronous alternator. In this lab course, students will be familiar with the use of different equipments, safety precautions on work place. This makes bridge on theoretical knowledge and practical practices.

Course outcomes:

Upon successful completion of lab Course, student will be able to:

After successful completion of this lab course students will be able to:

1. Apply basic knowledge of science and engineering to understand electrical machine.
2. Select suitable motors with technical specification for required application and adopt safety precautions.
3. Analyze data for qualitative and quantitative parameters to determine characteristics of machines by performing practical
4. Apply knowledge for technological subjects such as utilization of electrical energy, switch gear & protection, manufacturing processes and safety precautions.
5. Discharging duties in technical field for economical, societal and sustainable developments.
6. Do higher studies and able to use updated software and tools for continuous updating of knowledge.

LAB COURSE CONTENT

Electrical Machines-II Laboratory		**Semester:**	**IV**
Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**	**End semester exam (ESE):**	**25 marks**
		Internal Continuous Assessment (ICA):	**25 marks**

Teacher should facilitate learning following lab experiments:

1. Determination of voltage regulation and efficiency of three phase alternator by direct load test.
2. Open and short circuit test on three phase alternator: determination of its regulation by e.m.f. method and m.m.f. method.
3. Zero power factor test on three phase alternator: determination of regulation by Potier triangle method.
4. Determination of direct axis and quadrature axis reactance by slip test on synchronous machine. Determination of voltage regulation by two reactance theory.
5. Synchronizing alternators: lamp methods and use of synchroscope.
6. Synchronous alternator on infinite bus: behavior of machine under change in mechanical power and excitation.
7. Characteristic of synchronous motor at constant load and variable excitation.
8. Characteristic of synchronous motor at constant excitation and variable load.
9. Determination of performance of three phase induction motor by direct load test.
10. Determination of performance of three phase induction motor by no load, blocked rotor test and construction of circle diagram.
11. No load and blocked rotor tests on capacitor start single phase induction motor and determination of parameters of equivalent circuit.
12. Load test on single phase induction motor.

Note: Lab file should consist of minimum **Eight** experiments.

Text Books:

1. Ashfaq Husain, "Electrical Machines", Dhanpat Rai & Co., 3rd edition.
2. B. L. Theraja, "Electrical Technology" Vol –I and II, 1st edition, S Chand Publication.

Reference Books:

1. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education,
2. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers,
3. M. G. Say, "Performance and design of AC machines", CBS Publishers, 3rd edition, 2002.
4. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 5th edition, 2011.
5. J. Nagrath and D. P. Kothari, "Electric Machines", 4th edition, McGraw Hill Education, 2010.
6. P. C. Sen. "D.C. Machines", Tata McGraw Hill.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guidelines for ESE:

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical. Evaluation will be based on paper work and performance in the practical.

Measurement and Instrumentation Laboratory

LAB COURSE OUTLINE

Course Title:	**Measurement and Instrumentation Lab.**	**Short Title:**	**MI Lab**	**Course Code:**	

Course description:

In this laboratory, course emphasis on imparting the practical knowledge and understanding of basic principles, characteristic, performance of different measuring instruments and measurement of different electrical quantities. It also gives the platform to understand need and importance of calibration and standardization.

	Hours/week	No. of weeks	Total hours	Semester credits
Lecture	**01**	**14**	**14**	**02**
Laboratory	**02**	**14**	**28**	

End Semester Exam (ESE) Pattern:	**Oral (OR)**

Prerequisite course(s):

Knowledge of HSC, First year Engineering/Diploma.

Course objectives:

The objective of the laboratory is to impart the fundamental knowledge of measuring instruments. Students develop their ability to select the specific instrument in reference of ranges and resolution of instruments for proper and correct analysis. The students will able to understand the characteristic of measuring instruments. In this lab course, students will be familiar with the use of different equipments, safety precautions on work place. This makes bridge on theoretical knowledge and practical practices

Course outcomes:

Upon successful completion of lab Course, student will be able to:

1. Conduct practical and able to analyze the practical data for various purposes.
2. Measure various electrical quantities and circuit parameters
3. Able to select the measuring instrument with proper range and type for practical uses.
4. Calibrate various types of instruments as per IS.
5. Do professional duties in technical field and able to use advance measuring instruments.
6. Do professional duties in technical field for economical development.

LAB COURSE CONTENT

Measurement and Instrumentation Laboratory		**Semester:**	**IV**
Teaching Scheme:		**Examination scheme**	
Lectures:	**1 hour/week**	**End semester exam (ESE):**	**25 marks**
Practical:	**2 hours/week**	**Internal Continuous Assessment (ICA):**	**25 marks**

Theory:

Unit–I: Introduction to Measurement and instrumentation

Definition, purpose, measurement – definitions, types and Classification of instruments, Generalized measurement system, standards, and calibrations, Errors – types – gross, systematic, random, limiting, sources of errors, techniques to minimize them. Instrument transformers-theory, Expression for ratio and phase angle errors.

Unit–II: D.C. and A .C. Bridges

DC Bridges: Wheatstone bridge, Kelvin's double bridge, Megger, D.C. potentiometer. AC Bridges: Classification, Maxwell, Anderson, Schering, and Wein Bridge. Introduction to PMMC and MI.

Unit–III: Measurement of Power: Construction and principle of operation of electrodynamic wattmeter, low P. F. wattmeters, Active & reactive power measurement in three phase system for balanced and unbalanced load using three wattmeter method, two wattmeter method & one wattmeter method.

Unit–IV: Measurement of Energy: Construction and principle of operation, Torque equation for the induction type of energy-meter, Calibration of Energy meters, and three phase energy meter. Electronic Energy meters- construction and principle.

Unit–V: Introduction to transducers:

Transducers: Definition, classification, selection of transducer. Measurement of temperature: Using R T D, thermocouple. Pressure Measurement: Bourdon Tubes, bellows, diaphragms. Displacement measurement: LVDT, strain gauge -types, working principles

Teacher should facilitate learning following lab experiments:

1. Measurement of active power and reactive power in three phase circuit by two wattmeter method and one wattmeter method.
2. Calibration of single phase energy meter at different P.F.'s
3. Calibration of three phase two elements energy meter at different P.F.'s
4. Kelvin's double bridge: Measurement of low resistance
5. Strain Measurement using strain gauge.
6. Measurement of temperature by RTD/Thermocouple.
7. Measurement of pressure by using pressure transducer.
8. Measurement of displacement by using LVDT.
9. Measurement of inductance and capacitance by Andersons Bridge and Schering bridge.
10. Measurement of earth resistance.
11. Measurements of phase angle error and ratio error of current Transformer
12. Measurements of phase angle error and ratio error of Potential Transformer
13. Study of DSO.

Note: Lab file should consist of minimum **Eight** experiments.

Text Books:

1. E. W. Golding, “Electrical Measurements and Measuring instruments”, Reem Publication, 23rd edition. 2. C. T. Baldwin, “Fundamentals of Electrical Measurements”, Kalyani Publication, 2nd edition. 3. Cooper and Derfllick, “Electronic Instrumentation and Measurements Techniques”, Prentice-Hall of India, 3rd edition. 4. J. B. Gupta, “Electrical & Electronic Measurement and Instrumentation”, S. K. Kataria & Son, 14th edition. 5. R. K. Rajput, “Electrical & Electronic Measurement and Instrumentation”, S. Chand.
Reference Books:
1. A. K. Sawney. “Electrical & Electronic Measurement and Instrumentation” Danpant Rai & Co.
Guide lines for ICA:
ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.
Guidelines for ESE:
In ESE the student may be asked to perform any one practical. Evaluation will be based on paper work, performance and oral in the practical examination.

<table>
<tr><td colspan="6" align="center">Environmental Studies</td></tr>
<tr><td colspan="6"></td></tr>
<tr><td colspan="6" align="center">COURSE OUTLINE</td></tr>
<tr><td>Course Title:</td><td>Environmental Studies</td><td>Short Title:</td><td>EVS</td><td>Course Code:</td><td>Non Credit</td></tr>
<tr><td colspan="6">Course description:</td></tr>
<tr><td colspan="6">The course aims to percolate the importance of environmental science and environmental studies.</td></tr>
<tr><td colspan="6" align="center">COURSE CONTENT</td></tr>
</table>

Environmental Studies	**Semester:**	**IV**
	Examination scheme	
	End Semester Exam (ESE):	**80 marks**
	Duration of ESE:	**03 hours**
	Internal Continuous Assessment (ICA):	**20 marks**

Unit–I:	**No. of Lectures: 02 Hours**	

Multidisciplinary nature of environmental studies

Definition, scope and importance, Need for public awareness.

Unit–II:	**No. of Lectures: 08 Hours**	

Natural Resources :

Renewable and non-renewable resources

Natural resources and associated problems.

a. Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.
b. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
c. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
d. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
e. Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.
f. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

• Role of an individual in conservation of natural resources.

• Equitable use of resources for sustainable lifestyles.

Unit–III:	**No. of Lectures: 06 Hours**	

Ecosystems

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of thefollowing ecosystem :-
  a. Forest ecosystem
  b. Grassland ecosystem
  c. Desert ecosystem
  d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit–IV:	No. of Lectures: 08 Hours	

Biodiversity and its conservation

- Introduction – Definition: genetic, species and ecosystem diversity.
- Biogeographic classification of India
- Value of biodiversity : consumptive use, productive use, social, ethical, aestheticand option values
- Biodiversity at global, National and local levels.
- India as a mega-diversity nation
- Hot-sports of biodiversity.
- Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit–V:	No. of Lectures: 08 Hours	

Environmental Pollution

Definition, Cause, effects and control measures of :-

a. Air pollution
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

- Solid waste Management: Causes, effects and control measures of urban and industrial wastes.

- Role of an individual in prevention of pollution.
- Pollution case studies.
- Disaster management: floods, earthquake, cyclone and landslides.

Unit–VI:	No. of Lectures: 07 Hours	

Social Issues and the Environment

- From Unsustainable to Sustainable development
- Urban problems related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. CaseStudies
- Environmental ethics: Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear
- Accidents and holocaust. Case Studies.
- Wasteland reclamation.
- Consumerism and waste products.
- Environment Protection Act.
- Air (Prevention and Control of Pollution) Act.
- Water (Prevention and control of Pollution) Act
- Wildlife Protection Act
- Forest Conservation Act
- Issues involved in enforcement of environmental legislation.
- Public awareness.

Unit–VII:	No. of Lectures: 06 Hours	

Human Population and the Environment

- Population growth, variation among nations.
- Population explosion – Family Welfare Program
- Environment and human health.
- Human Rights.
- Value Education.
- HIV/AIDS.
- Women and Child Welfare.
- Role of Information Technology in Environment and human health.
- Case Studies.

Unit–VIII:	No. of Lectures:	

Field work

- Visit to a local area to document environmental assets, river/forest/grassland/hill/mountain

- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc. (Field work Equal to 5lecture hours)

Guide lines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Reference Books:

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India, Email:mapin@icenet.net (R)
3. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
4. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
5. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
6. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
7. Down to Earth, Centre for Science and Environment (R)
8. Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
9. Hawkins R.E., Encyclopedia of Indian Natural History, Bombay NaturalHistory Society, Bombay (R)
10. Heywood, V.H & Waston, R.T. 1995. Global Biodiversity Assessment.Cambridge Univ. Press 1140p.
11. Jadhav, H &Bhosale, V.M. 1995. Environmental Protection and Laws.Himalaya Pub. House, Delhi 284 p.
12. Mckinney, M.L. & School, R.M. 1996. Environmental Science systems &Solutions, Web enhanced edition. 639p.
13. Mhaskar A.K., Matter Hazardous, Techno-Science Publication (TB)
14. Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB)
15. Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574p
16. Rao M N. &Datta, A.K. 1987. Waste Water treatment. Oxford & IBH Publ.Co. Pvt. Ltd. 345p.
17. Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut
18. Survey of the Environment, The Hindu (M)
19. Townsend C, Harper J, Michael Begon, Essentials of Ecology, Black well Science (TB)

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Bachelor of Engineering

(Mechanical Engineering)

Faculty of Science and Technology

'A' Grade
NAAC Re-Accredited
(3rd Cycle)

Syllabus Structure & Contents
Of
Second Year of Engineering

Semester-III

w.e.f. 2018 – 19

Subject Group Code and Subject Groups

Sr. No.	GROUP	Category	Breakup of Credits (Total 160)
1	A	Humanities and Social Sciences including Management Courses (HSMC)	10
2	B	Basic Science Courses (BSC)	30
3	C	Engineering Science Courses including workshop, drawing, basics of electrical/mechanical/computer etc. (ESC)	33
4	D	Professional Core Courses (PCC)	53
5	E	Professional Elective Courses relevant to chosen specialization/branch (PEC)	18
6	F	Open subjects – Electives from other technical and /or emerging subjects (OEC)	12
7	G	Project work, seminar and internship in industry or appropriate work place/ academic and research institutions in India/abroad (PROJ)	15
8	H	Mandatory Courses (MC) [Environmental Sciences, Induction program, Indian Constitution, Essence of Indian Traditional Knowledge]	(non-credit)
		Total	171

Syllabus Structure for Second Year Engineering (Semester – III) (Mechanical Engineering) (w.e.f. 2018 – 19)

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Biology	B	3	1	--	4	40	60	-	-	100	4
Principles of Management	C	3	--	--	3	40	60	-	-	100	3
Electrical Drives and Controls	C	3	--	-	3	40	60	--	--	100	3
Thermodynamics	D	3	--	-	3	40	60	--	--	100	3
Industrial Psychology	A	3	--	--	3	40	60	-	-	100	3
Electrical Drives and Controls Lab	C	--	--	2	2	--	--	25	25(OR)	50	1
Thermodynamics Lab	D	--	--	2	2	--	--	25	25(OR)	50	1
Computer Graphics Lab	D	1	--	2	3	-	-	25	25(PR)	50	2
		16	1	6	23	200	300	75	75	650	20

ISE: Internal Sessional Examination ESE: End Semester Examination ICA: Internal Continuous Assessment

Syllabus Structure for Second Year Engineering (Semester – IV) (Mechanical Engineering) (w.e.f. 2018 – 19)

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Mathematics – III	B	3	1	--	4	40	60	--	--	100	4
Introduction to Engineering Design Principles	C	3	--	--	4	40	60	--	--	100	3
Applied Thermodynamics	D	3	1	--	3	40	60	--	--	100	4
Fluid Mechanics and Fluid Machines	D	3	--	--	3	40	60	--	--	100	3
Industrial Economics	A	3	--	--	3	40	60	--	--	100	3
Applied Thermodynamics Lab	D	--	--	2	2	--	--	25	25(OR)	50	1
Fluid Mechanics and Fluid Machines Lab	D	--	--	2	2	--	--	25	25(OR)	50	1
Metrology and Quality Control Lab	D	1	--	2	3	-	-	25	25(OR)	50	2
Environmental Science*	H	--	--	--	--	--	80	20	--	--	0
		16	2	6	24	200	300	75	75	650	21

ISE: Internal Sessional Examination ESE: End Semester Examination ICA: Internal Continuous Assessment

*: Only for Direct SE admitted students

COURSE OUTLINE					
Course Title:	*Biology*	Short Title:	*Biology*	Course Code:	

Course description:

This course is introduced for learning the basic fundamentals of Life sciences (zoology & Botany) to undergraduate students. The prospectus includes a prior knowledge of Biotechnology. The goals of the course are to understand the basic principles of Biology and its applications in the field of Engineering.

	Hours/week	No. of Weeks	Total hours	Semester credits
Lecture	03	14	42	04
Tutorial	01	14	14	

Prerequisite course(s):

-

Course objectives:

1. Students will understand the structures and characteristics or functions of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles.
2. Students will learn the basic principles of inheritance at the molecular, cellular and Organism levels.
3. Students will test and deepen their mastery of genetics by applying this knowledge in a variety of problem-solving situations.

Course outcomes:

After successful completion of this course the student will be able to:

1. Use current techniques and analysis methods in molecular biology and genetics.
2. Understand the current concepts in Cell Biology, Stem Cell Biology and Development.
3. Know the structure/function of the basic components of prokaryotic and eukaryotic cells including macromolecules and organelles.
4. Demonstrate proficiency with at least one instrument commonly used in biological research (microscope, etc).

COURSE CONTENT

Name of the Subject: Biology		Semester:	III
Teaching Scheme:		Examination scheme	
Lectures:	3 hours/week	End semester exam (ESE):	60 marks
		Duration of ESE:	03 hours
		Internal Sessional Exams (ISE):	40 marks

Unit–I: Diversity of Organism and Cell Biology	No. of Lectures: 08 Hours	Marks: 12

Introduction: Living systems, Bio-mimicry, Metabolism, Taxonomy, Concept of species, Structural organization of life, Concepts of modern cell, history of cell, Cell theory, Structure of cell:- Cell shape, size and cell number, Types of cells:- Prokaryotic cells and Eukaryotic cells,

Chemistry of cells. Cell Division: Cell cycle, mitosis, meiosis, mitotic cell division, cell cycle check points, meiotic cell division, embryonic cell division, cell death.		
Unit–II: Plant and Animal Kingdom	No. of Lectures: 08 Hours	Marks: 12
Plant Kingdom: Introduction to plants, Salient features of major plant groups: Bryophyta, Pteridophyta, Gymnospermae, Angiospermae. Plant Growth & Development: Introduction, Seed Dormancy, Seed Germination, Phases of growth, Plant growth hormones. Animal Kingdom: Animal Classification, Salient features of non-chordates up to phylum level: Phylum porifera, phylum Cnidaria, Phylum Ctenophora, Phylum Platyhelminthes.		
Unit–III: Plant Cell and Animal cell culture and Applications	No. of Lectures: 08 Hours	Marks: 12
Plant Cell Culture: Brief introduction to cell culture with respect to the properties of plant cells, Media requirements, Typical media used, Classification of tissue culture, callus culture, cell suspension culture, Application of callus culture and cell suspension culture, Plant cell cultivation Bioreactors Animal Cell Culture: Brief introduction to animal cell culture, Culture medium: Natural and Artificial media, introduction to balanced salt solutions and simple growth medium, Brief discussion on the chemical, physical and metabolic functions of different constituents of culture medium, Animal Bioreactors.		
Unit–IV: Microbial Culture and Applications	No. of Lectures: 08 Hours	Marks: 12
Introduction, Microbial Culture Techniques, growth curve, Pure culture techniques – microbial culture media, isolation, identification and maintenance of cultures, incidences of microorganisms in soil, water, air, food and sewage, food spoilage organisms, Applications of Microbial Culture Technology.		
Unit–V: Biotechnology and its Applications	No. of Lectures: 08 Hours	Marks: 12
Definitions, scope of Biotechnology, Recombinant DNA Technology: Making Recombinant DNA, Tools in Genetic Engineering, Polymerase Chain reaction (PCR). Applications of Biotechnology: Bioinformatics, Biomechanics, Biotechnology of waste treatment, Biosensors, Forensic science, Food Biotechnology, Fermentation Technology.		
Text Books:		
1. B.D. Singh “Genetics” Kalyani Publications Third Edition. 2. C.B. Pawar“Cell Biology” Himalaya Publications, Third Edition. 3. C.B. Pawar“Cell and Molecular Biology” Himalaya Publications. 4. Text book of Zoology by V.K. Agrawal, S. Chand Publication. 5. Text book of Botany by Dr. B.P. Pandey S. Chand Publication. 6. Text book of Biotechnology by R.C. Dubey, S. Chand Publications.		

Reference Books:

1. P. K Gupta, Introduction to Biotechnology, Rastogi Publications.
2. B. D. Singh, Biotechnology: Expanding Horizons, Kalyani Publishers, New Delhi, Second Revised Edition, 2008.
3. S. S. Purohit, Biotechnology: Fundamentals and Applications, Agrobios (India), 4^{th} Edition, 2005.
4. Andreas D. Boxevanis, Bioinformatics, Wiley International
5. David W. Mount, Bioinformatics: Sequence and Genome analysis, Cold Spring Harbour.
6. Bruce E Rittmann, Rurry L.Mc carty, Environmental Biotechnology: Principles and Applications, Mcgraw Hill international.
7. B. Sivashankar, Food Processing and Preservation, Prentice Hall ,India
8. Bhojwani, S.S. and Rajdan, Plant Tissue Culture: Theory and Practice, Revised Edition, Elsevier.
9. Freshney, Culture of Animal Cells, 5th Edition, Wiley-Liss, 2005
10. M. J. Pelczar, Jr. E.C.S. Chan and N.R. Krieg, Microbiology 5^{th} Ed., TMH Book Company.

<table>
<tr><td colspan="6">Principles of Management</td></tr>
<tr><td colspan="6"></td></tr>
<tr><td colspan="6">COURSE OUTLINE</td></tr>
<tr><td>Course Title:</td><td>Principles of Management</td><td>Short Title:</td><td>POM</td><td>Course Code:</td><td></td></tr>
<tr><td colspan="6">Course description:</td></tr>
<tr><td colspan="6">This course is designed to be an overview of the major functions of management. Emphasis is on planning, organizing, controlling, directing, and communicating. Upon completion, students should be able to work as contributing members of a team utilizing these functions of management.</td></tr>
</table>

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	03	14	42	03

<table>
<tr><td>Prerequisite course(s):</td></tr>
<tr><td>English</td></tr>
<tr><td>Course objectives:</td></tr>
<tr><td>To understand the principles of management and their application to the functioning of an organization</td></tr>
<tr><td></td></tr>
<tr><td>Course outcomes:</td></tr>
<tr><td>After successful completion of this course the student will be able to:</td></tr>
<tr><td>1. Get a clear understanding of management functions in an organization
2. Explain strategic management in business operations.
3. Define management, quality management, and project management.
4. Identify relevant issues in human resource management.</td></tr>
<tr><td></td></tr>
<tr><td>COURSE CONTENT</td></tr>
</table>

<table>
<tr><td colspan="2">Principles of Management</td><td>Semester:</td><td>III</td></tr>
<tr><td colspan="2">Teaching Scheme:</td><td colspan="2">Examination scheme</td></tr>
<tr><td>Lectures:</td><td>3 hours/week</td><td>End semester exam (ESE):</td><td>60 marks</td></tr>
<tr><td colspan="2" rowspan="2"></td><td>Duration of ESE:</td><td>03 hours</td></tr>
<tr><td>Internal Sessional Exams (ISE):</td><td>40 marks</td></tr>
</table>

<table>
<tr><td>Unit–I: Management & Organization</td><td>No. of Lectures: 08 Hours</td><td>Marks: 12</td></tr>
<tr><td colspan="3">Definition of management, science or art, manager vs. entrepreneur; Types of managers-managerial roles and skills; Evolution of management- scientific, human relations, system and contingency approaches; Types of Business Organizations, sole proprietorship, partnership, company, public and private enterprises; Organization culture and environment; Current trends and issues in management.</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td>Unit–II: Planning & Decision Making</td><td>No. of Lectures: 08 Hours</td><td>Marks: 12</td></tr>
<tr><td colspan="3">Nature and purpose of Planning, types of Planning, objectives, setting objectives, policies, Strategic Management, Planning Tools and Techniques, Decision making steps & processes.</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td>Unit–III: Human Resource Management</td><td>No. of Lectures: 08 Hours</td><td>Marks: 12</td></tr>
</table>

Nature and purpose of Organizing, formal and informal organization, organization structure, types, line and staff authority, departmentalization, delegation of authority, centralization and decentralization, job design, human resource management, HR planning, Recruitment selection, Training & Development, Performance Management, Career planning and Management.		
Unit–IV: Motivation & Jab Satisfaction	No. of Lectures: 08 Hours	Marks: 12
Directing, individual and group behaviour, motivation, motivation theories, motivational techniques, job satisfaction, job enrichment, leadership, types & theories of leadership, Effective communication.		
Unit–V: Process Control Techniques	No. of Lectures: 08 Hours	Marks: 12
Controlling, system and process of controlling, budgetary and non-budgetary control techniques, use of computers and IT in management control, productivity problems and management, control and performance, direct and preventive control, reporting.		
Text Books:		
1. Tripathy PC & Reddy PN, Principles of Management, Tata McGraw Hill, 1999. 2. Principal and Practice of Management, by L.M. Prasad. 3. Business Organisation & Management, R.K. Sharma. 11. Business Organisation & Management, C.B. Gupta.		
Reference Books:		
1. Hellriegel, Slocum & Jackson, ' Management - A Competency Based Approach', Thomson South Western, 10th edition, 2007. 2. Harold Koontz, Heinz Weihrich and Mark V Cannice, 'Management - A global 3. Robins S.P. and Couiter M., Management, Prentice Hall India, 10^{th} ed., 2009. 4. Stoner JAF, Freeman RE and Gilbert DR, Management, 6^{th} ed., Pearson Education		

Electrical Drives and Controls					
COURSE OUTLINE					
Course Title:	*Electrical Drives and Controls*	Short Title:	*EDC*	Course Code:	
Course description:					
This course is an advanced level of Basic Electrical Engineering which will further strengthen the knowledge of the students. The course explores on understanding of construction, basic principles and operation of electrical machines, performance and characteristic of electrical machines. It also gives the platform to understand adoptability of different drives for different type of load characteristic in industrial applications.					

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	03	14	42	03

Prerequisite course(s):
Knowledge of subject Introduction to Electrical Engineering at first year.
Course objectives:
The object of syllabus to impart the fundamental knowledge of DC and AC Machines. Students will able to develop their ability to apply the specific procedures for comprehensive treatment of rotating machines. In the earlier stage the machine worked in isolation and its simple analysis was sufficient. Now the electric machines form an integral part of large system comprising of other components as well. The object is not great depth, but presentation through enough to give theory at a level that can be understood by undergraduate. With this beginning, the students will have the foundation to continue his education and able to do better in professional duties in the field of manufacturing, testing operation and control.
Course outcomes:
After successful completion of this course the student will be able to:
1. Apply basic knowledge of science and engineering to understand electrical machines. 2. Understand construction, concepts, principles of operation and application of DC and AC motors. 3. Understand the behaviour of DC and DC Machines and analyze data for qualitative and quantitative parameters to determine characteristics of machines by performing practical. 4. Apply knowledge of drives for different application of load in industrial sectors. 5. Perform professional duties in team of manufacturing, testing, operation and maintenance with the sense of safety precautions. 6. Do higher studies and able to use updated software and tools for continuous updating of knowledge.

COURSE CONTENT		
Electrical Drives and Controls	Semester:	*III*

Teaching Scheme:		Examination scheme	
Lectures:	3 hours/week	End semester exam (ESE):	60 marks
		Duration of ESE:	03 hours
		Internal Sessional Exams	40 marks

		(ISE):	

Unit–I: DC Machines	No. of Lectures: 08 Hours	Marks: 12
DC Generator: Constructional features, basic principle of working, EMF equation, type of DC generators, applications of different types of generators. DC Motors: Principle, Significance of back EMF, Starter, classification of motors, torque & speed equation, speed control, applications of motors.		
Unit–II: Induction Motor	**No. of Lectures: 08 Hours**	**Marks: 12**
Construction of 3-phase squirrel cage and phase wound rotor, Operation, types, production of rotating magnetic fields, principle of operation, torque equation under starting & running condition, condition for maximum torque, torque – slip characteristics, applications of induction motor. Single Phase Induction Motors: principle of operation, construction, types and application, types of single phase induction motors (Capacitor start and split phase only)		
Unit–III: Transformer	**No. of Lectures: 08 Hours**	**Marks: 12**
Single Phase Transformers: Constructional features, basic principle of working, arrangements of core and coils in shell type and core type transformer, EMF equation, General phasor diagrams of transformer on no load and load, Losses, Efficiency and maximum efficiency. Three Phase Transformers: Constructional features, basic principle of working, EMF equation.		
Unit–IV: Special purpose motors	**No. of Lectures: 08 Hours**	**Marks: 12**
Construction, basic principle of working, applications of servomotor, permanent magnet DC Motor Stepper motor, Brush less DC motor.		
Unit–V: Electrical Drives	**No. of Lectures: 08 Hours**	**Marks: 12**
Advantages and disadvantages of Electric Drives, Type of motors used for electric drives, selection of electric drive, status of DC and AC drives, classification of electric drive, type of load and load torque, Starting, Reversing and braking of DC and AC motors, Size and rating of motor, Class of Duty, load equalization & use of flywheel, Mechanical consideration like enclosures, bearing, noise, type of transmission and choice.		

Text Books:

1. A. E. Fitzgerald & C. Kingsley & S. D. Umans, “Electric Machinery”, Tata McGraw Hill, New Delhi
2. A.E. Clayton & N. N. Nancock, “The performance & Design of DC Machines”’ CBC Publications & Distributors, Delhi
3. Nagrath I. J., Kothari D. P. , ‘Electric Machines’, Tata McGraw-Hill, New Delhi
4. Ashfaq Husain, ‘Electrical Machines’, Dhanpat Rai & Co.
5. B L Theraja, “Electrical Technology Vil-II”, S Chand Publication.
6. R K Rajput, “Utilization of Electrical Pawar”, Laxmi Publication Pvt Ltd, New Delhi.
7. G. K. Dubey , “Fundamentals of Electrical Drives”, Narosa Publishing House.
8. *http://nptel.iitm.ac.in*

Thermodynamics

COURSE OUTLINE

Course Title:	*Thermodynamics*	Short Title:	*THERMO*	Course Code:	

Course description:

It provides insights to the basic principles of classical thermodynamics. The system and surrounding interactions involving work and heat transfer associated with the change in property is included. Zeroth law, First Law, Second Law and Significance of Entropy are the key areas of the study in this course. It will help students to apply in everyday life and in industrial applications.

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	03	14	42	03

Prerequisite course (s):

1. Physics
2. Chemistry

Course objectives:

1. To learn about work and heat interactions, and balance of energy between system and its surroundings.
2. To learn about application of I law to various energy conversion devices.
3. To evaluate the changes in properties of substances in various processes.
4. To understand the difference between high grade and low grade energies and II law limitations on energy conversion.

Course outcomes:

After successful completion of this course the student will be able to:

1. After completing this course, the students will be able to apply energy balance to systems and control volumes, in situations involving heat and work interactions.
2. Students can evaluate changes in thermodynamic properties of substances.
3. The students will be able to evaluate the performance of energy conversion devices.
4. The students will be able to differentiate between high grade and low grade energies.

COURSE CONTENT

Thermodynamics		Semester:	*III*
Teaching Scheme:		Examination scheme	
Lectures:	3 hours/week	End semester exam (ESE):	60 marks
		Duration of ESE:	03 hours
		Internal Sessional Exams (ISE):	40 marks

Unit–I: Fundamentals of Thermodynamics	No. of Lectures: 08 Hours	Marks: 12

Introduction to Thermodynamics, Macroscopic & Microscopic aspects, System & Control Volume, properties, processes and cycles, thermodynamic equilibrium, Quasi static process, Temperature, Zeroth law of thermodynamics, thermal equilibrium, Measurement of temperature, temperature scales, liquid in glass thermometer, electrical resistance thermometer, thermocouples Work- Thermodynamic definition of Work, p-dv work or displacement work, path function ,

point function, electrical work, Shaft work, Flow work, magnetic, gravitational , spring work, Heat transfer, path function, specific heat, latent heat, comparison of heat transfer and work transfer phenomenon, examples of heat and work interactions.		
Unit–II: First Law of Thermodynamics	No. of Lectures: 08 Hours	Marks: 12
First law for non flow processes or closed system, Joule's experiment, Energy –a property of the system, different forms of the stored energy, internal energy, concept of total energy, specific heats, Enthalpy, First law for flow process or open system, steady flow process, general steady flow energy equations, Application of SFEE to Nozzle and diffuser, throttling device, Turbine and compressor, heat exchanger, pumps, variable flow process, system technique and control volume technique, discharging and charging a tank.		
Unit–III: Second Law of Thermodynamics	No. of Lectures: 08 Hours	Marks: 12
Introduction, Limitations of First Law, Energy reservoirs, Heat Engine, Refrigerator, Heat Pump, Kelvin-Plank statement, Clausius's Statement, equivalence of Kelvin –Plank and Clausius's statement, Reversibility and Irreversibility, Causes of irreversibility, Conditions for irreversibility, Carnot cycle, Carnot Theorem, Absolute Temperature scale. Entropy: Introduction, Entropy Principle, Clausius's theorem, Entropy is a property, Temperature Entropy plot, Clausius's inequality, Entropy change in an irreversible process, Entropy and Disorder.		
Unit–IV: Ideal & Real Gases	No. of Lectures: 08 Hours	Marks: 12
Introduction, The equation of State, p-v-T surface, Internal energy, Enthalpy, Specific heats, Real gases. Pure Substances: Definition, Phase change phenomenon, p-T chart, p-v-T surface, phase change terminology and definitions, Formation of steam, critical point, triple point, dryness fraction, Dry, Wet and Superheated steam, Vapour process, Use of steam table, Mollier Charts.		
Unit–V: Availability and Irreversibility	No. of Lectures: 08 Hours	Marks: 12
Quality of Energy, Available and unavailable energy, Availability, surrounding work, reversible work and Irreversibility, Availability in a closed system, Availability in SSSF process in an open system, Second law efficiencies of Processes of Turbine, Compressor and Heat Exchanger. Thermodynamic cycles: Basic Rankine Cycle, Basic Brayton Cycle, Basic Vapour Compression Cycle and comparison with Carnot cycle.		
Text Books:		
1. Nag, P.K, 1995, Engineering Thermodynamics, Tata McGraw-Hill Publishing Co. Ltd. 2. R K Rajput, 2016, A Textbook of Engineering Thermodynamics, Laxmi Publication, 5th edition. 3. Domkunwar,2016,A Course in Thermal Engineering, Dhanpat Rai & Co., 6th edition 4. Y.V.C.Rao, (2004), An Introduction to Thermodynamics, Universities Press. 5. C. P. Arora, (2005) Thermodynamics, Tata McGraw-Hill Publishing Company Ltd. 6. David R. Gaskell, (2003), Introduction to Thermodynamics of Materials, Taylor and Francis Publisher. 7. M. Achuthan, (2004), Engineering Thermodynamics, Prentice Hall India Limited.		

8. Eastop, (2004), Applied Thermodynamics for Engineering Technologies, Addison Wesley Logman Limited.
Reference Books:
1. Sonntag, R. E, Borgnakke, C. and Van Wylen, G. J., 2003, 6^{th} Edit ion, *Fundamentals of Thermodynamics*, John Wiley and Sons. 2. Jones, J. B. and Duggan, R. E., 1996, *Engineering Thermodynamics*, Prentice-Hall of India. 3. Moran, M. J. and Shapiro, H. N., 1999, *Fundamentals of Engineering Thermodynamics*, John Wiley and Sons. 4. Yunus A. Cengel, (2005), Thermodynamics: An Engineering Approach, Tata McGraw-Hill Publishing Company Ltd.

Industrial Psychology					
COURSE OUTLINE					
Course Title:	*Industrial Psychology*	Short Title:	*IP*	Course Code:	
Course description:					
This course will provide an Introduction to Industrial and Organizational Psychology, a scientific discipline that studies human behavior in the workplace. Organizational psychologists help institutions hire, manage, develop, support employees and align employee efforts with business needs.					

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	3	14	42	3

Prerequisite course (s):
English, Science
Course objectives:
1. The emergence of Industrial and Organizational Psychology. 2. The work done in Industrial and Organizational Psychology. 3. The significance of training, performance appraisal, leadership models. 4. The importance of Engineering Psychology. 5. To acquaint the students with work motivation, Attitudes, Job Satisfaction, Leadership, Communication.
Course outcomes:
After successful completion of this course the student will be able to:
1. To Identify major theoretical concepts in psychology 2. To Exhibit effective communication skills 3. To Understand importance of motivation 4. To Demonstrate knowledge of the topics listed in the course outline 5. To Think critically about concepts and issues in industrial psychology 6. To Understand and apply the different concepts in industrial psychology
Introduction to Industrial Psychology
COURSE CONTENT

Industrial Psychology		Semester:	III
Teaching Scheme:		Examination scheme	
Lectures:	3 hours/week	End semester exam (ESE):	60 marks
		Duration of ESE:	03 hours
		Internal Sessional Exams (ISE):	40 marks

Unit–I: Introduction to Industrial Psychology	No. of Lectures: 08 Hours	Marks: 12
Nature and Meaning of Industrial Psychology, Psychology as a science. Personality: Definition, types of personality, Measurement of Personality. Type 'A' Personality, Anger scale, wellbeing scales. Behaviour Modification: Perception, Motivation, and Learning, Relaxation Techniques, Assertive Training, and Desensitization Procedures Role of Industrial Psychology, Organizational Attitude, Groups & work teams, managing Work-force diversity, improving quality and productivity, improving people skills, Empowering peoples, Group formation & development, stimulating innovation and change Group Behaviour, productive & Counterproductive behaviour.		

Unit–II: Application of Psychology	No. of Lectures: 08 Hours	Marks: 12
Industry: Selection, Training, motivation and Productivity, Team building, Stress-management. Marketing: Consumer Behaviour and Advertising; Self Development: Application of Psychology in building memory and creativity, occupational health psychology. Motivation & Decision making :Motivation & work behaviour, Theories of Employee Motivation, Theory X and Y, McClelland's, Need Theory, Herzberg's Two Factor Theory, Cultural, Differences in Motivation, leadership and power in organization, Decision making process, individual influences, group decision process.		
Unit–III: Communication in Organization	No. of Lectures: 08 Hours	Marks: 12
Communication process: barriers in communications, Communication technology: management information systems, telecommunication and Interpersonal communication, factors involved in interpersonal communication, communication networks, And improving communications. Leadership: Leadership vs. Management, Leadership Theories, Emerging issues in Leadership		
Unit–IV : Personnel Selection and Training	No. of Lectures: 08 Hours	Marks: 12
Job Profile, job analysis and Recruitment techniques, Interviews, psychological testing and Needs assessment for training, Psychological Principles in training and training for knowledge and skill, Evaluation of Training Programme.		
Unit–V : Job Evaluation and satisfaction	No. of Lectures: 08 Hours	Marks: 12
Uses of performance evaluation: Downsizing, promotion, seniority, Appraisal rating systems: Graphic rating scales and rating errors, Non-rating evaluation methods: Checklists and comparison methods. Job satisfaction as a job attitude, Components of job satisfaction: Satisfaction with work, with pay and with Supervision, Measuring job satisfaction: Job Descriptive Index, Minnesota Satisfaction, feelings about work		
Text Books:		
1. Michael G. Aamodt A textbook on Applied Industrial/ Organizational Psychology. 2. Richard Cyert and James March, A Behavioural Theory of The Firm, Blackwell Publishers. 3. Paul Spector, Industrial and organizational Psychology, Wiley		
Reference Books:		
1. Aamodt, M.G. (2007). Industrial and organizational psychology: An applied approach. US:Thomson & Wadsworth. 2. Berry, L.M. (1998), reprint 2010. Psychology at work: An introduction to Industrial and Organizational Psychology. N.Y.: McGraw-Hill International Editions. 3. Luthans, F. (1995). Organizational behavior (7th ed). New York: McGraw- Hill, inc. Corporate Social Responsibility – Madhumita Chattergi – Oxford University Press 4. Khanna O.P. : Industrial Engineering obbins, Stephen, Organizational Behavior, Prentice Hall, India. 5. Aswathappa K. (2008). Human Resource Management (fifth edition) New Delhi: Tata McGraw Hill.		

LAB COURSE OUTLINE

Course Title:	*Electrical Drives and Controls Lab*	Short Title:	*EDC Lab*	Course Code:	

Course description:

In this laboratory, course emphasis on imparting the practical knowledge and understanding of basic principles, characteristic , performance and testing of Machines, Speed control and use of other measuring equipment with electrical safety standards. It also give the platform to selection of motor based on type of drives

Laboratory	Hours/week	No. of weeks	Total hours	Semester credits
	02	*14*	*28*	*01*

End Semester Exam (ESE) Pattern:	*Oral (OR)*

Prerequisite course(s):

Knowledge of HSC and First year Engineering.

Course objectives:

The objective of the laboratory is to impart the fundamental knowledge of Machines and drives. Students will able to develop their ability to apply the specific procedures for analyze the experimental results. The students will able to understand the characteristic of machines and application in process and manufacturing. It also gives the platform to understand adoptability of different drives for different type of load characteristic in industrial applications. In this lab course, students will be familiar with the use of different equipments, safety precautions on work place. This makes bridge on theoretical knowledge and practical practices.

Course outcomes:

Upon successful completion of lab Course, student will be able to:

1. Understand constructional details of dc electrical machines and transformer.
2. Understand specifications of machines.
3. Conduct practical for determination of characteristics of different type of generator, motors and transformers.
4. Able to analyze the test data for practical for applications, design and manufacturing processes.
5. Understand methods of speed control and starters for dc motors.
6. Select motor and transformer based on technical specifications, safety precautions and application.
7. Do professional duties in technical field for economical development.

LAB COURSE CONTENT

Electrical Drives and Controls Lab		Semester:	*III*
Teaching Scheme:		Examination scheme	
Practical:	2 hours/week	End semester exam (ESE):	*25 marks*
		Internal Continuous Assessment (ICA):	*25 marks*

Note: Lab file should consist of minimum Eight experiments.

1. Load test on DC Shunt generator and determination of voltage regulation.
2. Study of three point starter for DC Shunt Motor and Reversing the direction of rotation of DC Shunt motor.

3. Speed control of DC Shunt motor (a) Armature Voltage Control Method (b) Field Current Control Method.
4. Load Test on DC Shunt Motor.
5. Load Test on Single Phase Transformer and determination of Voltage regulation.
6. Load Test on Three Phase Induction motor.
7. Study of AC motor starter and Reversing of Three Phase Induction motor.
8. Load Test on single Phase Induction motor.
9. Study of Motors Enclosures and their applications.
10. Study of different type of drives.

Text Books:

1. A. E. Fitzgerald & C. Kingsley & S. D. Umans, "Electric Machinery", Tata McGraw Hill, New Delhi.
2. A.E. Clayton & N. N. Nancock, "The performance & Design of DC Machines"' CBC Publications & Distributors, Delhi.
3. Nagrath I. J., Kothari D. P., 'Electric Machines', Tata McGraw-Hill, New Delhi.
4. Ashfaq Husain, 'Electrical Machines', Dhanpat Rai & Co.
5. B L Theraja, "Electrical Technology Vil-II", S Chand Publication.
6. R K Rajput, "Utilization of Electrical Pawar", Laxmi Publication Pvt. Ltd, New Delhi.
7. G. K. Dubey, "Fundamentals of Electrical Drives", Narosa Publishing House.
8. *http://nptel.iitm.ac.in*

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guidelines for ESE:

In ESE evaluation will be based on continuous evaluation and oral examination.

Thermodynamics Lab

LAB COURSE OUTLINE

Course Title:	*Thermodynamics Lab*	Short Title:	*Thermo Lab*	Course Code:	

Course description:

This course provides the students with comprehensive study of domestic Refrigerator, Air conditioner, Four stroke engine, Two stroke engine, various Nozzles, Centrifugal pump, Air compressor and Heat exchangers.

Laboratory	Hours/week	No. of weeks	Total hours	Semester credits
	02	14	28	01

End Semester Exam (ESE) Pattern:	*Oral (OR)*

Prerequisite course(s):

Physics

Course objectives:

1. To understand the construction and working of thermal appliances.
2. To analysis the performance.
3. To study uses and applications of these thermal devices.

Course outcomes:

Upon successful completion of lab Course, student will be able to:

1. Describe the construction and working of thermal appliances.
2. Explain thermal systems.
3. Apply the thermal principles.

LAB COURSE CONTENT

Thermodynamics Lab		Semester:	*III*
Teaching Scheme:		Examination scheme	
Practical:	2 hours/week	End semester exam (ESE):	*25 marks*
		Internal Continuous Assessment (ICA):	*25 marks*

1. Demonstration and study of domestic Refrigerator.
2. Demonstration and study of Air conditioner.
3. Demonstration and study of Four stroke engine.
4. Demonstration and study of Two stroke engine.
5. Demonstration and study of various Nozzles.
6. Demonstration and study of Centrifugal pump.
7. Demonstration and study of Air compressor.
8. Demonstration and study of Heat Exchanger.

Text Books:

1. Nag, P.K, 1995, Engineering Thermodynamics, Tata McGraw-Hill Publishing Co. Ltd.
2. R K Rajput, 2016, A Textbook of Engineering Thermodynamics, Laxmi Publication, 5th edition.

3. Domkunwar, (2016), A Course in Thermal Engineering, Dhanpat Rai & Co., 6th edition
4. Y.V.C.Rao, (2004), An Introduction to Thermodynamics, Universities Press.
5. C. P. Arora, (2005), Thermodynamics, Tata McGraw-Hill Publishing Company Ltd.
6. David R. Gaskell, (2003), Introduction to Thermodynamics of Materials, Taylor and Francis Publisher.
7. M. Achuthan, (2004), Engineering Thermodynamics, Prentice Hall India Limited.
8. Eastop, (2004), Applied Thermodynamics for Engineering Technologies, Addison-Wesley Logman Limited.

Reference Books:

1. Sonntag, R. E, Borgnakke, C. and Van Wylen, G. J., 2003, 6th Edit ion, *Fundamentals of Thermodynamics*, John Wiley and Sons.
2. Jones, J. B. and Duggan, R. E., 1996, *Engineering Thermodynamics*, Prentice-Hall of India
3. Moran, M. J. and Shapiro, H. N., 1999, *Fundamentals of Engineering Thermodynamics*, John Wiley and Sons.
4. Yunus A. Cengel, (2005), Thermodynamics: An Engineering Approach, Tata McGraw-Hill Publishing Company Ltd.

Guide lines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guidelines for ESE:

ESE will be based on the laboratory assignments submitted by the students in the form of journal. Evaluation will be based on the understanding and execution.

Computer Graphics lab

COURSE OUTLINE

Course Title:	*Computer Graphics lab*	Short Title:	*CG*	Course Code:	

Course description:

This course includes design and drafting related to mechanical elements. Lab's related to elementary level knowledge of drafting and Auto-LISP program. Sketching and computer aided design tools are used to create the various types of views needed for design and documentation.

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	01	14	14	*2*
Laboratory	02	14	28	

Prerequisite course (s):
Engineering Graphics, Essential Computer Knowledge Required.

Course objectives:

1. Learn to sketch and take field dimensions.
2. Learn to take data and transform into the graphics drawing
3. Learn basic AutoCAD skills.
4. Learn basic engineering drawing formats
5. *To* model the object using Wireframe, surface and solid modeling techniques

Course outcomes:

After successful completion of this course the student will be able to:

1. Demonstrate and understand the basic concepts of geometric modeling and computer graphics.
2. Drafting of mechanical elements.
3. Programs for mechanical elements in Auto-LISP.
4. Solve numerical on transformation.

COURSE CONTENT

Computer Graphics		Semester:	*III*
Teaching Scheme:		Examination scheme	
Lectures:	1 hours/week	End semester exam (ESE):	25 marks
		Internal Class Assessment (ICA):	25 marks
Unit–I: Overview of Computer Graphics covering		No. of Lectures: 02 Hours	

Introduction to CAD. Advantages and Applications of CAD. Difference between conventional drafting methods and CAD. Introduction to Auto-CAD and Details of various menu bars and tool bars, Drawing Area etc. Demonstrating knowledge of the theory of CAD software such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Cross hairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects	
Unit–II: Customization & CAD Drawing	No. of Lectures: 02 Hours
Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles. Annotations, layering & other functions covering: Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers	
Unit–III: Transformations in Graphics	No. of Lectures: 04 Hours
Two Dimensional transformation, Homogeneous transformation, Concatenate co ordinate transformation, Translation, Rotation, Scaling, Mirror, Reflection, Inverse coordinate transformation, clipping, 3D transformation, View Port, Windowing and clipping	
Unit–IV: Computer-Aided Design (CAD)	No. of Lectures: 02 Hours
Requirement of Geometric Modeling, Salient features of Geometric Model, Geometric Model Construction Method: Wire Frame Modeling, Surface Modeling, Solid Modeling, and Introduction to Bezier curve.	
Unit–V: Auto-LISP Programming	No. of Lectures: 04 Hours
Introduction to Auto - LISP programming, Advantages and Applications of Auto-LISP . Auto-LISP commands, Auto-LISP Programs for simple geometric shapes-line, circle, rectangle, etc Auto-LISP Programs for elements geometric shapes such as circle in rectangle, triangle in rectangle, etc.	

LAB COURSE CONTENT			
Computer Graphics Lab		Semester:	*III*
Teaching Scheme:		Examination scheme	
Practical:	2 hours/week	End semester exam (ESE):	*25 marks*
		Internal Continuous Assessment (ICA):	*25 marks*
List of Practical’s and Assignments			

1. Two Dimensional Sketch of any mechanical component using AutoCAD software.
2. Isometric Drawing of any Mechanical Component using AutoCAD software.
3. AutoLisp Programming for any two components such as rectangular Plate, rectangular plate with hole, triangular plate etc.

Assignment:

1. Assignments on introduction to AutoCAD
2. Assignments on introduction to Auto LISP programming

Text Books:

1. AutoCAD reference manual
2. A text book on Computer Graphics Including CAD, AutoCAD & 'C' by. A. M. Kuthe , S. Chand Publications.
3. A text book on CAD/CAM and Automation by R. B. Patil, Tech. max Publication.
4. Auto-LISP Developer's Guide.
5. A text book on CAD CAM and Automations by Farazdak Haidri.
6. H.G. Phakatkar, Engineering Graphics, Nirali publication.

Reference Books:

1. Ibrahim Zeid and R. Sivasubramanian - CAD/CAM – Theory and Practice Tata McGraw Hill Publishing Co. 2009
2. Rao P.N., Introduction to CAD/CAM Tata McGraw Hill Publishing Co.
3. P. Radhkrishnan, S. Subramanyam, V. Raju ,"CAD/CAM/CIM" , New Age Publication.
4. Mikell P. Grover, Emory W. Zimmers ,"Computer Aided Design and manufacturing", P.H.I.

Guide lines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guidelines for ESE:

ESE will be based on the laboratory assignments submitted by the students in the form of journal. Evaluation will be based on the understanding and execution.

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Bachelor of Engineering

(Mechanical Engineering)

Faculty of Science and Technology

‘A’ Grade
NAAC Re-Accredited
(3rd Cycle)

Syllabus Structure & Contents
Of
Second Year of Engineering
Semester-IV
w.e.f. 2018 – 19

Mathematics-III					
COURSE OUTLINE					
Course Title:	Mathematics - III	Short Title:	M-III	Course Code:	
Course description: Basic Science course : This course provides the elementary level knowledge of first order and second order partial Differential Equations, Statistics and Probability Distributions. Course includes solution of 2^{nd} order partial differential equations, solution of one dimensional wave equation and heat diffusion and vibration problems.					

Lecture 03 Tutorial 01	Hours/week	No. of weeks	Total hours	Semester credits
	4	14	56	4

Prerequisite course(s):
mathematics- I and mathematics- II

Course objectives:

1. To introduce the solution methodologies for second order Partial Differential Equations with applications in engineering.
2. To provide an overview of probability and statistics to engineers.

Course outcomes:

Upon completion of this course, students will be able to solve field problems in engineering involving PDEs. They can also formulate and solve problems involving random variables and apply statistical methods for analyzing experimental data.

COURSE CONTENT			
Mathematics - III		Semester:	IV
Teaching Scheme:		Examination scheme	
Lectures:03	3 hours/week	End semester exam (ESE):	60 marks
Tutorial:01	1 hours/week	Duration of ESE:	03 hours
		Internal Sessional Exams (ISE):	40 marks

Unit–I: Laplace Transform	No. of Lectures: 8 Hours	Marks: 12
Properties of Laplace Transform. Inverse Laplace transform & Properties. Convolution theorem. Evaluation of integrals by Laplace transform.		
Unit–II: Partial Differential Equations	No. of Lectures: 08 Hours	Marks: 12
Definition of Partial Differential Equations, First order partial differential equations, solutions of first order linear PDEs; Solution to homogenous and non-homogenous linear partial differential equations of second order by complimentary function and particular integral method		
Unit–III: Application of LT and PDE	No. of Lectures: 08 Hours	Marks: 12

1) Application of Laplace Transform Solving ordinary differential equations by Laplace Transform. 2)Application Of PDE: Initial and boundary conditions. wave equation; one dimensional heat flow equation, Two dimensional heat flow equation.		
Unit–IV: Statistics	No. of Lectures: 08 Hours	Marks: 12
Measures of Central tendency, Moments, skewness and Kurtosis ,Probability distributions: Binomial, Poisson and Normal. Correlation and regression. Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas		
Unit–V: **Test of significance**	No. of Lectures: 08 Hours	Marks: 12
Large sample test for single proportion, difference of proportions, Tests for single mean, difference of means, and difference of standard deviations. Test for ratio of variances - Chi-square test for goodness of fit.		
Text Books:		
1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010, ninth edition 2016. 2. H.K.DASS “Advance Engineering Mathematics” S. Chand publications. 3. S. C. Gupta “Fundamentals of Statistics”,Himalaya Publishing House 4. Debashis Datta “Textbook of Engineering Mathematics’’New Age International Publication. Revised second edition		
Reference Books:		
1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006. 2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010, 9th edition 2016. 3. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint). 4. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.		

Introduction to Engineering Design Principles					
COURSE OUTLINE					
Course Title:	*Introduction to Engineering Design Principles*	Short Title:	*IEDP*	Course Code:	

Course description:
Introduction to Engineering Design Principles (IEDP) is a course that is appropriate for students who are interested in design and engineering. The major focus of the IEDP course is to expose students to design process, research and analysis, teamwork, communication methods, global and human impacts, engineering standards, and technical documentation. It also allows students to develop strategies to enable and direct their own learning, which is the ultimate goal of education.

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	03	*14*	*42*	*03*

Prerequisite course (s):
Knowledge of Engineering Drawing, Basic Elements of Mechanical Engineering.
Course objectives:
1. To introduce design as engineer's basic role in society and introduce them to various frontiers of engineering 2. To introduce various steps in engineering design and understand design parameters and constraints 3. To apply scientific knowledge to offer solution to problems 4. To provide context for curriculum studies and to motivate students to develop interest in engineering
Course outcomes:
After successful completion of this course the student will be able to: 1. Identify needs and formulate design problem 2. Follow engineering design process with due consideration to all requirements and constraints and make decisions 3. Apply scientific principles to design problem 4. Work in a team and communicate design output 5. Relate curricular courses to real life engineering

COURSE CONTENT			
Introduction to Engineering Design Principles		Semester:	*IV*
Teaching Scheme:		Examination scheme	
Lectures:	3 hours/week	End semester exam (ESE):	60 marks
		Duration of ESE:	03 hours
		Internal Sessional Exams (ISE):	40 marks

Unit–I: Introduction to Engineering Design	No. of Lectures: 08 Hours	Marks: 12
What is design, Engineering design process, It's importance, Types of design- Innovative, adaptive, redesign, selection. Design as iterative problem solving methodology, Considerations of a good design, CAE, Designing to codes and standards.		

Unit–II: Problem Definition and Need Identification	No. of Lectures: 08 Hours	Marks: 12
Identification of need, gathering information, Design and analysis of survey instrument, technical literature, internet, patent literature, scientific base, product design specifications.		
Unit–III: Generation and Evaluation of Alternative Concepts and Decision Making	No. of Lectures: 08 Hours	Marks: 12
Data and information sources, Concept generation: Creative thinking, creativity and problem solving, Refinement and evaluation of ideas, Biomimetic design, Functional decomposition and synthesis, Concept evaluation process.		
Unit–IV: Product Life Cycle	No. of Lectures: 08 Hours	Marks: 12
Product architecture, Industrial design, Human factors design, Life cycle design, Design for Sustainability and the environment, Prototyping and modelling, Testing.		
Unit–V: Detailed Design	No. of Lectures: 08 Hours	Marks: 12
Activities and decisions in detailed design, Make/Buy decision, Complete engineering drawings, Communicate design and manufacturing, Design for sustainability, Reporting		

Text Books:

1. Kosky P.G.,Wise G., Balmer R.G., Keat W.D., "Exploring Engineering: An Introduction for Freshman to Engineering and to the Design Process", Academic Press Publication, Fourth Edition 2016.
2. Dieter George, Schmit Linda, "Engineering Design", McGraw Hill Publication -Fifth Edition.
3. Dym Clive, Little Patrick, Orwin Elizabeth, "Engineering Design: A Project-Based Introduction", Wiley Publication, Fourth Edition.

Reference Books:

1. Ken Hurst "Engineering Design Principles" Elsevier Publication - 1st Edition -

COURSE OUTLINE

Course Title:	Applied Thermodynamics	Short Title:	AT	Course Code:	

Course description:

This course is designed to introduce students with basic concepts of thermodynamic systems and their application in real life including Steam Power Plant, Air Compressors and its different component. The course will help students to understand the dynamics of energy through the air, gas or other media and build students' ability to solve thermodynamic problems and understand other basic properties of gases, liquids, vapours with energy and energy transfer mechanisms, enthalpies/analysis of systems. The course also includes vapour and gas cycles theories of energy generating systems, such as boilers and the use of steam tables and mollier chart to study energy properties of the steam at different conditions. Students will also familiarize with the SI and English Units commonly used in the field of thermodynamics.

Lecture	Hours/week	Tutorial/ week	No. of weeks	Total hours	Semester credits
	03	01	*14*	*56*	*04*

Prerequisite course (s):-

- Applied Physics
- Fundamentals of Thermodynamics

Course Objectives:

1. To learn about of I law for reacting systems and heating value of fuels.
2. To learn about gas and vapour cycles and their first law and second law efficiencies.
3. To understand about the properties of steam and its applications in steam operated devices.
4. To learn about gas dynamics of air flow and steam through nozzles.
5. To learn the about reciprocating compressors with and without inter-cooling.
6. To analyse the performance of steam turbines.

Course Outcomes:

After successful completion of this course the student will be able to:

1. After completing this course, the students will get a good understanding of various practical power cycles and heat pump cycles.
2. They will be able to analyse energy conversion in various thermal devices such as engines, nozzles, diffusers, steam turbines and reciprocating compressors.
3. They will be able to comprehend the phenomena of Boiler performance system.
4. They will be able to understand phenomena occurring in high speed compressible flows.

COURSE CONTENT

Applied Thermodynamics		Semester:	*IV*
Teaching Scheme:		Examination scheme	
Lectures:	3 hours/week	End semester exam (ESE):	60 marks
Tutorials:	1 hours/week	Duration of ESE:	03 hours
		Internal Sessional Exams	40 marks

		(ISE):	

Unit–I: Chemical Thermodynamics	No. of Lectures: 08 Hours	Marks: 12
Introduction to solid, liquid and gaseous fuels– Stoichiometry, exhaust gas analysis – Orsat apparatus and Gas Chromatography, Actual Air-Fuel Ratio, Excess air supplied, First law analysis of combustion reactions- Heat calculations using enthalpy tables- Adiabatic flame temperature- Chemical equilibrium and equilibrium composition calculations using free energy, Joule–Thomson effect.		
Unit–II: Steam Generators (Boiler) and its Analysis	No. of Lectures: 09 Hours	Marks: 12
Steam Power Plant layout, Classification and selection of boilers, IBR act. Boiler performance - Equivalent evaporation, boiler efficiency. Numerical on boiler performance. Energy balance for a boiler. Numerical on Energy balance for a boiler. Boiler Draught - Natural & Artificial draught. Derivation of Height & Diameter of Chimney and Numerical. Draught losses, Condition for maximum discharge through chimney- Numerical.		
Unit–III: Power Cycles	No. of Lectures: 07 Hours	Marks: 12
Vapour power cycles- Rankine cycle with superheat, reheat and regeneration, use of mollier chart, Super-critical and ultra-super-critical Rankine cycle, Gas power cycles - analysis of air standard Otto, Diesel and Dual Cycles, Air standard Brayton cycle –Analysis and effect of reheat, regeneration and inter-cooling, Analysis of steam turbines, velocity and pressure compounding of steam turbines.		
Unit–IV: Compressible Fluid Flows	No. of Lectures: 08 Hours	Marks: 12
Basics of compressible flow, Stagnation properties, Mach number, Isentropic flow of a perfect gas through a nozzle, choked flow, subsonic and supersonic flows, normal shocks- use of ideal gas tables for isentropic flow and normal shock flow- Flow of steam and refrigerant through nozzle, supersaturation- compressible flow in diffusers, efficiency of nozzle and diffuser.		
Unit–V : Air Compressors	No. of Lectures: 08 Hours	Marks: 12
Applications of Compressed Air, Classification of Compressors, reciprocating compressors: with clearance, without clearance, staging of reciprocating compressors, optimal stage pressure ratio, effect of inter-cooling, minimum work for multistage reciprocating compressors, free air delivered (FAD), Volumetric efficiency and Isothermal efficiency.		
Text Books:		

1. Sonntag, R. E, Borgnakke, C. and Van Wylen, G. J., 2003, 6th Edition, Fundamentals of Thermodynamics, John Wiley and Sons.
2. Jones, J. B. and Duggan, R. E., 1996, Engineering Thermodynamics, Prentice-Hall of India
3. Moran, M. J. and Shapiro, H. N., 1999, Fundamentals of Engineering Thermodynamics, John Wiley and Sons.
4. Nag, P.K, 1995, Engineering Thermodynamics, Tata McGraw-Hill Publishing Co. Ltd
5. R. P. Yadav, Applied Thermodynamics & Heat Engines –Vol II, 5thedition, 2012
6. M M Rathod, “Thermal Engineering”, Tata McGraw Hill.

Reference Books:

1. R K Rajput, “Thermal Engineering”, Laxmi Publication New Delhi.
2. Domkundwar and Kothandaraman,“Thermal Engineering”, Dhanpat Rai & Co.
3. Onkar Singh, “Applied thermodynamics”, New Age International Publisher.
4. Y A Cengel and M A Boles, “Thermodynamics: an Engineering Approach”, Tata McGraw Hill.
5. P L Ballaney, “Thermal Engineering”, Khanna Publishers, New Delhi.
6. Venkanna, Swati,“Applied Thermodynamics”,PHI.
7. D.S. Kumar, “Thermal Science & Engineering”, S.K. Kataria & Sons
8. P K Nag,“Power Plant Engineering”, Tata McGraw Hill.
9. T. D. Eastop and A. McConkey, “Applied Thermodynamics for Engineering Technologists”, Pearson Education India

Fluid Mechanics And Fluid Machines

COURSE OUTLINE

Course Title:	*Fluid Mechanics And Fluid Machines*	Short Title:	*FM*	Course Code:	

Course Description:

The primary aim of this course is to provide students with a first introduction to continuum mechanics, in general and theoretical fluid mechanics in particular. Course is deal with understanding and hence predicting the properties of liquid and gases under external forces. Course provides introduction to principle concepts and method of fluid mechanics. Topics covered in the course include pressure, hydrostatics and buoyancy. Mass conservation and momentum conservation for moving fluids; viscous fluid flow, flow through pipes, dimensional analysis. Students will work to formulate and developed the problem solving skills essential to good engineering practice of fluid mechanics in practical applications.

	Hours/week	No. of weeks	Total hours	Semester credits
Lecture	*3*	*14*	*42*	*3*

Prerequisite course (s):

Engineering Mechanics, Applied Physics, Mathematics

Course objectives:

1. To learn about the application of mass and momentum conservation laws for fluid flows
2. To understand the importance of dimensional analysis
3. To obtain the velocity and pressure variations in various types of simple flows
4. To analyse the flow in water pumps and turbines.
5. To understand fundamental knowledge of fluid, its properties and behavior under various conditions of internal and external flows.
6. To implement basic laws and equations used for analysis of static and dynamic fluid.

Course outcomes:

After successful completion of this course the student will be able to:

1. Upon completion of this course, students will be able to mathematically analyze simple flow situations
2. They will be able to evaluate the performance of pumps and turbines.
3. Understand Euler's equation of motion hence to reduce Bernoulli's equation and its application in fluid mechanics.
4. Examine energy losses in pipes transitions and Evaluate pressure drop in pipe flow using Hagen-Poiseuille's equation.

COURSE CONTENT

Fluid Mechanics And Fluid Machines		Semester:	*IV*
Teaching Scheme:		Examination scheme	
Lectures:	3 hours/week	End semester exam (ESE):	60 marks
		Duration of ESE:	03 hours
		Internal Sessional Exams (ISE):	40 marks

Unit–I: Fundamental of Fluid Mechanics	No. of Lectures: 09 Hours	Marks: 12

Properties of fluid: -Definition of fluid, Newton's law of viscosity, Units and Dimensions-Properties of fluids, mass density, specific volume, specific gravity, viscosity, compressibility and surface tension, Control volume- application of continuity equation and momentum

equation, Incompressible flow Fluid Statics:- Pascal's law, pressure at a point, Hydrostatic law derivation , Total pressure and centre of pressure for vertical , horizontal, inclined curve surface it's derivation, concepts of buoyancy, metacentre and floatation.		
Unit–II: Fluid Kinematics & Dynamics	No. of Lectures: 09 Hours	Marks: 12
Kinematics: - Eulerian and langrangian approach to solution, Definition of streamlines, Path line, steak line, Different types of flow; steady and unsteady flow, uniform and non- uniform flow, Laminar, Turbulent, compressible, incompressible, rotational, irrotational flows. Fluid Dynamics: - continuity equation for flow, Euler's equation, Bernoulli's equation along stream line for incompressible flow. Practical application of Bernoulli's equation: Pitot tube, venture meter, Orifice meter.		
Unit–III: Laminar flow and Dimensional Analysis.	No. of Lectures: 08 Hours	Marks: 12
Laminar flow: - Definition of Laminar flow relation between pressure and shear stress, laminar flow through circular pipe, fixed plate. Exact flow solutions in channels and ducts, Couette and Poisuielle flow, laminar flow through circular conduits and circular annuli- concept of boundary layer – measures of boundary layer thickness Need for dimensional analysis – methods of dimension analysis – Similitude – types of similitude Dimensionless parameters – application of dimensionless parameters – Model analysis.		
Unit–IV: Fundamental of Fluid Machines & Flow Through Pipes	No. of Lectures: 08 Hours	Marks: 12
Euler's equation – theory of Rotodynamic machines – various efficiencies – velocity components at entry and exit of the rotor, velocity triangles – Centrifugal pumps, working principle, work done by the impeller, performance curves – Cavitation in pumps- Reciprocating pump – working principle. Flow through Pipes. TEL, HGL, Energy losses through pipes. Darcy- weisbach Equation. Minor losses in pipes. friction factor, Moody's diagram		
Unit–V: Hydraulic Turbines	No. of Lectures: 08 Hours	Marks: 12
Classification of water turbines, heads and efficiencies, velocity triangles- Axial, radial and mixed flow turbines- Pelton wheel, Francis turbine and Kaplan turbines, working principles – draft tube- Specific speed, unit quantities, performance curves for turbines – governing of turbines.		
Text Books:		
1. Textbook of fluid mechanics and hydraulics machine, Dr. R.K. Bansal, Laxmi publication New Delhi. 2. Textbook of fluid mechanics and hydraulics machine, R.K. Rajput, S Chand and Co. Delhi. 3. Egor P. Popov, Engineering Mechanics of Solids, Prentice Hall of India, New Delhi, 2001. 4. R. Subramanian, Strength of Materials, Oxford University Press, 2007. 5. Ferdinand P. Been, Russel Johnson Jr and John J. Dewole, Mechanics of Materials, Tata McGraw Hill Publishing Co. Ltd., New Delhi 2005.		

Reference Books:
1. Introduction to fluid mechanics, S. K. Som and G. Biswas, Tata McGraw Hill Publisher Pvt. Ltd. 2. Hydraulics and Fluid Mechanics, P.N. Modi and S.M. Seth, Standard book house Delhi. 3. Fluid Mechanics Victor Lyle Streeter, E. Benjamin Wylie, Tata McGraw-Hill Publisher Pvt. Ltd. 4. Fluid Mechanics by Frank. M. White, Tata McGraw-Hill Publisher Pvt. Ltd

COURSE OUTLINE					
Course Title:	Industrial Economics	Short Title:	*IE*	Course Code:	

Course Description:

Principles of Microeconomics: - To provide an overview of microeconomic issues - the behavior of individual household, firm & market in respect of demand, supply & price for goods and services; demand, supply & price determination.

Principles of Macroeconomics: - To provide an overview of macroeconomic issues – national income & economic growth, inflation, international trade, rate of exchange, balance of payment, monetary & fiscal policy.

Business & Managerial Economics: - To provide an overview of actual demand forecasting & price determination in practice

	Hours/week	No. of weeks	Total hours	Semester credits
Lecture	*3*	*14*	*42*	*3*

Prerequisite course (s):

Principles of Managements

Course objectives:

The student after studying this subject will learn about :-

1. The basic objectives & concepts of micro economics
2. The concept of economy & economic laws.
3. The concept of demand, supply & price, their inter-relation & their elasticity.
4. The concept of demand forecasting.
5. The basic objectives & concepts of macroeconomics.
6. The concepts of national income, economic growth & inflation
7. The concept of international trade policy, rate of exchange, trade, deficit, monetary & fiscal policy.

Course outcomes:

After completing this course the student will be able to: -

1. Confidently apply for the post of Purchase or Sales Engineer
2. Look for suitable projects & scope for entrepreneurship

COURSE CONTENT

Industrial Economics		Semester: IV	
Teaching Scheme:		Examination scheme	
Lectures:	3 hours/week	End semester exam (ESE):	60 marks
		Duration of ESE:	03 hours
		Internal Sessional Exams (ISE):	40 marks

Unit–I: Introduction to economics	No. of Lectures: 08 Hours	Marks: 12

Definition, importance, issues, micro & macroeconomics, Concept of Economy – 2 & 4 sector model, capitalist, socialist & mixed economy, Economic laws – their nature, limitation, importance & application. Law of diminishing return / marginal utility

Unit–II: Demand and Supply	No. of Lectures: 08 Hours	Marks: 12

Meaning, individual & market demand, factors effecting demand, Law of demand, demand curve, Price elasticity of demand & its measurement, demand forecasting, Supply – meaning, individual & market supply, factors effecting supply, Law of supply, supply curve, Price elasticity of supply & its measurement.		
Unit–III: Production	No. of Lectures: 08 Hours	Marks: 12
Short run, long run, very long run; issues, short run production curve, marginal & average production, Laws of production; cost concepts, economies of scale, Concept of market, market equilibrium & equilibrium price, Price determination in different types of market, Price determination in practice.		
Unit–IV: Macro-economics	No. of Lectures: 10 Hours	Marks: 12
Definition, importance & scope, National Income – definition & methods of measurement, Economic Growth – definition, factors affecting growth, Inflation – definition, measurement method, effects; demand-pull, cost-push & other factors.		
Unit–V: International Trade	No. of Lectures: 08 Hours	Marks: 12
Law of Reciprocal demand, free trade, trade protection policy, Concepts of Rate of Foreign Exchange, Balance of Payment, Monetary & Fiscal Policy – objectives, instruments, limitations		
Text Books:		
1. Principles of Economics by Frank and Bernanke – Tata McGraw hill publication 2. Principles of Economics by D.N. Dwivedi – Vikas Publishing House 3. Managerial Economics by D.M. Mithani - Himalaya Publishing House 4. Managerial Economics by Dr. H.L. Ahuja - S. Chand 5. Business Economics by Gillespe – Oxford University Press 6. Microeconomics by D.N. Dwivedi - Pearson 7. Macro Economics -A South Asian Perspective by W. McEachern , A. Indira, Cengage Learning		

COURSE OUTLINE

Course Title:	*Applied Thermodynamics Lab*	Short Title:	AT Lab	Course Code:	

Course description:

In this laboratory, course emphasis is on the understanding of basic principles, working of Orsat apparatus, Bomb calorimeter, Reciprocating air compressors, different components of Steam Power Plant. The learner can use this knowledge and apply in various industries as required.

Laboratory	Hours/week	No. of weeks	Total hours	Semester credits
	02	*14*	*28*	*01*

Prerequisite course (s):-

- Basic principles and theories
- Fundamentals of Thermodynamics

Course Objectives:

This course is intended to provide engineering students with an application of important concepts, principles of Engineering Thermodynamics and emphasis on those areas considered most relevant in an engineering context with practical applications in engineering and technology.

1. To impart knowledge of basic concepts in applied Thermodynamics and implementation to various engineering fields.
2. To provide the knowledge and methodology necessary for solving problems in the field of engineering.

Course Outcomes:

After successful completion of this lab course the student will be able to:

1. Comprehend the Performance parameters of 4-Stroke petrol/diesel engine
2. Analyze the Calorific value of fuel sample by using Bomb calorimeter.
3. Investigate the Flue Gas analysis using gas analyzer.
4. Conduct a trial on air compressor.
5. Understand the difference parameters of boiler performance and properties of steam.

LAB COURSE CONTENT

Applied Thermodynamics Lab	Semester:	*IV*
Teaching Scheme:	Examination scheme	
Practical: 2 hours/week	End semester exam (ESE):	*25 marks*
	Internal Continuous Assessment (ICA):	*25 marks*

(Any 5 Practical)

1. Determination of Calorific value of a solid / liquid fuel using Bomb Calorimeter.
2. Determination of Exhaust gas analysis using Gas Analyser.
3. Determination of Isothermal and Volumetric efficiency of single/multi-stage reciprocating air compressor.
4. Determination of the p-V diagram and the performance of a 4-stroke diesel engine.
5. Determination of the performance of 4-stroke petrol engine test rig.
6. To find out dryness fraction of steam using combined separating and throttling calorimeter.
7. Visit to the any Thermal Power plant station.

Text Books:

1. Sonntag, R. E, Borgnakke, C. and Van Wylen, G. J., 2003, 6th Edition, Fundamentals of Thermodynamics, John Wiley and Sons.
2. Jones, J. B. and Duggan, R. E., 1996, Engineering Thermodynamics, Prentice-Hall of India.
3. Moran, M. J. and Shapiro, H. N., 1999, Fundamentals of Engineering Thermodynamics, John Wiley and Sons.
4. Nag, P.K, 1995, Engineering Thermodynamics, Tata McGraw-Hill Publishing Co. Ltd
5. R. P. Yadav, Applied Thermodynamics & Heat Engines –Vol. II, 5^{th}edition, 2012.
6. M M Rathod, "Thermal Engineering", Tata McGraw Hill.

Reference Books:

1. R K Rajput, "Thermal Engineering", Laxmi Publication New Delhi.
2. Domkundwar and Kothandaraman, "Thermal Engineering", Dhanpat Rai & Co.
3. Onkar Singh, "Applied thermodynamics", New Age International Publisher.
4. Y A Cengel and M A Boles, "Thermodynamics: an Engineering Approach", Tata McGraw Hill.
5. P L Ballaney, "Thermal Engineering", Khanna Publishers, New Delhi.
6. Venkanna, Swati, "Applied Thermodynamics", PHI.
7. D.S. Kumar, "Thermal Science & Engineering", S.K. Kataria & Sons
8. P K Nag,"Power Plant Engineering", Tata McGraw Hill.
9. T. D. Eastop and A. McConkey, "Applied Thermodynamics for Engineering Technologists", Pearson Education India.

Guide lines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guidelines for ESE:

ESE will be based on the laboratory assignments submitted by the students in the form of journal. Evaluation will be based on the understanding and execution.

Fluid Mechanics Lab						
COURSE OUTLINE						
Course Title:	Fluid Mechanics Lab	Short Title:	FM Lab	Course Code:		
Course description:						
The primary aim of this course is to provide students with basic fundamentals of fluid mechanics through experimentations. Course provides introduction to principle concepts and method of fluid mechanics. Topics covered in the course include pressure, hydrostatics and buoyancy. Mass conservation and momentum conservation for moving fluids; viscous fluid flow, flow through pipes, dimensional analysis.						

Laboratory	Hours/week	No. of weeks	Total hours	Semester credits
	02	*14*	*28*	*01*

Prerequisite course (s):-
Engineering Mechanics, Applied Physics, Mathematics
Course Objectives:
1. To learn about the application of mass and momentum conservation laws for fluid flows 2. To obtain the velocity and pressure variations in various types of simple flows 3. To analyze the flow in water pumps and turbines. 4. To understand fundamental knowledge of fluid, its properties and behavior under various conditions of internal and external flows. 5. To implement basic laws and equations used for analysis of static and dynamic fluid.
Course Outcomes:
After successful completion of this course the student will be able to:
1. Upon completion of this course, students will be able to mathematically analyze simple flow situations 2. They will be able to evaluate the performance of pumps and turbines. 3. Understand Euler's equation of motion hence to reduce Bernoulli's equation and its application in fluid mechanics. 4. Examine energy losses in pipes transitions and Evaluate pressure drop in pipe flow using Hagen-Poiseuille's equation.

LAB COURSE CONTENT		
Fluid Mechanics Lab	Semester:	*IV*
Teaching Scheme:	Examination scheme	
Practical: 2 hours/week	End semester exam (ESE):	*25 marks*
	Internal Continuous Assessment (ICA):	*25 marks*
Note: Lab file should contain at list EIGHT experiments from below mentioned list.		
1. To find the viscosity of a given oil by using Red wood viscometer. 2. To verify the Bernoulli's theorem		

3. Measurement of Coefficient of Discharge of given Orifice and Venturi meters.
4. Experiment on determination of major and minor losses for flow through pipes
5. Determination of the performance characteristics of a centrifugal pump.
6. Determination of the performance characteristics of Pelton Wheel
7. Determination of the performance characteristics of a Francis Turbine
8. Determination of the performance characteristics of a Kaplan Turbine
9. Determination of the density & viscosity of an oil and friction factor of oil flow in a pipe
10. To study the flow patterns by using Reynolds's apparatus
11. Study of velocity distribution in boundary layer and its thickness

Text Books:

1. Textbook of fluid mechanics and hydraulics machine, Dr. R.K. Bansal, Laxmi publication New Delhi.
2. Textbook of fluid mechanics and hydraulics machine, R.K. Rajput, S Chand and Co. Delhi.
3. Egor P. Popov, Engineering Mechanics of Solids, Prentice Hall of India, New Delhi, 2001.
4. R. Subramanian, Strength of Materials, Oxford University Press, 2007.
5. Ferdinand P. Been, Russel Johnson Jr and John J. Dewole, Mechanics of Materials, Tata McGrawHill Publishing Co. Ltd., New Delhi 2005.

Reference Books:

1. Introduction to fluid mechanics, S. K. Som and G. Biswas, Tata McGraw Hill Publisher Pvt. Ltd.
2. Hydraulics and Fluid Mechanics, P.N. Modi and S.M. Seth, Standard book house Delhi.
3. Fluid Mechanics Victor Lyle Streeter, E. Benjamin Wylie, Tata McGraw-Hill Publisher Pvt. Ltd.
4. Fluid Mechanics by Frank. M. White, Tata McGraw-Hill Publisher Pvt. Ltd

Guide lines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guidelines for ESE:

ESE will be based on the laboratory assignments submitted by the students in the form of journal. Evaluation will be based on the understanding and execution.

<table>
<tr><td colspan="6">Metrology and Quality Control</td></tr>
<tr><td colspan="6"></td></tr>
<tr><td colspan="6">COURSE OUTLINE</td></tr>
<tr><td>Course Title:</td><td>Metrology and Quality Control</td><td>Short Title:</td><td>MQC</td><td>Course Code:</td><td></td></tr>
<tr><td colspan="6">Course description:</td></tr>
<tr><td colspan="6">This course introduces undergraduate students to Metrology and Quality Control. The background required includes a sound knowledge to Measurements, (calculus), applied thermodynamics, Industrial management</td></tr>
</table>

<table>
<tr><td rowspan="2">Lecture</td><td>Hours/week</td><td>No. of weeks</td><td>Total hours</td><td>Semester credits</td></tr>
<tr><td>01</td><td>14</td><td>14</td><td rowspan="2">02</td></tr>
<tr><td>Laboratory</td><td>02</td><td>14</td><td>28</td></tr>
</table>

<table>
<tr><td>Prerequisite course (s):</td></tr>
<tr><td>A sound knowledge to Measurements, (calculus), Applied Thermodynamics, Industrial management</td></tr>
<tr><td>Course objectives:</td></tr>
<tr><td>The course aims at imparting knowledge of metrology and quality control. The course aims at to familiarize to understand the principles metrology of screw threads, gear measurement, study of measuring machines, recent trends in engineering metrology. Learn to use standard practices and standard data, learn to use statistical concept, control chart for variables, control chart for attributes, acceptance sampling.</td></tr>
<tr><td></td></tr>
<tr><td>Course outcomes:</td></tr>
<tr><td>After successful completion of this course the student will be able to:</td></tr>
<tr><td>1. Explain the principals involved in measurement and inspection.
2. Select and use appropriate measurement instrument for a given application.
3. Apply the basics of sampling in the context of manufacturing.
4. Select and apply the seven basic quality tools in well-defined applications.</td></tr>
<tr><td></td></tr>
<tr><td>COURSE CONTENT</td></tr>
</table>

<table>
<tr><td colspan="2">Metrology and Quality Control</td><td>Semester:</td><td>IV</td></tr>
<tr><td colspan="2">Teaching Scheme:</td><td colspan="2"></td></tr>
<tr><td>Lectures:</td><td>1 hours/week</td><td colspan="2"></td></tr>
<tr><td colspan="4"></td></tr>
<tr><td colspan="2">Unit–I: Metrology</td><td colspan="2">No. of Lectures: 03 Hours</td></tr>
<tr><td colspan="4">Definition: Measurement, precision, accuracy, sensitivity, Classification of method of measuremen.t
Linear Measurement: -Standards, line standards, end standards, classification of standards, precision measurement, precision measuring instruments and their characteristics, slip gauge
Straightness, flatness and squareness:-Surface plates, measurement of straightness, flatness testing,</td></tr>
</table>

squareness testing, roundness testing, machine tool metrology, Measurement by light wave interference:- Basic principle, sources of light, optical	
Unit–II: Design of gauges &Metrology	No. of Lectures: 03 Hours
Design of gauges: - Types of gauges, limits, fits, tolerances, Taylor’s principle Comparators: -Characteristics, application, types, construction and working of different mechanical, optical, electrical, pneumatic comparators Angle measurement:-Sine bars, Sine centers, Use of sine bar, angle gauges, autocollimator angle dekkor, constant deviation prism, Measurement of surface finish:-Types of Surface texure, elements of surface texture, measuring surface finish by stylus probe, Tomlinson & Taly-surf , Pressure Measurment	
Unit–III: Metrology of Screw thread, Gear & recent trend in metrology.	No. of Lectures: 03 Hours
Metrology of screw threads: -Terminology, errors and their effects, thread gauges, measurement of elements of external and internal threads, Gear measurement: - calipers measurements, involutes testing, roller measurements, tool maker’s microscope, profile projectors Study of measuring machines:-Universal measuring machine, coordinate measuring machine, Errors in CMM, electronic inspection and measuring machine, Recent trend in engineering metrology:-precision instrument based on laser, probes, telemetric systems, Isometric viewing of surface defects, Machine vision	
Unit–IV: Quality control	No. of Lectures: 02 Hours
Introduction to quality:- Factors controlling quality of design and conformance, balance between cost of quality and value of quality, Introduction to quality tools: Demings PDCA,PDSA cycles & Juran quality approach, Seven quality tools, Pareto	
Unit–V: Statistical Quality Control	No. of Lectures: 03 Hours
Statistic concept: -Concept of variation, variable & attribute data, the frequency distribution, quantitative description of distribution, normal curve, concept of six sigmas, Control chart for variables: -definition of control chart, objective of control chart, R chart, Problems on X & R chart Control chart for attributes:-practical limitations of the control charts for variables charting chart, Problems on P & C chart	

Metrology and Quality Control Lab					
COURSE OUTLINE					
Course Title:	Metrology and Quality Control Lab	Short Title:	MQC Lab	Course Code:	
Course description:					
This course introduces undergraduate students to Metrology and Quality Control. The background required includes a sound knowledge to Measurements, (calculus), applied thermodynamics, Industrial management					

Laboratory	Hours/week	No. of weeks	Total hours	Semester credits
	02	*13*	*26*	*01*

Prerequisite course (s): - A sound knowledge to Measurements, (calculus), Applied Thermodynamics, Industrial management
Course Objectives:
The course aims at to familiarize to understand the principles metrology of screw threads, gear measurement, study of measuring machines, recent trends in engineering metrology. Learn to use standard practices and standard data, learn to use statistical concept, control chart for variables, control chart for attributes, acceptance sampling.
Course Outcomes:
After successful completion of this course the student will be able to:
1. Explain the principles involved in measurement and inspection. 2. Select and use appropriate measurement instrument for a given application 3. Apply the basics of sampling in the context of manufacturing 4. Select and apply the seven basic quality tools in well-defined applications.

LAB COURSE CONTENT		
Metrology and Quality Control Lab	Semester:	*IV*

Teaching Scheme:	Examination scheme	
Practical: 2 hours/week	End semester exam (ESE):	25 marks
	Internal Continuous Assessment (ICA):	25 marks

Note: Lab file should contain at list EIGHT experiments from below mentioned list.
1. Determination of linear/angular dimensions of part using precision & non precision instrument. 2. Machine tool alignment tests on any machine tool like Lathe, Drilling, Milling 3. Interferometer-Study of surfaces using optical flat. 4. Surface finish measurement. 5. Measurement of roundness/circularity using mechanical comparator. 6. Measurement of screw parameters 7. Measurement of Gear parameters i) gear tooth thickness ii) constant chord iii)PCD 8. Study and applications of tool makers microscope 9. Use of profile projector 10. Study and use of control charts
Text Books:
1. R.K. Jain: Engineering Metrology: Khanna Publishers. 2. Handbook To Industrial Metrology: ASTME: Printice Hall Pub. 3. G.M. Juran: Handbook of Quality Control, Mcgraw Hill Pub. 4. M. Mahajan: Statistical Quality Control. 5. K.C. Jain: TQM & ISO 9000; Khanna Publishers.
Guide lines for ICA:
Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty

in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.
Guidelines for ESE:
ESE will be based on the laboratory assignments submitted by the students in the form of journal. Evaluation will be based on the understanding and execution.

COURSE OUTLINE					
Course Title:	Environmental Science	Short Title:	EVS	Course Code:	
Course description:					
The course aims to percolate the importance of environmental science and environmental studies.					

COURSE CONTENT			
Environmental Studies	Semester:	IV	
	Examination scheme		
	End Semester Exam (ESE):		80 marks
	Duration of ESE:		03 hours
	Internal Continuous Assessment (ICA):		20 marks

Unit–I:	No. of Lectures: 02 Hours	

Multidisciplinary nature of environmental studies
Definition, scope and importance
Need for public awareness.

Unit–II:	No. of Lectures: 08 Hours	

Natural Resources :
Renewable and non-renewable resources
Natural resources and associated problems.

a. Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.
b. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
c. Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
d. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
e. Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.
f. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

• Role of an individual in conservation of natural resources.
• Equitable use of resources for sustainable lifestyles.

Unit–III:	No. of Lectures: 06 Hours	

Ecosystems

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.
- Food chains, food webs and ecological pyramids.

- Introduction, types, characteristic features, structure and function of the following ecosystem :-
  a. Forest ecosystem
  b. Grassland ecosystem
  c. Desert ecosystem
  d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit–IV:	No. of Lectures: 08 Hours	

Biodiversity and its conservation

- Introduction – Definition: genetic, species and ecosystem diversity.
- Biogeographic classification of India
- Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values
- Biodiversity at global, National and local levels.
- India as a mega-diversity nation
- Hot-sports of biodiversity.
- Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit–V:	No. of Lectures: 08 Hours	

Environmental Pollution

Definition

- Cause, effects and control measures of :-
  a. Air pollution
  b. Water pollution
  c. Soil pollution
  d. Marine pollution
  e. Noise pollution
  f. Thermal pollution
  g. Nuclear hazards
- Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution.
- Pollution case studies.
- Disaster management: floods, earthquake, cyclone and landslides.

Unit–VI:	No. of Lectures: 07 Hours	

Social Issues and the Environment

- From Unsustainable to Sustainable development
- Urban problems related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. Case Studies
- Environmental ethics: Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear
- accidents and holocaust. Case Studies.
- Wasteland reclamation.
- Consumerism and waste products.
- Environment Protection Act.

- Air (Prevention and Control of Pollution) Act.
- Water (Prevention and control of Pollution) Act
- Wildlife Protection Act
- Forest Conservation Act
- Issues involved in enforcement of environmental legislation.
- Public awareness.

Unit–VII:	No. of Lectures: 06 Hours	

Human Population and the Environment

- Population growth, variation among nations.
- Population explosion – Family Welfare Program
- Environment and human health.
- Human Rights.
- Value Education.
- HIV/AIDS.
- Women and Child Welfare.
- Role of Information Technology in Environment and human health.
- Case Studies.

Unit–VIII:		

Field work

- Visit to a local area to document environmental assets, river/forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc. (Field work Equal to 5lecture hours)

Guide lines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Reference Books:

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. BharuchaErach, The Biodiversity of India, Mapin Publishing Pvt. Ltd.,Ahmedabad – 380 013, India, Email:mapin@icenet.net (R)
3. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
4. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
5. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001,Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
6. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
7. Down to Earth, Centre for Science and Environment (R)
8. Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev.,Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
9. Hawkins R.E., Encyclopedia of Indian Natural History, Bombay NaturalHistory Society, Bombay (R)
10. Heywood, V.H &Waston, R.T. 1995. Global Biodiversity Assessment.Cambridge Univ. Press 1140p.

11. Jadhav, H &Bhosale, V.M. 1995. Environmental Protection and Laws.Himalaya Pub. House, Delhi 284 p.
12. Mckinney, M.L. & School, R.M. 1996. Environmental Science systems &Solutions, Web enhanced edition. 639p.
13. Mhaskar A.K., Matter Hazardous, Techno-Science Publication (TB)
14. Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB)
15. Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574p
16. Rao M N. & Datta, A.K. 1987. Waste Water treatment. Oxford & IBH Publ.Co. Pvt. Ltd. 345p.
17. Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut
18. Survey of the Environment, The Hindu (M)
19. Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science (TB)

Proposed Syllabus

(With effect from 2014-15)

T.E. Biotechnology

Third Year Biotechnology

Faculty of Engineering and Technology
North Maharashtra University, Jalgaon

T.E. Biotechnology

Semester-V

Third Year Biotechnology

Faculty of Engineering and Technology
North Maharashtra University, Jalgaon

NORTH MAHARASHTRA UNIVERSITY, JALGAON
STRUCTURE OF TEACHING & EVALUATION
T.E. (BIOTECHNOLOGY) W.E.F.2014-2015

Semester V

Course Code	Name Of The Course	Group	Teaching Scheme				Evaluation Scheme					Credits
							Theory		Practical		Total	
			Theory Hrs/Week	Tutorial Hrs/Week	Practical Hrs/Week	Total	ISE	ESE	ICA	ESE		
BTL-501	Bioprocess Instrumentation & Analysis	D	3	--	--	3	20	80	--	--	100	3
BTL-502	Molecular Biology	D	3	--	--	3	20	80	--	--	100	3
BTL-503	Chemical Reaction Engineering	D	3	--	--	3	20	80	--	--	100	3
BTL-504	Enzyme Engineering	D	3	--	--	3	20	80	--	--	100	3
BTL-505	Bioprocess Industrial Economics & Management	C	3	--	--	3	20	80	--	--	100	3
BTP-506	LAB Molecular Biology	D	--	--	4	4	--	--	50	25	75	2
BTP-507	LAB Bioprocess Instrumentation & Analysis	D	--	--	2	2	--	--	25	25	50	1
BTP-508	LAB Chemical Reaction Engineering	D	--	--	2	2	--	--	25	25	50	1
BTP-509	LAB Tissue Culture Engineering	B	1	--	2	3	--	--	50	--	50	2
BTP-510	Industrial Training/EDP/Special Study	D	--	--	--	--	--	--	25	--	25	2
TOTAL			**16**	**--**	**10**	**26**	**100**	**400**	**175**	**75**	**750**	**23**

NOTE: As Molecular Biology practical requires 4 hrs workload for performance of practical hence two laboratory hours are merged to form four hours slot.

Semester VI

Course Code	Name Of The Course	Group	Teaching Scheme				Evaluation Scheme					Credits
							Theory		Practical		Total	
			Theory Hrs/Week	Tutorial Hrs/Week	Practical Hrs/Week	Total	IS E	ESE	ICA	ESE		
BTL-601	Bioprocess Engineering	D	3	--	--	3	20	80	--	--	100	3
BTL-602	Genetic Engineering	D	3	--	--	3	20	80	--	--	100	3
BTL-603	Fermentation Technology	D	3	--	--	3	20	80	--	--	100	3
BTL-604	Mass Transfer	D	3	--	--	3	20	80	--	--	100	3
BTL-605	IPR & Entrepreneurship	C	3	--	--	3	20	80	--	--	100	3
BTP-606	LAB Bioprocess Engineering & Fermentation Technology	D	--	--	4	4	--	--	50	50	100	2
BTP-607	LAB Mass Transfer	D	--	--	2	2	--	--	25	25	50	1
BTP-608	LAB Genetic Engineering	B	--	--	2	2	--	--	25	--	25	1
BTP-609	Minor Project	D	--	--	2	2	--	--	50	--	50	2
BTP-610	Seminar - I	D	--	--	2	2	--	--	25	--	25	2
TOTAL			**15**	**--**	**12**	**27**	**100**	**400**	**175**	**75**	**750**	**23**

NOTE: As Bioprocess Engineering & Fermentation Technology practical requires 4 hrs workload for performance of practical hence two laboratory hours are merged to form four hours slot.

Bioprocess Instrumentation & Analysis

Course Outline

Bioprocess Instrumentation & Analysis	**BIA**	**BTL-501**
Course Title	Short Title	Course Code

Course Description:
This course describes basic principles of instrumentation and instrumental analysis. This course will make the students knowledgeable in various types of measuring instruments used in process industries.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	**15**	**45**	**03**

Objective of the Subject:
1. To make the student familiar with various types of Measurement techniques.
2. To make the student familiar with various methods of composition analysis.
3. To understand basic principles behind the working of different analytical instruments and its application in industries.

Prerequisite Course(s): 12th Std. Science and SE Biotechnology Courses

Learning outcomes:
After completion of this course students will able to:
1. Familiar with various standards and calibration methods used in Instrumentation and Instrumental Analysis.
2. Will get knowledge of basic principles behind the working of different analytical instruments and its application in industries.
3. Use suitable measurement technique for process industries.
4. Have ability to control system for monitoring of various parameters in bioprocess industries and to maintain safety.

Course Content

TE Biotechnology **Bioprocess Instrumentation & Analysis** **Semester - V**

Teaching Scheme	**Examination Scheme**	
Theory : 3 hours/ week	End Semester Examination (ESE) :	80 Marks
	Paper Duration (ESE):	03.00 hr
	Internal Sessional Examination (ISE):	20 Marks

Unit: I **No. of Lecture: 8 Hours, Marks: 16**

Qualities of Measurement: The meaning of measurement, the elements of instruments, Expansion Thermometers: Introduction, Constant volume gas thermometer, Bimetallic Thermometer, Industrial pressure spring thermometer, Response of Thermometer. Thermoelectric Temperature Measurement: Introduction, Simple thermocouple circuit, Industrial thermocouples, Thermocouple lead wires, thermal wells, response of thermocouples. Resistance temperature detector

Unit: II **No. of Lecture: 8 Hours, Marks: 16**

Pressure and Vacuum Measurement: Introduction, Indicating pressure gage, Bellows pressure element, Useful ranges of absolute pressure measuring gages, Mclead vacuum gage. Measurement of Level: Float and tape liquid level gage, Float and shaft liquid level unit, Level measurement in pressure vessels, Gamma ray method, Ultrasonic method and resistive method.

Unit-III **No. of Lecture: 8 Hours, Marks: 16**

pH measurement: Introduction , Method of pH Indicator, Potentiometric Method, Application of pH Measurement. Infrared Spectroscopy: Introduction, Instrumentation, Application of Infrared spectroscopy. X-ray diffraction: Introduction, Application of X- ray diffraction.

Unit-IV **No. of Lecture: 8 Hours, Marks: 16**

Refractrometry: Introduction, Abbe refractometer, Application of refractometer.
UV Spectrophotometer: Introduction, Instrumentation, Application of UV Spectrophotometer.
Colorimetery: Introduction, Theory.

Unit-V **No. of Lecture: 8 Hours, Marks: 16**

Flame photometry: Introduction, Instrumentation, Application of Flame photometry.
Scanning Electron Microscope: Introduction, Instrumentation, Application of Scanning Electron Microscope, Transmission Electron Microscope: Introduction, Instrumentation, Application of Transmission Electron Microscope.

Text Books:

1. D.P.Eckman, Industrial Instrumentation, Willey Eastern Ltd., New Delhi.
2. Gurdeep Chatwal and Sham Anand, Instrumental methods of Chemical analysis, Himalaya publication House, Mumbai.

Reference Books:

1. Patranabis D. Industrial Instrumentation, Tata – Mcgraw Hill Publications, New Delhi.
2. P. Kudesia and S.S. Sawhaney, Instrumental methods of chemical analysis Pragati Prakashan, P.O.Box No. 62, Begum Bridge, Meerut 250001,U.P.
3. Nakra B.C. and K.K. Chaudhary, Instrumentation Measurement and Analysis, Tata – McGraw Hill, New Delhi.
4. B.K.Sharma.Goel, Instrumentation methods of chemical analysis, Publishing House,11,Shivaji Road, Meerut-250001,U.P.

Molecular Biology

Course Outline

Molecular Biology	**Mol Bio**	**BTL-502**
Course Title	Short Title	Course Code

Course Description:
This course is aimed at developing the basic knowledge and skills of molecular biology to undergraduate students. The background expected includes a prior knowledge of SE Biotechnology courses. The goals of the course are to understand the basic principles of Molecular Biology and their applications in engineering trade.

Lecture	Hours per Week	No. of Weeks	Total Hours	Credits
	03	15	45	03

Prerequisite Course(s): 11^{th}, 12^{th} Biology, SE Biotechnology courses
General Objective:

- To develop the basic knowledge and skills of molecular biology, including the introduction to central dogma of molecular biology and their role in biological systems,.

Learning Outcomes:
After completion of the course, students will be able to;

- To describe basic molecular and genetic concepts and principles.
- To communicate the fundamental concepts of molecular biology both in written and in oral format.
- Critically evaluate data, develop and design experiments to address a novel problem in the form of project.
- Demonstrate advanced knowledge in a specialized field of molecular biology.

COURSE CONTENT

TE Biotechnology **Molecular Biology** **Semester-V**

Teaching Scheme
Lectures -3 Hrs/week

Examination Scheme
End Semester Exams (ESE): 80 Marks.
Paper Duration: 3 Hours.
Internal Sessional Exam (ISE):20 Marks.

Unit: I: **No. of Lecture: 8 Hours, Marks: 16**

Introduction to Genetic Material

Introduction: Nucleic acids, DNA Chemical Composition, Chargoffs Equimolar Base Ratio, Molecular Structure of DNA, Watson and Crick Double Helical Model of DNA, forms of DNA (B-DNA, A-DNA, C-DNA, D-DNA, E-DNA, Z-DNA)

RNA: Occurrence, types of RNA: rRNA, tRNA, mRNA. Structure of ribosome's. Central Dogma, One Gene – One Polypeptide Hypothesis.

Unit: II **No. of Lecture: 8 Hours, Marks: 16**

DNA Replication

Replication: Overview, Basic rules and requirements of Replication, Types of DNA replication: Generalized Model for the DNA replication, Semi conservative method of replication, Meselson and Stahl experiment, bidirectional DNA replication, Molecular mechanism of DNA replication, Enzymes and proteins involved in DNA replication: Structure and functions of DNA polymerase I,II,III, primase, polynucleotide ligase, endonuclease, helicase, single stranded binding proteins, topoisomerase, Replication Models Theta replication model, Rolling circle Model, D-Loop Model.

Unit: III **No. of Lecture: 8 Hours, Marks: 16**

Transcription

Transcription and Processing of RNA: Transcription, **Mechanism of Transcription in Prokaryotes,** RNA polymerase of prokaryotes (structure, types and function),Transcription Unit, Promoter Site, Molecular Mechanism of Transcription in Prokaryotes, , Molecular **Mechanism of Transcription in Eukaryotes**, RNA polymerase of Eukaryotes (structure, types and function), Transcription Factors, Eukaryotic promoters, **RNA processing/Post transcriptional modification:** Introduction, processing of the pre rRNA, tRNA, and the mRNA transcript(eukaryotic), RNA splicing (mechanism).

Unit: IV **No. of Lecture: 8 Hours, Marks: 16**

Genetic Code and Protein Synthesis

Genetic code: Nature and characteristics of Genetic Code, Reasons for degeneracy, Biological Significance of Degeneracy of Genetic Code

Protein synthesis:- Mechanism of protein synthesis: Transcription Overview, *Translation:* Activation of the amino acids, attachment of activated amino acids with tRNA, stages during translation, Translation in Prokaryotes and Eukaryotes, Translocation of proteins, Post translational processing of Proteins (Protein Folding and Biochemical Modifications)

Unit: V **No. of Lecture: 8 Hours, Marks: 16**

Regulation of gene expression & DNA damage and repair

Gene regulation in prokaryotes, Mechanisms of gene regulation at Transcription level, Induction and repression, Lac Operon System, Tryptophan Operon System, Gene regulation and Translation level, Gene regulation in eukaryotes,

DNA damage and repair: Types of damages, damaging agents, repair mechanisms - photoreactivation, dark repair, postreplicational recombination repair, SOS repair.

Reference books:

1. Fundamentals of Molecular Biology by Veer Bala Rastogi; Ane Books Pvt. Ltd
2. Cell and Molecular Biology by P.K.Gupta, Third Edition, Rastogi Publications
3. Molecular Biology of cell – Lodish et al
4. Genes and Genomes – Singer M and Berg P.

Chemical Reaction Engineering

Course Outline

Chemical Reaction Engineering	CRE	BTL-503
Course Title	Short Title	Course Code

Course Description:
The goal of the course is intended to provide a strong foundation in concepts and principles of Chemical reactions used in bioprocess industries.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	**15**	**45**	**03**

Objective of the Subject:

1. To make the student familiar with various types of reactions.
2. Student will be able to understand the kinetic study of various chemical & biochemical reactions.
3. Student will be able to design various types of reactors used in process industries.

Prerequisite Course(s): 12^{th} Std. Science and SE Biotechnology Courses.

Learning outcomes:
After completion of this course students will able to:

1. Determine the rate and order of reaction from experimental data.
2. Analyze and interpret the kinetics of reactions.
3. Apply the fundamentals of chemical reaction engineering to design different types of reactors.
4. Explain heterogeneous system with its applications.

Course Content

TE Biotechnology	Chemical Reaction Engineering	Semester - V
Teaching Scheme	**Examination Scheme**	
Theory : 3 hours/ week	End Semester Examination (ESE) :	80 Marks
	Paper Duration (ESE):	03.00 hr
	Internal Sessional Examination (ISE):	20 Marks

Unit: I **No. of Lecture: 8 Hours, Marks: 16**

Introduction to chemical reaction engineering: Classification of chemical reactions, rate of reaction, order and molecularity of reaction, rate constant, activation energy, transition state theory and temperature dependency, comparison of theories, Reaction mechanism.

Unit: II **No. of Lecture: 8 Hours, Marks: 16**

Collection and interpretation of kinetic data, ,integral and differential method of analysis of data, Half life method , Constant volume batch reactor ,Variable volume batch reactor.

Unit: III **No. of Lecture: 8 Hours, Marks: 16**

Ideal reactors, mixed flow reactor, plug flow reactor, space time and space velocity, holding time and space time , comparison in mixed and plug flow reactors, Recycle reactor, Autocatalytic reaction.

Unit: IV **No. of Lecture: 8 Hours, Marks: 16**

Residence time distribution of fluid in vessel, Conversion directly from tracer information, Models for non-ideal flow, Dispersion models, Tank in series model, Concept of micro and macro mixing.

Unit: V **No. of Lecture: 8 Hours, Marks: 16**

Introduction – Rate equations for heterogeneous systems , Contacting patterns in Two –Phase system ,Introduction to fluid particle reaction non-catalytic reactions, un reacted core model for Spherical particle of unchanging size, Rate of reaction for shrinking spherical particles , Determination of rate controlling step , Various contacting patterns in fluid solid reactors for fluid-particle non-catalytic reactions.

Text Books:

1. H. Scott Fogler, Elements of chemical reaction engineering, Prentice Hall New, Jersy.
2. Octave Levenspiel, Chemical reaction engineering, John Wiley and sons.

Reference Books:

1. J.M. Smith, Chemical engineering kinetics, McGraw Hill
2. S.D. Dawande, Principles of reaction engineering, Central Techno publication, Nagpur.
3. Lanny D. Schimdt , Chemical reaction engineering, Oxford University Press.

Enzyme Engineering

Course Outline

Enzyme Engineering	EE	BTL-504
Course Title	Short Title	Course Code

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	15	45	03

Course Description: This course is introduced for learning the basic fundamentals of Enzyme Engineering to undergraduate students. The goals of the course are to understand the basic knowledge of Enzymes, their classification, production, purification and Immobilization to be use in different areas.

Prerequisite Course(s): 12th Std. Science and SE Biotechnology Courses.

Objective of the subject

1. Get knowledge of enzyme & its classification & its role in metabolic pathway of living systems.
2. Will get knowledge of enzyme kinetics and its application in production of desired products
3. Can communicate the molecular mechanism of enzyme action and modification to increase its stability.
4. Ability to design and conduct experiments to analyze and interpret enzyme kinetic data for the design of enzyme reactor for production of value added products
5. Get knowledge of various analytical techniques for characterization of enzymes
6. Get knowledge of application of enzymes in various industries used for the production of Bioproduct for the welfare of society.
7. Will have ability to apply knowledge of enzyme kinetics in designing metabolic pathway in living system to produce value added products.

Learning outcomes

After successful completion of this course the student will be able to:

1. Classify enzymes on the basis of their working mechanism.
2. Calculate the enzyme kinetics and activity by performing various assays.
3. Characterize the enzymes by using modern equipments.
4. Immobilize enzyme by various immobilization techniques for better stability and activity as well as to reduce their losses during use.
5. Will able to apply molecular mechanism of various enzymes in different metabolic pathways.

Course Content

TE Biotechnology | **Enzyme Engineering** | **Semester - V**

Teaching Scheme
Theory: 3 hours/ week

Examination Scheme
End Semester Examination (ESE): 80 Marks
Paper Duration (ESE): 03 Hours
Internal Sessional Examination (ISE): 20 Marks

Unit- I **No. of Lecture: 8 Hours, Marks: 16**

Enzymes

Classification, nomenclature, International units and types of enzymes, General characters of enzymes: characters such as specificity, catalysis and regulation and localization of enzymes in the cell, Structure of enzymes: Primary, secondary and tertiary structure of enzyme, Models of enzyme activity: Lock and key model, Induced fit, Substrate Strain model. Isoenzyme, with example and its application.

Unit- 2 **No. of Lecture: 8 Hours, Marks: 16**

Enzyme Kinetics

Introduction to kinetics: activation energy, transition state theory and energy, consideration, Enzyme kinetics, rate equation, Rate of reaction, First order and second order reaction, Michaelis – menten equation (Steady state kinetics) and Haldane relationship, Significance of Km, Lineweaver – Burk or Double – reciprocal plot, Eadie-Hofstee plot, Hanes plot, Turnover number, Specificity constant, Bisubstrate reaction.

Unit- 3 **No. of Lecture: 8 Hours, Marks: 16**

Enzyme inhibition, its kinetics and Catalysis

Types of inhibition- Reversible and irreversible inhibition, Kinetics of inhibition. Catalytic efficiency- proximity and orientation effects, distortion or strain, Different mechanisms of enzyme catalysis, acid base and covalent catalysis and metal-ion catalysis, Molecular mechanism of action of chymotrypsin, Lysozyme, Chemical modification of enzymes, Bisubstrate or Multisubstrate reaction: Ping – Pong mechanism, sequential mechanism,

Unit-4 **No. of Lecture: 8 Hours, Marks: 16**

Allosteric and regulatory enzyme, enzyme production and purification

Binding of ligands to Protein, Co-operativity models- MWC and KNF model, Regulations by allosteric enzymes, other mechanisms of enzyme regulation-enzyme induction and repression and covalent modification.

Sources of enzymes-animal plant and microbial sources, large scale production of enzymes- basic methodology of production, extraction and purification of enzymes, Enzyme production and recombinant DNA technology.

Unit-5 **No. of Lecture: 8 Hours, Marks: 16**

Enzyme immobilization and Enzyme applications

Methods of immobilization - ionic bonding, adsorption, covalent bonding (based on R groups of amino acids), and microencapsulation and gel entrapment, Properties of immobilized enzymes, Applications of immobilized enzymes.

Applications of enzymes in food, sugar, leather, detergent industries etc., Uses of enzymes in drug, medicine, industries, Uses of enzymes to make amino acids and peptides, Legislative and safety aspects.

Reference Books:

1. Lehninger, Nelson and cox. Principles of Biochemistry –Macmillan publishers.
2. Voet and Voet, Biochemistry, Wiley publisher.
3. Biotol series, Principles of Cell energetics , Butterworth- Heinemann Ltd,Jordan Hill, Oxford.
4. Biotol Series, Principles of enzymology and its application, Butterworth- Heinemann Ltd,Jordan Hill, Oxford.
5. Nicholascprice and Tewis stereous, Fundamentals of Enzymology, Oxford University press.
6. Palmer, Enzymes, Oxford University press.
7. Michael L. Shuler, Fikret Kargi, Bioprocess Engineering, Basic concepts, Prentice Hall India Pvt. Ltd., New Delhi.. .
8. J. F. Richardson and D. G. Peacock, Coulson and Richardson's Chemical Engineering (Vol: 3) Asian Books Pvt. Ltd., New Delhi
9. Murray moo-young, Comprehensive Biotechnology Pergemon Press(Vol 2)
10. Pauline M. Doran, Bioprocess Engineering Principles, Academic Press an Imprint of Elsevier.
11. James E. Bailey, David F. Ollis, Biochemical Engineering Fundamentals, Mc Graw-Hill Book Company.
12. Textbook of Biotechnology by B.D.Singh, Kalyani Publication.

Bioprocess Industrial Economics and Management

Course Outline

Bioprocess Industrial Economics and Management	**BIEM**	**BTL-505**
Course Title	Short Title	Course Code

Lecture	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	03	**15**	**45**	**03**

Course Description: This course is introduced for learning the basic fundamentals of Bioprocess Industrial Economics and Management to undergraduate students. The goals of the course are to understand the basic knowledge of economics, various factors to be considered during industrial set up, marketability of product etc.

Prerequisite Course(s): 12th Std. Science and SE Biotechnology Courses.

Course Objectives:
The objective of the course is to provide the basic knowledge of Bioprocess Industrial Economics and Management, economics, profitability, various factors to be considered during industrial set up, marketability of product etc.

Learning outcomes
After completion of this course students will able:

1. To apply the basic knowledge of economics in order to design the bioprocesses at low cost
2. To apply knowledge of marketability to communicate effectively about various bioprocesses of products.
3. To apply the knowledge to set up a bioprocess Industry in all respect
4. To estimate the cost of final product
5. To calculate the profitability and losses during the product formation.

Course Content

TE Biotechnology   Bioprocess Industrial Economics and Management   Semester - V

Teaching Scheme
Theory: 3 hours/ week

Examination Scheme
End Semester Examination (ESE): 80 Marks
Paper Duration (ESE): 03 Hours
Internal Sessional Examination (ISE): 20 Marks

Unit I
Bio process Design Considerations: **No. of Lecture: 8 Hours, Marks: 16**
Technical feasibility survey, process development, flow diagram, equipment design and specifications, marketability of product, availability of technology, raw materials, equipments, human resources, land and utilities, site characteristics, waste disposal, government regulations and other legal restrictions, community factors and other factors affecting investment and production cost, Indian Bioprocess Industry - Current Status and Trends.

Unit II
Cost Estimation: **No. of Lecture: 8 Hours, Marks: 16**
Factors affecting investment and production cost, capital investment, fixed investment and working capital, estimating equipment cost by 6/10 factor rule, method of estimating capital investment. Different costs involved in total product cost, computer automization in costing.

Unit III
Investment Cost and Profitability: **No. of Lecture: 8 Hours, Marks: 16**
Interest and investment cost, type of interest, types of taxes and tax returns, types of insurance and legal responsibility, depreciation, types of depreciation, and methods of determining depreciation. Profitability, mathematical methods of profitability evaluation, cash flow diagram, break even analysis, balance sheet, pricing issue method and income statement.

Unit IV
Fermentation Economics: **No. of Lecture: 8 Hours, Marks: 16**
Introduction, isolation of microorganisms of potential industrial interest, strain improvement, market potential, effects of legislation on production of antibiotics and recombinant proteins, plant and equipment, media, air sterilization, heating and cooling, aeration and agitation, batch process cycle times, continuous culture, recovery costs, water usage and recycling, effluent treatment.

Unit V

Bioproduct Economics: **No. of Lecture: 8 Hours, Marks: 16**

Bioproduct regulation, Fermentation process economics: A complete example, Economic consideration of commercial Bioproduct: Enzymes, Proteins via rDNA, Antibiotics, Vitamins, Alkaloids, Nucleosides, Steroids, Monoclonal antibodies, Brewing and wine making, Fuel Alcohol Production, Organic and Amino acid manufacture, Single cell protein, Anaerobic methane production.

Reference Books:

1. Peter M.S. Timmerhaus K.D. Plant Design and Economics for Chemical Engineers. McGraw Hill.
2. Vilbrandt F.C. and C.E. Dryden, Chemical Plant Design. McGraw Hill
3. T.R. Banga and S.C.Sharma, Industrial Organization and Engineering Economics, Khanna Publications, New Delhi.
4. O.P.Khanna Industrial Engineering and Management, Dhanpat Rai Publications Pvt. Ltd. New Delhi.
5. Dewett and Varma, Elementary Economic Theory, S Chand and Company Ltd New Delhi
6. James E. Bailey, David F. Ollis, Biochemical Engineering Fundamentals, Mc Graw-Hill Book Company.
7. P. F. Stanbury, A. Whitaker and S. J. Hall, Principles of Fermentation Technology, Aditya Book Private Limited.

Molecular Biology Lab

LAB COURSE OUTLINE

(Molecular Biology Lab)

Molecular Biology	**Mol Bio**	**BTL-506**
Course Title	Short Title	Course Code

Practical	**Hours/ Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	04	**15**	**60**	**02**

Molecular Biology Lab

Course Description:

In this laboratory, course emphasis is on the understanding of basics of Molecular Biology techniques. The learner can use this knowledge and apply in allied branches of Biotechnology as required.

Prerequisite Course(s): 11th, 12th Biology, SE Biotechnology courses

General Objective:

The objective of the laboratory is to impart the fundamental knowledge of molecular biology at the research level to the students and to develop their ability to apply the specific procedures to analyze the experimental results.In this lab, students will be familiar with the molecular Biology lab techniques which they can apply in research and development in the field of Biotechnology.

Learning Outcomes:

After successful completion of this lab student will be able to:

- Isolate the genetic material e.g. DNA & RNA from different cells.
- Isolate the total plasmid DNA from bacteria.
- To calculate molecular weight by using DNA marker with agrose gel electrophoresis
- To spool of chromosomal DNA from onion cells
- To determine the melting temperature (Tm) and base composition of DNA from thermal denaturation characteristics.
- Well versed with the principles and practice of agarose gel electrophoresis.
- To quantify Nucleic acids.

Molecular Biology Lab

Semester-V

Teaching Scheme
Practicals -4 Hrs/week

Examination Scheme
External Sessional Exams (ESE)/Oral (OR):25 Marks.
Internal Continuous Assessment: 50 Marks.

Minimum eight experiments from the following:

1. Isolation of genomic DNA from bacteria.
2. Isolation of RNA from yeast.
3. Isolation of total plasmid DNA from bacteria.
4. Calculation of molecular weight by using DNA marker with agarose gel electrophoresis.
5. DNA extraction from blood.
6. Spooling of chromosomal DNA from onion cells.
7. Determination of melting temperature (Tm) and base composition of DNA from thermal denaturation characteristics.
8. Principles and practice of agarose gel electrophoresis.
9. Quantitation of Nucleic acids.

Reference books:

1. Introduction to Practical Biochemistry, Third Edition, by David Plummer.
2. Biochemical Methods, Second Edition by S. Sadasivam, A. Manickam, New Age International Ltd, Publishers.

Lab Bioprocess Instrumentation & Analysis

LAB COURSE OUTLINE

Bioprocess Instrumentation & Analysis Lab	**BIA LAB**	**BTP-507**
Course Title	Short Title	Course Code

	Hours/ Week	**No. of Weeks**	**Total Hours**	**Semester Credit**
Laboratory	**02**	**15**	**30**	**01**

Bioprocess Instrumentation & Analysis Lab

Course Description:
The goal of the lab course is intended to provide a strong foundation in concepts and principles of Bioprocess Instrumentation & Analysis of different materials.

Prerequisite Course(s): 12^{th} Std. Science and SE Biotechnology Courses.

General Objective: The objective of the laboratory is to impart the fundamental knowledge of Bioprocess Instrumentation & Analysis to the students and develop their ability to apply the specific procedures to analyze the experimental results.

Learning Outcomes:
After successful completion of this lab course the student will be able to:

1. Familiarized with various measurement techniques used in bioprocess industries.
2. Determine purity of product in process industries.
3. Will get knowledge of basic principles behind the working of different analytical instruments and its application in bioprocess industries.

Lab Bioprocess Instrumentation & Analysis

Semester-V

Teaching Scheme
Practicals -4 Hrs/week

Examination Scheme
External Sessional Exams (ESE)/Oral (OR):25 Marks.
Internal Continuous Assessment (ICA): 25 Marks.

Minimum 08 experiments shall be performed from the following:

1. To study the response of bimetallic thermometer.
2. To study Calibration of thermocouple.
3. To measure the pH of given solution.
4. To determine concentration of given solution by colorimeter
5. To study Flame photometry
6. To study Abbey's refractometer
7. To study infra red spectrophotometer
8. To study UV spectrophotometer.

References:

1. Patranabis D. Industrial Instrumentation, Tata – Mcgraw Hill Publications, New Delhi.
2. P. Kudesia and S.S. Sawhaney, Instrumental methods of chemical analysis Pragati Prakashan, P.O.Box No. 62, Begum Bridge,Meerut250001,U.P.
3. Nakra B.C. and K.K. Chaudhary, Instrumentation Measurement and Analysis, Tata – McGraw Hill, New Delhi.
4. B.K.Sharma.Goel, Instrumentation methods of chemical analysis, Publishing House,11,Shivaji Road, Meerut-250001,U.P.

Lab Chemical reaction Engineering

LAB COURSE OUTLINE

Chemical reaction Engineering Lab	**CRE LAB**	**BTP-508**
Course Title	Short Title	Course Code

	Hours/ Week	**No. of Weeks**	**Total Hours**	**Semester Credit**
Laboratory	**02**	**12**	**24**	**01**

Chemical reaction Engineering Lab

Course Description:
The goal of the Lab course is intended to provide a strong foundation in concepts and principles of Chemical reactions used in bioprocess industries.

Prerequisite Course(s): 12^{th} Std. Science and SE Biotechnology Courses.

General Objective: The objective of the laboratory is to impart the fundamental knowledge of Chemical reaction engineering to the students and develop their ability to apply the specific procedures in industries and to analyze the experimental results.

Learning Outcomes:
After successful completion of this lab course the student will be able to:

1. Understand the kinetic study of various chemical and biochemical reactions used in process industries
2. To design various types of Reactors.
3. Demonstrate an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Lab Chemical Reaction Engineering

Semester-V

Teaching Scheme
Practicals -2 Hrs/week

Examination Scheme
External Sessional Exams (ESE)/Oral (OR):25 Marks.
Internal Continuous Assessment (ICA): 25 Marks.

Minimum 08 experiments shall be performed from the following:

1. To determine the reaction rate constant {k} for given reaction.(CSTR / BATCH / SEMIBATCH / PFR)
2. To determine the effect of temperature on reaction rate constant. .(CSTR / BATCH / SEMIBATCH / PFR)
3. To determine the activation energy {E} for the given reaction. .(CSTR /BATCH / SEMIBATCH / PFR)
4. To draw C [t], E [t] and F [t] curve and to calculate the mean residence time {tm} variance { σ2} and skewness { S3} for plug flow reactor.
5. To draw C [t], E [t] and F [t] curve and to calculate the mean residence time {tm} variance {σ^2} and skewness {S^3} for annular reactor.
6. To draw C [t], E [t] and F [t] curve and to calculate the mean residence time {tm} variance {σ2} and skewness {S3} for packed Bed reactor.
7. To study the cascade CSTR.
8. To study the kinetic in tubular flow reactor [coiled tube] for the given reaction.

Reference Books:

1. H. Scott Fogler, Elements of chemical reaction engineering, Prentice Hall New, Jersy.
2. Octave Levenspiel, Chemical reaction engineering, John Wiley and sons.

Lab Tissue Culture Engineering

Course Outline

Lab Tissue Culture Engineering	TCE	BTP-509
Course Title	**Short Title**	**Course Code**

LAB	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Theory	**01**	**15**	**15**	**02**
Practical	**02**	**15**	**30**	

Course Description:
This course is aimed at introducing the fundamentals of plant tissue culture to TE students. The basics of animal tissue culture techniques are also incorporated in the course. The course also includes the lab designing, sterilization techniques, media involved and various laboratory techniques.

Prerequisite Course(s): 12^{th} Std. Science and SE Biotechnology Courses.

Course Objectives
The objective of the course is to provide the basic knowledge of plant tissue culture and animal tissue culture techniques. Also to get the students acquainted with various laboratory techniques.

Learning outcomes:

After successful completion of this course the students will be able to:

1. Understand the basics of the lab design

2. Understand various sterilization techniques

2. Apply the knowledge of various PTC techniques

3. Understand the fundamentals of ATC

4. Understand the genetic engineering approaches related to the course

Course Content

TE Biotechnology **Tissue Culture Engineering** **Semester – V**

Teaching Scheme
Theory: 1 hours/ week
Practical: 2 hours/week

Examination Scheme
Internal Continuous Assessment (ICA):50 Marks

Theory:

(a) Introduction to PTC

(b) Applications of PTC

(c) Genetic Engineering in plant

(d) Introduction to ATC

(e) Fundamentals of ATC

Lab Work: (Any Eight Experiments from the following)

1. Laboratory Setup & Introduction to PTC techniques

2. General Sterilization techniques

3. Preparation of culture medium sterilization of explants

4. Initiation of callus culture

5. Micropropogation/ Multiple shoot induction

7. Embryo culture

8. In-vitro seed germination

9. Meristem culture

10. RAPD (DEMO)

11. Lab design, sterilization procedures, media preparation for ATC and cryopreservation

12. Hardening and acclimatization of in vitro raised rooted shoots

13. Encapsulate the shoot buds/ seeds to demonstrate the production of synthetic seeds

14. Primary culture from chick embryo.

Reference Books:

1.R.A.Dixon and Gonzales, Plant cell culture : A Practical Approach, IRL Press.

2. S.S.Purohit, Biotechnology Fundamentals and Applications, Agrobios (India), 4th Edition, 2005.

3. S.S.Bhojwani and M.K.Razdan, Plant Tissue Culture : Theory and Practical, (1996) Elsevier, Amsterdam.

4. S.B Primrose and R.M.Twyman, Principles of Gene Manipulation and Genomics, Blackwell publishing, 7th edition, 2006.

5. Plant Biotechnology: The genetic manipulation of plants; A. Slater, N. Scott, M. Fowler; Published by Oxford University press, New York (2003)

6. Methods in Plant Tissue Culture; U Kumar; AgroBios India, (2003)

7. Bernard R. Glick, Molecular Biotechnology 3rd edition, CBS Publishers Distributors.

8. J.Hammond,P.McGarvey and V.Yusibov (Eds.), Plant Biotechnology New Products and Applications, Springer.

Industrial Training / EDP/ Special Study

Course Outline

Industrial Training/EDP/Special Study	**IT/EDP/SS**	**BTP-510**
Course Title	Short Title	Course Code

Examination Scheme
Internal Continuous Assessment: 25 marks

Industrial Training:

• Every student has to undergo industrial/practical training for a minimum period of two weeks during summer vacation after S.E (after fourth semester).

• The industry in which practical training is taken should be a medium or large scale industry.

• The paper bound report on training must be submitted by every student in the beginning of T.E. First term along with a certificate from the company where the student underwent training.

• The report on training should be detailed one.

• Maximum number of students allowed to take training in company should be five. Every student should write the report separately.

OR

Special Study:

• In case if a student is not able to undergo practical training , then the students should be asked to prepare a review paper on a recent topic in Biotechnology and allied fields.

OR

EDP/EAC of 3-5 days:

Student should undergo Entrepreneurship Awareness/Development Camp (EAC/EDP) of minimum 3 days and should submit the certificate of the programme.

Every student shall be required to present a seminar on Industrial Training / EDP/EAC/ Special Study in the presence of two teachers.

These teachers (fixed by the head of department in consultation with the Principal) shall award marks based on the following:

(a) Report 10 marks

(b) Seminar presentation 10 marks

(c) Viva-voce at the time of Seminar presentation 05 marks.

T.E. Biotechnology

Semester-VI

Third Year Biotechnology

Faculty of Engineering and Technology

North Maharashtra University, Jalgaon

Bioprocess Engineering

Course Outline

Bioprocess Engineering	BPE	BTL-601
Course Title	Short Title	Course Code

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**03**	**15**	**40**	**03**

Course Description:

This course is aimed at introducing the fundamentals of bioprocess engineering. The basics of bioreactor designing have also been incorporated in the course. The course also includes study of various types of bioreactors.

Prerequisite Course(s): 12^{th} Std. Science and SE Biotechnology Courses.

Course Objectives

The objective of the course is to provide the basic knowledge of fermentation processes and media preparations along with the sterilization procedures. The course also deals with various parameters involved in bioreactors designing. The course also aims at providing the knowledge of various types of industrially used bioreactors.

Learning outcomes:

After successful completion of this course the students will be able to:

1. Apply knowledge of chemical and mechanical engineering for design of biological system in biotech industries.
2. Design and conduct experiments on different bioreactors and to analyze and interpret data for optimization of process.
3. Design various bioprocess equipment to meet desired needs of mankind within realistic constrain like social, ethical, health and safety
4. To get the knowledge of properties of materials and its view in designing bioprocess equipment within the standards prescribed by regulating authority in India and world.
5. Integrate knowledge of bioscience, biochemical engineering, , in commercial context to solve a substantial range of bio- processing and biological engineering problems and issues for production of value added products for societal development.

Course Content

TE Biotechnology **Bioprocess Engineering** **Semester – VI**

Teaching Scheme
Theory: 3 hours/ week

Examination Scheme
End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Examination (ISE): 20 Marks

UNIT I: **No. of Lecture: 8 Hours, Marks: 16**

Introduction to Fermentation process & Media for Industrial Fermentation Process

Upstream Process, Downstream Process, Range of fermentation process, Component parts of fermentation process , Medium Sterilization. Batch Sterilization: Continuous sterilization, Fermentor Sterilization, Feed Sterilization, Filter sterilization.

Unit II: **No. of Lecture: 8 Hours, Marks: 16**

Design of Bioreactors:

Introduction, Basic objective in design of a reactor, aseptic operation and containment, body construction, aeration and agitation, stirrer glands and bearings, baffles design, sparger system, achievement and maintenance of aseptic conditions, valves and steam traps, types of valves and pressure control valves. Scale up of fermenters, design condition for scale up, scale-up methods.

Unit III: **No. of Lecture: 8 Hours, Marks: 16**

Types of Bioreactors:

Batch bioreactors, Continuous bioreactors, Semi continuous bioreactors, Stirred tank bioreactors, Airlift bioreactor systems, Trickle bed bioreactor, Airlift external loop bioreactors, waldhof-type fermenter, Tower fermenter, Cylindro- conical vessel, Deep jet fermenter, Cyclone column, Rotating disc fermenter, Reactor dynamics: Dynamic models and stability

Unit IV: **No. of Lecture: 8 Hours, Marks: 16**

Solid state & Submerged Fermentation, Process monitoring & Control:

Introductions, types of solid state fermenter, Submerged Fermentation , Brief introduction to pipe joints, Physical and chemical sensors for medium and gases, Online/ Offline sensors.

Unit V: **No. of Lecture: 8 Hours, Marks: 16**

Bioreactor Design Considerations:

Design consideration: Design codes, maximum working pressure, design pressure, design temperature, design stress, factor of safety, and selection of factors of safety, design of wall thickness, corrosion ratio, Poisson ratio, criteria of failure. Materials of construction: mechanical properties, materials, corrosion, protective coating, choice of materials, corrosion prevention.

Reference Books:

1. Biochemical Engineering Fundamentals (1986) (2/e) Bailey JE and Ollis DF, McGraw-Hill International Editions CES, Singapore.

2. Biochemical Engineering (1997) Blanch HW and Clark DS, Marcel Dekker Inc., USA.

3. Bioprocess Engineering Principles (1995) Doran PM, Academic Press Ltd, USA.

4. Bioprocess Engineering: Basic Concepts (2002) Shuler ML and Kargi F, Pearson Education Pvt. Ltd., Singapore.

5. Principles of Fermentation Technology (1995) (2/e) Stanbury PF, Whitaker A and Hall SJ, Butterworth-Hienemann Ltd., UK.

6. Comprehensive Biotechnology Vol. 2 (1985) Moo-Young M, Pergamon Press Ltd., UK.

Genetic Engineering

Course Outline

Genetic Engineering	**GE**	**BTL-602**
Course Title	Short Title	Course Code

Lecture	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	03	**15**	**45**	**3**

Course Description: This course is introduced for learning the basic fundamentals of Genetic Engineering to undergraduate students. The goals of the course are to understand the basic knowledge of Genetics, different enzymes used to engineer the genes, rDNA technology, and applications of rDNA technology.

Course Objectives:
The objective of the course is to provide the basic knowledge of Genetics, different enzymes used to engineer the genes, rDNA technology, and applications of rDNA technology.

Prerequisite Course(s): 12th Std. Science and SE Biotechnology Courses.

Learning outcomes:
After completion of this course students will able:

1. To apply the knowledge of rDNA technology for the construction of novel gene for the better use with wide functionality.
2. To use various vector systems to study functionality of insert gene.
3. To use various instrument to increase the efficiency of the DNA.
4. Apply the knowledge of genetics for human welfare in disease diagnosis, in criminal cases as well as pharmaceuticals for drug designing and development.
5. To express the knowledge of genetic engineering both in written and oral format.

Course Content

TE Biotechnology **Genetic Engineering** **Semester - V**

Teaching Scheme
Theory: 3 hours/ week

Examination Scheme
End Semester Examination (ESE): 80 Marks
Paper Duration (ESE): 03 Hours
Internal Sessional Examination (ISE): 20 Marks

Unit I
Recombinant DNA technology **No. of Lecture: 8 Hours, Marks: 16**
The recombinant DNA concept, Important Discoveries, Principles of cloning, Biohazards and Bioethics of Genetic Engineering.

Unit II
The Tools: Enzymes **No. of Lecture: 8 Hours, Marks: 16**
Nucleases, The Restriction Endonucleases Type I, II, III, star activity, isoschizomers Phosphodiesterase,Polynucleotidekinase,DNAligase,DNApolymeraseI,Reversetranscriptase,
Terminal deoxynucleotidyl transferase,Poly A polymerase.

Unit III
The Tools: Vector Systems **No. of Lecture: 8 Hours, Marks: 16**

E coli systems – the host cells , *E. coli* – Plasmid Vectors , *E .coli* – Bacteriophage vectors , *E. coli* systems – Plasmid-Phage combination vectors , Other Prokaryotic Host-Vector systems , Eukaryotic Host-Vector Systems: Yeast, Eukaryotic Host-Vector Systems: Animals, Eukaryotic Host-Vector Systems: Plants.

Unit IV **No. of Lecture: 8 Hours, Marks: 16**
Molecular research procedures
DNA sequencing techniques PCR, Blotting Techniques, Gene silencing techniques, RNAi, Knockout Technology, SAGE.

Unit V **No. of Lecture: 8 Hours, Marks: 16**
Significance of rDNA technology and Human Welfare
Gene therapy, Restriction fragment length polymorphism (RFLPs), Random amplified polymorphic DNA (RAPD), SNPs, AFLP, microarray, DNA fingerprinting.

Reference Books:

1. Genes VIII – Benjamin Lewin, Benjamin Cummings; United States edition.
2. Genes and Genomes – Singer M and Berg P
3. Textbook of Biotechnology by R.C.Dubey, S. Chand & Co. P Ltd, New Delhi.
4. Textbook of Biotechnology by B.D.Singh, Kalyani Publication.
5. Textbook of Biotechnology by U.Satyanarayana, Books and Allied Pvt.Ltd.

Fermentation Technology

Course Outline

Fermentation Technology	**FT**	**BTL- 603**
Course Title	Short Title	Course Code

Lectures	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	03	**15**	**45**	**03**

Course Description:
This course is introduced for learning the basic fundamentals of Fermentation Process to undergraduate students. The prospectus includes a prior applications involved in Industrial Biotechnology. The goals of the course are to understand the basic principles, Mechanism and working of fermenters and processes and its applications in different areas.

Prerequisite Course(s): 12^{th} Std. Science and SE Biotechnology Courses.

Course Objectives
The objective of the course is to provide the basic knowledge of fermentation technology, preparation of inoculums, sterilization and various fermentation processes.

Learning outcomes:

By completion of this course students will able:

1. Describe the fermentation process and evaluate factors that contribute in enhancement of cell and product formation during fermentation process.
2. Interpret the suitable media to obtain high yield of the product and to develop inoculum for different fermentation processes.
3. Analyze lab scale information and apply it for scaling up process.
4. To design the experiment and fermenter for beverages production.
5. To design the experiment and fermenter for food production.
6. To increase the productivity and yield of fermentation process.

Course Content

TE Biotechnology **Fermentation Technology** **Semester – VI**

Teaching Scheme
Theory: 3 hours/ week

Examination Scheme
End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Examination (ISE): 20 Marks

UNIT – I **No. of Lecture: 8 Hours, Marks: 16**

Introduction to Fermentation Process & Media Formulation:

An introduction to fermentation process, Isolation methods for Industrial microorganisms, Culture preservation and stability, the improvement of industrial microorganisms. Media for Industrial fermentation, Introduction ,typical media, Medium fermentation: Water, Energy sources, Carbon sources, Nitrogen sources, Minerals, Growth factors, Nutrient recycle, Buffers, Precursors, Metabolic regulators, Oxygen requirement and antifoams, pH.

UNIT – II **No. of Lecture: 8 Hours, Marks: 16**

Types of Sterilization Processes

Sterilization: Introduction, Medium sterilization, Design of Batch sterilization process:
Calculation of Del factor during heating and cooling, Calculation of holding time at constant temperature, Richard's rapid method for the design of sterilization cycles, the scale up of batch sterilization processes, Filter sterilization: Filter sterilization of fermentation media, air and fermenter exhaust air, the theory and design of depth filters.

UNIT –III **No. of Lecture: 8 Hours, Marks: 16**

Inoculum Development Processes

The development of Inocula for industrial fermentation: Introduction, Criteria for the transfer of inoculums, The development of inocula for yeast processes, The development of inocula for bacterial processes, The development of inocula for mycelial processes, The aseptic inoculation of plant fementers, Solid state fermentation.

UNIT –IV **No. of Lecture: 8 Hours, Marks: 16**

Fermentative production of Beverages, Industrial Chemicals and Biomolecules.

Beer, Wine, Rum, Gin, Whisky, Brandy, Champaign. Fermentative production of citric acid, acetic acid, lactic acid, ethanol, acetone and butanol, gluconic acid, steroid biotransformation, Enzyme production- Amylases, Proteolytic enzymes, Invertase enzyme, Pectinases, Lipases; Vitamins: Vitamine B12, Riboflavin, Vitamin A, Amino acid production: LGlutamic acid, L-Lysine, L-Threonine.

UNIT –V **No. of Lecture: 8 Hours, Marks: 16**

Fermentation of food products and Antibiotics.

Fermentative production of food products: cheese and types of cheese, fermented soyabean foods, biomass production (single cell protein, baker's yeast), fermented dairy products like yogurt, cultured buttermilk, Production of penicillin, B-Lactum antibiotics, Streptomycin, Cephalosporin, Tetracycline.

Reference books:

1. P. F. Stanbury, A. Whitaker and S. J. Hall, Principle of Fermentation Technology, Aditya Books (P) Ltd, New Delhi.
2. L. E. Casida, Industrial Microbiology, New Age Industrial Publishers.
3. Pauline M. Doran, Bioprocess Engineering Principles, Academic Press an Imprint of Elsevier.
4. B.D.Singh, Biotechnology, Kalyani Publication.
5. Prescot and Dun, Industrial Microbiology, McGraw-Hill Book Company, Inc. New York.
6. Text Book of Biotechnology by R.C.Dubey ,S. Chand & Co. P Ltd, New Delhi
7. Text Book of Biotechnology by U. Satyanarayana, Books and Allied Pvt.Ltd.
8. Murray moo-young, Comprehensive Biotechnology Pergemon Press (Vol. 2)

Mass Transfer

Course Outline

Mass Transfer	**MT**	**BTL-604**
Course Title	Short Title	Course Code

Course Description:
The goal of the course is intended to provide a strong foundation in concepts and principles of mass transfer operations used in industries.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	15	45	03

Objective of the Subject:
1. Student will be able to understand the basic principles of separation techniques.
2. Student will be able to design various mass transfer equipments.

Prerequisite Course(s): 12th Std. Science and SE Biotechnology Courses.

Learning outcomes:
After completion of this course; students will be able to:
1. Demonstrate the knowledge of various mass transfer operations and its application in process industries.
2. Explain & apply knowledge of different separation techniques in downstream processing.
3. Apply appropriate criteria for selection among alternative separation technologies.
4. Increase yield and purity of various products in process industries by applying knowledge.
5. Ability to analyze and design mass transfer equipments.

Course Content

TE Biotechnology **Mass Transfer** **Semester -VI**

Teaching Scheme

Theory : 3 hours/ week

Examination Scheme

End Semester Examination (ESE) : 80 Marks

Paper Duration (ESE): 03.00 hr

Internal Sessional Examination (ISE): 20 Marks

Unit: I **No. of Lecture: 8 Hours, Marks: 16**

Mass Transfer

Introduction to mass transfer, Equilibrium for mass transfer process: Local two phase mass transfer. Local overall mass transfer coefficient, Use of local overall coefficient. Material balances for steady state co current, countercurrent, cross flow cascade, counter flow cascade. Application of mass transfer processes.

Unit: II **No. of Lecture: 8 Hours, Marks: 16**

Distillation

Introduction to distillation process, Vapor liquid equilibrium, The methods of distillation (Binary mixture), The fractionating column, McCabe Thiele & Lewis Sorel method, Batch distillation, Azeotropic, extractive and steam distillation, Introduction to distillation equipments.

Unit: III **No. of Lecture: 8 Hours, Marks: 16**

Extraction & Leaching

Introduction to extraction process, Liquid equilibria, Material balances for stage wise contact methods, Stage contact and continuous contact type extractors.

Leaching: General principles of leaching, working principle of moving-bed leaching equipments: Bollman extractor, Hildebrandt extractor

Unit: IV **No. of Lecture: 8 Hours, Marks: 16**

Adsorption

Introduction to adsorption operation, Type of adsorption operation, Nature of adsorbents, Adsorption equilibria, Adsorption of liquids, Material balances for stage wise for operation, Continues contact process for adsorption, Principle of ion exchange operation, Equilibria for ion exchange operation, Rate of ion exchange operation, Application of ion exchange operation.

Unit: V **No. of Lecture: 8 Hours , Marks :16**

Crystallization

Introduction to crystallization, Growth and properties of crystals, Effect of impurities in crystallization, Effect of temperature on solubility, Fractional crystallization, Caking and yield of crystals, Different type of crystallizers.

Text Books:

1. R. E. Treybal , Mass transfer operation ,McGraw Hill Publication
2. Coulson and Richardson Chemical Engineering (Vol. I and II), Pergamon Press

Reference Books:

1. Christie J. Geankoplis ,Transport Processes and Unit Operations ,Prentice Hal inc
2. P. Chattopadhayay , Unit operation in Chemical Engg. (Vol. I and II), Khanna Publications Delhi.

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IPR and Entrepreneurship

Course Outline

IPR and Entrepreneurship	**IPRE**	**BTL-605**
Course Title	Short Title	Course Code

Lecture	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	03	**15**	**45**	**03**

Course Description: This course is introduced for learning the basic fundamentals of Intellectual property rights and Entrepreneurship to undergraduate students.The goals of the course are to understand the basic knowledge of Intellectual property rights, trademarks, biosafety & bioethics and entrepreneurship.

Prerequisite Course(s): 12^{th} Std. Science and SE Biotechnology Courses.

Objectives of the subjects

The objective of the course is to provide the basic knowledge of IPR and Entrepreneurship, Intellectual property, trademarks, biosafety & bioethics and entrepreneurship.

Learning outcomes

After successful completion of this course the student will be able to:

1. Choose which type of IPR they should apply for.
2. Adopt environment friendly approach industrially.
3. Understand various ethical issues regarding the field.
4. Understand entrepreneurial aspects.
5. Understand the basics of marketing management.

Course Content

TE Biotechnology **IPR and Entrepreneurship** **Semester - VI**

Teaching Scheme
Theory: 3 hours/ week

Examination Scheme
End Semester Examination (ESE): 80 Marks
Paper Duration (ESE): 03 Hours
Internal Sessional Examination (ISE): 20 Marks

UNIT 1: IPR, Patents and copyright **No. of Lecture: 8 Hours, Marks: 16**

General Overview of Intellectual Property Rights, WIPO, WTO, Trade Related Intellectual Property Rights. Patent- Basic requirements of Patentability, Patentable Subject Matter, Procedure for Obtaining Patent, Provisional and Complete Specification. Copyright-Objectives of copyright, Rights conferred by registration of copyright, Infringement of copyright.

UNIT 2: Trademarks, GI and other types of IPR **No. of Lecture: 8 Hours, Marks: 16**

Trademarks-Basic Principles of Trademark, Rights conferred by Registration of Trademark, Infringement of Trademark. Geographical Indications-Objectives of Geographical Indications, Rights conferred, Infringement of Geographical Indications, International Position, Indian Position, Bioprospecting and Biopiracy. GATT Farmers rights, plant breeders right.

UNIT 3: Biosafety and Bioethics **No. of Lecture: 8 Hours, Marks: 16**

Biosafety and Bioethics Management-Key to environmentally responsible use of biotechnology. Cartagena Protocol on Biosafety, Ethical implications of Biotechnological products and techniques. Contempory ethics of healthcare. Ethical aspects of hazardous worte and toxic substance. Ethical aspects of scientific publishing.

UNIT 4: Entrepreneurship **No. of Lecture: 8 Hours, Marks: 16**

Need, scope and characteristics of entrepreneurship management of self and understanding human behavior, business ethics, performance appraisal, and (SWOT) analysis. Market survey techniques - Criteria for the principles of product selection and development.

UNIT 5: Marketing **No. of Lecture: 8 Hours, Marks: 16**

Elements of Marketing and Sales Management - Nature of product and market strategy, Packaging and advertising, After Sales Service, Pricing techniques. Financial institutions, financial incentives. Technical feasibility of the project, plant layout & process planning for the product, Quality Control, Critical Path Method (CPM) and Project Evaluation Review Techniques (PERT) as planning tools for establishing SSI.

Reference Books:

1. Entrepreneurship: New Venture Creation, David H. Holt.
2. Patterns of Entrepreneurship: Jack M. Kaplan.
3. Entrepreneurship and Small Business Management: C.B. Gupta, S.S. Khanka,Sultan Chand.

Bioprocess Engineering & Fermentation Technology

LAB COURSE OUTLINE

(Bioprocess Engineering & Fermentation Technology Lab)

Genetic Engineering	**BEFT**	**BTP-608**
Course Title	Short Title	Course Code

Practical	**Hours/ Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	04	**15**	**60**	**02**

Course Description:
In this laboratory course, emphasize has given on the understanding of basics of bioreactor design, various sterilization procedures involved, kinetics of the processes and fermentation procedure of various products.

General Objective:
The objective of the laboratory is to impart the basic knowledge of bioprocess engineering. This practical course also focuses on various sterilization techniques involved in the field of bioprocess engineering. This course also deals with the study of kinetics and other aspects of microbial cultures.

Prerequisite Course(s): 12th Std. Science and SE Biotechnology Courses.

Learning Outcomes:
After successful completion of this lab student will be able to:

1. Understand the basic design of the fermenter.
2. Apply the knowledge to study kinetics of the process.
3. Apply the knowledge of sensors and various sterilization techniques involved in the process.

LAB Course Content

TE Biotechnology Bioprocess Engineering & Fermentation Technology Semester – VI

Teaching Scheme	**Examination Scheme**	
Theory: 3 hours/ week	Internal Continuous Assessment (ICA)	: 50 Marks
	External Sessional Examination (ESE)/ Oral (OR)	: 50 Marks

Minimum eight experiments from the following:

1. Introduction to the fermenter.
2. Feed Sterilization
3. Fermenter Sterilization
4. Growth kinetics of microorganisms using shake flask method.
5. Determination of specific thermal death rate constant (Ka).
6. Determination of Volumetric oxygen transfer coefficient (KLa), effect of aeration and agitation speed.
7. Preparation of Immobilized enzymes and cells and evaluation of kinetic parameters.
8. Kinetics study of Product formation.
9. Effect of substrate and product concentration on biomass yield for baker's yeast production.
10. Studies on settling characteristics of various microbial cultures
11. Study of Physical and chemical sensors for medium and gases.
12. Fermentative production of Sauerkraut.

Reference books:

1. R.A.Dixon and Gonzales, Plant Cell Culture : A Practical Approach, IRL Press.
2. S.S.Purohit, Biotechnology: Fundamentals and Applications, Agrobios (India), 4th Edition, 2005.
3. P.F.Stanbury, A.Whitkar and S.J.Hall, Principles of Fermentation Technology, Aditya Book House, New Delhi.
4. B.D.Singh, Biotechnology: Expanding Horizons, Kalyani Publishers, New Delhi, Second Revised Edition, 2008.
5. Biochemical Methods, Second Edition by S. Sadasivam, A. Manickam, New Age International Ltd, Publishers.

Lab Mass Transfer

LAB COURSE OUTLINE

Mass transfer Lab	**MT LAB**	**BTP-607**
Course Title	Short Title	Course Code

Laboratory	Hours/Week	No. of Weeks	Total Hours	Semester Credit
	02	**12**	**24**	**01**

Mass Transfer Lab

Course Description:
The goal of the course is intended to provide a strong foundation in concepts and principles of mass transfer operations used in industries.

Prerequisite Course(s): 12^{th} Std. Science and SE Biotechnology Courses.

General Objective: The objective of the laboratory is to impart the practical knowledge of Mass transfer operations to the students.

Learning Outcomes:
After successful completion of this lab course; the student will be able to:

1. Explain and apply various separation techniques in industries.
2. Determine purity of product in process industries.
3. Increase purity of various products in process industries.

Mass Transfer

Semester-V

Teaching Scheme
Practicals -2 Hrs/week

Examination Scheme
External Sessional Exams (ESE)/Oral (OR):25 Marks.
Internal Continuous Assessment (ICA): 25 Marks.

Minimum 08 experiments shall be performed from the following:

1. To determine mass transfer coefficient for dissolution of benzoic acid without chemical reaction.
2. Simple Distillation: To verify Rayleigh's equation for simple distillation
3. To study Bubble Cap Distillation.
4. Liquid – Liquid Extraction: To study and determine the efficiency of cross Current liquid- liquid extraction.
5. To construct ternary diagram for acetic acid –water –benzene
6. To plot Tie line diagram for acetic acid –water –benzene
7. To determine the percentage leaching of NaOH from a mixture of NaOH and $CaCo_{3.}$
8. Adsorption: To study adsorption of acetic acid on activated charcoal
9. To calculate percentage yield of crystals obtained with and without seeding in saturated solution of solute.

Reference Books:

1. R. E. Treybal , Mass transfer operation ,McGraw Hill Publication
2. Coulson and Richardson Chemical Engineering (Vol. I and II), Pergamon Press

Genetic Engineering

LAB COURSE OUTLINE

(Genetic Engineering Lab)

Genetic Engineering	**GE**	**BTP-608**
Course Title	Short Title	Course Code

Practical	**Hours/ Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	02	**15**	**30**	**02**

Course Description:
In this laboratory, course emphasis is on the understanding of basics of Genetic Engineering techniques. The learner can use this knowledge and apply in allied branches of Biotechnology as required.

Prerequisite Course(s): 11th, 12th Biology, SE Biotechnology courses

General Objective:
The objective of the laboratory is to impart the fundamental knowledge of Genetic Engineering at the research level to the students and develop their ability to apply the specific procedures to analyze the experimental results. In this lab, students will be familiar with the Genetic Engineering lab techniques which they can apply in research and Development in the field of Biotechnology.

Learning Outcomes:
After successful completion of this lab student will be able to:

1. Use restriction digestion enzyme for various applications of DNA study
2. Use ligation enzyme to join different DNA to form new product
3. Prepare plasmid for various applications
4. Use DNA fingerprinting method by RFLP for various applications.
5. To map the genomic DNA
6. To transform DNA by using various vectors
7. Will be able to apply the knowledge of Southern, Northern and western blotting for the detection of target DNA, RNA and proteins.

LAB COURSE CONTENT

TE Biotechnology **Genetic Engineering** **Semester – V**

Teaching Scheme
Practical: 2 hours/ week

Examination Scheme
Internal Continuous Assessment: 25 Marks

Minimum eight experiments from the following:

1. Restriction digestion of genomic DNA of bacteria
2. Ligation of bacterial DNA.
3. Plasmid preparation.
4. DNA fingerprinting (by RFLP)
5. DNA mapping using restriction enzymes
6. Transformation of *E.coli* with plasmid pBR 322
7. Transduction
8. Southern Blotting
9. Northern Blotting

Reference books:

1. Introduction to Practical Biochemistry, Third Edition, by David Plummer.
2. Biochemical Methods, Second Edition by S. Sadasivam, A. Manickam, New Age International Ltd, Publishers.

Minor Project

Course Outline

Minor Project	Minor Project	BTP-609
Course Title	Short Title	Course Code

Examination Scheme:
Internal Continuous Assessment: 50 Marks
Practical Hrs/week: 2 hrs

A minor project related to Biotechnology and allied fields.
Project report should consist of details of work carried out by the student.
Every student shall be required to present a seminar in the presence of two teachers. These teachers (fixed by the head of department in consultation with the Principal) shall award the marks based on the following:
(a) Report 20 marks
(b) Seminar presentation 20 marks
(c) Viva-voce at the time of Seminar presentation 10 marks

SEMINAR-I

Course Outline

Seminar-I	**Seminar-I**	**BTP-610**
Course Title	Short Title	Course Code

Examination Scheme:
Internal Continuous Assessment: 25 Marks
Practical hrs / week: 2 hrs.

During sixth term, every student individually will study a topic assigned to him and submit a report in a typed form and shall deliver a short lecture / seminar on the topic at the time of seminar oral examination .The topic assigned will be related to the field of Biotechnology, Biochemical Engineering and allied fields.
The students shall deliver the seminar (10 to 15 minutes) and submit the seminar report to the staff member on different technical subjects during the semester. The assessment of the term work shall be based on the: -
1. Attendance to the seminar-5 Mark
2. Performance of the seminar delivery-10 Mark
3. Seminar report -5Mark
4. Viva voce during the seminar- 5 Mark

The staff member/members shall guide the students in:
1. Selecting the seminar topic.
2. Information retrieval (literature survey)
a) Source of Information i.e. names of the journals, reports, books etc.
b) Searching for the information i.e. referring to chemical abstracts etc.
3. Preparing the seminar report
4. Delivering the seminar

The oral examination shall be conducted by a committee of teachers internally which shall include the concerned guide also and shall award the oral marks (at the end of sixth term).

Proposed Syllabus

(With effect from 2014-15)

T.E. Chemical Engineering

Third Year Chemical Engineering

Faculty of Engineering and Technology

North Maharashtra University, Jalgaon

T.E. Chemical Engineering

Semester-V

Third Year Chemical Engineering

Faculty of Engineering and Technology

North Maharashtra University, Jalgaon

Course Outline

Process Equipment Design- I	**PED-I**	**CHL 501**
Course Title	Short Title	Course Code

Course Description:

This course describes to use appropriate terminology of process equipment preliminaries and design. It illustrates basic functions of process equipment; and relates scientific principles associated with process equipment design.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	15	40	03

Prerequisite Course(S): Chemical Engineering Materials, Fluid Flow Operation, Applied Inorganic Chemistry, Process Calculations, Mechanical Operation, Applied Physical chemistry.

General Objectives:

1. To study the design preliminaries.
2. To study the corrosion and its prevention.
3. To study the mechanical design of heads.
4. To study the mechanical design of keys.
5. To study the process equipment design of circular flange pipe joints.
6. To study the process equipment design of storage vessel.
7. To study the process equipment design of cylindrical vessel using external pressure.
8. To study the process equipment design of packed absorption tower.
9. To study the safety measures in equipment design.
10. To study the pressure relief devices.

Learning Outcomes:

At the end of course students exhibit how to use basic standard equipment symbols in chemical process industry and in a competitive manner how to design Heads, Keys, and cylindrical vessels under external pressure, circular flange pipe joints and packed absorption tower with safety requirements of equipments. Students demonstrate the ability to perform the task by identifying, formulating, designing and providing the solution to various chemical engineering problems, understanding of professional and ethical responsibilities formally and informally show the capacity of designing the product to meet economical and societal requirements and understanding about the environmental issues and will provide solutions for green and clean technologies.

TE Chemical Engineering **Semester – V**

Process Equipment Design-I
(Course Content)

Teaching Scheme		**Examination Scheme**	
Theory	: 3 hours/ week	End Semester Examination (ESE)	: 80 Marks
		Paper Duration (ESE)	: 03 Hours
		Internal Sessional Examination (ISE)	: 20 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Design Considerations: Design codes, Maximum working pressure, Design pressure, Design Temperature, Design stress, Factor of safety, Selection of factor of safety, Design wall thickness, Corrosion ratio, Poisson ratio, Criteria of failure, Elastic stability.
Corrosion: Types of Corrosion, Corrosion prevention, Protective coating, Choice of materials

UNIT-II **No. of Lect. – 08, Marks: 16**

Keys: Introduction, Types of keys, Strength of sunk key, Effect of key ways, Design of keys
Design of Heads: Introduction, Analysis and design of conical head, Flat cover head, Standard dished heads.

UNIT-III **No. of Lect. – 08, Marks: 16**

Pipe joints: Standard pipe flanges for steam, Hydraulic pipe joints for high pressure, Design of circular flange pipe joints.
Storage vessels: Introduction, Design of fixed conical roof cylindrical tank, Storage of gases in Spherical vessels.
Supports for vessels: Introduction of Bracket or Lug supports and Leg supports.

UNIT-IV **No. of Lect. – 08, Marks: 16**

Design of Cylindrical Vessels under internal Pressure: Introduction, Thin wall vessels, Design Equations.
Design of process vessels and pipes under external pressure: Introduction, Determination of safe pressure against elastic failure, Determination safe external pressure against plastic deformation, circumferential stiffness, Pipes and tubes under external pressure.

UNIT-V **No. of Lect. – 08, Marks: 16**
Process Hazards and Safety Measures in Equipment Design: Introduction, Hazards in Process Industries, Hazards Analysis, Safety Measures, Safety Measures in Equipment Design, Pressure relief Devices.
Design of packed absorption tower: Introduction, Design of height & diameter of Packed Absorption Tower.

Textbooks:

1 B.C. Bhattacharya, Introduction to Chemical Equipment Design (Mechanical Aspects), CBS Publisher and Distributors, New Delhi.
2 Coulson & Richardson Chemical Engineering (Vol. VI), Butterworth-Heinmann (Elsevier) (Sixth Edition).
3 M.V.Joshi, V.V. Mahajani Process Equipment Design, Macmillan Publishers India Ltd. (Fourth Edition).
4 R. S. Khurmi, J.M. Gupta, A Text Book of Machine Design, S. Chand & Company Ltd, New Delhi.

References:

1 S.D. Dawande, Process Equipment Design (Vol. I),Denett & Co., Nagpur.

Course Outline

Process Heat Transfer	**PHT**	**CHL 502**
Course Title	Short Title	Course Code

Course Description:

This course aims to introduce students the heat transfer mechanisms in solids and fluids and their chemical process applications. The purpose of the course is to make student capable to model steady and unsteady heat transfer in simple systems, and design heat exchangers and simple heat exchanger networks.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**03**	**15**	**40**	**03**

Prerequisite Course(S): Fluid Flow Operation, Applied Inorganic Chemistry, Process Calculations, Mechanical Operation, Applied Physical chemistry.

General Objectives:

1. To introduce the heat transfer principles.
2. To study various modes of heat transfer.
3. To study the heat exchanger for conversion of hot and cold fluid.
4. To study the design techniques involving heat transfer in chemical process.
5. To study dimensional analysis in heat transfer.
6. To study the natural and forced convection.
7. To study the equation of one dimensional and three dimensional conduction.
8. To study the lumped heat capacity method of unsteady state conduction.
9. To study the heat exchange equipment, counter current and parallel flows.
10. To study the individual & overall heat transfer coefficient and its significance.

Learning Outcomes:

After successful completion of this course the student will be able to understand conduction, convection and radiation modes applicable to design heat exchanging equipments widely used in chemical process and allied industry. The students will also apply the knowledge of individual and overall heat transfer coefficient for designing steady state and unsteady state heat transfer processes and will provide suitable designing of heat exchanger network.

TE Chemical Engineering **Semester – V**

Process Heat Transfer
(Course Content)

Teaching Scheme		**Examination Scheme**	
Theory	: 3 hours/ week	End Semester Examination (ESE)	: 80 Marks
Practical	: 2 hours week	Paper Duration (ESE)	: 03 Hours
		Internal Sessional Examination (ISE)	: 20 Marks
		Internal Continuous Assessment (ICA)	: 25 Marks
		End Semester Examination (ESE) (OR)	: 25 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Heat transfer by conduction in solids: Fourier's law of heat conduction, steady state heat conduction through walls (single and multilayer), heat flow through cylinder, unsteady state heat conduction. Derivation of Fourier's heat conduction equation in three dimensions, equation for one dimensional conduction. Thermal insulation- insulating material, design factor and properties, economics of thickness, critical thickness

UNIT-II **No. of Lect. – 08, Marks: 16**

Heat transfer through extended surface of uniform cross section: Fin efficiency and its conditions, fin efficiency and effectiveness, counter current and parallel flows, energy balances, overall heat transfer coefficient , log mean temperature difference, individual heat transfer coefficient, calculation of overall heat transfer coefficient from individual coefficients , transfer units in heat exchangers.

UNIT-III **No. of Lect. – 08, Marks: 16**

Convection without phase change: Types of convection, empirical equations for forced convection, heat transfer in laminar and turbulent flow through tubes over a flat plate and submerged plate, dimensional analysis method, Dropwise and film type condensation, coefficient for film type condensation, practical use of Nusselt's equations, and application in petroleum industry.

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UNIT-IV **No. of Lect. – 08, Marks: 16**

Heat transfer of boiling liquids: Boiling of saturated liquids, maximum flux and critical temperature drop, maximum Flux and film boiling.

Radiation heat transfer: Fundamental of radiation, black body radiation, laws of radiation, radiant heat exchange between non black surfaces. Greenhouse effect and radiation shape factor.

UNIT-V **No. of Lect. – 08, Marks: 16**

Heat exchange equipments:

Heat exchanger single pass 1-1 exchanger, 1-2 shell and tube heat exchanger, correction for LMTD for cross flow, design calculation (Kern Method) in heat exchanger.

Evaporation:

Liquid characteristics and types of evaporator, single effect evaporator calculation, pattern of liquid flow in multiple effect evaporators.

Textbooks:

1 Coulson & Richardson Chemical Engineering (Vol. I), Butterworth-Heinmann (Elsevier) (Sixth Edition).

2 Donald Q. Kern. Process Heat Transfer, Tata McGraw Publishing Company Limited, New Delhi (Tenth Edition).

3 S.S.Barkade and Mrs. P.L.V.N. Saichandra, Heat Transfer, Denett & Co., Nagpur.

References:

1 D.S.Kumar, Process Heat Transfer, S.K.Kataria and Sons Publisher, New Delhi

2 W.L.McCabe and J.C.Smith, Unit Operations of Chemical Engineering, McGraw Hill/ International Edition (Seventh Edition).

Course Outline

Instrumentation & Instrumental Analysis IIA **CHL 503**

Course Title Short Title Course Code

Course Description:

This course describes basic principles of instrumentation and instrumental analysis. The rationale of the course is to apply the principles learned in science and to provide characterization of solids and fluids for understanding the changes occurring in the chemical processes. This course aims to examine the variables and measure them to get exact product specifications.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	15	40	03

Prerequisite Course(S): Applied Inorganic Chemistry, Applied Physical chemistry.

General Objectives:

1. To study the meaning of measurement.
2. To study elements of instruments.
3. To study static and dynamic characteristics of instruments.
4. To study the principle of different instruments and their characteristics.
5. To understand how to calibrate the instruments.
6. To understand differences between various analytical methods.
7. To study the analytical chemistry and spectroscopic analysis.
8. To study the concepts, terminology, conventions and calculations important in analytical chemistry and instrumental analysis.
9. To understand basic principle behind measurements and their applicability in chemical processes.
10. To study characterization of materials using modern instrumentation and techniques.

Learning Outcomes:

After completion of the course the students will learn basics of instrumentation, dynamic and static characteristics of an instrument and importance of measuring and thereby controlling the quantities which are frequently involved in chemical process industries. After finishing the course the learners will also identify the instrument needed for measuring the quantity in different working atmospheres.

TE Chemical Engineering **Semester – V**

Instrumentation & Instrumental Analysis
(Course Content)

Teaching Scheme		**Examination Scheme**	
Theory	: 3 hours/ week	End Semester Examination (ESE)	: 80 Marks
Practical	: 2 hours/ week	Paper Duration (ESE)	: 03 Hours
		Internal Sessional Examination (ISE)	: 20 Marks
		Internal Continuous Assessment (ICA)	: 25 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Qualities of Measurement: The meaning of measurement, elements of instruments, Static Characteristics, Dynamic characteristic.
Expansion Thermometers: Introduction, Temperature scales, Constant volume gas
Thermometer, Bimetallic Thermometer, Industrial pressure spring Thermometer, Response of Thermometer.

UNIT-II **No. of Lect. – 08, Marks: 16**

Thermoelectric Temperature Measurement: Introduction, Simple thermocouple circuit,
Industrial thermocouples, Thermocouple lead wires, thermal wells, response of thermocouples.
Resistance Thermometer: Introduction, Industrial resistance-thermometer bulbs, Resistance thermometer element, Resistance thermometer circuit, RTD.

UNIT-III **No. of Lect. – 08, Marks: 16**

Radiation Temperature Measurement: Introduction, Black body conditions, Black body devices, Radiation receiving elements, Thermopile, Vacuum thermocouples, Radiation pyrometers , Lens type thermal radiation receiver , Photoelectric pyrometers, Photoelectric radiation receiver, Optical pyrometer.
Pressure and Vacuum Measurement: Introduction, Indicating pressure gage, Bellows pressure element, Useful ranges of absolute pressure measuring gages, McLeod vacuum gage.
Measurement of Pressure in Corrosion Fluids: The steam gage siphon, Diaphragm seal in Pressure measurement, Liquid seal in pressure measurement, Response of mechanical pressure gages.

UNIT-IV **No. of Lect. – 08, Marks: 16**

Measurement of Level: Float and tape liquid level gage, Float & shaft liquid level unit, Level measurement in pressure vessels, Gamma ray method, Ultrasonic method & resistive method.
Introduction, Theory, Instrumentation, advantages, and Application of: pH measurement, Refractrometry, Potentiometry, colourometry, Flame photometry, and Conductometric titrations.

UNIT-V **No. of Lect. – 08, Marks: 16**

Introduction, Theory, Instrumentation, Advantages and Application of: Gas chromatography, Thin layer chromatography, Paper chromatography, HPLC.
Introduction, Theory, Instrumentation, Advantages and Application of: Infrared spectroscopy, Ultraviolet spectroscopy, Mass spectroscopy, NMR spectroscopy.

Textbooks:

1. D.P.Eckman, Industrial Instrumentation, Willey Eastern Ltd., New Delhi.
2. Dr.B.K.Sharma, Instrumentation methods of chemical analysis, Goel Publishing House, Meerut, U.P.
3. Gurdeep Chatwal and Sham Anand, Instrumental methods of Chemical analysis, Himalaya Publication House, Mumbai.

References:

1 Nakra B.C. and K.K. Chaudhary, Instrumentation Measurement & Analysis, Tata – McGraw Hill, New Delhi.
2 Patranabis D. Industrial Instrumentation, Tata – McGraw Hill Publications, New Delhi.
3 V.P. Kudesia and S.S. Sawhaney, Instrumental methods of chemical analysis Pragati Prakashan, Meerut,U.P.

Course Outline

Mass Transfer- I	**MT-I**	**CHL 504**
Course Title	Short Title	Course Code

Course Description:

This course describes fundamental aspects of Mass Transfer operations, Mass Transfer theories and Mass transfer with phase change. The objective of the course is to apply the principles learned in science and engineering courses to the design of equipment for physical transformations, to design new processes and optimize existing processes.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	15	40	03

Prerequisite Course(S): Fluid Flow Operation, Applied Inorganic Chemistry, Process Calculations, Mechanical Operation, Applied Physical chemistry.

General Objectives:

1. To introduce the mass transfer principles.
2. To study various modes of mass transfer.
3. To study steady state and unsteady state diffusion.
4. To estimate diffusion coefficients.
5. To study concept of convective mass transfer coefficient.
6. To study gas liquid equilibrium and various gas liquid contactors.
7. To study design of cooling towers.
8. To study and design various gas absorption systems.
9. To study crystallization operation.
10. Analyze and design drying systems.

Learning Outcomes:

At the end of the course the students will learn about the basics of the mass transfer process, diffusion phenomenon in solids and fluids. They will be capable to demonstrate knowledge of mathematics, science and engineering principles. Students also will be capable of providing a sound process design of various equipments used in humidification, gas absorption/stripping, crystallization and drying operation.

TE Chemical Engineering **Semester – V**

Mass Transfer-I
(Course Content)

Teaching Scheme		**Examination Scheme**	
Theory	: 3 hours/ week	End Semester Examination (ESE)	: 80 Marks
Practical	: 4 hour/ week	Paper Duration (ESE)	: 03 Hours
		Internal Sessional Examination (ISE)	: 20 Marks
		Internal Continuous Assessment (ICA)	: 50 Marks
		End Semester Examination (ESE) (PR)	: 50 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Introduction to mass transfer operations, classification of mass transfer operations, diffusivity, Fick's law of diffusion.
Steady state molecular diffusion in fluid at rest, molecular diffusion in gases and liquids, multicomponent mixture diffusion, Maxwell's law of diffusion, diffusion in solids, unsteady state mass transfer.

UNIT-II **No. of Lect. – 08, Marks: 16**

Eddy (turbulent) diffusion, relation between mass transfer coefficients. Mass transfer coefficient in laminar and turbulent flow, theories of mass transfer, Equilibrium for mass transfer process: Local two phase mass transfer, Local overall mass transfer coefficient, Use of local overall coefficient.

UNIT-III **No. of Lect. – 08, Marks: 16**

Equipments for gas liquid operation.
Material balances for steady state co current, countercurrent, cross flow cascade, counter flow cascade.
Introduction to humidification: vapor liquid equilibrium, humidification terms, Determination of humidity, humidification and dehumidification, cooling towers.

UNIT-IV **No. of Lect. – 08, Marks: 16**

Introduction to gas absorption operation, equilibrium solubility of gases in liquids.
Material balance for one component transferred in countercurrent flow and co current flow, countercurrent multistage operation, one component transferred .Absorption with chemical reaction
Different absorption operation equipments (plate tower, packed tower, venturiscrubber)

UNIT-V **No. of Lect. – 08, Marks: 16**

Introduction to crystallization, Growth and properties of crystals, Effect of impurities in crystallization, Effect of temperature on solubility, Fractional crystallization, Caking & yield of crystals, Different type of crystallizers.

Introduction to drying operation, rate of drying, mechanism of moisture movement during drying, drying equipments, different methods of drying.

Textbooks:

1 Coulson & Richardson Chemical Engineering (Vol. I), Butterworth-Heinmann (Elsevier) (Sixth Edition).
2 Coulson & Richardson Chemical Engineering (Vol. II), Butterworth-Heinmann (Elsevier) (Fifth Edition).
3 R.E.Treybal , Mass transfer operation ,McGraw Hill Book Company, (Third Edition).

References:

1 Christie J.Geankoplis, Transport Processes & Unit Operations, Prentice Hall Inc.
2 Coulson & Richardson Chemical Engineering (Vol.IV), Butterworth-Heinmann (Elsevier).
3 Coulson & Richardson Chemical Engineering (Vol.V), Butterworth-Heinmann (Elsevier).

Course Outline

Industrial Economics & Management	**IEM**	**CHL 505**
Course Title	Short Title	Course Code

Course Description:

This course provides basic understanding about importance of economics and economic system and its contribution in the technological development. The course intents to develop managerial skill and enhance decision making power for providing economically viable products.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**03**	**15**	**40**	**03**

Prerequisite Course(s): -- Soft Skills – I, Soft Skills - II

General Objective:

1. To understand nature & scope of economics, and to Study different economic systems.
2. To understand demand & supply schedule, markets & market forms.
3. To understand concept, factors & measurement of national income:
4. To study various types of banks & their role in economic development.
5. To study principles & functional areas of management.
6. To study concepts of marketing, and sales management.
7. To study concepts of personnel management.
8. To study concepts of purchasing and materials management.
9. To understand importance of leadership qualities in an organization.
10. To understand importance of motivation and communication.

Learning Outcomes:

The students will be able to understand and apply the principle of economics along with science, engineering and technology, and will contribute to the profitable growth of industry. The study of various economic systems will help the students to share responsibilities and will make them able to work effectively in diverse, multicultural environments. The students will demonstrate ability to work in multidisciplinary team and will display communication skills. The students will display ability to design, develop, implement, and improve integrated systems that include people, materials, information, equipment, and energy and will provide engineering solutions in a global, economic, environmental, and societal context.

TE Chemical Engineering **Semester – V**

Industrial Economics & Managment
(Course Content)

Teaching Scheme		**Examination Scheme**	
Theory	: 3 hours/ week	End Semester Examination (ESE)	: 80 Marks
		Paper Duration (ESE)	: 03 Hours
		Internal Sessional Examination (ISE)	: 20 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Economics, Nature & Scope of economics, Usefulness of Economics to engineering organizations, Economy: Types, Problems and Functioning, Basic Terms & Concepts used in Economics. Principal Economic system: Socialism, Capitalism, Mixed Economy.
Utility analysis of Demand, Demand & Law of Demand, Elasticity of Demand.

UNIT-II

No. of Lect. – 08, Marks: 16

Factor of Production, Land, Labor, Capital & Organization, Forms of Business Organizations, Laws of returns. Market & Market Forms, Price determinations: Perfect & Imperfect Competitions
National Income: Concept, Factors & Measurement, Keynesian Model.

UNIT-III **No. of Lect. – 08, Marks: 16**

Types of Banks & Role of Banks in economic development, Theories of Money. Sources of Finance: Shares & Debentures & other Sources of Finance.
Management Concept: Difference & Relationship between Management, Administration.
Principles, Process, Functions, Levels & Types of Management. Management by Objectives.

UNIT-IV **No. of Lect. – 08, Marks: 16**

Marketing Research and Techniques, Sales Management, Function of sales Manager, Salesman's quota. Marketing Management, Duties of Marketing Manager.
Personnel Management: Manpower Planning, Recruitment, selection & Training, Job Evaluation Methods, Merit Rating, Industrial Safety.

UNIT-V **No. of Lect. – 08, Marks: 16**

Purchasing Techniques and Purchasing Cycle, Materials Management its Functions, Importance of Materials Management,
Leadership in Business and Qualities, Motivation, Industrial Relations, Industrial Disputes. Communication: Principles, Types, Characteristics and Role of Communication in Management.

Textbooks:

1 Dewett & Varma, Elementary Economic Theory, S. Chand & Company Ltd New Delhi
2 O.P.Khanna, Industrial Engineering & Management, Dhanpat Rai Publications (P) Ltd New Delhi

References:

1 Banga & Sharma, Industrial Engineering Science & Management, Khanna Publishers New Delhi.
2 C.R.Basu, Business Organisation and Management, Tata McGraw Hill Publishing Company Ltd. New Delhi.

Course Outline

Lab Process Heat Transfer	**Lab PHT**	**CHP 506**
Course Title	Short Title	Course Code

Course Description:

This course illustrates practical aspect of heat transfer and its application to chemical engineering. It describes various modes of heat transfer and mechanism responsible for heat transmission. It helps the students to understand various equipments used in industries.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**15**	**16**	**01**

Prerequisite Course(S): Engineering Physics I&II, Engineering Chemistry I&II, Fluid Flow Operation.

General Objectives:

1. To develop the students' skills in applying differential equations for describing steady and transient heat transfer problems.
2. To develop students' skills in applying mechanical design approaches for thermal engineering components and heat transfer systems.
3. To provide the students with fundamental theoretical concepts and practical analysis skills associated with convective heat transfer including external and internal heat transfer configurations.
4. To provide the students with fundamental theoretical concepts and practical analysis skills associated with radiation heat transfer.

Learning Outcomes:

Students will demonstrate an ability to mathematically describe different practical heat transfer problems including governing equations together with boundary and initial conditions. Students will demonstrate an ability to solve the heat transfer problems for a range of practically important simplified configurations and symmetries, including one dimensional problem in cylindrical and spherical coordinates. Students will learn using generic data processing software to solve heat transfer problems.

<u>Course Content:</u>

(Any eight experiments from the following)

List of Experiments:

1 Determination of thermal conductivity of metals rod.
2 To determine heat flux through composite walls.
3 Determination of heat transfer coefficient in natural/ forced convection.
4 Determination of temperature distribution, fin efficiency in natural and forced convection.
5 Determination of emissivity of a test surface.
6 Determination of Stefan Boltzmann constant..
7 Determinations of log mean temperature difference and over all heat transfer coefficient of Parallel and counter flow heat exchanger.
8 Heat transfer through lagged pipe.
9 Study of heat transfer in evaporator.
10 Study and calculate the efficiency of a fin in natural convection.
11 To find out overall heat transfer coefficient by drop wise and film wise condensation.

References for Practicals:

Prof.Addul Matheen, Heat Transfer laboratory Manual (Second Edition), University Science Press.

Course Outline

Lab Instrumentation & Instrumental Analysis	**Lab IIA**	**CHP 508**
Course Title	Short Title	Course Code

Course Description:

This course describes the importance of instrumentation in the field of chemical engineering. By instrumental analysis, different materials and their properties can be studied and measured which provides characterization of raw materials and finished products from the industry.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**15**	**16**	**01**

Prerequisite Course(S): Lab Applied Inorganic Chemistry.

General Objectives:

1. To expertise the students in handling laboratory instruments with due care & precautions.
2. To train the students in calibration of instruments.
3. To develop analytical skills in students through instrumental techniques.

Learning Outcomes:

Students completing this laboratory course will learn due care and precautions in handling measuring instruments. Students will also have proficiency in measuring different properties of samples and their concentration with the aid of instruments. They will also expertise in chromatographic techniques for analyzing the samples.

Course Content:

(Any eight experiments from the following)

List of Experiments:

1. To study the response of bimetallic thermometer.
2. To study the response of thermocouple.
3. To measure the pH of given solution.
4. To measure the conductance of given solution.
5. To investigate the conductometric titration of strong acid and strong base.
6. To determine concentration of given solution by colorimeter.
7. To study separation of components present in given mixture by thin layer chromatography.
8. To study separation of components present in given sample by paper chromatography.
9. To determine refractive index of liquids by Abbey's refractometer.
10. To identify the given sample by FTIR.

References for Practicals:

Designed Standard College Laboratory Manual and Instruction Manuals of the Laboratory Equipment Suppliers.

Course Outline

Lab Mass Transfer-I	**Lab MT-I**	**CHP 508**
Course Title	Short Title	Course Code

Course Description:

This course describes how practically Mass Transfer takes place within and during inter-phase transfers. It aims to understand, operate various equipments and gain practical knowledge of diffusion phenomenon through experimentation.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**04**	**15**	**32**	**02**

Prerequisite Course(S): Lab Applied Inorganic Chemistry, Lab Applied Physical Chemistry.

General Objectives:

1. To reinforce concepts of Mass Transfer operation through experimentation.
2. To analyze & interpret data obtained during performance of the experiment for understanding the Mass Transfer lecture course.
3. To improve technical skills & ability by formulating a solution through experimentation.

Learning Outcomes:

Students will understand types of diffusion and the mechanism of diffusion. Students will demonstrate an ability to solve the mass transfer problems by calculating the Mass Transfer Coefficient and will use practical considerations for designing and operation of mass transfer operations/equipments.

Course Content:

(Any eight experiments from the following)

List of Experiments:

1. Diffusion in Still Air: To estimate mass transfer coefficient for given system at room temperature.
2. Liquid – Liquid Diffusion: To determine diffusion coefficient for given system as function of concentration.
3. Solid – Liquid Diffusion: To determine mass transfer coefficient for dissolution of given system without chemical reaction.
4. Solid in Air Diffusion: To calculate mass transfer coefficient for vaporization of given solid in air using packed bed.
5. Wetted Wall Column: To determine mass transfer coefficient for air – water system.
6. Cooling Tower: To determine volumetric mass transfer coefficient for air – water system.
7. Absorption in Packed Column: To find mass transfer coefficient of given system.
8. Crystallization: To determine percentage yield of crystallization without and with seeding.
9. Natural Drying: To obtain drying curve for batch drying operation.
10. Fluidized Bed Dryer: To determine the rate of drying and to obtain mass transfer coefficient for the given material.

References for Practicals:

Designed Standard College Laboratory Manual and Instruction Manuals of the Laboratory Equipment Suppliers.

Course Outline

Lab Data Analysis & Interpretation	**Lab DAI**	**CHP 509**
Course Title	Short Title	Course Code

Course Description: The laboratory course intended to develop ability amongst the student to understand qualitative and quantitative techniques and to evaluate and analyze the data obtained by these techniques. This course will be a thorough and reasonably comprehensive introduction to understanding, critically evaluating, conducting, and writing about analyses for most studies.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	01	15	10	01
Laboratory	02	15	16	01

Prerequisite Course(S): Engineering Mathematics I, II and III, Soft Skills- I, II and III, LAB Computer Applications.

General Objectives:

1. To learn and use the qualitative and quantitative techniques in engineering profession.
2. To prepare and present various reports using standard procedure adopted.
3. To demonstrate the designing, computational abilities required to prepare a technical report.

Learning Outcomes:

The students after completing the course will be able to coordinate, analyze and interpret data, and work in groups. It will develop an ability to apply classroom concepts in report writing along with importance of concepts of accuracy and precision. The students will develop an ability to communicate specialized results into a standard formats. The students will demonstrate interpersonal skills required to lead and will recognize the importance of life-long learning.

TE Chemical Engineering **Semester – V**

Lab Data Analysis & Interpretation
(Course Content)

Teaching Scheme
Theory : 1 hours/ week
Practical : 2 hours/ week

Examination Scheme
Internal Continuous Assessment (ICA): 50 Marks

Theory:

Qualitative Data: Collection of data, Open-ended questions and written comments on questionnaires, Testimonials, Interviews, Focus groups, Logs, Journals, Diaries ,Observations, Documents, Reports, News Articles, Stories, Case studies.
Quantitative Data: Tabulation of data, Count (frequencies), Percentage, Mean, Mode, Median, Range, Standard deviation, Variance, Ranking, Cross tabulation.

Lab Work: (Any Eight from the following)

1. To design questionnaire.
2. To write Analysis Report for the questionnaire.
3. To prepare and write sample Industrial Reports/Seminar Reports/Case Studies.
4. To write Literature review using Websites, Magazines, Books, Reports, Surveys, Journals, Research Papers, Research work on PhD .etc.
5. To prepare and write sample Project Reports with references in standard format.
6. To Prepare Excel Chart for Count (frequencies).
7. To Prepare Excel Chart for Percentage.
8. To Prepare Excel Chart showing Mean, Mode, and Median.
9. To Prepare Excel Chart for Range, Standard deviation.
10. To Prepare Excel Chart showing Variance, Ranking.

Reference Books:

1. C.R. Kothari (2008), Research Methodology- Methods and Techniques, New Age International Publishers, New Delhi (2nd Revised edition).
2. S.C.Gupta (2007), Fundamentals of statistics, Himalaya Publishing House (6th Revised & Enlarged edition)

Course Outline

Industrial Training/EDP/Special Study — **IT/EDP/SS** — **CHP 510**

Course Title — Short Title — Course Code

Course Description:

The course aims to understand industrial applications of chemical engineering and management principles. It attempts to investigate current status and trends adopted in actual practice. The reason to undergo this course is to make aware the students about real life working environment and practice.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**--**	**--**	**--**	**2**

Prerequisite Course(S): F.E. Chemical Engineering & S.E. Chemical Engineering

General Objectives:

1. To develop technical and managerial skills.
2. To understand various problems of industry and society.
3. To develop competent, patriotic engineers for societal development.

Learning Outcomes:

At the end of this course, students will be able to understand real life working environment and practice the right work attitude to solve industrial problems and can suggest possible solutions. The students will be able to gain new knowledge, skills and aware of current technologies. The students will be able to communicate both orally & in writing on their work experience and will be able to know safety measures to be taken to avoid industrial hazards.

Course Content:

Industrial Training:

Every student has to undergo industrial/practical training for a minimum period of two weeks during summer vacation between fourth semester and fifth semester.

• The industry in which practical training is taken should be a medium or large scale industry.

• The paper bound report on training must be submitted by every student, along with a certificate from the company where the student has undergone industrial training.

• The report on industrial training should be detailed one.

• Maximum number of students allowed to take training in a company should be five. Every student should write the report separately.

In case if a student is not able to undergo industrial training, then such student should prepare any one of the following report

A. EDP (Engineering Development Program)

A detailed study of problem faced by any chemical or allied engineering industry based on recent topic from reported literature.

- The paper bound report must be submitted by every student, along with a certificate from the company where the student approached for study.
- The report should be detailed one.
- Maximum number of students allowed to take training in a company should be three. Every student should write the report separately.

B. Special Study

A case study defining problem related to society and perspective chemical engineering based solution based on study material available through various resources.

- The paper bound report must be submitted by every student, along with a certificate from the company/authority where the student approached for study.
- The report should be detailed one.
- Maximum number of students allowed to take training in a company should be three. Every student should write the report separately.

Every student shall be required to present a seminar in presence of Panel of teachers constituted by the Head of Department in consultation with the Principal. The evaluation shall be based on:

(a) Report: 10 marks

(b) Seminar Presentation: 10 marks

(c) Viva-Voce at the time of Seminar: 05 marks

Total 25 marks

T.E. Chemical Engineering

Semester-VI

Third Year Chemical Engineering

Faculty of Engineering and Technology

North Maharashtra University, Jalgaon

Course Outline

Process Equipment Design-II	**PED-II**	**CHL 601**
Course Title	Short Title	Course Code

Course Description:

This course describes how to use appropriate terminology of process equipment design. It illustrates the application of scientific principles associated with process equipment design.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	15	40	03

Prerequisite Course(s): Process Equipment Design-I, Process Heat Transfer, Mass Transfer-I

General Objective:

1. To study the process design of shell and tube heat exchanger.
2. To study the process design of calendria type evaporator.
3. To study the process design of crystallizers.
4. To study the process design of reaction vessel.
5. To study the process design of rotary dryer.
6. To study the process design of vertical tall vessel.
7. To study the process design of sieve tray column.
8. To study the process design of thick wall high pressure vessel.
9. To study the process design of bubble cap tray distillation column.
10. To study the mechanical design of turbine agitator.

Learning Outcomes:

At the end of course students exhibit how to use basic standard equipment symbols in chemical process industry and in a competitive manner how to design shell and tube heat exchanger, calendria type evaporator, crystallizers, reaction vessel, rotary dryer, vertical tall vessel, sieve tray column, thick wall high pressure vessel, bubble cap tray distillation column and turbine agitator with safety requirements of equipments. Students demonstrate the ability to perform the task by identifying, formulating, designing and providing the solution to various chemical engineering problems, understanding of professional and ethical responsibilities formally and informally, show the capacity of designing the product to meet economical and societal requirements and understanding about the environmental issues and will provide solutions for green and clean technologies.

TE Chemical Engineering **Semester – VI**

Process Equipment Design-II (Course Content)

Teaching Scheme		**Examination Scheme**	
Theory	: 3 hours/ week	End Semester Examination (ESE)	: 80 Marks
		Paper Duration (ESE)	: 03 Hours
		Internal Sessional Examination (ISE)	: 20 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Process Design of Heat Exchanger: Introduction, Types of Heat Exchanger, Process Design of Shell and Tube Heat Exchanger.
Process Design of Evaporator: Introduction, Types of Evaporator, Methods of Feeding of Evaporator, Design of Calendria type Evaporator.

UNIT-II

No. of Lect. – 08, Marks: 16

Process Design of Reaction Vessels: Introduction, Materials of Construction, Agitation, Classification of Reaction Vessels, Heating Systems, Design of Reaction Vessel.
Crystallizer Design: Introduction, Types of Crystallizers, Design of crystallizers.

UNIT-III **No. of Lect. – 08, Marks: 16**

Process Design of Rotary Dryer: Introduction, Types of Dryer, Design of Rotary Dryer.
Design of Tall Vessels: Introduction, The Axial Stresses Due To Dead Loads, The Axial Stresses Due To Pressure, Longitudinal Bending Stresses due to Dynamic Loads, Design of Distillation (Tall) Column (Tower).

UNIT-IV **No. of Lect. – 08, Marks: 16**
Design of Sieve Tray for Distillation Column.
Design of Thick Walled High Pressure Vessel.

UNIT-V **No. of Lect. – 08, Marks: 16**
Design of Bubble Cap Tray for Distillation Operation.
Agitators: Introduction, Types of Agitators, Baffling, Power Requirements, Design of Turbine Agitator.

Textbooks:

1. B.C. Bhattacharya, Introduction to Chemical Equipment Design (Mechanical Aspects), CBS Publisher and Distributors, New Delhi.
2. M.V.Joshi and V.V. Mahajani Process Equipment Design, Macmillan Publishers India Ltd. (Fourth Edition).
3. Coulson & Richardson Chemical Engineering (Vol. VI), Butterworth-Heinmann (Elsevier) (Sixth Edition).

4 R.E.Treybal, Mass Transfer Operations, McGraw Hill, New Delhi
5 G.K.Roy, Solved Problems In Chemical Engg., Khanna Publications, NewDelhi.

References:

1 S.D. Dawande, Process Equipment Design (Vol. I & II), Denett & Co., Nagpur.
2 J.H.Perry, Chemical Engineer’s Hand Book, McGrawhill, New Delhi.
3 Lloyed E.Brownell, Edwin H.Young, Process Equipment Design, John Wiley & Sons

Course Outline

Chemical Reaction Engineering-I	**CRE-I**	**CHL 602**
Course Title	Short Title	Course Code

Course Description:

This course applies the concepts of reaction rate, stoichiometry and equilibrium to the analysis of chemical reacting systems. It derives rate expressions from reaction mechanisms and equilibrium or steady state assumptions, design of chemical reactors via synthesis of chemical kinetics, mass and energy balances.

	Hours per Week	**No. of Weeks**	**Total Hours**	**Semester Credits**
Lecture	**03**	**15**	**40**	**03**

Prerequisite Course(s): Chemical Engineering Materials, Fluid Flow Operation, Applied Organic Chemistry, Applied Physical Chemistry, Process Calculations, Process Heat Transfer, Mass Transfer-I.

General Objective:

1. To study the chemical reaction, rate of reaction, order and molecularity of reaction, rate constant.
2. To study the activation energy and temperature dependency of rate equation.
3. To study the constant volume batch reactor and variable volume batch reactor.
4. To study the integral and differential method of analysis of data.
5. To study the ideal batch reactor, mixed flow reactor and plug flow reactor.
6. To study the space time and space velocity, holding time and space time for batch, mixed and plug flow reactors.
7. To study the reaction in parallel, series, Series parallel reaction.
8. To study the Optimum temperature progression for single reaction, Isothermal, adiabatic, non adiabatic operation.
9. To study the residence time distribution of fluid in vessel.
10. To study the Concept of micro and macro mixing.

Learning Outcomes:

Students will be able to understand the basic concepts of chemical reaction engineering. Students will be able to understand the concept of micro and macro mixing & residence time distribution of fluid in vessel. Students will be capable of identifying the calculation and solutions to chemical reaction engineering problems.

TE Chemical Engineering **Semester – VI**

Chemical Reaction Engineering-I
(Course Content)

Teaching Scheme		**Examination Scheme**	
Theory	: 3 hours/ week	End Semester Examination (ESE)	: 80 Marks
Practical	: 2 hours week	Paper Duration (ESE)	: 03 Hours
		Internal Sessional Examination (ISE)	: 20 Marks
		Internal Continuous Assessment (ICA)	: 25 Marks
		End Semester Examination (ESE) (OR)	: 25 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Introduction to chemical reaction engineering: Review of chemical reaction equilibrium, Classification of chemical reaction, rate of reaction, order and molecularity of reaction, rate constant, Temperature dependent term of rate equation, comparison of theories, Activation energy and temperature dependency, rate of reaction predicted by theories, Reaction mechanism.

UNIT-II

No. of Lect. – 08, Marks: 16

Collection & interpretation of kinetic data, Constant volume batch reactor, integral and differential method of analysis of data, Variable volume batch reactor , integral and differential method of analysis of data, The search for rate equation.

UNIT-III **No. of Lect. – 08, Marks: 16**

Ideal batch reactor ,mixed flow reactor ,plug flow reactor, space time and space velocity, holding time and space time for batch , mixed and plug flow reactors, comparison in mixed and plug flow reactors, Combined flow system, Recycle reactor, Autocatalytic reaction.

UNIT-IV **No. of Lect. – 08, Marks: 16**

Introduction to multiple reactions: Reaction in parallel, Reaction in series, Series parallel reaction. Optimum temperature progression for single reaction, Isothermal, adiabatic, non adiabatic operation. Product distribution and temperature for multiple reactions.

UNIT-V **No. of Lect. – 08, Marks: 16**

Residence time distribution of fluid in vessel, Conversion directly from tracer information, Models for non-ideal flow, Dispersion models, Tank in series model, Concept of micro and macro mixing.

Textbooks:

1. Octave Levenspiel, Chemical Reaction Engineering, John Wiley and Sons.
2. J.M. Smith, Chemical Engineering Kinetics, McGraw Hill
3. H.Scott Fogler, Elements of Chemical Reaction Engineering, Prentice Hall New Jersey.

References:

1. Coulson & Richardson Chemical Engineering (Vol. III), Butterworth-Heinmann (Elsevier) (Sixth Edition).
2. Coulson & Richardson Chemical Engineering (Vol. V), Butterworth-Heinmann (Elsevier) (Sixth Edition).
3. S.D. Dawande, Principles of Reaction Engineering, Denett & Co., Nagpur.
4. Lanny D. Schimdt , Chemical Reaction Engineering, Oxford University Press.

Course Outline

Chemical Engineering Thermodynamics	CET	CHL 603
Course Title	Short Title	Course Code

Course Description:

The purpose of this course is to introduce chemical engineering thermodynamics and its importance to study the phase behavior and properties of pure fluids with applications. The course covers the application of the first and second law of thermodynamics to non-flow and steady-flow processes.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	15	40	03

Prerequisite Course(s): Process Calculations, Applied Physical Chemistry, Process Heat Transfer.

General Objective:

1. To study the laws of thermodynamics.
2. To study equations of state.
3. To study concept of entropy.
4. To study Vapour-Liquid Equilibria (VLE) and test of VLE data.
5. To study phase equilibria for single component system.
6. To study the determination of partial molar quantities, fugacity and fugacity coefficient.
7. To study properties of solutions.
8. To study phase equilibrium.
9. To study chemical reaction equilibria.
10. To study and construct pressure-composition & boiling point diagrams.

Learning Outcomes:

Students will execute knowledge of basic science and engineering after study of the laws of thermodynamics and state functions. Students will be capable of identifying, formulating, designing and providing the solution to chemical engineering problems by study of calculations of entropy changes, Vant' Hoff equation. Students will display the research ability by designing, conducting, interpreting and analyzing to experimental data for preparing reports by study of the thermodynamic consistency test of VLE data.

TE Chemical Engineering **Semester – VI**

Chemical Engineering Thermodynamics (Course Content)

Teaching Scheme		**Examination Scheme**	
Theory	: 3 hours/ week	End Semester Examination (ESE)	: 80 Marks
		Paper Duration (ESE)	: 03 Hours
		Internal Sessional Examination (ISE)	: 20 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Introduction to the subject, The laws of Thermodynamics, Cyclic rule, Coefficient of Thermal Expansion, Compressibility Coefficient ,First Law of Thermodynamics : Basic Laws, Law of corresponding state, Heat Capacities, Enthalpy as a function of Temperature & Pressure, Joule-Thomson Coefficient , Relation between C_p and C_v, Thermodynamic relations, Generalized Equation of State, Redlich-kwong equation of state, Soave-Redlich-Kwong equation of state.

UNIT-II

No. of Lect. – 08, Marks: 16

The Second Law of Thermodynamics, Mathematical Treatment of Entropy Concept, Combined form of First and Second Law of Thermodynamics, Thermodynamic Relations based on Second Law of Thermodynamics, Calculations of Entropy Changes, Third Law of Thermodynamics.

UNIT-III **No. of Lect. – 08, Marks: 16**

Partial Molar Quantities: General Aspects, Determination of Partial Molar Volume and Enthalpy, Fugacity and Fugacity Coefficient, Fugacity coefficient through equation of state, Fugacity coefficient through virial coefficient correlation.
Ideal solution: General Aspects, Phase equilibrium: General Aspects, Gibbs-Duhem Equation, Gibbs-Duhem-Margules Equation, Application of Gibbs-Duhem Equation.

UNIT-IV **No. of Lect. – 08, Marks: 16**

Vapour-Liquid Equilibria (VLE): Basic equations for VLE, Reduction of VLE data, Excess Gibbs free energy Model, Margules Equation & Van Laar Equation, Thermodynamic consistency test of VLE data Phase Equilibria for Single Component System: Gibbs-Helmholtz Equation, The Clapeyron Equation, Clausious-Clapeyron Equation, Application of Clapeyron Equation.

UNIT-V **No. of Lect. – 08, Marks: 16**

Chemical Reaction Equilibria: The criteria for chemical equilibrium, Equilibrium constant, Law of chemical equilibrium, Relations between equilibrium constant, Homogeneous gaseous equilibria, Temperature dependence of the equilibrium constant (The Van't Hoff Equation), Integrated form of the Van't Hoff equation, Pressure dependence of the equilibrium constant.
Applications of Phase Equilibrium in Ideal Solutions: To construct pressure-composition and boiling point diagrams.

Textbooks:

1. K.V. Narayanan, A Text book of Chemical Engineering Thermodynamic, Prentice Hall India Pvt. Ltd., New Delhi.
2. R.R.Rastogi and R.R.Mishra, An Introduction to Chemical Thermodynamics, Vikas Publishing House Pvt.Ltd, New Delhi.

References:

1. B.G.Kyle, Chemical and Process Thermodynamics, Prentice Hall India Pvt. Ltd., New Delhi.
2. G.N. Pandey and J.C.Chaudhari, Chemical Engineering Thermodynamics, Khanna Publishers, Delhi.
3. J.M.Smith, H.C.Vanness, M.M.Abbott Introduction to Chemical Engineering Thermodynamics, 5^{th} edition, McGraw Hill International Edition.
4. Y.V.C. Rao, Chemical Engineering Thermodynamics, University Press (INDIA) Ltd., Orient Longman Ltd., Hyderabad.

Course Outline

Mass Transfer-II	**MT-II**	**CHL 604**
Course Title	Short Title	Course Code

Course Description:

The purpose of this course is to introduce the fundamental concepts, principles to various separation processes such as distillation, liquid- liquid extraction, solid liquid extraction, adsorption and ion exchange. The course illustrates new techniques of separation such as membrane separations and their possible areas of industrial application.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**03**	**15**	**40**	**03**

Prerequisite Course(s): Fluid Flow operation, Process Calculations, Mass Transfer-I, Process Heat Transfer

General Objective:

1. To study the vapor liquid equilibrium and importance of relative volatility in distillation.
2. To study different methods of distillation.
3. To design various distillation equipments.
4. To study liquid-liquid extraction process, with material balances.
5. To study and design stage contact and continuous contact type extractors.
6. To study adsorption operation and various adsorption isotherms.
7. To study ion exchange operation and its application in industry.
8. To study mass transfer in leaching operation.
9. To study and design leaching operation.
10. To study different membrane separation processes.

Learning Outcomes:

The students will develop ability to apply mass transfer principles to various phase equilibrium based separation processes viz. perform graphical calculations for binary distillation. The students will understand and apply process design principles for large scale industrial separators – process design of liquid-liquid; solid liquid extraction, columns and thus will be capable of identifying, formulating, designing and providing the solution to chemical engineering problems. The students will develop understanding of implications of factors affecting column operation, and design, effect of reflux ratio, feed conditions, and flow regimes and thus will demonstrate the caliber of product design according to the standards. The students will understand the concept of membrane separation and thus will have an understanding about the environmental issues and will provide solutions for green and clean technologies.

TE Chemical Engineering **Semester – VI**

Mass Transfer-II
(Course Content)

Teaching Scheme		**Examination Scheme**	
Theory	: 3 hours/ week	End Semester Examination (ESE)	: 80 Marks
Practical	: 4 hour/ week	Paper Duration (ESE)	: 03 Hours
		Internal Sessional Examination (ISE)	: 20 Marks
		Internal Continuous Assessment (ICA)	: 50 Marks
		End Semester Examination (ESE) (PR)	: 50 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Introduction to distillation process, Vapor liquid equilibrium, The methods of distillation (Binary mixture), - differential , flash, azeotropic, extractive, low pressure, steam distillation, batch rectification. Condition for varying overflow in non- ideal system (Binary), Multi component mixture.
The fractionating column, Continuous rectification for binary system. Equipments for Distillation.

UNIT-II

No. of Lect. – 08, Marks: 16

Multistage (Tray) towers: Bubble cap trays, Sieve trays, Valve trays. Tray efficiencies, concept of reflux, minimum reflux ratio, optimum reflux, total reflux. Lewis Sorrel, McCabe Thiele, and Ponchon Savarit methods for multistage operations.
Packed towers for distillation, Types of Packing's, NTU, HTU, HETP concept and calculations.

UNIT-III **No. of Lect. – 08, Marks: 16**

Introduction to extraction process, Liquid equilibria, Material balances for stage wise contact methods, Extraction with reflux, Fractional extraction, Stage contact and continuous contact type extractors.

UNIT-IV **No. of Lect. – 08, Marks: 16**

Introduction to adsorption operation, Type of adsorption operation, Nature of adsorbents, Adsorption equilibria, Adsorption of vapor, gas mixture and liquids, Material balances for stage wise operation, Continues contact process for adsorption, Unsteady state fixed bed adsorption, Principle of ion exchange operation, Equilibria for ion exchange operation, Rate of ion exchange operation, Application of ion exchange operation.

UNIT-V **No. of Lect. – 08, Marks: 16**

Introduction to leaching operation, Mass Transfer in leaching operation, Calculation of stages for different processes, Graphical method for calculation of number of stages counter current washing process, Equipments for leaching operation.

Introduction to membrane separation process, Different Types of membrane separation process, (Ultrafiltration, Reverse Osmosis, Dialysis, Electro Dialysis, Pervaporation), General membrane equation, Liquid membrane.

Textbooks:

1. Coulson & Richardson Chemical Engineering (Vol. II), Butterworth-Heinmann (Elsevier) (Fifth Edition).
2. R.E.Treybal , Mass transfer operation ,McGraw Hill Book Company, (Third Edition).

References:

1. Christie J.Geankoplis, Transport Processes & Unit Operations, Prentice Hall Inc.
2. Coulson & Richardson Chemical Engineering (Vol.V), Butterworth-Heinmann (Elsevier).

Course Outline

Process Engineering Economics & Costing	PEEC	CHL 605
Course Title	Short Title	Course Code

Course Description:

The purpose of this course is to understand important principles and present economic principles and their applications in the field of Chemical Engineering. It is a collective effort of Economics and Management along with Chemical Engineering field, to present optimum engineering solutions by developing cost effective products and processes.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**03**	**15**	**40**	**03**

Prerequisite Course(s): IEM

General Objective:

1. To introduce concepts of process economics and importance in engineering decisions.
2. To study scales of production, selection of plant capacity, plant location.
3. To study present economic scenario and status of chemical industries.
4. To study factors affecting investment and production cost.
5. To study methods of estimating capital investment.
6. To study various interests.
7. To study various types of taxes and tax returns and types of insurances and legal responsibility.
8. To estimate depreciation and study replacement analysis.
9. To study methods of profitability analysis.
10. To study break even analysis.

Learning Outcomes:

At the end of the course students will be capable of understanding various factors responsible for establishing a chemical process industry. The students will be capable of applying their process engineering knowledge by allocating resources to obtain maximum profitability. The students will be capable of applying management techniques by a systematic study of economic system of the country to engineering problems. The students will exhibit their ability to identify, formulate, and solve engineering problems with the economic consideration.

TE Chemical Engineering **Semester – VI**

Process Engineering Economics & Costing
(Course Content)

Teaching Scheme		**Examination Scheme**	
Theory	: 3 hours/ week	End Semester Examination (ESE)	: 80 Marks
		Paper Duration (ESE)	: 03 Hours
		Internal Sessional Examination (ISE)	: 20 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Indian Chemical Industry, Current Status, Trends and Challenges ahead.
Scale of Production, Selection of Plant Capacity, Plant Location : Factors involved, Selection of Plant Site. Energy Gestation Period. Expansion, Diversification and Obsolescence. Scope for Standardization in Design and Production. Economics of Research and Development.

UNIT-II

No. of Lect. – 08, Marks: 16

Cost: Prime Cost, Overhead Cost, Total Cost, Standard Cost & Variances.
Cost Estimation: Factors Affecting Investment and Production Cost. Capital Investment, Fixed Investment and Working Capital .Estimating Equipment Cost By 6 /10 Factor Rule. Method of Estimating Capital Investment. Different Costs Involved in Total Product Cost. Computer Automization in Costing.

UNIT-III **No. of Lect. – 08, Marks: 16**

Interest and Investment Cost, Simple and Compound Interest, Nominal and Effective Rates of Interest, Continuous Interest, Present Worth, Ordinary Annuity, Perpetuities and Capital Costs.
Taxes and Insurances: Types of Taxes and Tax Returns. Types of Insurance and Legal Responsibility.

UNIT-IV **No. of Lect. – 08, Marks: 16**

Depreciation: Types of Depreciation, Service Life, Salvage Value, Present Value. Methods of Determining Depreciation, Single Unit and Group Depreciation. Causes of Obsolescence and Inadequacy.

UNIT-V **No. of Lect. – 08, Marks: 16**

Profitability: Mathematical Methods of Profitability Evaluation, Cash Flow Diagram, Alternative Investment, Replacement: Types and Factors.
Break Even Analyses, Balance Sheet, Pricing Issue Method and Income Statement.

Textbooks:

1. Max S. Peters, Klaus D. Timmerhaus, Ronald E. West, Plant Design and Economics for Chemical Engineers, McGraw Hill (Fifth Edition).
2. T.R. Banga and S.C.Sharma, Industrial Organization & Engineering Economics, Khanna Publishers, New Delhi (Twenty Fourth Edition).
3. O.P.Khanna, Industrial Engineering & Management, Dhanpat Rai Publications (P) Ltd. New Delhi (Revised Enlarged Edition).

References:

1. Dewett & Varma, Elementary Economic Theory: S. Chand & Company Ltd New Delhi.
2. James Riley Couper, (2003), Process Engineering Economics, CRC Press (Taylor & Francis Group).

Course Outline

Lab Chemical Reaction Engineering-I	**Lab CRE-I**	**CHP 606**
Course Title	Short Title	Course Code

Course Description:

The intent of this course is to help to understand concepts in chemical reaction engineering. This course describes experimental techniques for determining rate laws for chemical reactions, the mechanisms and theories of chemical reactions.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**15**	**16**	**01**

Prerequisite Course(S): Lab Applied Physical Chemistry.

General Objectives:

1. To introduce and study the multiple reactions and concept of residence time distribution.
2. To study various Models for non-ideal flow, concept of micro and macro mixing.
3. To study ideal batch reactor, mixed flow reactor, plug flow reactor.

Learning Outcomes:

Students will demonstrate the concepts of chemical reaction engineering using knowledge of basic Sciences and Mathematics. The students will be able to design various reactors such as Continuous Stirred Tank Reactor, Plug Flow Reactor, and Packed Bed Reactor by obtaining experimental data.

<u>Course Content:</u>

(Any eight experiments from the following)

List of Experiments:

1. To determine the reaction rate constant {k} for given reaction.(CSTR / BATCH / SEMIBATCH / PFR)
2. To determine the effect of temperature on reaction rate constant. .(CSTR / BATCH / SEMIBATCH / PFR)
3. To determine the activation energy {E} for the given reaction. .(CSTR / BATCH / SEMIBATCH / PFR)
4. To draw C [t], E [t] & F [t] curve and to calculate the mean residence time {tm} variance { σ^2 } and skew ness { S^3 } for plug flow reactor.
5. To draw C [t], E [t] and F [t] curve and to calculate the mean residence time {tm} variance { σ^2 } and skew ness { S^3 } for packed Bed reactor.
6. To study the cascaded CSTR
7. To draw C [t], E [t] and F [t] curve and to calculate the mean residence time {tm} variance { σ^2 } and skew ness { S^3 } for Annular reactor.
8. To study the kinetic in tubular flow reactor [coiled tube] for the given reaction.

References for Practicals:

Designed Standard College Laboratory Manual and Instruction Manuals of the Laboratory Equipment Suppliers.

Course Outline

Lab Mass Transfer-II	**Lab MT-II**	**CHP 607**
Course Title	Short Title	Course Code

Course Description:

This course aims to apply principle and theory of diffusion to various Mass Transfer operations. It helps to understand, operate various equipments and gain practical knowledge of Mass Transfer phenomenon through experimentation.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**04**	**15**	**32**	**02**

Prerequisite Course(S): Lab Applied Inorganic Chemistry, Mass Transfer-I, Lab Mass Transfer-I

General Objectives:

1. To impart design skills, both in analysis and synthesis.
2. To define driving potential for mass transfer as concentration gradient, and verify for various mass transfer operations.
3. To understand and develop process replica of experiments performed.

Learning Outcomes:

Students are able to understand the theoretical principles and practical considerations for design and operation of mass transfer operations, processes, and the engineering approaches to deriving the design equations for complex mass transfer operations. The students are able to design and predict the major process parameters in separation processes. The students can use and analyze experimental data to derive the kinetic and process parameters with simple computing techniques.

Course Content:

(Any eight experiments from the following)

List of Experiments:

1. Simple Distillation: To verify Rayleigh's equation for simple distillation.
2. To plot the vapor liquid equilibrium curve for a binary mixture.
3. Determination of HTU, HETP and NTU.
4. Ternary Diagram: To construct ternary diagram for given system.
5. Tie Lines.
6. Liquid – Liquid Extraction: To study and determine the efficiency of cross current liquid-liquid extraction.
7. Spray Column.
8. Leaching: To calculate efficiency of cross current leaching operation.
9. Adsorption: To study adsorption of acetic acid on activated charcoal
10. Ion Exchange.

References for Practicals:

Designed Standard College Laboratory Manual and Instruction Manuals of the Laboratory Equipment Suppliers.

Course Outline

Lab Entrepreneurship	**Lab ENTR**	**CHP 608**
Course Title	Short Title	Course Code

Course Description:

The purpose of this course is to prepare the students as successful Entrepreneurs and choose Entrepreneurship as career option. It is an effort to build the necessary competencies and motivation for a career in Entrepreneurship. This course provides practical insights to launch successfully and subsequently manage their enterprises.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**15**	**16**	**01**

Prerequisite Course(S): Industrial Economics and Management, LAB Data Analysis & Interpretation, Industrial Training/EDP/Special Study.

General Objectives:

1. To develop basic skills in operations, finance, marketing and human resource management.
2. To plan and design a business according to current status, trends.
3. To encourage and develop young entrepreneurs to meet global challenges.

Learning Outcomes:

Students completing this course will be able to develop core skills and competencies required to start an enterprise. The students will be able to initiate, organize, control the business and will be able to undertake the risk. The students introduce innovations along with technical skills, and will learn the characteristics of an effective team through projects. Students will learn the characteristics of leadership and management styles, using effective communication and feedback techniques by developing their approach to case studies and real-world examples and will help in overall socio-economic development of the nation.

TE Chemical Engineering Semester – VI

Lab Entrepreneurship

Teaching Scheme
Practical : 2 hours/ week

Examination Scheme
Internal Continuous Assessment (ICA): 25 Marks

Course Content:

(Any eight assignments from the following)

List of Assignments:

1. To identify and define various elements essential for developing and leading a successful enterprise.
2. Enlist the qualities entrepreneur posses to be successful businessman.
3. How to select and what procedure is to be adopted for setting up an enterprise.
4. With the help of schedule/questionnaire how to prepare a market survey report.
5. What are the possible financial resources available for setting up an enterprise?
6. Preparation of feasibility report to set up a small scale enterprise.
7. A report on various industry promotion schemes facilitated by State and Central government.
8. A visit report to various State and Central Agencies involved in setting up an enterprise such as industrial development corporation, pollution control board etc.
9. A visit report by group of students to any enterprise of their interest.
10. A case study defining what great managers do to sustain in ever changing world.

References for Practicals:

1. Amar Bhide, (2000), The Origin and Evolution of New Business, Oxford University Press, New York.
2. C.R. Kothari (2008), Research Methodology- Methods and Techniques, New Age International Publishers, New Delhi (2nd revised edition).
3. Dr.Vasant Desai (2013), Entrepreneurial Development, Himalaya Publishing House, Mumbai.
4. O.P.Khanna, Industrial Engineering & Management, Dhanpat Rai Publications (P) Ltd.

Course Outline

Minor Project	**MNRP**	**CHP 609**
Course Title	Short Title	Course Code

Course Description:

This course intends to induce amongst students the skills required to undertake research activities and enhance competency in preparing products, based on chemical engineering principles in the laboratory/industry.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**15**	**16**	**02**

Prerequisite Course(S): LAB Chemical Process, LAB Data Analysis & Interpretation, Industrial Training/EDP/Special Study

General Objectives:

1. To induce the habit of self study, enhance analytical ability.
2. To promote research oriented activity
3. To develop ability of extracting the material from the different sources and writing comprehensively and exhaustive report on an allotted topic.

Learning Outcomes:

Students finishing this course will develop ability to explore and present a topic in systematic manner. It will enhance the technical and analytical ability required to write a project report amongst the upcoming engineering talents. The students will build up confidence for writing review papers, articles, and technical papers. The students will be capable of providing solutions to various engineering, social problems by investigation based on research activity.

TE Chemical Engineering **Semester – VI**

Minor Project
(Course Content)

Teaching Scheme
Practical : 2 hours/ week

Examination Scheme
Internal Continuous Assessment (ICA): 50 Marks

Course Content:

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A mini project related to the Chemical Engineering and Allied disciplines. A mini project may be based upon following

- Preparation of Chemical Compound and study of its properties.
- Kinetics of different types of reactions.
- Analysis of Natural Products, Chemical Products etc.

Project report should contain

1. Problem defining
2. Objectives of the project
3. Benefits & highlights
4. Relevant literature
5. Chemicals and glassware and any other requirement
6. Methodology
7. Solution
8. Books and Journals referred

Course Outline

Seminar-I	**SMNR-I**	**CHP 610**
Course Title	Short Title	Course Code

Course Description:

The purpose of the course is to introduce students to several major themes of chemical engineering. It also aims to boost the communication ability of an individual and to improve technical knowledge through study of specific topic.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**15**	**16**	**02**

Prerequisite Course(S): Industrial Economics and Management, LAB Data Analysis & Interpretation, Industrial Training/EDP/Special Study.

General Objectives:

1. To develop communication skills.
2. To inculcate presentation skills and enhance confidence level of individual.
3. To improve overall technical knowledge.

Learning Outcomes:

Students completing this course will be able to present the concepts in chemical engineering and allied engineering disciplines by extensive literature review. It will induce a clear understanding ability, ability to listen, proper language, oral presentation skill amongst students. The students will be able to communicate effectively by answering questions and giving explanations and/or instructions. The students will demonstrate ability to transfer of information orally, in writing and electronically and will be able to work in multidisciplinary teams.

Seminar-I
(Course Content)

Teaching Scheme
Practical : 2 hours/ week

Examination Scheme
Internal Continuous Assessment (ICA): 25 Marks

Course Content:

- **Every student has to present a seminar based on Minor Project carried out during Semester- VI**

The student shall be required to present a seminar in presence of Panel of teachers constituted by the Head of Department in consultation with the Principal. The evaluation shall be based on:
(a) Report: 10 marks
(b) Seminar Presentation: 10 marks
(c) Viva-Voce at the time of Seminar: 05 marks

Total 25 marks

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Third Year Engineering

(CIVIL)

Faculty of Engineering and Technology

COURSE OUTLINE

TERM – V

W.E.F 2014 – 2015

TE (Civil): Semester–V

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs/ week	Tutorial Hrs/ week	Practical Hrs/ week	Total	ISE	ESE	ICA	ESE		
Structural Design I	D	3	---	---	3	20	80	---	---	100	3
Infrastructural Engineering I	D	3	---	---	3	20	80	---	---	100	3
Fluid Mechanics II	D	3	---	---	3	20	80	---	---	100	3
Environmental Engineering I	D	3	---	---	3	20	80	---	---	100	3
Construction Management I	C	3	---	---	3	20	80	---	---	100	3
Structural Design I lab	D	---	---	2	2	---	---	25	25	50	1
Infrastructural Engineering I lab	D	---	---	2	2	---	---	25	---	25	1
Fluid Mechanics II lab	D	---	---	2	2	---	---	25	25	50	1
Environmental Engineering I lab	D	---	---	2	2	---	---	25	25**(PR)**	50	1
Testing of Materials I lab	B	1	---	2	3	---	---	50	---	50	2
Industrial Training/EDP/Special Study	D	---	---	---	---	---	---	25	---	25	2
Total		**16**	**---**	**10**	**26**	**100**	**400**	**175**	**75**	**750**	**23**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA: Internal Continuous Assessment**

Note 1: For branches like Chemical Engineering and Biotech Engg, two laboratory hours can be merged to form a four hour slot.

Note 2: Out of 3 practical ESE heads, at least 1 head should be practical.

TE (Civil): Semester–VI

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs/ week	Tutorial Hrs/ week	Practical Hrs/ week	Total	ISE	ESE	ICA	ESE		
Structural Design II	D	3	--	---	3	20	80	---	---	100	3
Theory of Structures II	D	3	---	---	3	20	80	---	---	100	3
Geotechnical Engineering I	D	3	---	---	3	20	80	---	---	100	3
Infrastructural Engineering II	D	3	---	---	3	20	80	---	---	100	3
Construction Management II	C	3	---	---	3	20	80	---	---	100	3
Structural Design II lab	D	---	---	2	2	---	---	25	25	50	1
Geotechnical Engineering I lab	D	---	---	2	2	---	---	25	25	50	1
Infrastructural Engineering II lab	D	---	---	2	2	---	---	25	25	50	1
Testing of Materials II lab	B	---	---	2	2	---	---	25	---	25	1
Minor Project	D	---	---	2	2	---	---	50	---	50	2
Seminar-I	D	---	---	2	2	---	---	25	---	25	2
Total		**15**	**---**	**12**	**27**	**100**	**400**	**175**	**75**	**750**	**23**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA: Internal Continuous Assessment**

Note 1: For branches like Chemical Engineering and Biotech Engg, two laboratory hours can be merged to form a four hour slot.

Note 2: Out of 3 practical ESE heads, at least 1 head should be practical.

STRUCTURAL DESIGN - I

Structural Design - I **SD–I**

Course Description:

The primary aim of this course is to provide an introduction to the analysis and design of reinforced concrete structures, by limit state method conforming to IS 456:2000. The course covers design of various elements viz. beams, slabs, columns, footing and the students should independently design a RCC Structure of a residential or commercial building up to 3 stories.

	Hours / Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	13	39	03
Tutorial	--	--	--	

General Objective:

The primary course objective is to equip the students with the tools necessary for designing Concrete structures and to familiarize them with the relevant national design codes such as IS 456:2000. It deals the concepts of various limit states such as limit state of collapse, serviceability and durability etc. It also covers design of various components of structure.

Learning Outcomes:

Upon successful completion of this course the student will be able to:

- Understand various design philosophies for reinforced concrete structures
- Understand the concepts of limits states of collapse, serviceability, durability, characteristics strength, characteristics load, partial safety factors for material and loads.
- Use IS 456:2000 code requirements for reinforced concrete structures.
- Design of singly, doubly and flanged reinforced concrete sections
- Design various components of structures such as beam, column, slab, footings, etc

COURSE CONTENT

Structural Design - I		**Semester – V**
Teaching Scheme	**Examination Scheme**	
Lecture: 3 hours / week	**End Semester Examination (ESE)**	**: 80 Marks**
Practical: 02/week	**Paper Duration (ESE)**	**: 04 Hours**
	Internal Sessional Exam (ISE)	**: 20 Marks**

UNIT - I **(07 Hours, 16 Marks)**

a) Introduction: Introduction to various design philosophies of R.C structures, working stress method, ultimate load method, limit state method , limit state of collapse, limit state of serviceability, limit state of durability, characteristic strength, characteristic load, partial safety factors for material strengths and loads, structural properties of concrete.

b) Singly Reinforced section: Limit state method for flexure, Assumptions, stress & strain diagram, Balanced, under reinforced & over reinforced RC sections, Analysis and design of rectangular section.

UNIT - II **(08 Hours, 16 Marks)**

a) Doubly Reinforced section Analysis and design of doubly reinforced sections.

b) Flanged Section: Analysis and design of flanged sections.

UNIT - III **(08 Hours, 16 Marks)**

a) Design of beams for flexure, shear and bond: simply supported, cantilever beams & continuous beams using IS code coefficient method.

b) Design of slabs: One way simply supported, cantilever slab & continuous slab

UNIT - IV **(08 Hours, 16 Marks)**

a) Design of two way slabs: Two way simply supported & continuous slabs.

b) Design of staircase: Design of dog legged stair case.

UNIT - V **(08 Hours, 16 Marks)**

a) Column: Introduction, strain and stress variation diagrams, axially loaded short column with minimum eccentricity requirements, Design of short column for axial load.

b) Footings:-Design of isolated pad footing for axial load & uniaxial bending.

ICA: - shall consist of Design of G + 2 building (Residential/Commercial) covering slab, beam, column, footing & stair case.

1) A design report shall be prepared along with showing details on half imperial drawing sheets.
2) A few typical details of beam column etc. shall be shown on A4 / A3 size sheets using drafting software also.
3) A report on at least one site visit shall be submitted in ICA.
4) Design of column should be done for uniaxial and biaxial bending in ICA

RECOMMENDED BOOKS:

1) B. C. Punmia, Ashok Kr. Jain, Arun Kr. Jain, Limit State Design of Reinforced Concrete, Laxmi Publication, 1st edition 2007
2) P. C. Varghese ,Limit State Design of Reinforced Concrete, PHI, 2nd Edition 2006
3) S. Ramamrutham, R. Narayan ,Design of Reinforced Concrete Structures (conforming to IS 456), Dhanpat Rai Publication, 7th Edition 2013
4) Dr. V. L. Shah and Dr. S. R ,Limit State Theory and Design . Karve, Pune Vidharthi Gruh Publication, Pune, 6th Edition
5) P. Dayaratnram, Limit State Analysis and Design, Wheeler Publishing company, Delhi.,12th edition 2009
6) Pillai Menon ,Reinforced Concrete Design, Tata Mc Graw Hill, New Delhi., 3rd edition 2013

INFRASTRUCTURAL ENGINEERING-I

Infrastructural Engineering I **IE – I**

Course Description:

This course introduces the students about concepts in Infrastructure Engineering which includes

- Transport Sector in India, Development plans, permanent way, Material requirement for permanent way, Geometric design of track, Construction and Track maintenance, Points and crossings, Signaling and interlocking, stations & yards, Modernization of Railway.
- Airport engineering, requirements, runway, taxiway, Wind rose diagram, basic runway length & corrections, Terminal building requirements, airport drainage, heliports.
- Harbors, jetty, tides winds & waves, dry dock, wet dock, signals, light house.

	Hours/ week	**No. of weeks**	**Total hours**	**Semester credit**
Lectures	**03**	**13**	**39**	**3**
Tutorial	**---**	**---**	**---**	

General Objectives:

The general objective of this course is to study permanent way, its requirements, geometric design of track, Station & Yards, Basic requirements of airport & heliport, Harbors and port.

Learning Outcomes:

Upon successful completion of course the student will be able to

- Know the permanent way and its gauges.
- Identify various components of permanent way.
- Design the track geometries like gradients, alignment curve etc.
- Plan the track management systems.
- Suggest the types and extent of preliminary survey for construction and maintenance of railway track.
- Understand the basics involved in the crossing and turnout of railway track.
- Know the type of signals, principle of interlocking and their working.
- Understand the Civil Engineering aspects of airport.
- Describe working and procedures adopted in airport management systems in India.
- Know the basics of docks and harbors and its construction.

Course Content

Infrastructural Engineering I **Semester V**

Teaching Scheme **Examination Scheme**

Lectures: 3 hours / week **End Semester Examination (ESE):-80 marks**

Paper Duration (ESE): 3 hours **Internal Sessional Exam.(ISE):-20 marks**

Unit-1 (8 hours, 16 marks)

a. **Introduction:** Role of Civil Engineers in Infrastructure Development, Advantages of Railways as mode of transport, Organizational structure, Permanent Way**,** definition of track, basic components, and ideal requirements.
b. **Railway Track Gauge:** Different gauges on Indian Railways, loading gauge, construction gauge, Unigauge , Problems caused by change of gauge.
c. **Track and Track stresses:** requirements, forces acting on Track, coning of Wheels, Tilting of Rails, Rails: Functions, types of rails, rail joints, rail failure, function suitability and drainage, treatment, Defects, Standard rail sections,
d. **Sleeper:** Functions, requirements, types of sleepers; Concrete sleepers, Pre stressed, sleeper density, manufacturing and spacing of sleepers, Ballast: Function, specifications of track ballast, Track fittings: Fittings and fastening

Unit-2 (7 hours, 16 marks)

a. **Alignment of Railway lines:** Importance, Basic requirements of an ideal alignment, selection of a good alignment, Geometric design of Track: Necessity for geometric design, Gradients, Grade compensation on curves, Super elevation, equilibrium cant, cant deficiency, maximum permissible speed, negative super elevation
b. **Resistance to Traction:** Resistance to-friction, wave action, Causes of creep, Effects of creep, Measures to reduce creep. Speed, track irregularity, wind, gradient, curvature. Stress in rails, sleepers, ballast and formation,
c. **Construction and Track maintenance:** Plate laying method, operations involved Tools & common items of track maintenance.

Unit-3 (7 hours, 16 marks)

a. **Points and crossings:** Important terms, types of track layouts and sketches of turn out, diamond crossing, triangle, double junction, scissors cross over, Single slip, Double slip, Gathering line, Signaling and interlocking: objectives of signaling, classification of signals, CTC and ATC system, Interlocking & it's Principles.
b. **Railway Stations and yards:** Classification of Railway stations, Purpose, facilities required at railway stations, Requirements of station yard, Types of Yards,
c. **Modernization in railways:** Types of railways, high speeds, improvements in track structure: components, Automation, Safety aspects, Introduction to Skybus, Monorail & Metro rails.

Unit-4 (7 hours, 16 marks)

a. **Basic definition & terms:** Runway, Taxiway, Apron, Hanger, Airport obstruction, Airport Classification (ICAO), selection of site for airport.
b. **Wind Rose Diagram**, characteristics of aircraft, corrections to basic length of runway, Runway Geometrics, Taxiway Geometrics
c. **Terminal Building requirements**, Airport Drainage, Heliports, Main characteristics of Helicopters, nature of helicopters transport, site selection for helicopters

Unit-5 (7 hours, 16 marks)

a. **Introduction**: Classification of harbors, selection of site for harbor. Definitions/ methods of Breakwater, Quay walls, Bulkhead, Wharves, Jetty, Dolphins, Dock fenders, piers, slips, moles, berths , pier heads, Jetties, , mooring accessories- function
b. **Natural Phenomena**: Inland water transport in India, tide winds and waves erosion, littoral drift, coast protection,
c. **Other Facilities**: Dry Dock, Wet docks-purpose, Lift docks, repair docks, graving docks, floating docks, marine railway, signals, buoys, beacons, light house, ware house and Transit sheds.

RECOMMENDED BOOKS:

1) Saxena S.C. & Arora S. P. A course of Railway Engineering, Dhanpat Rai & Sons, New Delhi.,7th edition,2010
2) Agarwal M. M. – Indian Railway Track, Sachdeva Press, Mayapuri, New Delhi.,5th edition 2013
3) Khanna & Arora, Airport planning & design, Nemchand Bros, Roorkee, Delhi.,3rd edition 2005
4) Rangwala, Airport Engineering, 13th edition,2013
5) G. Venkatappa Rao, Airport Engineering,1st edition,1992.
6) Rao G. V., Airport Engineering, Tata Mc Graw Hill
7) Bindra S. P., Docks & Harbour Engineering, Dhanpat Rai & Sons,1992
8) R. Shrinivasan, Harbour dock & tunnel Engineering, New Delhi.,26th edition,2013
9) Rangwala, Docks and Harbour ,3rd editon,2004
10) K. L. Bhanot & S. B. Sehgal, Highway Engineering & Airport.,3rd edition 1996
11) S. Ponnuswamy, Bridge Harbour.2nd edition,2012

FLUID MECHANICS-II

Fluid Mechanics II **FM II**

Course Description:

This course provides the elementary level knowledge of Fluid mechanics which includes:-

- Study of boundary layer and fluid flow around submerged bodies.
- Analysis of turbulent flow in pipes and pipe flow systems.
- Analysis of open channel flows: Uniform, critical, gradually and rapidly varied flows.
- Study of impact of jet and hydraulic turbines and centrifugal pumps.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	**3**	**13**	**39**	**3**
Practical	**2**	**13**	**26**	**1**

Prerequisite Course(s):

Knowledge of fluid properties and fluid statics. Ability to solve simple fluid flow problems using fluid kinematics and dynamics. Concepts of dimensional analysis.

General Objective:

The general objective of course is to teach elementary concepts of boundary layer and to analyze and solve turbulent pipe flow and open channel flow problems. Also it aims to explain impact of jet and introduce hydraulic turbines and centrifugal pumps to students.

Learning Outcomes:

Upon successful completion of this course the student will be able to:

- Identify various thicknesses of boundary layer.
- Analyze laminar and turbulent boundary layers (B.L.) and compute local and overall skin friction drags in laminar and turbulent B.L. on flat plate using approximate empirical formulae.
- Compute drag and lift forces on moving submerged bodies in fluid such as cylinder, airfoil etc.
- Analyze turbulent flow and compute velocity distributions in smooth and rough pipes.
- Explain Moody's diagram and solve pipe flow problems for pipes in series and parallel.
- Analyze uniform and critical flows in open channels.
- Determine the most economical sections of open channels using Manning's and / or Chezy's equations.
- Analyze Gradually Varied Flow in open channels for various applications.
- Assess and compute hydraulic jump in open channels.

- Discuss impact of fluid jet on stationary and moving, flat and curved plates using momentum principle.
- Explain hydraulic turbines such as Pelton, Francis and Kaplan turbines and working and various efficiencies of these turbines.
- Identify centrifugal pump; its classification, working and various efficiencies.
- Discuss performance of hydraulic turbines and centrifugal pumps in terms of unit and specific quantities and demonstrate their characteristics curves.

COURSE CONTENT

FLUID MECHANICS II **FM II**

Teaching Scheme:-	**Examination Scheme:-**
Lectures:- 03 hours / week	ESE (Theory paper):- 80 marks
Credits:- 03	Paper duration:- 03 hours
Practical:- 02 hours / week	ISE (Class tests):- 20 marks
	ICA (Term work):- 25 marks
	ESE (Oral):- 25 marks

Unit I **No. of lectures: 09, Marks: 16**

a. **Boundary Layer Theory**: Concept of boundary layer, various thicknesses of boundary layer, applications of Von Karman momentum equation (no derivation of the equation), boundary layer over a flat plate, laminar and turbulent boundary layers, local and average drag coefficients, separation of boundary layer and control of separation.

b. **Fluid Flow around submerged Bodies**: Practical problems involving fluid flow around submerged objects, definitions and expressions of drag & lift, drag & lift coefficients, types of drags, drag on cylinder. Circulation, Magnus effect and lift on cylinder and airfoil, polar diagram.

Unit II **No. of lectures: 08, Marks: 16**

a. **Turbulence Flow Theory**: Turbulence phenomenon, instantaneous & temporal mean velocities, Reynolds's expression for turbulent shear stress, introduction to Prandtl's mixing length theory, Karman-Prandtl equation (no derivation), hydro-dynamically smooth and rough boundaries and mentions of equations for velocity distributions; (no derivations of equations of velocity distributions).

b. Darcy-Weisbach equation (no derivation), only mention of different equations (no derivations) for friction factors for smooth, rough & transition boundaries, Moody's diagram.

c. **Pipe flow systems**: major and minor losses, pipes in series & parallel and their equivalent pipes, siphon.

Unit III **No. of lectures: 08, Marks: 16**

a. **Open Channel flow –** Classification of open channels, geometric elements, steady and unsteady, uniform and non uniform flows, continuity and energy equations, kinetic energy correction factor.
b. **Uniform flow**: Chezy's and Manning's equations, concept of normal depth, calculation of normal depth for triangular & wide rectangular channels. Hydraulically efficient sections.
c. **Critical flow**: Specific energy, specific energy diagrams, fundamental equation of critical flow, calculation of critical depth in rectangular and triangular channels.

Unit IV **No. of lectures: 07, Marks: 16**

a. **Gradually varied flow:** Types of non-uniform flows, differential equation of gradually varies flow (GVF) - alternate forms, introduction to different types of GVF profiles and practical examples of their occurrence, control sections; (no mathematical treatment for gradually varied flow).

b. **Hydraulic Jump :** Phenomenon of hydraulic jump, application of momentum equation to hydraulic jump in horizontal, frictionless, rectangular channel, specific force, conjugate depths & relation between conjugate depths, energy loss in hydraulic jump, length of jump, classification & practical uses of hydraulic jump.

Unit V **No. of lectures: 07, Marks: 16**

a. **Impact of Jet**: Impact of jet on stationary & moving, flat & curved plates using linear momentum principle, work done, introduction to principle of angular momentum, mention of Euler's momentum equation for turbine & pumps (no derivation).

b. **Hydraulic Turbines:** Elements of hydro electric power plant, unit & specific quantities, classification of hydraulic turbines, introduction to work done, heads & efficiencies of turbines, (no mathematical treatment for hydraulic turbines).

c. **Centrifugal Pumps:** Classification of centrifugal pumps, specific speed, priming, introduction to work done by impeller, heads & efficiencies. Characteristics of hydraulic turbines and centrifugal pumps (no mathematical treatment for centrifugal pumps).

RECOMMENDED BOOKS:-

1. Dr. A. K. Jain, Fluid Mechanics, Khanna Publishers, Delhi, Edition – 2011.
2. Dr. K. Subramanya, Flow in Open Channels, Tata McGraw-Hill Education Pvt., Ltd., New Delhi, 3rd Edition-2012.
3. Dr. K. Subramanya, FM & HM-Problems & Solutions, Tata McGraw-Hill Education Pvt. Ltd. New Delhi, 6th reprint-2013.
4. Dr. Jagdish Lal, Hydraulic Machines, Metropolitan Book Co. Pvt. Ltd., New Delhi.
5. Dr. P.N.Modi , Dr. S.M. Seth, Hydraulic and Fluid Mechanics, Standard Publications, Delhi, Edition – 2011.
6. Dr. R.K.Bansal, A Textbook of Fluid Mechanics & Hydraulic Machines, Laxmi Publications (P) Limited, 9th Edition, 2012.
7. Streeter V.L. & Wylie E.B., Fluid Mechanics, Tata McGraw-Hill Education Pvt., Ltd., New Delhi, 6th reprint - 2012.
8. Dr.Garde and Mirajgaokar. - Fluid Mechanics.---
9. Rajput -Hydraulic Machines
10. Som S K and Biswas G – Introduction to Fluid Mechanics and Fluid Machines, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
11. John M. Cimbala, Yunus A. Cengel – Fluid Mechanics : Fundamentals and Applications, McGraw-Hill Higher Education. Second Edition 2010.

ENVIRONMENTAL ENGINEERING-I

Environmental Engineering I **EE I**

Course description:

The course is designed to develop awareness about water quality and its impact on public health, and to appraise of the water treatment technologies. It deals with estimation of water requirements of a community, identification of appropriate sources of water, collection of water from source, transportation of water, examination of water as per standard methods, purification of water to meet the standard norms, and to supply the water to the community, including municipalities and industrial zones.

Lectures	Hours/week	No. of weeks	Total hours	Semester credit
	03	13	39	03

General Objective:

The basic objective of this course is to make students aware about importance of water& its purification and know the methods used for purifying the water to make it fit for drinking purpose as per the standards. Students should also be aware about principles related to public health engineering .

Learning Outcomes:

- An ability to apply scientific and engineering principles as well as contemporary technology to the discipline.
- An ability to analyze and interpret data in several areas which include resources like air, water and land .and energy systems and environmental and human health impacts.
- An ability to identify, formulate and solve engineering problems and to design a system, component, or process to meet desired needs.
- An ability to convey technical material through oral presentations and written communications.
- A knowledge of contemporary and emerging environmental issues and a recognition of the need for, and an ability to engage in, life-long learning.
- An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice with an integrated understanding of professional, societal, and ethical responsibilities and the importance of, and role for, multidisciplinary teams in professional practice.

COURSE CONTENT

Environmental Engineering I **EE I**

Lecture: 3 hours / week **End Semester Examination (ESE) : 80 Marks**

Practical: 2 Hour/Week **Paper Duration (ESE) : 03 Hours**

Internal Sessional Exam (ISE): 20 Marks

ICA: 25 Marks **Oral: 25 Marks**

UNIT-I **(7 Hours 16 marks)**

A: Introduction to water supply schemes: data collection for water supply scheme, components and layout, design period, factors affecting design period.

B: Water intake structures: General design considerations, intake structures, such as river intake, canal and reservoir intake, conveyance of raw water, hydraulic design of pumping station.,

C: Water demand, rate of water consumption for various purposes, like domestic, industrial and institutional and commercial. Fire demand. Water system losses. Factors affecting the rate of demand. Population forecasting: arithmetical increase method geometrical increases method, incremental increase method logistic curve methods.

UNIT-II **(7 Hours 16 marks)**

A: Water quality: impurities in water, physical, chemical and biological characteristics, water quality standards as per IS 10500-1991, USEPA and WHO.

B: Water treatment processes: introduction to different water treatment processes, flow sheets, aeration- principle, concept, necessity, methods and design of aeration fountains (Stepped aerators), Flash mixer, function, design and power requirements.

C: Flocculation and sedimentation: coagulation, flocculation theory, zeta potential and its significance, mean velocity gradient G, power consumption, common coagulants, coagulant aids, principle of sedimentation, efficiency of ideal settling basin, types of settling and related theory. Design of settling tanks, clariflocculators, tube settlers.

UNIT-III **(7 Hours 16 marks)**

A: Filtration: theory of filtration, mechanism of filtration, filter materials, types of filters, rapid Sand Filter, Slow Sand Filter, multimedia and dual media filters, components- under drainage system, working and cleaning of filters. Operational troubles, design of filters-RSF and SSF. Design of under drainage system.

B: Disinfection- objectives, theory, types of disinfection, chlorination, free and combined chlorine, effect of pH, types of chlorination, pre and post chlorination, break point chlorination, de-chlorination bleaching powder estimation.

UNIT-IV **(7 Hours 16 marks)**

A: water softening- theory, methods, lime soda, zeolite, and ion exchange processes, quantity estimation of lime soda process, re-carbonization. Demineralization-methods like reverse osmosis, electro-dialysis

B: Miscellaneous methods- adsorption: theory, Frendlich isotherms design. effect of fluoride, fluoridation and de-fluoridation.

C: Water treatment of swimming pool.

UNIT-V **(7 Hours 16 marks)**

A: Water distribution system, types of distribution system, continuous and intermittent system, gravity, pumping and combined system. Wastage of water-detection and prevention. Lay out of distribution system. Design of hydraulic network. Residual pressure, Hardy-Cross method, design of ESR capacity.

B: Service reservoir, ESR, GSR, balancing reservoir- necessity, location, capacity calculation by arithmetic and mass curve method. types of pipes. types of valves, Functions and locations.

C: presence of heavy metals in water, their effects and remedy. Presence of non-biodegradable organics in water, their effects, halide formations. Their removal methods including osmosis, ultra-filtration, and adsorption Basic idea of photo-catalysis technology from removal of non-degradable organics.

RECOMMENDED BOOKS:-

1. E W Steel and Terence J McGhee : Water supply and Sewerage" Tata McGraw Hill Publishing Co.
2. Water supply and Sanitary Engineering by J S Birdie, Dhanpat Rai and Sons Publication, New Delhi
3. Physici-chemical processes for water quality control by Walter J Weber, Wiley Inter-science Publications.
4. Garg S.K., "Water Supply Engineering", Khanna Publisher, New Delhi
5. Punamia, Jain & Jain, "Water Supply Engineering", Laxmi Publications, New Delhi
6. Manual on Water Supply & Treatment, Central Public Health & Environmental Engineering, Organization, Ministry of Urban Affairs, Government of India
7. Therous, Eldridge & Mallmann, "Laboratory Manual for Chemical & Bacteriological Analysis of Water & Sewage", Agro Botanic Publisher, India
8. Benergee & Jain, "Handbook of Technical Analysis", Jain Brothers New Delhi.
9. Laboratory Manual for Environmental Quality Testing, Environmental Protection Research Foundation, Sangli

CONSTRUCTION MANAGEMENT-I

Construction Management – I **CM – I**

Course Description: The subject deals with principles of management in construction industry which will enable the students to become familiar with organizational structures, modern techniques to complete the project, cost analysis, application of economics in engineering and various equipments.

	Hours / Week	No. of weeks	Total hours	Semester credit
Lectures	**03**	**13**	**39**	**03**
Tutorial	--	--	--	--

General Objective:

The general objective of course is to understand concepts in construction industry and analyze activities involved using CPM & PERT methods with respect to cost, Engineering economics etc. Also it aims to explain various excavating and hauling equipments.

Learning Outcomes:

Upon successful completion of this course the student will be able to:

- To indentify construction activities.
- To indentify organization chart of various construction industries with their forms.
- Analyze network techniques by using PERT, Bar charts, etc.
- To analyses Optimization and crashing of networks.
- Discuss Engineering economics, banking systems, profit and loss accounts concepts.
- Discuss the various Excavating & Hauling Equipments like power shovel, Dragline, etc

Course Content

Construction Management – I **C M-I**

Teaching Scheme **Examination scheme**

Lectures: 3 hours / week **End Semester Examination (ESE) : 80 marks**
Paper Duration (ESE): 3 hours
Internal Session Exam. (ESE) : 20 marks

UNIT–I (07 Hours, 16 marks)

Construction industry, construction team, Construction activities, classification of construction, stages in construction, Need of management in construction, Job layout and value engineering.

Leadership and its quality, Organization, meaning and function, forms of organization - line, line and staff, functional, Type A, Type B and Type C

UNIT–II (10 Hours, 16 marks)

Network Technique: - History, Advantages, Bar charts, S –Curve etc. various terms used in network technique, activity, event, critical path, duration etc Development of networks, network scheduling, to find various times and float, EST, EFT, TF etc Monitoring of Network, Three phases of network technique.

PERT - its concept and PERT Time.

UNIT–III (08 Hours, 16 marks)

Cost analysis, Cost Curve, Optimization and crashing of networks. Updating of network During monitoring, resource leveling, allocation, leveling and smoothening. Line of balance- Concept and uses. (no problems on crashing of network)

UNIT – IV (07 Hours, 16 marks)

Engineering economics, its definition and importance, demand and supply, factors affecting demand and supply, cost concept.

Bank, its type, uses and functions, banking systems, profit and loss account, appreciation and depreciation of money.

UNIT – V (07 Hours, 16 marks)

Excavating & Hauling Equipments:-

a) Power shovels; size, basic parts, selection ,factors affecting output.

b) Draglines: - types, size, basic parts.

c) Bulldozers-types, moving earth with bull dozers.

d) Clamshells – Clamshell buckets.

BOOKS RECOMMENDED:-

1) Mahesh Varma - Construction planning and management,6th edition,2002.
2) S.V.Deodhar - Construction equipment and job planning,Khanna publishers,4th edition 2010 reprint2012.
3) U.K.Shrivastava - Construction Management, 3rd edition 2005 reprint 2013.
4) Gehlot and Dhir - Construction Management.,2nd edition 1992 reprint 2002.
5) L.S.Srinath - CPM and PERT,PHI, 3rd edition,2012.
6) Peurifoy - Construction Planning and Management,McGraw-Hill,2002
7) Tarachand - Engineering Economics,14th edition 2007
8) Chitkara - Construction Project Management, TMH,NewDelhi,2009
9) R.L.Peurifoy - Construction planning ,Equipments and Methods.
10) Mahesh Verma - Construction equipments and its planning and application, vikas publication

STRUCTURAL DESIGN -I

LAB COURSE OUTLINE

Structural Design – I **SD-I**

ICA (Term Work): 25 Marks
ESE (Oral) : 25 Marks

Course Description:-

In this Laboratory course emphasis is given on analysis & design of different RCC structural members such as beam, slab, column, footing etc. using Indian Standard (IS 456:2000) design code and to prepare detailed drawings of the same

	Hours/ Week	No. Of weeks	Total Hours	Semester Credits
Lectures	2	13	26	1

General Objective:

The primary lab course objective is to analyze and design G+2 building with all the details and relevant drawings for various components of the structure.

Learning Outcomes:

Upon successful completion of this course the student will be able to:

- Calculate various load on the given building structure
- Analyze internal forces in the components of the structure
- Design individual components of structures
- Use IS 456:2000 code requirements for reinforced concrete structures.
- Prepare details and drawing of the given project.

Lab course content:-

1) Structural Layout

a) To prepare a plan of G+2 building (Residential/ Commercial).
b) To draw layout of Ground beam, plinth bean, floor beam, column, slabs etc.

2) Analysis and design of various beams and slabs

a) To calculate of loads and internal forces on beams and slabs.
b) To decide the sections and calculate steel reinforcement.
c) Detailing & drawing of beams, slab.

3) Analysis and design of column and footing

a) To calculate loads and internal forces on columns and footings.
b) To decide the sections and calculate steel reinforcement.
c) Detailing & drawing of column, footings.

4) Analysis and design of dog-legged staircase

a) To calculate loads and internal forces.
b) To calculate steel reinforcement.
c) Detailing & drawing of staircase.

5) A report on at least one site visit.

a) A report on at least one site visit shall be submitted in ICA.

Note-

a) A design report shall be prepared along with showing details on half imperial drawing sheets.
b) A few typical details of beam column etc. shall be shown on A4 / A3 size sheets using drafting software also.

Guidelines for ICA:

ICA shall be based on continuous evaluation of students performance throughout the semester and ICA drawing sheets submitted by the students.

Guide lines for ESE:

ESE will be based on drawing sheets submitted by the student. In ESE the student may be asked to answer questions based on ICA. Evaluation will be based on performance in **oral** examination.

RECOMMENDED BOOKS:

1) B. C. Punmia, Ashok Kr. Jain, Arun Kr. Jain, Limit State Design of Reinforced Concrete, Laxmi Publication, 1st edition 2007
2) P. C. Varghese ,Limit State Design of Reinforced Concrete, PHI, 2nd Edition 2006
3) S. Ramamrutham, R. Narayan ,Design of Reinforced Concrete Structures (conforming to IS 456), Dhanpat Rai Publication, 7th Edition 2013
4) Dr. V. L. Shah and Dr. S. R ,Limit State Theory and Design . Karve, Pune Vidharthi Gruh Publication, Pune, 6th Edition
5) P. Dayaratnram, Limit State Analysis and Design, Wheeler Publishing company, Delhi.,12th edition 2009
6) Pillai Menon ,Reinforced Concrete Design, Tata Mc Graw Hill, New Delhi., 3rd edition 2013

INFRASTRUCTURAL ENGINEERING-I LAB

Lab course outline

Infrastructural Engineering I Lab **I. E. I Lab**

ICA (Term Work) : 25 Marks

Course Description:

This lab course covers the assignments related to theory units about

- Permanent way, track gauges in India, sleepers, ballast & track fittings
- Alignment & geometric design, construction & maintenance of track
- Points & crossings, Stations & yards
- Airport, planning, runway taxiway, heliports
- Harbors, Dry & wet docks, facilities

Practical	Hours/week	No. of weeks	Total hours	Semester credit
	02	13	26	1

General Objective:

In this laboratory work student will be introduced to railway Engineering, Airport Engineering & Docks and harbors.

Learning outcomes

Upon successful completion of course the student will be able to

- Understand the permanent way and its gauges.
- Identify various components of permanent way.
- Design of track geometries like gradients type, alignment curve etc.
- Plan the track management systems.
- Suggest type and extent of preliminary survey for construction and maintenance of railway track.
- Know basics involved in the crossing and turnout of railway track.
- Describe the type of signals, principle of interlocking and their working.
- Understand the Civil Engineering aspects of airport.
- Realize working principles and procedures adopted in airport management systems .
- Know basics of docks and harbors and familiar with its construction.

Lab Course Content

Infrastructural Engineering I lab

1. Draw neat labeled sketches of railway track in cutting and in embankment
2. Draw neat labeled sketches of left hand turnout, right hand turnout and different type of crossings.
3. Draw neat labeled plans of different types of railway stations
4. Numerical on geometric design of railway tracks
5. Wind rose diagrams: types and their uses
6. Planning of a terminal building showing all the accessories and spaces

7. Numerical on basic runway length & corrections
8. A Visit to Railway/Airport/ port site& preparation of report

Guide line for ICA:
ICA shall be based on continuous evaluation of student performance throughout the semester and ICA submitted by the student.

RECOMMENDED BOOKS:

1) Saxena S.C. & Arora S. P. A course of Railway Engineering, Dhanpat Rai & Sons, New Delhi.,7th edition,2010
2) Agarwal M. M. – Indian Railway Track, Sachdeva Press, Mayapuri, New Delhi.,5th edition 2013
3) Khanna & Arora, Airport planning & design, Nemchand Bros, Roorkee, Delhi.,3rd edition 2005
4) Rangwala, Airport Engineering, 13th edition,2013
5) G. Venkatappa Rao, Airport Engineering,1st edition,1992.
6) Rao G. V., Airport Engineering, Tata Mc Graw Hill
7) Bindra S. P., Docks & Harbour Engineering, Dhanpat Rai & Sons,1992
8) R. Shrinivasan, Harbour dock & tunnel Engineering, New Delhi.,26th edition,2013
9) Rangwala, Docks and Harbour New Delhi.,3rd editon,2004
10) K. L. Bhanot & S. B. Sehgal, Highway Engineering & Airport.,3rd edition 1996
11) S. P. Bindra, Bridge Engineering, latest edition
12) S. Ponnuswamy, Bridge Harbour.2nd edition,2012

FLUID MECHANICS II

LAB COURSE OUTLINE

FLUID MECHANICS II LAB **FM II LAB**

ICA (Term Work): 25 Marks
ESE (Oral) : 25 Marks

Course Description:

This laboratory covers experiments related to measurement of drag and lift, flow properties in pipes and open channels and also characteristics of hydraulic turbines and centrifugal pump. These include:-

- Study of boundary layer on a flat plate.
- Measurement of drag and lift on airfoil and cylinder.
- Determination of friction factor in pipe flow.
- Study of uniform flow formulae in open channel (Chezy's & Manning's formulae).
- Measurement of Velocity distribution, specific energy, specific force and parameters of hydraulic jump in open channel flow.
- Calibration of Venturi flume / standing wave flume.
- Characteristics of hydraulic turbines and centrifugal pump.

Laboratory	Hours/week	No. of weeks	Total hours	Semester credit
	02	13	26	1

ESE Pattern: Oral

General Objective:

In this laboratory students will be introduced to the applications of viscous property of fluid to measure drag and lift. Also students are introduced to pipe and open channel flows and characteristics of hydraulic turbines and centrifugal pump.

Objective to develop following Intellectual skills:

1. To understand basic laws of fluid friction and to apply the same to solve pipe and open channel flow problems.
2. To learn working of hydraulic turbines and centrifugal pump.
3. To identify principles and working of different apparatus in laboratories.

Objective to develop following Motor skills:

1. Ability to draw diagrams of equipments and characteristics curves of machines on graphs.
2. Ability to perform the experiments and record the observations of pressure, forces, velocity, rotational speed, volume, time, discharge etc.
3. Ability to apply various discharges and measure the corresponding effects.
4. Ability to apply the basic principles in various field conditions.

Learning Outcomes: Upon successful completion of these experiments the student will be able to

- Plot velocity profiles and hence analyze development of boundary layer on flat plate.
- Measure drag and lift forces on airfoil and explain their variation with angle of attack.
- Measure and assess pressure variation over surface of circular cylinder and hence analyze development of drag and lift on cylinder.
- Determine friction factor and hence to develop calibration equation for pipe.
- Measure average velocity, depth in open channel flow and hence to explain uniform flow formulae, specific energy, specific force and hydraulic jump.
- Explain venturiflume and its calibration for discharge measurement in open channel.
- Plot and identify velocity distribution in open channel flow.
- Measure discharge, head, input and output power for different hydraulic turbines and centrifugal pump and hence analyze their various characteristics.

Outline of Content: These experiments contain

1. **Study of boundary layer on flat plate.**
   a. To measure velocities of flow by Pitot tube at various points along the length over a flat plate at various depths (in wind tunnel).
   b. To plot velocity profiles at various points along the length and hence analyze development of boundary layer on flat plate.
2. **Measurement of drag and lift on airfoil.**
   a. To measure drag and lift forces on an airfoil at various angles of attack in wind tunnel with the help of digital force measuring transducer.
   b. To calculate coefficients of drag and lift at various angles of attack and plot polar diagram for studying characteristics of the airfoil.
3. **Determination and analysis of Pressure distribution over circular cylinder.**
   a. To measure pressure at various points on surface of circular cylinder in wind tunnel by multi-limbed manometer.
   b. To calculate coefficients of pressure at these points and plot pressure distribution diagram for analyzing development of drag and lift on cylinder.
4. **Determination of friction factor and calibration equation for given pipe**
   a. To measure pressure difference between two points on a horizontal pipe.
   b. To calculate discharge experimentally through the pipe by measuring volume of water and the required time and hence to calculate the average velocity.

c. To compute friction factor by using Darcy-Weisbach equation.
d. To develop the calibration equation for given pipe by plotting graph of log h_f versus log Q and also compute the graphical value of friction factor.

5. **Study of uniform flow formulae in open channel (Manning's and Chezy's formulae).**
   a. To measure depths of flow at two sections by pointer gauge in an open channel.
   b. To calculate discharge experimentally through the open channel by measuring volume of water and the required time and hence to calculate the average velocity.
   c. To compute Manning's and Chezy's coefficients by knowing the bed slope of the channel.
6. **Study of specific energy and specific force in open channel flow.**
   a. To measure depths of flow at two sections by pointer gauge for a given discharge and for various bed slopes of an open channel.
   b. To calculate discharge experimentally through the open channel by measuring volume of water and the required time and hence to calculate the average velocity.
   c. To calculate specific energies and specific forces and plot these diagrams on graph papers.
7. **Determination of velocity distribution in open channel flow.**
   a. To measure velocity of flow by pitot tube at various points in a cross section.
   b. To plot velocities at these points and draw contours of equal velocities, i.e. isovels.
   c. To calculate discharge experimentally through the open channel by measuring volume of water and the required time and hence to calculate the average velocity.
8. **Calibration of venturiflume.**
   a. To measure depths of flow at inlet and throat of venturiflume by pointer gauge in an open channel.
   b. To calculate discharge experimentally through the open channel by measuring volume of water and the required time.
   c. To compute the discharge analytically by knowing the depths of flow at inlet and throat.
   d. To calculate the coefficient of discharge of the venturiflume.
9. **Measurement of different parameters of hydraulic jump in laboratory or on site.**
   a. To calculate discharge experimentally through the open channel by measuring volume of water and the required time.
   b. To measure conjugate depths of the hydraulic jump.
   c. To compute velocities, Froude numbers, energy loss, length and height of the jump.

10. Study of operating characteristics of Pelton wheel

a. To measure (i) discharge (Q) supplied to the turbine with the help of venturimeter or any other equipment, (ii) pressure by pressure gauge at inlet to turbine, (iii) load on turbine by spring balance and attached loads on brake drum and (iv) speed of the turbine by tachometer.
b. To compute head on turbine, input power (P_a) and output power ($P_{t)}$, specific speed and overall efficiency ($\eta_{t)}$ of the turbine.
c. To plot the operating characteristics (i.e. constant speed) curves for the Pelton wheel, i.e. graphs of (i) P_t and η_t versus Q and (ii) η_t versus P_t.

11. Study of main characteristics of Kaplan turbine.

a. To measure (i) discharge (Q) supplied to the turbine with the help of orificemeter or any other equipment, (ii) pressures by pressure gauge at inlet of turbine and by vacuum gauge at outlet of runner, (iii) load on turbine by spring balance and attached loads on brake drum and (iv) speed of the turbine by tachometer.
b. To compute net head across turbine, input power (P_a) and output power ($P_{t)}$, specific speed (N_S) and overall efficiency ($\eta_{t)}$ of the turbine.
c. To plot the main characteristics (i.e. constant head) curves for the Kaplan turbine, i.e. graphs of (i) unit discharge, unit output power and overall efficiency versus unit speed and (ii) overall efficiency versus specific speed.

12. Study of operating characteristics of Francis turbine.

a. To measure (i) discharge (Q) supplied to the turbine with the help of triangular notch installed in the sump or any other equipment, (ii) pressures by pressure gauge at inlet of turbine and by vacuum gauge at outlet of runner, (iii) load on turbine by spring balance and attached loads on brake drum and (iv) speed of the turbine by tachometer.
b. To compute net head across turbine, input power (P_a) and output power ($P_{t)}$, specific speed (N_S) and overall efficiency ($\eta_{t)}$ of the turbine.
c. To plot the operating characteristics (i.e. constant speed) curves for the Francis turbine, i.e. graphs of (i) P_t and η_t versus Q and (ii) η_t versus P_t.

13. Study of performance of centrifugal pump

a. To measure (i) discharge (Q) supplied to the pump with the help of triangular notch installed in the sump or any other equipment, (ii) pressures by pressure gauge installed on delivery pipe at outlet of pump and by vacuum gauge installed on suction pipe at inlet of pump, (iii) time for one revolution of the energy meter for calculating input power to the pump.
b. To compute manomerric head (H_m) developed by the pump, input power (P_a) to the pump and output power (P_t), specific speed (N_S) and overall efficiency (η_o) of the pump.
c. To plot the operating characteristics (i.e. constant speed) curves for the centrifugal pump, i.e. graphs of manometeric head (H_m), overall efficiency

(η_o) and output power (P_t) versus discharge (Q) and hence to find the discharge, manometeric head and the output power corresponding to the maximum efficiency.

14. Visit to any hydropower plant.

a. The students should study layout of the hydropower plant, type of the turbines installed and their salient features and submit a detailed report of the visit.

Note: The necessary permission and proof of the visit should be obtained from the concerned authorities and should be available with the head of the department of Civil Engineering.

Note: (i) The ICA will consist of a laboratory journal consisting of seven experiments/assignment. At least seven out of 13 experiments/assignment should be performed. At least one site visit compulsory.

(ii) In the experiments of hydraulic turbines (no. 10, 11 and 12) any characteristics of the turbine, i. e. either main or operating characteristics can be carried out.

Guidelines for ICA:

ICA shall be based on continuous evaluation of students' performance throughout the semester and practical assignments submitted by the students in the form of journal.

Guide lines for ESE:-

ESE will be based on laboratory journal submitted by the student. In ESE the student may be asked to answer questions based on experiments/assignments. Evaluation will be based on performance in **oral** examination.

RECOMMENDED BOOKS:-

2. Dr. A. K. Jain, Fluid Mechanics, Khanna Publishers, Delhi, Edition – 2011.
3. Dr. K. Subramanya, Flow in Open Channels, Tata McGraw-Hill Education Pvt., Ltd., New Delhi, 3rd Edition-2012.
4. Dr. Jagdish Lal, Hydraulic Machines, Metropolitan Book Co. Pvt. Ltd., New Delhi.
5. Dr. P.N.Modi , Dr. S.M. Seth, Hydraulic and Fluid Mechanics, Standard Publications, Delhi, Edition – 2011.
6. Dr. R.K.Bansal, A Textbook of Fluid Mechanics & Hydraulic Machines, Laxmi Publications (P) Limited, 9th Edition, 2012.
7. Som S K and Biswas G – Introduction to Fluid Mechanics and Fluid Machines, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
8. John M. Cimbala, Yunus A. Cengel – Fluid Mechanics : Fundamentals and Applications, McGraw-Hill Higher Education. Second Edition 2010.
9.

ENVIRONMENTAL ENGINEERING I

LAB COURSE OUTLINE

Environmental Engineering Lab. I **EE-I lab**

ICA (Term Work): - 25 Marks

ESE(Practical):- 25 Marks

Course description:-

In this Laboratory the emphasis is given on determining various properties and characteristics of water, design of water supply scheme, design of water distribution scheme and to prepare report on site visit to water treatment plant.

Practical	Hours/week	No. of weeks	Total hours	Semester credit
	02	13	26	1

General Objectives:-

To determine various properties & characteristics of water the laboratory & to design water supply scheme.

Learning outcome:-

Upon successful completion of this course the student will be able to

1 Determine various properties of water such as pH value, Acidity, Alkalinity, DO content, Residual Cl_2 etc.

2 Design water supply scheme for various townships.

Lab course content:-

Environmental Engineering I Lab:

ICA consists of

(A) Experiments (minimum eight)

List of Experiments

1. Determination of pH in given water samples
2. Determination of turbidity and optimum dose of coagulant
3. Determination of total solids, dissolved, volatile and fixed solids
4. Determination of alkalinity and acidity of given sample
5. Determination of carbonate and non-carbonate hardness of water
6. Determination of chlorine demand and residual chlorine of water
7. Determination of dissolved oxygen present in the given water samples
8. Determination of Fluoride//iron content in given water sample
9. Determination of Sodium/Potassium/Calcium using flame photometer
10. Most probable number(MPN) Test
11. Determination of conductivity/salinity of water

(B) Assignments (minimum two).

1. Design of water treatment scheme for medium size township
2. Design of water distribution scheme for medium size township.
3. A complete report on site visit to a Municipal Water Treatment Plant.

RECOMMENDED BOOKS:-

1. Physici-chemical processes for water quality control by Walter J Weber, Wiley Inter-science Publications.
2. Garg S.K., "Water Supply Engineering", Khanna Publisher, New Delhi
3. Manual on Water Supply & Treatment, Central Public Health & Environmental Engineering, Organization, Ministry of Urban Affairs, Government of India
4. Therous, Eldridge & Mallmann, "Laboratory Manual for Chemical & Bacteriological Analysis of Water & Sewage", Agro Botanic Publisher, India
5. Laboratory Manual for Environmental Quality Testing, Environmental Protection Research Foundation, Sangli.

TESTING OF MATERIAL I LAB

Lab course outline

Course Title / Subject Title **Short Title**

Testing of Material I Lab **TOM- I Lab**

ICA (Term Work) : 50Marks

Course Description:

This laboratory course introduces students to various types of concrete and alternative construction materials, related laboratory tests and non destructive tests.

	Hours/ week	No. of weeks	Total hours	Semester credit
Theory	**1**	**13**	**13**	**2**
Practical	**02**	**13**	**26**	

Lab Course Content

Prerequisite Course: Concrete Technology.

General Objective: - In this laboratory work students will be introduced to concrete mix design by IS & IRC codes. They will also know various alternative construction materials and their applications**.**

Learning Outcomes:-

Upon successful completion of this course the student will be able to:

- Perform laboratory testing of civil engineering materials.
- Plan and execute testing schedule for Civil Engineering project.
- Know the provisions of Indian standard codes for related civil engineering materials
- Understand different Non Destructive tests and their applications.

COURSE CONTENT

Unit – I **No. of Lect. – 5, Marks: 10**

Concrete Mix Design by IS and IRC/Road Note No.4 Method

Unit – II **No. of Lect. – 2, Marks: 10**

Concept & use of non destructive testing such as Ultrasonic pulse velocity, rebound hammer, half cell potential, carbonation depth, and core test etc.

Unit – III **No. of Lect. – 2, Marks: 10**

Study of Precast and Pre stressed Concrete – Precast concrete and its uses, introduction to Pre stressed concrete, types of pre stressing methods.

Unit – IV **No. of Lect. – 2, Marks: 10**

Fiber Reinforced Concrete – Introduction, classification, mechanism, role of fiber size, and its application

Unit – V **No. of Lect. – 2, Marks: 10**

Alternative materials (Fly ash,stabilized soil , construction and demolition waste, Fibre Reinforced Polymer, Glass Fibre Reinforced Plastics, Bamboo as construction material: uses and suitability, ferro-cement etc.)

Lab Course Content

Group A) It will contain of any **Five** experiments out of following set-

1) Concrete Mix Design (M15/M20/M25) by IS Method and compressive strength at 7days and 28days.
2) Concrete Mix Design (M15/M20/M25) by IRC Method and compressive strength at 7days and 28days.
3) Rebound hammer test on concrete.
4) Ultrasonic Pulse velocity test.
5) Determination of Modulus of Elasticity of Concrete by extensometer.
6) Effect of admixtures on concrete strength
7) Experimental investigation of effect of aggregate gradation and fineness on concrete properties.
8) Compressive strength of Paver blocks
9) Compressive strength of Solid/ Hollow blocks

Group B) At least one site visit to civil engineering project/ready mix concrete plant should be arranged.

Guide line for ICA:

ICA shall be based on continuous evaluation of student performance throughout the semester and ICA submitted by the student.

RECOMMENDED BOOKS:

1. M L Gambhir Neha Jamwal : Building & construction materials lab manual : McGraw Hill Education (India) Pvt. Ltd.
2. Dr. Janardan, Jha, Engineering Materials, Khanna Publishers
3. R. K Rajput, Engineering Materials, S. Chand
4. Parbin Singh, Civil Engineering Materials, S. K.Kataria & Sos New Delhi.
5. Dr. A. V. Narasimha Rao, Fundamentals of Soil Mechanics, University Science press.
6. S.K. Duggal, Building Materials, New Age International Publishers.
7. M. S. Shetty, Concrete Technology, S Chand Publication.
8. M. L. Gambhir, Concrete Technology, TMH Publication.

9. S. V. Deodhar, Concrete Technology, Central Techno Publication
10. N.V. Nayak & A.K. Jain, Concrete Technology, Narosa Publishing House Pvt. Ltd.
11. Kulkarni P.D. Ghosh, R.K. Phull Y.R., Concrete Technology, New Age International.
12. M.L. Gambhir, Concrete Manual, Dhanpat Rai & Co.

Industrial Training/EDP/Special Study

COURSE CONTENT

Course Title	Short Title	Course Code
Industrial Training / EDP / Special Study	**IT/EDP/SS**	

Semester-V **Examination Scheme**

Total Semester Credits: 02 **Internal Continuous Assessment (ICA): 25 Marks**

Teacher should facilitate learning of following real life working environment, new knowledge, skills, and current technologies.

Industrial Training	• Student shall undergo industrial training for a minimum period of **two weeks** during summer vacations between fourth semester and fifth semester. • The industry in which industrial training is taken should be a medium or large scale industry • The paper bound report on training must be submitted by the student in the beginning of Fifth semester along with a certificate from the company where the student took training. • Every student should write the report separately. • Institute / Department/T&P Cell have to assist the students for finding Industries for the training. • Students must take prior permission from Department before joining for Industrial Training.
EDP (Entrepreneurship Development Program)	• Student has to participate in Entrepreneurship Development Program for a minimum period of **One week** during summer vacations between fourth semester and fifth semester. • Every student must submit the paper bound report based on the program in the beginning of Fifth semester along with a certificate (Course / Program completion) from the program organizers. • Every student should write the report separately. • Institute / Department may arrange Entrepreneurship Development Program at their campus. • Students must take prior permission from Department before attending any Entrepreneurship Development Program.
Special Study	• Student has to submit name of three topics of his interest to the department. • Special study in a group shall not be allowed. • The three-member committee appointed by Head of Department shall allot one topic out of the three topics submitted by the student. • Every student must submit the paper bound report based on special study at the end of Fifth semester.

	• Department should allot guide to all such students, for monitoring their progress and guide them for literature survey / report writing etc. • Evaluation of special study shall be done based on presentation made by student, followed by brief question answer session.

Guide lines for ICA:

Assessment shall be based on the active participation of the students in the Industrial Training / EDP / Special study and based on knowledge / skill acquired by the student. The three-member committee appointed by Head of Department in consultation with the Principal shall assess the reports and award marks based on following:

(a) Report	10 marks.
(b) Presentation	10 marks.
(c) Viva-voce at the time of presentation	05 marks.
Total:	**25 marks.**

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Third Year Engineering

(CIVIL)

Faculty of Engineering and Technology

COURSE OUTLINE

TERM – VI

W.E.F 2014 – 2015

STRUCTURAL DESIGN – II

COURSE OUTLINE

Structural Design – II **SD – II**

Course Description:

This course aims to provide an introduction to design of steel structures through the use of the Indian Standard (IS 800:2007) design code. It deals with the design of individual members and connections, such as, the design of riveted/bolted and welded connections, design of tension members, compression members, beams, and beam columns; plate girders, also to equip the students with the tools necessary for designing steel structures and to familiarize them with the relevant national design code.

<table>
<tr><th rowspan="2">Lecture</th><th>Hours / Week</th><th>No. of Weeks</th><th>Total Hours</th><th>Semester Credits</th></tr>
<tr><td>03</td><td>13</td><td>39</td><td rowspan="2">03</td></tr>
<tr><th>Tutorial</th><td>--</td><td>--</td><td>--</td></tr>
</table>

General Objective:

This course is to serve as an introduction to the concepts in structural steel design through the use of the Indian Standard IS 800:2007 design code. It deals with analysis and design of individual members and connections such as the design of tension members, compression members, beams, and beam columns; plate girders and bolted and welded connections, etc. The primary course objective is to equip the students with the tools necessary for designing steel structures and to familiarize them with the relevant national design codes.

Learning Outcomes:

Upon successful completion of this course the student will be able to:

- Understand types of steel structures, grades of structural steel, various rolled steel sections, relevant IS specifications.
- Understand types of Connections, bolted & welded Connections.
- Analyze & design axially loaded tension, compression members.
- Analyze & design built-up compression members.
- Analyze & design roof truss.
- Analyze & design flexural members and column bases.
- Analyze & design of compound beams.
- Analyze & design welded plate girder.

COURSE CONTENT

Structural Design – II **SD-II**

Lecture: 03 hours / week	**End Semester Examination (ESE): 80 Marks**
Practical: 02 hrs/week	**Paper Duration (ESE) : 04 Hours**
	Internal Sessional Exam (ISE) : 20 Marks

Design should be based on IS 800-2007

UNIT – I **(07 Hours 16 marks)**

a) Introduction: Types of steel structures, grades of structural steel, various rolled steel sections, relevant IS specifications such as IS 800-2007, IS:808-1989, IS:875 part I to III & V, SP: 6(1), SP: 6(6), IS:4000-1992, codes for welded connections. Limit state method of design for strength and serviceability, partial safety factor for load and resistance, various design load combinations.

b) Types of Connections: Strength of bolted & welded Connections, Design of connections subjected to Axial Forces & Moments. Beam to beam & beam to column connection (framed connections)

UNIT – II **(08 Hours 16 marks)**

a) Tension member: Behaviour, Modes of failure – Yielding of cross-section, Rupture, block shear. Design of single and double angle sections with gusset plate with bolted and welded end connections.

b) Compression member: Behaviour – effective length, slenderness ratio, Modes of failure- failure with full strength, local buckling, torsional buckling. Classification of cross sections, Buckling curves, Design of compression members with bolted and welded connection using single and double angle sections.

UNIT – III **(08 Hours 16 marks)**

a) Design of built-up column: Built up Column. Design of lacing. Introduction to battened column, design of connections.

b) Roof truss: Design of members for DL, LL and WL, detailing of typical joints and supports.

UNIT – IV **(08 Hours 16 marks)**

a) Flexural member- Laterally supported beams using single rolled steel section with and without flange plate, strength in flexure, low and high shear, check for deflection. Secondary and main beam arrangement for floor of a building, design of beam to beam and beam to column connections using bolt / weld. Design of purlin.

b) Column bases: Column bases under axial load: design of slab base, gusseted base

UNIT – V **(08 Hours 16 marks)**

a) Compound beams: Design of compound beams.

b) Design of welded plate girder: design of cross section, curtailment of flange plates, stiffeners and connections

RECOMMENDED BOOKS:-

1. Subramanian N.,Design of Steel Structures., Oxford University Press, New Delhi, 2008
2. Shah V. L. & Gore ,Limit state design of Steel Structure, Structures Publication, Pune, 5th Edition.
3. Duggal S. K.,Limit State Design of Steel Structures, Tata Mc Graw Hill publishing company Ltd., New Delhi, 3rd Edition, 2009
4. Bhavikatti S. S ,Design of Steel Structure by Limit State Method as per IS: 800-2007., I K International Publishing House, New Delhi, 3rd Edition
5. Ram Chandra, Design of Steel Structures Vol.I & Vol.II, Standard Book House, New Delhi, 10th Edition, 2011

THEORY OF STRUCTURE - II

Theory of Structure - II **TOS – II**

Course Description:

This course covers the introduction to the analysis of statically indeterminate beams and rigid frames. Methods taught include slope deflection, moment distribution, approximate analysis of frames, matrix analysis and plastic analysis.

	Hours / Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	13	39	03
Tutorial	--	--	--	

General Objective:

The primary course objective is to equip the students with the methods necessary for analyzing various types of structures such as trusses, continuous beams and frames. It deals with the fundamental concepts of flexibility and stiffness method of structural analysis. The course also covers introduction to plastic analysis for steel structures

Learning Outcomes:

Upon successful completion of this course the student will be able to:

- Know basic concepts and principles for analysis of structures
- Understand the basic methods of analysis in structural engineering.
- Determine internal forces in various structures such as trusses, continuous beams and frames
- Solve statically indeterminate structures using flexibility and stiffness method
- Understand various concepts in plastic analysis such as shape factor, plastic hinge, collapse mechanism and applications of plastic theory to beams and single story rectangular frames

COURSE CONTENT

Theory of Structure - II **Semester – VI**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week **End Semester Examination (ESE) : 80 Marks**
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

UNIT – I **(08 Hours 16 marks)**

a) Basic concepts of Structural Analysis:- Types of skeletal structures, static and kinematics indeterminacy, equilibrium and compatibility conditions, stress-strain relations, force-displacement relations, concept of linear/non-linear structures. Energy theorem, Miller Breslau principle, Concept of complementary energy, Fundamental concept of Force and the displacement method of analysis.

b) Slope deflection method:- Applied to continuous and rigid jointed frames, transverse and rotational yielding of supports.(up to three unknown).

UNIT – II **(08 Hours 16 marks)**

a) Moment distribution method: - Applied to continuous beams and rigid jointed rectangular frames, transnational and rotational yielding of supports.

b) Approximate Analysis of Multistory Frames: - Vertical and lateral loads, substitute frame, portal frame and cantilever method.

UNIT – III **(08 Hours 16 marks)**

Fundamental concept of flexibility: - Method for structural analysis , flexibility coefficient, matrix formulation for flexibility methods, degree of freedom. Influence coefficients, physical significance, choice of basic determinate structure and redundant forces, compatibility equations, effect of settlement and rotation of supports, temperature and lack of fit, hand solution of simple problems on beams, pin jointed plane truss and rigid jointed frames (Involving not more than three unknown)

UNIT – IV **(07 Hours 16 marks)**

Fundamental concept of Stiffness: - Method of structural analysis, stiffness coefficient, matrix formulation for stiffness methods, Degree of freedom.

Influence coefficients, physical significance, effect of settlement and rotation of trusses and rigid jointed plane frames (involving less than three unknown)

UNIT – V **(08 Hours 16 marks)**

Plastic Analysis of Steel Structures :- Introduction, Shape factor, plastic hinge, collapse mechanism, upper bound and lower bound theories, application to continuous, fixed and single bay single storey rectangular frames.

Assignments

It shall consist of at least one assignments based on each unit.

RECOMMENDED BOOKS

1. Punmia B. C. – Theory of Structure, Laxmi Publication.
2. Bavikatti S. S. - Structural Analysis, New Age Publicatio.
3. Ramamruthum S. Theory of Structure, Dhanpat Rai & Sons Publication.
4. Pandit & Gupta -Structural Analysis,TataMcGrawHill,Pub. Co.Ltd ., New Delhi
5. Wang C.K.-Intermediate structural analysis, McGraw Hill, New York.
6. Kinney- Streling J. Indeterminate structural Analysis, Addition Wesley.
7. Reddy C.S.-Basic Structural Analysis, Tata McGraw Hill Pub. Co. New Delhi.
8. Weaver W & Gere J.M-Matrix Method of framed Structures CBS Publishers & Distributors, Delhi.
9. Ghali A & Neville M. Structural Analysis- A Unified classical and matrix Approach, Chapman and Hall, New York.
10. Vaidyanathan & Perumal – Theory of Structure Vol. I & II, Laxmi Publication.
11. Negi L. S. & Jangid - Theory of Structures, Tata McGraw Hill Pub. Co. New Delhi.

GEOTECHNICAL ENGINEERING – I

Geotechnical Engineering-I **GTE-I**

Course Description

The aim of this course is to equip the students about the principles of mechanics and hydraulics needed to understand soil behavior such that they can apply those abilities to solve more complex problems in practice.

Teaching Scheme
Lecture: 3 hours / week
Credits: 3
Practical: 2 hours / week

Examination Scheme
ESE (Theory Paper) : 80 Marks
Paper Duration (ESE) : 03 Hours
ISE (Class Test) : 20 Marks
ICA (Term work): 25 marks
ESE (Oral): 25 marks

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	3	13	39	3
Practical	2	13	26	1

General Objective:

The primary objectives of this course is to

- Introduce the subjects of soil mechanics, basic terms and relationship between them.
- Classify soils based on soil classification systems in the lab and on the field.
- Define various properties of soil
- Define soil permeability, carry out seepage analysis and understand the characteristics of flow nets.
- Describe compaction and consolidation of soils and difference between them
- Introduce to effective stress principle and describe shear strength of soil, types of shear tests, principal stresses and relation between them

Learning Outcomes:

Upon successful completion of this course the student will be able to:

- Know the basic principles of soil mechanics,
- Describe various index / engineering properties of soil and measurements of the same.
- Predict soil behavior under the application of loads.
- Solve problems in practice.

Course Content

Geotechnical Engineering I **Semester-VI**

Teaching Scheme	**Examination Scheme**
Lecture: 3 hours / week	ESE(Theory Paper) : 80 Marks
Credits : 3	Paper Duration (ESE) : 03 Hours
Practical: 2 hours / week	ISE (Class Test) : 20 Marks
	ICA (Term work) : 25 marks
	ESE (Oral) : 25 marks

Unit – I **No. of Lect. – 8, Marks: 16**

a) Soil as Engg. Material: Origin and formation of soil, geotechnical problems, volume-weight relationships, three phase system, definitions, functional relationships.

b) Geotechnical Properties: Index properties, engineering properties, Atterberg's limits, sieve analysis and its classification systems, and identification of soil.

Unit – II **No. of Lect. – 8, Marks: 16**

a) Stresses in Soil: Geostatic stresses, Boussinesq's Theory, point load, circular load, pressure bulb and its significance, Introduction to Westergaard's theory and Newmark's chart, stress strain relationship soil modulus, elastic settlement.

b) **Soil Compaction and Stabilization:** Methods of Compaction, M.D.D. and O.M.C., standard proctors test, heavy compaction test, Concept of stabilization and its methods.

Unit – III **No. of Lect. – 9, Marks: 16**

a) Consolidation Theory: Terzaghi's theory, consolidation test, rate of settlements, Normal consolidated and over consolidated deposits, Pre consolidation pressure.

b) Flow of water through soils: soil water, capillarity, Darcy's law, laboratory measurement of permeability, simple field measurement, flow net, its construction and uses, seepage force, quick sand, critical gradient.

Unit – IV **No. of Lect. – 7, Marks: 16**

a) Shear resistance in soil: Pore pressure and effective stresses failure theories, Mohr stress circle, Mohr's Coulomb's failure theory, law of shear strength,

b) Measurement of Shear Strength: Direct shear test, Tri-axial test, Unconfined compression test, Vane shear test, factors affecting the shear strength, effect of drainage conditions.

Unit – V **No. of Lect. – 7, Marks: 16**

a) **Introduction to Earth Pressure:** Introduction, Rankine's state of Plastic Equilibrium in soils, Active and Passive states due to wall movement, Earth Pressure at rest.

b) Earth Pressure determination: Rankine's Theory- Earth pressure on Retaining wall due to submerged backfill, Backfill with uniform surcharge, backfill with sloping surface, layered backfill. Coulomb's Wedge theory, Rebhann's and Culmann's graphical method of determination of earth pressure.

RECOMMENDED BOOKS:

1) Dr. B.C.Punmia, Soil Mechanics and Foundation Engineering, Laxmi Publications,16th Edition 2005.
2) Gulhati and Datta , GeoTechnical Engineering, 2000 4th Edition,Tata McGraw Hill.
3) Dr. Alam Singh, Soil Engineering in Theory and Practice (Vol.II), CBS Publication,2006 2nd Edition Delhi.
4) Dr. Alam Singh, Modern Geotechnical Engineering & Foundation, CBS Publication, Delhi.
5) Ramamurthy T.N. and Sitharam T.G., GeoTechnical Engineering,5th Edition,S.CHAND publication.
6) Venkatramaiah C., Geotechnical Engineering,2013 4th Edition.
7) V. N. S. Murthy, Soil Mechanics and Foundation Engineering, Saitech Publications.2004 1st Edition.
8) K. R. Arora, Soil Mechanics and Foundation Engineering, Standard Publishers and Distributors, New Delhi.2010 7th Edition.
9) Taylor, D. W., Fundamentals of Soil Engineering, John Wiley & Sons
10) K. Terzaghi, Soil Mechanics in Engg. Pracice, John Wiley & Sons
11) Relevant Indian Standard Specifications & Codes, BSI Publications, New Delhi.

INFRASTRURAL ENGINEERING II

Infrastructural Engineering II **IE – II**

Course Description

This course introduces the students to various concepts in highway, bridge & traffic engineering and advanced urban technologies. Also it deals with techniques of tunneling in soft and hard rocks and alignment of tunnel.

Lectures	Hours/ week	No. of weeks	Total hours	Semester credit
	03	13	39	3
Tutorial	---	---	---	

General Objectives:

The basic objective of this course is to introduce the students about

- Highway planning for rural and urban road.
- Various types of field surveys.
- Highway geometric deign
- Construction of roads and suitability of various materials.
- Traffic engineering and advanced urban transport technologies.
- Types of bridges and suitability of each type.
- Tunneling in soft and hard rocks and alignment of tunnel.

Learning Outcomes:

Upon successful completion of this course the student will be able to

- Understand developments, classification of roads and highway planning in India.
- Select the material for use in different road layers.
- Know the construction techniques for rural and urban roads.
- Recognize traffic studies, traffic control devices and traffic operation.
- Design road geometries as per IRC conditions.
- Provide effective suggestions for construction and maintenance of any type of road.
- Know classification, construction and maintenance of bridges.
- Understand basics of tunneling and its construction.

Course Content

Infrastructural Engineering II **Semester VI**

Teaching Scheme **Examination Scheme**

Lectures: 3 hours / week **End Semester Examination (ESE):-80 marks**

Paper Duration (ESE): 3 hours **Internal Sessional Exam.(ESE):-20 marks**

Unit-1 (8 hours, 16 marks)

a. **Highway Planning and Development:**
   Highway planning in India, development, rural and urban roads, road, departments in India, road classification, road authorities i.e. IRC, CRRI, NHAI, etc., Financing of road projects, road safety audit.
b. **Field Surveys:** Reconnaissance, aerial surveys, location surveys, location of bridges.
   Highway alignment: Basic requirements of an ideal alignment and factors controlling it, special requirements for hill roads.
c. **Highway Geometric Design:** Topography and physical features, cross section elements like carriageway width, formation width, right of way, etc., friction, Light reflecting characteristics, roughness, camber, sight distances, horizontal alignment, design speed, super-elevation, transition curve, gradients.

Unit-2 (8 hours, 16 marks)

a. **Road Materials:** Aggregates and their types, physical and engineering properties, Fillers, bitumen, characteristics, emulsions and cutbacks, basic tests on all materials, soil investigation, test on soil; CBR, plate load test.
b. **Construction of Roads:** Stabilized earth, gravel roads, W.B.M. roads, high cost Roads: bituminous roads, cement concrete roads.
   Highway Drainage: Surface and sub-surface drainage arrangements,
c. **Highway Pavements:** Design of Flexible (G.I. method and CBR method using IRC recommendations) and rigid pavements (Westergaurd wheel load analysis), Maintenance & Strengthening of pavements.

Unit-3 (8 hours, 16 marks)

a. **Traffic Engineering:** Road user characteristics, vehicular characteristics, traffic flow characteristics, speed, traffic volume studies, parking studies - definition, purpose, types, survey methods. Accident studies - purpose, types, causes, collision diagram, condition diagram, preventive measures
b. **Traffic control devices**: pavement marking, signs, signals, Traffic management, various types of intersection and their design criteria, Traffic Simulation & it's advantages,
   Roadside Developments: Arboriculture, street lighting.

c. **Advanced Urban Transport Technology:** Classification, mass and rapid transit system, introduction to intelligent transportation System (ITS), electronic toll Collection.

Unit-4 (8 hours, 16 marks)

- **a. Bridges:** Site investigation, waterway calculations, scours depth, afflux, and economic span.
- **b. Classification & suitability:** Classification of superstructures with respect to structural behavior and material used types of substructures, flooring joints, movable bridges, and temporary bridges.
- **c. Construction methods & Maintenance:** Methods of erection of various types of bridges, testing and strengthening of bridges.
- **d. Bridge Bearings & Foundation:** Suitability for each type of bridges

Unit-5 (7 hours, 16 marks)

a. **Introduction to Tunneling**: Need, classification, advantages and disadvantages of tunnels compared to open cuts, shape and size of tunnel shafts, pilot tunnels, Alignment of Tunnel.

b. **Tunneling in hard rock:** Meaning of the term 'Faces of Attack', Mucking, methods of removal of muck, heading and benching method, drilling-patterns, blasting, tunnel lining(rock bolting and strata anchoring), methods of Ventilation, Lighting and aspects of drainage, Dust control, Safety in tunnel construction

Tunneling in soft materials: mucking, forepoling and shield methods, needle beam method, modern tunneling methods.

RECOMMENDED BOOKS:

1. L. R. Kadiyali, N B. Lal, Principles & practice of Highway Engineering, Khanna Publication, 2005.
2. Khanna & Justo, Highway Engineering, Nemchand Bros
3. Rangwala, Highway Engineering, Charotar
4. K. L. Bhanot & S. B. Sehgal, Highway Engineering & Airport
5. S. P. Bindra, Bridge Engineering, Khanna Publication
6. S. Ponnuswamy, Bridge Harbour.
7. Rangwala, Tunnel Engineering,Charotar
8. S. C. Saxena, Tunnel Engineering,Charotar
9. L. R. Kadiyali, Traffic Engineering & Transport Planning, Khanna Publishers

CONSTRUCTION MANAGEMENT – II

Construction Management – II **CM – II**

Course Description: This subject deals with various laws and acts applicable to construction industry, safety measures in construction works, material management, tender and contract systems, various pile driving and compacting equipments.

Lectures	Hours / Week	No. of weeks	Total hours	Semester credit
	03	13	39	03
Tutorial	--	--	--	--

General Objective:

The general objective of this course is to know the important acts and laws related to Construction Industry and safety measures with respect to material handling, managing the materials using different analysis methods, contract and tendering system in construction sector. Also it aims to explain various pile driving, compacting and hoisting equipments.

Learning Outcomes:

Upon successful completion of this course the student will be able to:

- Know various acts in construct on industry like Factory act, Workman compensation act, etc.
- Understand safety measures in handling of building materials. Causes of accidents and their reports.
- Explain material management and inventory analysis by using various analysis methods like ABC Analysis, FSN Analysis, etc.
- Discuss technical terms like buffer stock, EOQ, Material planning, etc.
- Describe quality control management as per ISO.
- Explain and understand the concept of Contract and tendering systems in the construction industry.
- Discuss the various pile driving, compacting, hosting equipments also explain the advance construction equipments like crushers, RMC plants and cranes.

Course Content

Construction Management – II **Semester VI**

Teaching Scheme	**Examination scheme**
Lectures: 3 hours / week	**End Semester Examination (ESE) : 80 marks**
Paper Duration (ESE): 3 hours	**Internal Session Exam. (ESE) : 20 marks**

UNIT –I (07 Hours, 16 marks)

a) Important acts and laws related to constructions Industry- factory act, the employees provident fund Act, minimum wage act, workman compensation act, Indian trade union act, arbitration act,

b) Safety measures in handling of building materials, construction of elements of building, demolition of buildings, hot bituminous works, scaffolding, formwork and other equipments, excavation, causes of accidents and preparing accident reports.

UNIT–II (08 Hours, 16 marks)

Materials management, its aims and functions, inventory analysis, inventory models, ABC analysis, inventory management, buffer stock, lead time, EOQ, material requirement, planning, market research, system of purchase of materials, stock of material at site, MAS account, supervision and quality control, concept of quality, stages of control, measures of control, quality control management, introduction to ISO 9000 and ISO 14000.

UNIT—III (10 Hours, 16 marks)

Contract, essentials, types, registration and law of contract, free consent, contract documents, performance of contract, breach of contract, advances to contractor, bills of contract and payments , subletting , inspection of works, tender, tender notice ,various terms used in tender notice such as SD, EMD, estimated cost, time period of work ,cost of tender form, invitation of tender, concept of e-tendering, time schedule of calling tender, tender documents two envelopes system, scrutiny and acceptance , revocation of tender, extra items , additions and alterations , defect liability , liquidated and un-liquidated damages , escalation of rates, work order.

UNIT IV (07 Hours, 16 marks)

a) Pile driving Equipments:-

Pile hammers, drop, single acting steam, double acting steam, differential acting steam, diesel, vibratory , hydraulic hammers , sonic hammers, selection of pile driving hammers.

b) Crushers – types, primary, secondary, tertiary crushers, jaw, gyratory, cone crushers, hammer mills, roll crushers, rod and ball mills Screening aggregate, revolving, vibrating screens

c) Ready mix concrete plant- central concrete batch plant, portable concrete batch plant, ready mixed concrete – central mixed , shrink mixed, truck mixed concrete, concrete pumps.

UNIT –V (07 Hours, 16 marks)

a) Compacting Equipments:-

Types of compacting equipments such as tamping rollers, smooth wheel rollers, pneumatic tired rollers,

b) Hoisting equipments:

Cranes: Classification, derrick crane, mobile crane, Tower crane, Hydraulic crane, overhead or gantry crane, use of cranes in steel construction, use of cranes in concrete construction and safety in crane operation.

RECOMMENDED BOOKS:

1) R.L.Peurifoy - Construction planning, Equipments and Methods.
2) Mahesh Verma - Construction equipments and its planning and application, Vikas publication
3) U.K. Shrivastava - Construction planning and Management, 3rd edition 2005 reprint 2013
4) S.V.Deodhar - Construction equipment and job planning,Khanna publishers,4th edition 2010 reprint2012.
5) Chitkara - Construction Project Management, TMH,NewDelhi,2009
6) B.N.Dutta - Estimating and Costing, UBS Publishers
7) M.Chakroborty - Estimating and Costing, EWP
8) B.S.Patil - Estimating and Costing -Vol-1& 2, Orient Blackson
9) Seetharaman – Construction Engineering and Management, Umesh Publication.
10) P.S.Gahlot & B.M.Dhir – Construction Planning & Management-2010

STRUCTURAL DESIGN – II
LAB COURSE OUTLINE

Structural Design – II **SD – II**
ICA (Term Work): 25 Marks
ESE (Oral) : 25 Marks

Course Description:-

In this Laboratory course emphasis is given on analysis & design of different structural members such as roof truss, components of industrial building, welded plate girder, etc. using Indian Standard (IS 800:2007) design code and to prepare detailed drawings of the same

	Hours/ Week	No. Of weeks	Total Hours	Semester Credits
Lectures	2	13	26	1

General Objective:
The primary lab course objective is to analyze and design Roof Truss, an Industrial Building, Welded Plate Girder and prepare relevant drawings and details for these structures.

Learning Outcomes:
Upon successful completion of this course the student will be able to:
- Analyze dead load, live load, wind load as per IS: 875 Part I to III & design of various components of roof truss as per IS 800:2007.
- Calculate member forces, design main beam & secondary beams, connections, columns, column bases for an industrial building.
- Analyze & design welded plate girder
- Prepare details and drawing of the above project.

Lab course content:-
1) Design of Roof Truss
a) Load analysis-dead load, live load, wind load as per IS: 875 part I to III
b) Design of various components roof truss by IS 800:2007
c) Detailing & drawing of roof truss.

2) Design of an Industrial Building
a) Analysis of industrial building: Calculations of member forces.
b) Design of main beam & secondary beams, connections, columns, column bases.
c) Detailing & drawing of various components of industrial building.

3) Design of Welded Plate Girder

a) Analysis of welded plate girder- Calculation of maximum shear force and maximum bending moment.

b) Design of web plate for shear, design of flange plate for bending moment, design of web stiffeners, design of intermediate stiffeners, design of bearing stiffeners, curtailment of flange plate

4) A report on at least one site visit.

Drawing shall be on half imperial sheets. At least one sheet of above three designs shall be in A3/A4 size sheets using drafting software.

Guidelines for ICA:

ICA shall be based on continuous evaluation of student's performance throughout the semester and ICA drawing sheets submitted by the students.

Guide lines for ESE:

ESE will be based on drawing sheets submitted by the student. In ESE the student may be asked to answer questions based on ICA. Evaluation will be based on performance in **oral** examination.

RECOMMENDED BOOKS:-

6. Subramanian N.,Design of Steel Structures., Oxford University Press, New Delhi, 2008
7. Shah V. L. & Gore ,Limit state design of Steel Structure, Structures Publication, Pune, 5th Edition.
8. Duggal S. K.,Limit State Design of Steel Structures, Tata Mc Graw Hill publishing company Ltd., New Delhi, 3rd Edition, 2009
9. Bhavikatti S. S ,Design of Steel Structure by Limit State Method as per IS: 800-2007., I K International Publishing House, New Delhi, 3rd Edition
10. Ram Chandra, Design of Steel Structures Vol.I & Vol.II, Standard Book House, New Delhi, 10th Edition, 2011

GEOTECHNICAL ENGINEERING–I

Geotechnical Engineering I Lab **GTE -I Lab**

Course Description:

This laboratory course covers experiments related to properties of soils and measurement of the same.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Practical	2	13	26	1

Lab Course Content:

Any **eight** experiments out of following set-

1. Field density by core cutter method, sand replacement method.
2. Sieve analysis and particle size determination or hydrometer analysis.
3. Specific gravity determination by voluminometer/ pycnometer method.
4. Determination of liquid limit and plastic limit
5. Determination of shrinkage limit
6. Determination of co-efficient of permeability by constant head and falling head method.
7. Direct shear test.
8. Unconfined compression test
9. Vane shear test.
10. Proctor's test (MDD / OMC)
11. Tri- axial shear test
12. C.B.R. test or Consolidation test
13. Differential free swell test or swelling test.
14. Any one of the following assignments using software / programming –
    a) Classification of Soils.
    b) Construction of Pressure bulb.
15. Assignments on the following topics
    a) Rebhann's and Cullman's graphical method for determination of earth pressure.
    b) Solution of problems on shear strength parameters using graph.

Guidelines for ICA :

ICA shall be based on continuous evaluation of students' performance throughout the semester and practical assignments submitted by the students in the form of journal.

Guide lines for ESE:-

ESE will be based on laboratory journal submitted by the student. In ESE the student may be asked to answer questions based on experiments/assignments. Evaluation will be based on performance in **oral** examination.

RECOMMENDED BOOKS:

1. Dr. B.C.Punmia, Soil Mechanics and Foundation Engineering, Laxmi Publications,
2. Gulhati and Datta , GeoTechnical Engineering, Tata McGraw Hill.
3. Dr. Alam Singh, Soil Engineering in Theory and Practice (Vol. -1), CBS Publication, Delhi.
4. Dr. Alam Singh, Modern Geotechnical Engineering & Foundation, CBS Publication, Delhi.
5. Ramamurthy T.N. and Sitharam T.G., GeoTechnical Engineering,
6. Venkatramaiah C., Geotechnical Engineering,
7. V. N. S. Murthy, Soil Mechanics and Foundation Engineering, Saitech Publications.
8. K. R. Arora, Soil Mechanics and Foundation Engineering, Standard Publishers and Distributors, New Delhi.
9. Taylor, D. W., Fundamentals of Soil Engineering, John Wiley & Sons
10. K. Terzaghi, Soil Mechanics in Engg. Pracice, John Wiley & Sons
11. Relevant Indian Standard Specifications & Codes, BSI Publications, New Delhi.

INFRASTRUCTURAL ENGINEERING II

Lab course outline

Infrastructural Engineering II **IE – II**

ICA (Term Work) : 25Marks

ESE (oral) : 25Marks

Course Description:

The course in infrastructural engineering incorporates experimental methods, assignments and site visits. The experimental methods are as it is given by the Indian standard code for practice. It includes assignments based upon the data analysis and design, in order to fill the gap between theory and practice through real world exposure. It proposes a site visit to a major road project and also to a hot mix plant. Such site visits will enable the students with the real engineering constraints faced by a civil engineering at site.

Practical	Hours/ week	No. of weeks	Total hours	Semester credit
	02	13	26	1

General objectives:

The basic objective of this syllabus is to appraise the students with experimental methods as applicable for various civil engineering materials used for road construction. It also includes the introduction to the IS practices applicable at every stage of the Lab work including sampling, testing in the laboratory and data interpretation. Over and above, the syllabus also aims to introduce the students with the real world situation through site visit. The experimental data can be used for design and this aspect is covered by assignments on certain topic of the syllabus.

Learning outcomes:

- Student will be aware of the IS codes prevailing in the testing of road construction materials
- Student will be well versed with the experimental methods as applicable for the testing of common road construction material.
- Student will be able to design flexible and rigid pavement.
- Student will be aware of the site constraints and real working environment situations.

Lab Course Content

A) Any **six** experiments on bitumen out of following set.

1. Penetration test
2. Ductility of Bitumen
3. Softening point of Bitumen
4. Flash & fire point

5. Specific gravity of Bitumen
6. Viscosity of Bitumen
7. Stripping value of road aggregates.
8. Bitumen extraction test(on premix sample)

B) Bituminous mix design Marshal Stability test

C) Numerical based on Flexible Pavement Design

D) Numerical based on Rigid Pavement Design

E) A report on at least one site visit.

Visit to construction site of major road projects, hot mix plant etc.

Guide line for ICA:

ICA shall be based on continuous evaluation of student's performance throughout the semester and ICA submitted by the student.

Guide line for ESE:

ESE will be based on ICA submitted by the student. In ESE the student may ask to answer questions based on practical performed/ assignments. Evaluation will be based on performance in oral examination.

Recommended Books:

1. L. R. Kadiyali, N B. Lal, Principles & practice of Highway Engineering, Khanna Publication, 2005.
2. Khanna & Justo, Highway Engineering, Charotar Publishers
3. Rangwala, Highway Engineering, Charotar Publishers,
4. Khanna S.K, Highway Materials And Pavement Testing, Nem Chand & Brothers-Roorkee

TESTING OF MATERIAL II LAB

Lab course outline

Testing of Material II Lab **TOM – II**

ICA (Term Work) : 25 Marks

Course Description:

The present syllabus includes the IS code prescribed methods of testing of various building materials used in civil engineering. The emphasis is given on aggregate materials like bricks, cement, tiles, timber etc. The course includes experimental methods, data interpretation techniques, and design approaches. It recommends a site visit also for transition of students from the theory to the real application.

Practical	Hours/ week	No. of weeks	Total hours	Semester credit
	02	13	26	1

General Objectives

The basic objective of the syllabus is to appraise the students with the IS code permissible limits, IS code methods of experimentations, safety norms of laboratory and general protocols of material sample collections, preservations, testing and data interpretations. The students should also develop skill in the actual implementation aspect of the experimental observations through design. The student should be exposed to the real working environment also.

Learning Outcomes:-

- Student is expected to perform laboratory testing of any Civil Engineering material.
- Student is expected to plan the testing program me's for any Civil Engineering project.
- Student is expected to know the Indian standard codal provision of testing laid in various codes.
- Student is capable to deduce the Engineering behavior based on laboratory testing of Civil Engineering material.
- Student can deliver the results of laboratory testing according to the industry standards

Lab Course Content

Group A)

It will contain of any **Six** experiments out of following set-

1) Water Absorption by Burnt Brick / Fly ash bricks.
2) Compressive strength of Brick/ Fly ash bricks.
3) Abrasion test on tile.
4) Transverse test on flooring / roof tile.
5) Moisture content in timber.
6) Bending/Flexural test on timber.
7) Compressive strength of timber (load parallel to grain and perpendicular to grain and comparison of results)
8) Tensile strength, Bend/Re-bend test on tor Steel.

B) Minimum three assignments / Study Report on following topics.

1. Study of High-Strength concrete design
2. Study of Polymer Modified Bitumen (PMB)
3. Study of Crumb rubber Modified Bitumen (CRMB)
4. Study of New Building Construction Materials
5. Study of Low-cost Building Construction Materials
6. Study of Eco-Friendly material

RECOMMENDED BOOKS:

1. L. R. Kadiyali, N B. Lal, Principles & practice of Highway Engineering, Khanna Publication, 2005.
2. Khanna & Justo, Highway Engineering, Nemchand Bros
3. Rangwala, Highway Engineering, Charotar Publication
4. M.S.Shetty, Concrete Technology, S Chand
5. M.L.Gambhir, Concrete Technology, TMH Publcation.
6. A.N.Neville, J.J.Books- Concrete Technology
7. R.S.Varshney, Concrete Technology-Oxford & IBH
8. Handbook of Low-Cost Housing, A.K.Lal, New Age International Publishers
9. Pacheco Torgal, Fernando et.al, Eco-efficient Construction & Building Materials, Springer
10. M L Gambhir Neha Jamwal : Building & construction materials lab manual : McGraw Hill Education (India) Pvt. Ltd.

MINOR PROJECT

COURSE CONTENT

Minor Project **MIP**
Course Title Short Title Course
Code

Semester-VI

Laboratory	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	2	**10**	**20**	**2**

Examination Scheme
Internal Continuous Assessment (ICA): 50 Marks

Teacher should facilitate learning of self study, enhance analytical ability, promote research oriented activity by developing ability of extracting the material from the different sources and writing comprehensively and exhaustive report on an allotted topic and ability to explore and present a topic in systematic manner.

Following should be considered:

1	Every student shall undertake the Minor Project in semester VI. It is expected that the broad area of major project shall be finalized by the student in the beginning of the VI semester and Minor project undertaken may be a part of Major Project
2	Each student shall work on an approved project, a group of 05 students (maximum) shall be allotted for the each minor project and same group may be continued for major project
3	Minor project may involve fabrication, design or investigation of a technical problem that may take design, experimental or analytical character or combine element of these areas. The project work shall involve sufficient work so that students get acquainted with different aspects of fabrication, design or analysis
4	Each group of students is required to maintain separate log book for documenting various activities of minor project
5	The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of minor project. Maximum four minor project groups shall be assigned to one teaching staff

Guide lines for ICA: Assessment of the project for award of ICA marks

Shall be done jointly by the guide and departmental committee as per the guidelines given in Table-A.

Assessment of Minor Project

Name of the Project: ____

Name of the Guide: ____

Table-A

SN	Exam Seat No	Name of Student	Project Selection	Documentation	Design /Simulation/Logic	PCB/hardware/programming	Result Verification	Presentation	Total
			5	10	10	10	10	5	50

SEMINAR-I

COURSE CONTENT

Seminar-I **S-I**
Course Title Short Title Course Code

Semester-VI

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	**10**	**20**	**2**

Examination Scheme
Internal Continuous Assessment (ICA): 25 Marks

Teacher should facilitate learning of communication ability of an individual and to improve technical knowledge through study of specific topic. Teacher should also facilitate understanding ability, ability to listen, proper language, oral presentation skill amongst students.]

Following should be considered:

1	For Seminar-I every student will individually study a topic assigned to him / her and submit a report and shall deliver a short lecture / Seminar on the topic during the term
2	The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of Seminar-I. Seminar shall be related state of the art topic of his choice approved by the committee
3	Seminar topic should not be repeated and registration of the same shall be done on first come first serve basis
4	Topic of Seminar shall be registered within a two week from commencement of VI Semester and shall be approved by the committee
5	Maximum six seminar supervision shall be allotted to each teacher
6	At the end of semester, student should submit the seminar report (paper bound copy)in following format: a. Size of report shall be about 25 pages. b. Student should preferably refer minimum five reference books / magazines/standard research papers. c. Format of Report i. Introduction ii. Literature survey iii. Theory 1) Implementation 2) Methodology 3) Application 4) Advantages, Disadvantages iv. Future scope v. Conclusion

Guide lines for ICA: ICA shall be based on evaluation of student performance by a seminar presented by the student. Every student shall be required to present a seminar in presence of Panel of teachers constituted by the Head of Department in consultation with the Principal. The evaluation shall be based as per the guidelines given in Table- B

Title of Seminar: ____________________________________
Name of Guide: ____________________________________

Table-B

SN	Exam Seat No	Name of Student	Topic Selection	Literature survey	Report writing	Depth of understanding	Presentation	Total
			5	5	5	5	5	25

NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Third Year Engineering

(Computer)

Faculty of Engineering and Technology

COURSE OUTLINE

Semester – V

W.E.F. 2014 – 2015

Annexure - I

TE Semester – V

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Software Engineering*	D	3	---	---	3	20	80	---	---	100	3
Formal Language & Automata Theory*	D	3	---	---	3	20	80	---	---	100	3
Computer Network*	D	3	---	---	3	20	80	---	---	100	3
System Programming*	D	3	---	---	3	20	80	---	---	100	3
Principles of Management*	C	3	---	---	3	20	80	---	---	100	3
Software Engineering Lab*	D	---	---	2	2	---	---	25	25 **(OR)**	50	1
Linux Lab*	D	---	---	2	2	---	---	25	---	25	1
Computer Network Lab*	D	---	---	2	2	---	---	25	25 **(PR)**	50	1
System Programming Lab*	D	---	---	2	2	---	---	25	25 **(OR)**	50	1
Java Programming Lab*	B	1	---	2	3	---	---	50	---	50	2
Industrial Training / EDP / Special Study*	D	---	---	---	---	---	---	25	---	25	2
Total		**16**	**---**	**10**	**26**	**100**	**400**	**175**	**75**	**750**	**23**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA : Internal Continuous Assessment**

*** Common Subjects with TE I.T.**

TE Semester – VI

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Operating System*	D	3	--	---	3	20	80	---	---	100	3
Object Oriented Modeling & Design*	D	3	---	---	3	20	80	---	---	100	3
Database Management System*	D	3	---	---	3	20	80	---	---	100	3
Analysis & Design of Algorithms	D	3	---	---	3	20	80	---	---	100	3
Management Information System*	C	3	---	---	3	20	80	---	---	100	3
Operating System Lab*	D	---	---	2	2	---	---	25	25 **(OR)**	50	1
Object Oriented Modeling & Design Lab*	D	---	---	2	2	---	---	25	25 **(OR)**	50	1
Database Management System Lab*	D	---	---	2	2	---	---	25	25 **(PR)**	50	1
Web Programming Lab*	B	---	---	2	2	---	---	25	---	25	1
Minor Project*	D	---	---	2	2	---	---	50	---	50	2
Seminar – I*	D	---	---	2	2	---	---	25	---	25	2
Total		**15**	**---**	**12**	**27**	**100**	**400**	**175**	**75**	**750**	**23**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA: Internal Continuous Assessment**

*** Common Subjects with TE I.T.**

Software Engineering

COURSE OUTLINE

Course Title	Short Title	Course Code
Software Engineering	**SE**	

Course Description:
The objective of this course is to introduce students the knowledge of Software Development Life Cycle, application of analysis, design, testing principles and project planning & management concepts to develop quality software economically.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Knowledge of programming languages and data structures.

COURSE CONTENT

Software Engineering **Semester-V**

Teaching Scheme **Examination Scheme**

Lecture: 3 Hours / Week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Introduction to Software Engineering (08Hrs, 16 Marks)

a. Nature of Software
b. Software Process
c. Software Engineering Practice
d. Software Myths
e. Generic Process model
f. Process Assessment and Improvement
g. Perspective Process Models
h. Specialized Process Models
i. Personal and Team Process Models
Agile Process models:
j. Agile process
k. Extreme programming

2. Requirements Engineering (08Hrs, 16 Marks)

Requirements Engineering:
a. Eliciting Requirements
b. Building the Requirements Model
c. Negotiating requirements
d. Validating requirements
e. Requirements Analysis

f. Scenario-Based Modeling
g. Requirements modeling strategies
h. Flow-Oriented Modeling
i. Data modeling Concepts
j. Class based modeling
k. SRS.

3. Design Engineering (08Hrs, 16 Marks)

a. Design Process
b. Design Concepts
c. The Design Model
   Architectural Design:
d. Software Architecture
e. Architectural Styles
f. Architectural Design
   User Interface Design:
a. Rules
b. User Interface Analysis and Design
c. Interface Analysis
d. Interface Design Steps
e. Pattern Based Design
f. Design Patterns
g. Pattern Based software Design
h. Component Level Design patterns
i. User Interface Design patterns
j. WebApp Design patterns

Introduction to UML Diagrams.

4. Software Testing (08Hrs, 16 Marks)

Testing Strategies:

a. A Strategic approach to Software Testing
b. Strategic Issues
c. Testing Strategy for Conventional Software
d. Testing Strategy for Object-Oriented Software
e. Testing strategies for Web App
f. Validation Testing
g. System Testing
   Testing Tactics:
h. Testing Fundamentals
i. White Box Testing
j. Basis Path Testing
k. Control Structure Testing
l. Black Box Testing

5. Software Project Planning & Management Concepts (08Hrs, 16 Marks)

a. Management Spectrum
b. People
c. Product

d. Process
e. Project
f. Critical Practices

Estimation for software project:

g. Project Planning Process
h. Software scope and feasibility
i. Resources
j. Decomposition Techniques
k. Empirical Estimation Models
l. Make/Buy Decision

Project Scheduling:

a. Task set for Software project
b. Defining a task network
c. Scheduling
d. Earned Value Analysis

Product Metrics:

e. A framework for product metrics
f. Software Quality
g. Software Quality Factors

Text Books:

1. Pressman R., "Software Engineering, A Practitioners Approach", 7th Edition, Tata McGraw Hill.

Reference Books:

1. Rajib Mall, "Software Engineering", 3rd Edition, PHI.
2. Pankaj Jalote, "An Integrated Approach to Software Engineering", 3rd Edition, Springer.
3. Sommerville, "Software Engineering", 8th Edition, Pearson.
4. Fairly R. , "Software Engineering", Tata McGraw Hill.
5. Davis A. , "Principles of Software Development", Tata McGraw Hill.
6. Shooman, M.L., "Software Engineering", Tata McGraw-Hill.

Formal Language and Automata Theory

COURSE OUTLINE

Course Title	Short Title Course Code
Formal Language and Automata Theory	**FLAT**

Course Description:
The objective of this course is to introduce the students the knowledge of automata Theory, principles of Grammars, Push down Automata, Turing Machines and enable them to apply these concepts for solving real world problems.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Knowledge of Discrete Structure & Graph Theory and Data Structures.

COURSE CONTENT

Formal Language and Automata Theory **Semester-V**

Teaching Scheme	Examination Scheme	
Lecture: 3 hours / week	**End Semester Examination (ESE)**	**: 80 Marks**
	Paper Duration (ESE)	**: 03 Hours**
	Internal Sessional Exam (ISE)	**: 20 Marks**

1. Finite State Machines: **(08 Hrs, 16 Marks)**

Mathematical Preliminaries:

a. Sets , Relations and Functions
b. Alphabets, Words / Strings, their Properties and operations
c. Graphs and trees
d. Basic machine

Finite State Machines:

e. State tables, Transition graph
f. Adjacency matrix
g. Description of a Finite automaton
h. Transition Systems
i. Properties of Transition functions
j. Acceptability of a string by a FA
k. Deterministic and Non-deterministic FSM's
l. Equivalence of DFA and NFA
m. Moore and Mealy Models
n. Minimization of Finite Automata
o. FSM with Epsilon moves

2. Regular Expressions: **(08 Hrs, 16 Marks)**

a. Definition, Identities for Regular Expressions

b. Finite Automata and Regular Expressions

   Transition System Containing ^-moves, NDFAs with ^-moves and Regular Expressions, Conversion of Nondeterministic Systems to Deterministic Systems

c. Building RE
d. Construction of Finite Automata Equivalent to a Regular Expression
e. Conversion of RE to FA
f. Converting FA to RE
g. Equivalence of two FA
h. Pumping lemma for regular sets
i. Applications of Pumping lemma
j. Closure properties of Regular sets

(08 Hrs, 16 Marks)

3. Grammars:

a. Definition
b. Derivation trees
c. Leftmost and Rightmost Derivations
d. Ambiguous grammar
e. Removal of ambiguity
f. Chomsky hierarchy
g. Construction of Reduced Grammar
h. Eliminating Useless symbols
i. Eliminating Epsilon productions
j. Eliminating Unit productions

Normal Forms for Context – free Grammars

k. Chomsky Normal Form
l. Greibach Normal Form
m. Reduced Forms – CNF and GNF
n. Reduction to CNF and GNF
o. Pumping Lemma for Context – free Languages
p. Decision Algorithms for Context- free Languages

4. Pushdown Stack Memory Machines & Production Systems (08 Hrs, 16 Marks)

Pushdown Stack Memory Machines:

a. Definition, PDM examples
b. Acceptance by PDA
c. Power of PDM
d. Deterministic and Non-deterministic PDM
e. Construction of PDA from CFG
f. Construction of CFG from PDA

Production Systems:

a. Definition, Post canonical system
b. PMT systems
c. Markov algorithm

5. Turing Machine: (08 Hrs, 16 Marks)

a. Turing Machine Model
b. Representation of Turing Machines

c. Language Acceptability By Turing Machines
d. Design of Turing Machines
e. Techniques for TM Construction
f. Variants of Turing Machines
g. Composite and Iterated TM
h. Universal TM
i. TM limitations
j. The Halting problem

Text Books -

1. E V Krishnamurthy, S.K.Sen, “Introductory Theory of Computer Science”, Second Edition, EWP.
2. John E. Hopcroft, Rajeev Motwani, Jeffery D. Ullman, “Introduction to Automata Theory, Languages and Computation”, Third Edition, Pearson.
3. K.L.P.Mishra, N. Chandrasekaran, “Theory of Computer Science Automaton, Languages and Computation”, Third Edition, PHI.

Reference Books -

1. Daniel Cohen, “Introduction to computer Theory”, Wiley India.
2. John Martin, “Introduction to Languages and the Theory of Computation”, TMH.
3. Lewis H., Papadimitriou C., "Elements of Theory of Computation", Second Edition, Pearson.
4. Moret B., “The Theory of Computation", Pearson Education.

Computer Network

COURSE OUTLINE

Course Title	Short Title	Course Code
Computer Network	**CN**	

Course Description:

This course is aimed at introducing the fundamentals of Computer Networking to undergraduate students. The objective of the course is to understand the basics and knowledge about the Computer Network concepts and different protocols.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	3	14	42	03

Prerequisite Course(s): Data Communications.

COURSE CONTENT

Computer Network **Semester-V**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. **TCP/IP Protocol Suit, Data Link Layer and Ethernet**

(08 Hours, 16 marks)

TCP/IP Protocol Suit: Physical and Data Link Layers, Network Layer, Transport Layer, Application Layer. Addressing: Physical Addresses, Logical Addresses, Port Addresses, Specific Addresses.
Data Link Layer: Framing: Fixed size and variable size framing.
Ethernet: IEEE Standards: Data Link Layer, Physical Layer. Standard ETHERNET: MAC Sublayer, Physical Layer. Changes in the standard: Bridged Ethernet, Switched Ethernet, Full-Duplex Ethernet. Fast Ethernet: MAC Sublayer, Physical Layer. Gigabit Ethernet: MAC Sublayer, Physical Layer, Ten-Gigabit Ethernet.

2. **Network Layer: Logical Addressing, Internet Protocol and Address Mapping**

(08 Hours, 16 marks)

Logical Addressing: IPv4 Addresses: Address Space, Notations, Classful Addressing, Classless Addressing, Network Address Translation (NAT).
Internet Protocol: IPv4: Datagram, Fragmentation, Checksum, Options. IPv6: Structure, Address Space, Advantages, Packet Format, Extension Headers, Transition from IPv4 to IPv6: Dual Stack, Tunneling, Header Translation.

Address Mapping: Mapping Logical to Physical Address: ARP, Mapping Physical to Logical Address: RARP, BOOTP and DHCP.

3. Network Layer: Error Reporting, Delivery, Forwarding and Unicast 7 Mulicast Routing Protocols **(08 Hours, 16 marks)**

Error Reporting: ICMP: Types of Messages, Message Format, Error Reporting, Query, Debugging Tools.

Delivery: Direct Versus Indirect Delivery.

Forwarding: Forwarding Techniques, Routing Table.

Unicast Routing Protocols: Optimization, Intra and Interdomain Routing, Distance Vector Routing, Link State Routing, Path Vector Routing.

Multicast Routing Protocols: Source-Based Tree and Group-Shared Tree, MOSPF, Core-Based Tree (CBT).

4. Transport Layer: UDP and TCP

(08 Hours, 16 marks)

Transport Layer: Transport-layer services: Process-to-Process Communication, Addressing: Port Numbers, Encapsulation and Decapsulation, Multiplexing and Demultiplexing, Flow Control and Error Control.

User Datagram Protocol (UDP): User Datagram, UDP Services: Process-to-Process Communication, Connectionless Services, Flow Control and Error Control.

Transmission Control Protocol (TCP): Services, Features, Segment, Connection, Flow Control, Error Control and Congestion Control: open-loop congestion control and closed-loop congestion control.

5. Wireless Networks: 802.11 and Network Security

(08 Hours, 16 marks)

Introduction to Wireless Network: Why Wireless? A Network by Any Other Name.

Overview of 802.11 Networks: IEEE 802 Network Technology Family Tree, 802.11 Nomenclature and Design, 802.11 Network Operations, Mobility Support.

Network Security: Introduction to cryptography, symmetric-key and asymmetric-key cryptography. Symmetric-Key cryptography: Introduction, traditional ciphers, simple modern ciphers: XOR Cipher, Rotation Cipher, Substitution Cipher: S-box, Transposition Cipher: P-box. Asymmetric-Key cryptography: RSA, Diffie-Hellman algorithms.

Text Books:

1. B. A. Forouzan, "Data Communications and Networking", TMH, Fourth Edition.
2. A. S. Tanenbaum, "Computer Networks", Pearson Education, Fourth Edition.
3. Matthew S. Gast, "802.11 Wireless Networks: The Definitive Guide", O'Reilly, Second Edition.

Reference Books:

1. B. A. Forouzan, “TCP/IP Protocol Suite", TMH, Fourth Edition.
2. W.R. Stevens, “Unix Network Programming”, Vol.1, Pearson Education.
3. S. Keshav, “An Engineering Approach to Computer Networking”, Addison Wesley.
4. Comer, “Internetworking with TCP/IP", Vol. 1, Pearson Education, Fourth Edition.
5. W. Stallings, “Data and Computer Communications", Pearson Education, Fifth Edition.

System Programming

COURSE OUTLINE

Course Title	Short Title	Course Code
System Programming	**SP**	

Course Description:
The objective of this course is to introduce the students to the fundamentals of System Programming. In this basic system programs are studied in order to understand the working of system software.

	Hours per week	No. of Weeks	Total Hours	Semester Credits
Lectures	**03**	**14**	**42**	**03**

Prerequisite Course(s): Discrete Structure and Graph Theory, Data Structures.

COURSE CONTENT

System Programming **Semester-V**

Teaching Scheme
Lecture: 3 hours / week

Examination Scheme
End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Introduction to System Programs and Assembler: (08 Hours, 16 marks)

a. Introduction to system programming, Types of software and application software, System programming and system programs, Need of system software. Assemblers, Loaders, Compilers, Interpreters, Macros, Operating system and formal system, Translators and its types.
b. Assemblers: Structure of assembler, basic function, Machine dependent and machine independent features of assembler, Types of assemblers – single pass, multi-pass, cross assembler.
c. General design procedure of assembler, Design of Pass-I and Pass-II assembler (with reference to 8086 assembler).
d. Operating System:- concept, services, types (brief introduction only).

2. Macro processor & Loader: (08 Hours, 16 marks)

a. Macros and Macro Processors: Definition and function of Macro Processor, Macro expansion, Features of macro facility.
b. Design of macro processor – single pass and two pass macro processor, detailed design of two pass macro processor.
c. Loaders and Linkage Editors: Basic loader functions, Relocation and linking concepts, various loader schemes (Compile and go loader, Absolute loader, Relocating loader, general loading scheme) with their advantages and disadvantages.

3. Loader, Linker & Grammar: (08 Hours, 16 marks)

- **a.** Design of direct linking loaders, specification of problem, specification of data structures, format of databases.
- **b.** Design of a linker, A linker for MS DOS, Linking for overlays.
- **c.** Other loader schemes – Binders, Linking loaders, Overlays, Dynamic binders.
- **d.** Grammar and scanner, Programming language grammar, Derivation, Reduction and Syntax tree, Ambiguity, Regular grammar and Regular expression.

4. Parser and Parsing Techniques (08 Hours, 16 marks)

- **a.** Parsing Techniques: - Concept, Top Down and Bottom up Parsing.
- **b.** Top Down Parsing :- limitations of Top Down Parsing -Recursive descent and Predictive Parsing
- **c.** Bottom Up Parsing:- Concept, Shift Reduce Parser, LR Parser, LALR, SLR Parser
- **d.** Operator Precedence Parser, Syntax directed translation (Concept and introduction only).
- **e.** Introduction to software development tools LEX & YACC.

5. Compiler & Inter Process Communication (08 Hours, 16 marks)

- **a.** Overview of compilation process, Basic functions of complier, Machine dependent and machine independent features of compiler.
- **b.** Types of compilers – single pass, multi-pass, cross compiler and pseudo code compiler,
- **c.** Phase structure of compiler.
- **d.** Introduction to inter process communication in windows(DLL, DDE, OLE, Clipboard:- concept and introduction only).

Reference Books:

1. John J. Donovan, "System Programming", 2nd Edition, TATA Mc GRAW HILL.
2. D. M. Dhamdhere, "System Programming and Operating Systems", Second Revised Edition, TATA Mc GRAW HILL.
3. Aho Alfred V, Sethi Rav and Ullman D, "Compiler Principles Techniques and Tools", 2nd Edition, Pearson Education.

Principles of Management

COURSE OUTLINE

Course Title	Short Title	Course Code
Principles of Management	**POM**	

Course Description:
The objective of this course is to introduce the students to the Knowledge of Functions of Management and Project management, life-cycle of project, its scheduling and total quality management enable them to Understood and gain for further study.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	**14**	**42**	**03**

COURSE CONTENT

Principles of Management **Semester- V**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Basic Concepts of Management **(08 Hours, 16 marks)**

a. Management :Definition, classification, Characteristics and Importance of management, Principles of Management
b. Management objectives, Types of objectives
c. Functions of managers, Managerial accounting
d. Development of management thoughts : Functional approach to management by Henry Foyal
e. Scientific Management Approach by Taylor, Gilbreth, Gantt
f. Human Relation Approach by Elton Mayo,Follet
g. Schools of management Thoughts
h. Tools of Management science, Managerial economics

2. Functions of Management and Organisations

(08 Hours, 16 marks)

a. Functions of Management: Planning, Organising
b. Staffing - Concept, Nature, Importance, Steps, Concept of Knowledge worker
c. Directing– Concept, Nature, Importance
d. Controlling-Concept, Nature, Importance, Process of controlling Leadership theories, characteristic and styles of leaderships
e. Management by objectives: steps in setting up M.B.O, Problem in the approach of M.B.O., Management of participation, management by exception, quantitative and qualitative objectives

f. Organisation and its Concept: Nature, Importance, Principles, Centralization, Decentralization
g. Organization Structures- Line and Staff, Functional, Organizations.

3. **Human Resource Management**

(08 Hours, 16 marks)

a. Function and objective Personnel Management
b. Manpower Planning, Selection and Recruitment of Employees
c. Needs & Types of Training, Objective and Benefits of training, Training for Craftsman, supervisor and Executive
d. Motivation and motivators: motivations, perspective: self-motivation
e. Motivation: the carrot and the sticks, kinds of Motivation, Herzberg's motivation, Hygien Theory
f. Personal management: concept, principles of good personal policy
g. Communication in industry, suggestion system, discipline in industry, promotion, transfer, layout and discharge

4. **Project and Quality Management**

(08ours, 16 marks)

a. Introduction, Project Management Terminology, Concept of project Management
b. Role and Responsibilities of Project Manager
c. Types of project, Project Life Cycle Phase
d. Project Planning, Project Scheduling, Project Monitoring and Control
e. Basic tools and Techniques for Project Scheduling
f. Total quality management: Introduction, factors affecting quality,
g. product quality analysis, product quality analysis, causes of quality failure
h. elements of T.Q.M , requirements of T.Q.M, Aims of T.Q.M., quality circles, ISO 9000

5. **Industrial Psychology, Ethics and MIS**

(08 Hours, 16 marks)

a. Industrial Psychology: Definition and Concepts, Industrial psychology Vs Personal Management
b. Aims and Objectives of Industrial Psychology, Scope
c. Individual difference in behavior, Group Dynamics
d. Theory X and Y, Working Environmental Conditions, Industrial Fatigue
e. Professional and Business Ethics: Concepts, Ethics and Morals, Business Ethics, Professional Ethics
f. Need and Importance of ethics, Ethical problems and business, Ethical Issues, How to make business ethical
g. Definition, Evolution of MIS, Need/Objective/Functions of an MIS, Need for Information, Qualities of Good information
h. Information as an Organizational Resource, Management Information Categories, Application of MIS

Text Books:

1. T.R.Banga & S.C.Sharma , "Industrial Organization and Management Economics" Twenty-Third Edition, Hanna Publishers.
2. O.P.Khanna, "Industrial Organization and Management Economics", Dhanpat Rai Publications, 2006.

Reference Books:

1. Koontz and Weihrich, "Management –A Global Perspective", Tenth Edition, Mc Graw-Hill International Editions.
2. Tritaphy and Reddy, "Principles of Management", Second edition, TMH.
3. Hill and Steven, "Principles of Management", McGraw Hill, Special Indian Edition, 2007.
4. M.S.Mahajan," Industrial Engineering and Production Management" Dhanpat Rai and Co.
5. W.S.Jawadekar, "Management Information System", TMH.

Software Engineering Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Software Engineering	**SE**	

Course Description:
This laboratory provides students an ability to apply analysis & design concepts to develop quality software economically.

Laboratory	Hours/Week	No. of Weeks	Total Hours	Semester Credits
	02	14	28	01

Prerequisite Course(s) : Knowledge of Object Oriented Concepts and any system programming language.

LAB COURSE CONTENT

The Software Engineering Lab must include any five of following software Mini-Projects covering Problem Definition, Analysis & Design using a CASE Tool and Documentation for each.

1. ATM System
2. Library Management System
3. Inventory Control System
4. Railway Reservation System
5. College Admission System
6. University Result Management System
7. Vehicle Navigation System
8. Hospital Management System
9. Banking System
10. Web based/Online Auction System

Guidelines for ICA:
Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guidelines for ESE:
The oral examination will be based on the assignments performed by the candidates as part of ICA. Questions will be asked during the oral examination to judge the understanding of the student. It is expected that student knows theoretical (Software Engineering) aspect of the problem.

Reference Books:

1. Timonthy C. Lethbridge and Robert Laganiere, “Object Oriented Software Engineering – A Practical Software Development using UML and JAVA”, 2nd Edition, Tata McGraw-Hill.
2. Mike O’Docherty, “Object-Oriented Analysis & Design – Understanding System Development with UML 2.0”, Wiley.

Note:-

- Use of Open Source Tool / Technology is recommended for laboratory assignments of concern subject.

Linux Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Linux	**Linux**	

Course Description:

This laboratory provides students with a basic knowledge of the linux programming environment. So that students able to use basic commands of linux as well as they will able to perform basic operations.

Laboratory	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	02	14	28	01

Total Semester Credits: 01

Prerequisite Course(s): Fundamental knowledge of Operating system.

LAB COURSE CONTENT

Outline of Content:

Teacher should facilitate learning following lab experiments:

Group A

1 **Installation of Linux OS.**
Installing latest version of Linux. Observing each step of installation and notice the differences.

2 **Study and execution of various Linux Commands.**
Studying various basic commands of Linux. Use of commands.

3 **Study of vi editor.**
Studying basic working and use of vi editor.

4 **Configuration of Linux Server (any two)**
It shows step by step Configuration of various types of servers
1) Web Server
2) Mail Server
3) Proxy Server
4) Telnet Server
5) FTP Server

5 **Shell script for finding out factorial of a number.**
To calculate the Factorial of number.

6 **Shell script for finding out file type and displaying list of a directory.**
To find out file type and displaying list of directory.

7 **Shell Script for File Handling.**
Demonstrates the various file operations such as :
1) Create a File.
2) Read a File.
3) Add a record into a File.

4) Delete a record from File.
5) Delete a file.
6) Update a File.

Group B

1 **Write shell script for displaying user process and system related information using environment variables.**
Displays a user process and system related information using environment variables.

2 **Write a shell script to find the largest among the 3 given numbers.**
To find out largest number among 3 given numbers.

3 **Write a shell script to reverse the contents of a String.**
To print contents of string in reverse order.

4 **Write a shell script to print date and time.**
To print date and time along with greetings depend on time.

5 **Shell script to perform arithmetic operations.**
To perform arithmetic operations such as – Addition, Subtraction, Multiplication, Division**.**

Guidelines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Reference Books:

1. Stevens Richard W, Rago Stephen A "Advanced Programming in the Unix Environment", Pearson 2008.
2. Gopalan N P,Sivaselvan B "Beginners guide to unix", PHI Learning: New Delhi, 2009.
3. Richard Blum, Christine Bresnahan, "Linux Command Line and Shell Scripting Bible, 2nd Ed", Wiley India, 2011.
4. Dayanand Ambawade, Deven N. Shah, "Linux Lab: Hands on Linux", Dreamtech Press
5. "Linux Administration", Kogent Learning Solutions Inc.
6. Evi Nemeth, Garth Snyder, Trent R. Hein, Ben Whaley, "Unix and Linux System Administration Handbook" 4th Edition, Pearson.
7. Neil Matthew, Richard Stones, "Beginning Linux Programming", 4th Edition, Wiley.
8. K. L. JAMES, "Linux -Learning the Essentials", PHI, 2011.

Note:

- Concerned faculty should suitably frame at least **10 practical** assignments **(SIX from PART – A and FOUR from PART – B)** out of the above list.
- Every assignment should include syntax, use of commands/functions used for coding & print out of code with proper comments and output.
- Every student is required to submit the assignments in the form of journal.
- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Computer Network Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Computer Network	**CN**	

Course Description:

This laboratory provides students with a comprehensive study of the Computer Networking and protocols. Classroom lectures stress the strengths of Computer Networks, which provide students with the means of writing efficient, maintainable, and portable code and simulating protocols and networks.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**14**	**28**	**01**

Total Semester Credits: 01

Prerequisite Course(s): Fundamental knowledge of Computers and Data Communication, C, C++ and Java Programming.

LAB COURSE CONTENT
Outline of Content:

(Note: Minimum SIX Experiments from PART A and TWO from PART B.)

PART - A

1. Implementation of Character count/Bit-Stuffing/Byte stuffing framing methods.
2. Implementation of Dijkastra's Shortest Path Network routing algorithm.
3. Implementation of TCP checksum.
4. Socket programming for TCP.
5. Socket programming for UDP.
6. Encryption/Decryption using XOR symmetric-key cryptography algorithm.
7. Encryption/Decryption using RSA asymmetric-key cryptography algorithm.
8. Implementation of RLE data compression algorithm.

PART – B

1. Simulate the Ethernet LAN for wired networks.
2. Simulate the point-to-point wired network.
3. Simulate any Wireless network.

Guidelines for ICA:
Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guidelines for ESE:
ESE will be based on the practical assignments submitted by the students in the form of journal. In the ESE, the students may be asked to perform the practical assignment with minor modification.
Evaluation will be based on the paper work of algorithm, understanding of the logic and the syntax, quality of the program, execution of the program, type of input and output for the program.

NOTE: -

- Concerned faculty should use any network simulator software like NS-2/NS-3/ OPNET/ NetSim/ OMNeT++ to perform **PART-B** assignments.
- Concerned faculty should suitably frame at least **08 practical** assignments **(SIX from PART – A and TWO from PART – B)** out of the above list.
- Every assignment should include, theory, algorithm, print out of code with proper comments and output. Every student is required to submit the assignments in the form of journal.
- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

System Programming Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
System Programming	**SP**	

Course Description:

The objective of this course is to introduce the students to the fundamentals of System Programming. In this basic system programs are studied in order to understand the working of system software.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**14**	**28**	**01**

Total Semester Credits: 01

Prerequisite Course(s): Fundamental knowledge of Discrete Structures and Graph Theory, Data Structures.

LAB COURSE CONTENT
Outline of Content:

1. **Develop an application to simulate pass-I of Two Pass Assembler.**
   To analyse the source program for finding Pseudo–opcode, Machine opcode, Literals and symbols.
2. **Develop an application simulate pass- II of Two pass Assembler.**
   To analyse the output of pass-I to generate the machine operation code.
3. **Develop an application to create simple text editor.**
   Develop a text editor for creation, opening, editing and saving the content into a file.
4. **Develop an application for simulating Lexical Phase of compiler.**
   Develop a Lexical Analyser for generating keywords, symbols, operators and identifires within the source code.
5. **Develop an application for simulating Syntax Analysis Phase of compiler.**
   Develop a Syntax Analyser for generating a Parse tree from source code.
6. **Develop an application for simulating Pass-I of Macro Processor.**
   Develop Pass-I of Macro processor for recognizing macro definition specified within a program.
7. **Develop an application for simulating Pass-II of Macro Processor.**
   Develop Pass-II of an Macro processor for expanding a macro definition specified within a program
8. **Develop an application for simulation of any one of parsing techniques.**
   Develop a parser from the grammar specified within a source code.

Guidelines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guidelines for ESE:

- ESE will be based on the practical assignments submitted by the students in the form of journal.
- In the ESE, the students may be asked to perform the practical assignment with minor modification.

Note:

- Concerned faculty should suitably frame at least **06 practical** assignments out of the above list.
- Every assignment should include theoretical concept, algorithm, print out of code with proper comments and output.
- Every student is required to submit the assignments in the form of journal.
- Use of Open Source Tool / Technology is recommended for laboratory assignments of concern subject.

Java Programming Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Java Programming	**JPL**	

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**14**	**28**	**01**

Group-A

1 **Write a program that demonstrates string operations.**

2 **Write a program that demonstrate package creation and use in program.**

3 **Write a program to demonstrate the abstract class and abstract method**.

4 **Write a Java program that illustrates the concepts of Java class that includes**

(a) constructor with and without parameters.
(b) Overloading methods.
(c) Overriding methods

5 **Write a Java program to demonstrate inheritance by creating suitable classes.**

6 **Create a Java package, interface and implement in Java program.**

7 **Write a program to demonstrate**

- Use of implementing interfaces.
- Use of extending interfaces.

Group- B

1 **Write a program to implement the concept of threading.**

2 **Write a program to demonstrate the predefined and User defined exception handling.**

3 **Write a program using Applet**

- to display a message in the Applet.
- for configuring Applets by passing parameters.

4 **Write programs for using Graphics class**

- to display basic shapes and fill them.
- draw different items using basic shapes

- set background and foreground colors.

5 **Write a program in Java that demonstrates JDBC**

6 **Write a program that demonstrates JDBC on applet/application**

Guidelines for ICA:
Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Reference Books:

1. Herbert Schildt, “Java2: The Complete Reference”, Tata Mc GrawHill, 5th edition.
2. E. Balagurusamy,”Programming with Java A primer”, 3rd Edition.
3. Horstman Cay and Cornell Gary, “Core JavaTM2”, Vol.1, Pearson education.
4. Kathey Sierra and Bert Bates, “Head First Java”, SPD Publication.
5. Steven Holzner, “JAVA 2 Programming Black Book”, Wiley India.

Note:
- Concerned faculty should suitably frame at least **08 practical** assignments **(FIVE from PART – A and THREE from PART – B)** out of the above list.
- Every assignment should include algorithm, print out of code with proper comments and output.
- Every student is required to submit the assignments in the form of journal.
- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Industrial Training / EDP / Special Study

COURSE CONTENT

Industrial Training / EDP / Special Study	**IT/EDP/SS**	
Course Title	Short Title	Course Code

Semester-V	**Examination Scheme**
Total Semester Credits: 02	**Internal Continuous Assessment (ICA): 25 Marks**

Industrial Training

- Student shall undergo industrial training for a minimum period of **two weeks** during summer vacations between fourth semester and fifth semester.
- The industry in which industrial training is taken should be a medium or large scale industry
- The paper bound report on training must be submitted by the student in the beginning of Fifth semester along with a certificate from the company where the student took training.
- Every student should write the report separately.
- Institute / Department/T&P Cell have to assist the students for finding Industries for the training.
- Students must take prior permission from Department before joining for Industrial Training.

OR

EDP (Entrepreneurship Development Program)

- Student has to participate in Entrepreneurship Development Program for a minimum period of **One week** during summer vacations between fourth semester and fifth semester.
- Every student must submit the paper bound report based on the program in the beginning of Fifth semester along with a certificate (Course / Program completion) from the program organizers.
- Every student should write the report separately.
- Institute / Department may arrange Entrepreneurship Development Program at their campus.
- Students must take prior permission from Department before attending any Entrepreneurship Development Program.

OR

Special Study

- Student has to submit name of three topics of his interest to the department.
- Special study in a group shall not be allowed.
- The three-member committee appointed by Head of Department shall allot one topic out of the three topics submitted by the student.
- Every student must submit the paper bound report based on special study at the end of Firth semester.
- Department should allot guide to all such students, for monitoring their progress and

guide them for literature survey / report writing etc.

- Evaluation of special study shall be done based on presentation made by student, followed by brief question answer session.

Evaluation of Industrial Training / EDP / Special Study

ICA: The Internal Continuous Assessment shall be based on the active participation of the students in the training / EDP / Special study and based on knowledge / skill acquired by the student. The three-member committee appointed by Head of Department shall assess the reports and award marks based on following:

(a) Report		10 marks.
(b) Presentation		10 marks.
(c) Viva-voce at the time of presentation		05 marks.
	Total:	**25 marks.**

NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Third Year Engineering

(Computer)

Faculty of Engineering and Technology

COURSE OUTLINE

Semester – VI

W.E.F. 2014 – 2015

Operating System

COURSE OUTLINE

Course Title	Short Title	Course Code
Operating System	**OS**	

Course Description:
The objective of this course is to introduce the students to the concepts of Operating Systems functions, types and their working details.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Computer Organization, System Programming.

COURSE CONTENT

Operating System **Semester-VI**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Operating System Overview

(08 Hours, 16 marks)

a. Introduction: Computer system organization, Architecture, Evolution of OS, Need of OS, User view and System view of OS.
b. Types of Operating System: Batch, Timesharing, Multiprogramming, Multitasking, RTOS, Distributed.
c. Operating System Services and Components: Different OS services and OS components, System calls and its types.
d. Operating System Structures: Monolithic, Layered, Kernel, Microkernel, Virtual Machine.
e. Threads: Overview, Benefits, Models (Introduction Only).

2. Process and Process Management

(08 Hours, 16 marks)

a. Process Concept: The process, Process states, Process Control Block, Context Switching, SPOOLING, CPU & I/O burst.
b. Scheduling: Concept, Objectives, Queuing diagram.
c. Types of Schedulers: Long term Scheduler, Middle term Scheduler, Short term Scheduler.

d. Scheduling Algorithm (For Uniprocessor System): FCFS, SJF (preemptive & non preemptive), Priority (preemptive & non preemptive), Round Robin, MLQ with and without feedback.
e. IPC: Concept and Types.
f. Critical Section: Critical section problem, Solution to critical section problem, Mutual exclusion with busy waiting, TSL, Peterson's solution for two processes, Dijkstra's semaphore.
g. Problem in Concurrent Programming: Producer-Consumer problem, Readers–Writers problem, Dinning Philosopher problem, Monitors.

3. Deadlocks

(08 Hours, 16 marks)

a. Deadlock: System Model, Deadlock Characterization, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.
b. Memory Management: Memory Management Requirements.
c. Memory Partitioning: Fixed and Dynamic Partitioning.
d. Memory Allocation: Allocation strategies (First Fit, Best Fit and Worst Fit), Fragmentation, Swapping, Paging and Segmentation.
e. Virtual Memory Management: Background, Demand Paging, Page Replacement (FIFO, LRU, Optimal LRU), Thrashing.

4. Storage Management

(08 Hours, 16 marks)

a. File concept: File Organization, Access Methods and Directory Structure.
b. Allocation of Disk Space: Contiguous allocation, Non-contiguous allocation (chaining and indexing).
c. Disk Scheduling: FCFS, SSTF, SCAN, C-SCAN, LOOK.

5. Secondary Storage Structure, Protection and Security, Introduction to UNIX.

(08 Hours, 16 marks)

a. Disk Management: Disk formatting, Boot block, Bad blocks.
b. Swap Space Management: Swap Space Use, Swap Space.
c. System Protection: Goals of protection, Domain of protection, Threats, Security attacks.
d. Introduction to UNIX: History, System architecture.
e. Internal Representation of File: Inode, Structure of regular file, Super block, Pipes (No Algorithms).
f. Process Control: Process creation, Process States and Transitions, Process system calls (exec, fork).

Text Books:

1. A. Silberschatz, P. B. Galvin, G. Gagne, “Operating Systems Concepts”, 7th / 8th edition, John Wiley Publications, 2008.
2. William Stalling, “Operating System Internals and Design Principles”, 6th edition, Pearson Publication, 2013.

Reference Books:

1. Maurice J. Bach, “The Design of the Unix Operating System”, 1st edition, PHI.
2. Dhananjay M. Dhamdhere, “Operating Systems-A Concept-Based Approach”, 3rd edition, TMH, 2012.
3. A. S. Tanenbaum, “Modern Operating System”, 2nd edition, Pearson publication”, 2001.
4. H. M. Deitel, P. J. Deitel, D. R. Choffnes, “Operating System”, 3rd edition, Pearson publication, 2013.
5. Rajiv Chopra, “Operating Systems-A Practical Approach”, 1st edition, S. Chand Publication, 2009.
6. Sibsankar Haldar, Alex A. Arvind, “Operating Systems”, 1st edition, Pearson Publication, 2009.

Object Oriented Modeling & Design

Course Title	Short Title	Course Code

Object Oriented Modeling and Design **OOMD**

Course Description:

The objective of this course is to introduce students the knowledge about Modeling and Design of Software firmware and business processes. It introduces UML 2.0 and its diagrams as a modeling tool for large and complex systems. It also gives understanding of the concepts being modeled in UML.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Knowledge of software engineering and object oriented concepts.

COURSE CONTENT

Object Oriented Modeling and Design **Semester-VI**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Introduction of Object Oriented Modeling **(08 Hrs, 16 Marks)**

Introduction:

a. What is object-oriented?
b. What is Object oriented development? : Modeling Concept , Not Implementation , Object- Oriented Methodology , Three Models
c. Object oriented themes

Why We Model:

d. The Importance of Modeling
e. Principles of Modeling
f. Object-Oriented Modeling

4+1 View architecture,

Architectural approaches: Use case driven, Architecture-centric, Iterative and Incremental,

Rational Unified Process:

g. Characteristics of the process

Phases and Iterations:

h. Inception Phase
i. Elaboration Phase
j. Construction Phase
k. Transition Phase
l. Iterations
m. Process Workflows
n. Artifacts
o. Other Artifacts

2. Introduction to UML **(08 Hrs, 16 Marks)**

a. An Overview of the UML: Visualizing, Specifying, Constructing, Documenting
b. Background , UML Basics

c. Introducing UML 2.0

A Conceptual Model of the UML:

d. Building Blocks of the UML
e. Rules of the UML
f. Common Mechanisms in the UML: Specifications, Adornments, Common divisions
g. Extensibility Mechanisms: stereotypes, tagged values, constraints

Object Constraint Language:

h. OCL Basics, OCL Syntax, Advanced OCL Modeling

3. Class Diagram and Composite Structure Diagram (08 Hrs, 16 Marks)

Object Diagram:

a. **Terms and Concepts:**
   Common Properties, Contents, Common Uses
b. **Common Modeling Techniques:** Modeling Object Structures

Class Diagram:

c. Classes, Attributes, Operations, Abstract Classes
d. **Relationships:** Dependency, Association, Aggregation, Composition, Generalization, Association Classes, Association Qualifiers
e. **Advanced Relationships:**
   Stereotypes on Dependency, Stereotypes and Constraints on Generalization, Constraints on Association, Realization
f. Interfaces
g. Templates
h. Class Diagram: Common Properties, Contents, Common Uses
i. Common Modeling Techniques : Modeling Simple Collaborations, Modeling a Logical Database Schema
j. Forward and Reverse Engineering

Composite Structures Diagram:

k. Connectors, Ports, Structured classes and Properties

4. Behavioral Diagrams (08 Hrs, 16 Marks)

a. **Use case Diagram**
   Names, Use Cases and Actors, Use Cases and Flow of Events, Use Cases and Scenarios, Use Cases and Collaborations, Organizing Use Cases, Common Properties, Contents, Common Uses
b. **Sequence Diagram**
c. **Communication Diagram**
d. **Timing Diagram**
e. **State chart Diagram:**
   Behavioral State Machines, States, Composite States, Submachine States, Transitions, Activities, Protocol State Machines ,Pseudo States , Event Processing
f. **Activity Diagram:**
   Common Properties, Contents, Action States and Activity States, Transitions, Branching, Forking and Joining, Swimlanes, Object Flow, Common Uses

5. Package Diagram, Component Diagram, Deployment Diagram (08 Hrs, 16 Marks)

Package Diagram:

a. **Terms and Concepts**
   Names, Owned Elements, Visibility, Importing and Exporting
b. **Common Modeling Techniques:** Modeling Groups of Elements, Modeling Architectural Views

Component:

c. **Terms and Concepts**
   Names, Components and Classes, Components and Interfaces, Kinds of Components

Component Diagram:

d. Common Properties, Contents, Common Uses
e. **Common Modeling Techniques:** Modeling Source Code, Modeling an Executable Release, Modeling a Physical Database, Modeling Adaptable Systems
f. Forward and Reverse Engineering

Deployment:

g. **Terms and Concepts**
   Names, Nodes and Components, Connections

Deployment Diagram:

h. Common Properties, Contents, Common Uses
i. **Common Modeling Techniques:** Modeling an Embedded System, Modeling a Client/Server System, Modeling a Fully Distributed System
j. Forward and Reverse Engineering

Text Books:

1. James Rumbaugh , Michael Blaha , William Premerlani, Frederick Eddy, William Lorensen ,“Object- Oriented Modeling and Design”, Pearson Education.
2. Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", Pearson Education.
3. Dan Pilone, Neil Pitman, "UML 2.0 in a Nutshell", SPD ,O'Reilly.

Reference Books:

1. Martin Fowler, "UML Distilled: A Brief Guide to the Standard Object Modeling Language", Third Edition ,Addisioh Wesley.
2. Tom Pender, “UML 2 Bible”, Wiley.
3. Meilir Page-Jones, “Fundamentals of Object Oriented Design in UML”, Pearson Education.
4. Pascal Roques, “Modeling Software Systems Using UML2”, Wiley.
5. Atul Kahate, “Object Oriented Analysis & Design”, The McGraw-Hill Companies.
6. Mark Priestley, “Practical Object-Oriented Design with UML”, TATA McGraw-Hill.
7. Craig Larman, “Appling UML and Patterns: An introduction to Object–Oriented Analysis and Design and Iterative Development”, Pearson Education.
8. Mike O’Docherty, “Object-Oriented Analysis & design understanding system development with UML 2.0”, John Wiley and Sons.

Database Management System

COURSE OUTLINE

Course Title	Short Title	Course Code
Database Management System	**DBMS**	

Course Description:
The objective of this course is to introduce the students to Learn and practice data modeling using the entity-relationship and developing database designs, apply normalization techniques to normalize the database, learn techniques for controlling the consequences of concurrent data access also understand the needs of Object based Database and Database System Architecture.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Knowledge of data structures.

COURSE CONTENT

Database Management System **Semester-VI**

Teaching Scheme

Lecture: 3 hours / week

Examination Scheme

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1) Introduction to DBMS (08 Hrs, 16 Marks)

a. Database-System Applications
b. Purpose of Database Systems
c. View of Data: Data Abstraction ,Instances and Schemas, data independence
d. Data Models: Relational Model , Entity-Relationship Model ,Object-Based data model, Semistructured Data Model
e. Database Languages
f. Data Storage and Querying
g. Transaction Management
h. Database Architecture
i. Database Users and Administrators

Database Design and E-R Model

j. Overview of the Design Process
k. The Entity Relationship Model: Entity Sets , Relationship Sets, Attributes, Constraints
l. Entity-Relationship Diagram: Basic Structure , Mapping Cardinality, Roles, Weak Entity sets
m. Extended E-R Features: Specialization, Generalization, Attribute Inheritance, Constraints on Generalizations, Aggregation

2) Structured Query Language (08 Hrs, 16 Marks)

a. Introduction to relational Model: structure of relational Databases, Database Schema, Keys, Schema Diagrams
b. Overview of the SQL Query Language
c. SQL Data Definition

d. Basic Structure of SQL Queries
e. Additional Basic Operations
f. Set Operations
g. Null Values
h. Aggregate Functions
i. Nested Subqueries
j. Modification of the Database

Intermediate SQL:

k. Joined Expressions: Join Conditions , Outer Joins
l. Views
m. Integrity Constraints

3) Formal Relational Query Languages (08 Hrs, 16 Marks)

The Relational Algebra:

a. Fundamental Operations:
   The select Operation, The Project Operation, The Union Operation, The Set-Difference Operation, The Cartesian-Product Operation, The Rename Operation, Formal definition of Relational Algebra
b. Additional Algebra Operations:
   The Set-Intersection Operation, The Natural-Join Operation, The Assignment Operation, Outer Join Operations
c. Extended Relational-Algebra Operations:
   Generalized Projection, Aggregation

The Tuple Relational Calculus:

d. Formal Definition
e. Example Queries

The Domain Relational Calculus:

f. Formal Definition
g. Example Queries

Functions and Procedures

Triggers

4) Relational Database Design and Transaction Management (08 Hrs, 16 Marks)

Relational Database Design:

a. Features of Good Relational Designs
b. Atomic Domains and First Normal Form
c. Decomposition Using Functional Dependencies:
   Keys and Functional Dependencies, Boyce-Codd Normal Form, BCNF and Dependency Preservation, Third Normal Form
d. Decomposition Using Multivalued Dependencies: Multivalued Dependencies, Fourth Normal Form

Transaction Management:

e. Transaction Concept
f. A simple Transaction Model
g. Transaction Atomicity and Durability

Concurrency Control:

h. Lock-Based Protocols: Locks, Granting of Locks, The Two Phase Locking protocol
i. Timestamp–Based Protocols: Timestamps , The Timestamps-Ordering Protocol

Recovery System:

j. Failure Classification
k. Storage
l. Recovery and Atomicity: Log records, Database Modification, Concurrency Control and Recovery ,Transaction Commit , Using the Log to Redo and Undo Transactions

5) Object–Based Databases and Database- System Architectures (08 Hrs, 16 Marks)
Object–Based Databases

a. Overview,
b. Complex Data Types
c. Structure Types and Inheritance in SQL
d. Table Inheritance
e. Array and Multiset Types in SQL: Creating and Accessing Collection Values, Querying Collection-Valued Attributes
f. Object–Identity and Reference Types in SQL
g. Persistent Programming Languages: Persistence of Objects, Object Identity and Pointers

Database-System Architectures

h. Centralized and Client–Server Architectures
i. Server System Architectures
j. Parallel Systems
k. Distributed Systems

Text Book:

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, “Database System Concepts”, 6th Edition, McGraw-Hill.

Reference Books:

1. R. Ramkrishnan , J. Gehrke, "Database Management Systems", 3rd Edition, McGraw-Hill.
2. C. J. Date, “Introduction to Database Management Systems”, 8th Edition, Pearson.
3. V.K.Jain, “ Database Management System”, Dreamtech Press (Wiley India).
4. Atul Kahate, “Introduction to Database Management System”, 3rd Edition, Pearson.
5. G. K. Gupta, “Database Management Systems”, McGraw–Hill.
6. S. K. Singh, “Database Systems Concepts, Design and Applications”, Pearson.
7. Bipin Desai, “Introduction to database management systems”, Galgotia.

Analysis & Design of Algorithms

COURSE OUTLINE

Course Title	Short Title	Course Code
Analysis and Design of Algorithms	**ADA**

The objective of this course is to introduce the students to the fundamentals of Algorithm and their analysis. In this basic system program are studied in order to understand the working of system program.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Fundamental knowledge of Algorithm and their analysis.

COURSE CONTENT

Analysis and Design of Algorithms **Semester-VI**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week
End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Course Description:

1. Introduction to Algorithm

(08 Hours, 16 marks)

a. Defination
b. Role of Algorithm in computing
c. Performance analysis: space and time complexity
d. Asymptotic notation and complexity issues
e. Analysis of Algorithm: Insertion sort and bubble sort
f. Recurrence: The Master Method

2. Divide and Conquer

(08 Hours, 16 marks)

a. General strategy, analysis
b. Merge sort, Quick Sort, Binary Search- Analysis of algorithm
c. Hiring Problem
d. Indicator Random variable Problem
e. Randomized algorithms

3. Backtracking

(08 Hours, 16 marks)

a. Backtracking: Introduction and Analysis
b. N Queens Problem, graph coloring Problem
c. Branch and Bound: General Strategy and analysis
d. Traveling salesman's problem, knapsack problem
e. Single Source Shortest Path in directed acyclic Graph

4. Advanced Design and Analysis Techniques

(08 Hours, 16 marks)

a. Greedy Algorithms: General strategy, analysis
b. Huffman Code
c. Job sequencing, optimal merge patterns
d. Dynamic Programming: Elements of dynamic programming.
e. Multistage graph, Traveling salesman problem, 0/1 Knapsack Problem, Optimal Binary Search Tree

5. Classification of problems

(08 Hours, 16 marks)

a. Non- deterministic algorithm
b. Satisfiability Problem
c. P, NP-Hard and NP- complete class with example
d. NP-Hard problems: code generation Problems
e. Approximation algorithm for NP-hard problems
f. Parallel Sorting Networks: The zero-one Principle, Parallel Merging Networks, Improved Sorting Networks

Text Books:

1. E. Thomas H. Cormen and Charles E.L. Leiserson, "Introduction to Algorithm", Third Edition, PHI.
2. Horowitz/Sahani, "Fundamentals of Computer Algorithm", Second Edition,Galgotia.
3. Gilles,Brassard and Paul Bratley, " Fundamentals of Algorithmics", PHI.

Reference Books:

1. Aho, "Design & Analysis of Computer Algorithms", Pearson LPE.
2. Russ Miller, "Algorithms: Sequential and Parallel", Dreamtech Press.
3. Goodrich, "Algorithm Design: Foundation and Analysis", Wiley India.
4. Grama , "An Intro to Parallel Computing : Design & Analysis of Algorithms", Second Edition, Pearson LPE.
5. Baase , "Computer Algorithms: Intro to Design & Analysis", Third Edition, Pearson LPE.
6. A. V. Aho and J.D. Ullman, "Design and Analysis of Algorithms", Pearson LPE.
7. Bressard, Bratly, "Fundamentals of Algorithm", Pearson LPE/PHI.
8. Simon Harris, "Beginning Algorithms" Wrox Press (Wiley India).

Management Information System

COURSE OUTLINE

Course Title	Short Title	Course Code
Management Information System	**MIS**	

Course Description:

This course provides an introduction to information systems for business and management. It is designed to familiarize students with organizational and managerial foundations of systems, the technical foundation for understanding information systems, the role of information systems in enhancing business processes and management decision making across the enterprise, and the process of building and managing systems in organizations. The course will focus on topics such as Management of the Digital Firm, Internet and Internet technology, the Electronic Business and Electronic Commerce, the Information Technology (IT) Infrastructure, the Ethical and Security Issues related to Information Systems, and the Enterprise Applications. The course will provide students with information systems knowledge that is essential for creating successful and competitive firms.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Principles of Management.

COURSE CONTENT

Management Information Systems **Semester-VI**

Teaching Scheme
Lecture: 3 hours / week

Examination Scheme
End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Information Systems

(08 Hours, 16 marks)

i. Introduction

a) Data Vs Information
b) Functions of Management
c) Managerial Roles
d) Levels of Management
e) Classification of Information System
f) Framework for Information System

ii. Systems

a) System concepts
b) System and their Environments
c) How system works
d) System approach for problem solving

2. E Business Enterprise:

(08 Hours, 16 marks)

i. E Business Technology

a) Introduction to E Business
b) Models of E Business
c) Internet and WWW
d) Security in E Business
e) Electronic Payment System
f) Web Enabled Business Management
g) Enterprise Portal
h) MIS in Web Environment

ii. Organization of Business in Digital Firm

a) E Business
b) E Commerce
c) E Communication
d) E Collaboration
e) Real Time Enterprise

3. Applications To Functional Business Areas

(08 Hours, 16 marks)

i. Operational Information System

a) Accounting / Finance
b) Marketing
c) Production
d) Human Resource

ii. Tactical Information System

a) Accounting / Finance
b) Marketing
c) Production
d) Human Resource

iii. Strategic Information System

a) Accounting / finance
b) Marketing
c) Production
d) Human Resource

4. DSS, EMS And ES:

(08 Hours, 16 marks)

i. Decision Support System

a) Characteristics of Decision Making Process
b) Features of DSS
c) Development of DSS
d) Benefits and Risks of DSS
e) GDSS

ii. Enterprise Management System

a) ERP System
b) ERP Model and Modules
c) Benefits of ERP
d) Supply Chain Management
e) Customer Relationship Management

iii. **Expert Systems**

a) Characteristics
b) How an Expert System Works
c) Advantages
d) Expert System and DSS
e) Expert Systems and AI.

5. **Information Security and Information Technology**

(08 Hours, 16 marks)

i. **Information Security Challenges in E Enterprise**

a) Risks
b) Common Threats
c) Common Controls
d) Protection of information system

ii. **IT: Impact on Society**

a) Impact of IT on Privacy
b) Ethics
c) Technical Solution for Privacy Protection
d) Intellectual Property
e) Copyright and Patents
f) Impact of IT on the Workplace
g) Impact of quality on Life

Text Books:

1. Robert Schultheis and Mary Sumner, "Management Information Systems The Managers View", 4th Edition Tata McGraw Hill
2. Waman S. Jawadekar, "Management Information Systems", 4th Edition Tata McGraw Hill.

Reference Books:

1. Sahil Raj "Managament Information Systems" PearsonEducation
2. Kenneth C Laudon and Jane Laudon, "Management Information System", Pearson Education
3. James A. O'Brien, "Management Information Systems", Tata McGraw Hill
4. S. Sadagopan, "Management Information System", PHI.

Operating System Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Operating System	**OS**	

Course Description:

This laboratory provides students with a comprehensive study of the operating system functions, its working details and implementation of various algorithms used in the operating systems.

Laboratory	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	02	**14**	**28**	**03**

Total Semester Credits: 03

Prerequisite Course(s): C Programming, Basic Knowledge of Linux Operating System.

LAB COURSE CONTENT

Outline of Content:

(Note: Minimum FOUR Experiments each from group A and B)

Group A

1. **Study of Commercial and Open Source Operating Systems (01 each) and Design structure of these of Operating Systems.**
   a. Study the basic structures.
   b. Study the File systems.
   c. Study the Security aspects of Operating Systems.
   d. e. g. Windows OS, Linux OS.
2. **Write a program to implement Command Interpreter using system calls.**
   Implementation of Command Interpreter using various system calls showing working of Command Line Interpreter.
3. **Write a program to implement concept of Threading.**
   Demonstrate the concept of Threading in process. (Without using System Call / Kernel Functions).
4. **Write a program to implement CPU Scheduling algorithms**
   Demonstrate the working of CPU Scheduling algorithms (any two).
   a. FCFS
   b. SJF(Preemptive & non-preemptive)
   c. Round Robin
   d. Priority(Preemptive & non-preemptive)
5. **Write a program to implement algorithmic solution for Critical Section Problem**

Demonstrate solution to overcome the critical section problem.

Group B

1. **Write a program to implement Memory Management algorithms – best fit, first fit, worst fit**

   Demonstrate the working of Memory Management algorithms (any two).
   a. First Fit
   b. Best Fit
   c. Worst Fit
2. **Write a program to implement Page Replacement algorithms**

   Demonstrate the working of Page Replacement algorithms (any two).
   a. FIFO(First In First Out)
   b. LRU(Least Recently Used)
   c. Optimal
3. **Write a program to implement Inter process communication**

   Demonstrate the working of Inter Process Communication (any one).
   a. Full Duplex pipes
   b. Half Duplex pipes
4. **Write a program for Banker's algorithm**

   Demonstrate the working of Banker's algorithm.
5. **Write a program to demonstrate disk scheduling algorithms**

   Demonstrate the working of the Disk Scheduling algorithms (any two).
   a. FCFS
   b. SSTF
   c. SCAN
   d. C-SCAN

Guidelines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guide lines for ESE:-

- ESE will be based on the practical assignments submitted by the students in the form of journal.
- In the ESE, the students may be asked to perform the practical assignment with minor modification.
- Evaluation will be based on the paper work of algorithm, understanding of the logic and the syntax, quality of the program, execution of the program, type of input and output for the program.

Reference Books:

1. A. Silberschatz, P. B. Galvin, G. Gagne, "Operating Systems Concepts", 7th/ 8th edition, John Wiley Publications, 2008.
2. William Stalling, "Operating System Internals and Design Principles", 6th edition, Pearson Publication, 2013.

3. Maurice J. Bach, “The Design of the Unix Operating System”, 1st edition, PHI.
4. Dhananjay M. Dhamdhere, “Operating Systems-A Concept-Based Approach”, 3rd edition, TMH, 2012.
5. A. S. Tanenbaum, “Modern Operating System”, 2nd edition Pearson publication, 2001.
6. H. M. Deitel, P. J. Deitel, D. R. Choffnes, “Operating System” 3rd edition, Pearson publication, 2013.
7. Rajiv Chopra, “Operating Systems-A Practical Approach”, 1st edition, S. Chand Publication, 2009.
8. Sibsankar Haldar, Alex A. Arvind, “Operating Systems”, 1st edition, Pearson Publication, 2009.

Note:-

- Use of Open Source Tool / Technology is recommended for laboratory assignments of concern subject.

Object Oriented Modeling & Design Lab

LAB COURSE OUTLINE

Course Title | Short Title Course Code
Object Oriented Modeling and Design | **OOMD**

Course Description:
The objective of this course is to introduce the students to learn how to understand the requirements of a system, its analysis, its scope, good design and good modeling practices and to document them. Students are being able to discuss the pros and cons of system design and issues in modeling large and complex systems. It explores UML 2.0 Basic and advanced concepts and notation for the same & diagrams for modeling different aspects of a system throughout the SDLC lifecycle.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	02	14	28	01

Total Semester Credits: 01
Prerequisite Course(s): Knowledge of software engineering.

LAB COURSE CONTENT
Outline of Content:
(Note: Minimum Six Experiments out of eight)

To meet above objectives teachers will help students choose a following system for modeling. The students will try and identify scope of such a system as realistically as possible. Students will learn to draw, discuss different UML 2.0 diagrams, concepts, notation, advanced notation, forward and reverse engineering aspects. As far as possible draw as many diagrams for one single system, unless they are not applicable for the chosen system in which case other systems may be chosen for specific diagrams.

1. Design ATM system using Structural and Behavioral UML diagram.
2. Design Coffee vending machine using Structural and Behavioral UML diagram.
3. Design College Admission Process using Structural and Behavioral UML diagram.
4. Design Library Management system using Structural and Behavioral UML diagram.
5. Design Hospital Management system using Structural and Behavioral UML diagram.
6. Design Railway Reservation system using Structural and Behavioral UML diagram.
7. Design Online Shopping system using Structural and Behavioral UML diagram.
8. Design Hotel Management system using Structural and Behavioral UML diagram.

Guidelines for ICA:
Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guide lines for ESE:-
- ESE will be based on the practical assignments submitted by the students in the form of journal.

Reference Books:

1. Pascal Roques, “Modeling Software Systems Using UML 2”, Wiley.
2. Russ Miles and Kim Hamilton, “Learning UML 2.0, SPD”, O’Reilly.
3. Craig Larman, “Applying UML and patterns: An introduction to Object-Oriented Analysis and Design and Iterative Development”, Pearson Education.
4. Mike O’Docherty “Object-Oriented Analysis & design understanding system development with UML 2.0”, John Wiley and Sons.
5. Jim Arlow, Ila Neustadt, “UML 2 and the Unified Process: Practical Object-Oriented Analysis and Design”, 2nd Edition, Addison-Wesley Professional.
6. Mark Priestley, “Practical Object-Oriented Design with UML”, TATA McGraw-Hill.

Note:-

- Use of Open Source Tool / Technology is recommended for laboratory assignments of concern subject.

Database Management System Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Database Management System	**DBMS**	

Course Description:

The objective of this course is to introduce the students to learn and practice Structure Query Language for creation, Manipulation, controlling database, apply normalization techniques to normalize the database also learn different types of Join, view, PL/SQL, Trigger, Stored Procedure, Stored function and enable them to apply these concepts for solving real world problems.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	02	14	28	01

Total Semester Credits: 01

Prerequisite Course(s): knowledge of Data Structures

LAB COURSE CONTENT

Outline of Content:

(Note: Group A is Mandatory and Minimum Three experiments from Group B.)

GROUP A

1. Creating a sample database using any client server RDBMS (Oracle/ Open Source Database) package using SQL DDL queries. This will include constraints (Primary key, Foreign key, Unique, Not Null, and Check) to be used while creating tables.
2. SQL DML queries: Use of SQL DML queries to retrieve, insert, delete and update the database created in experiment No. 1.
3. SQL Queries: The queries should involve SQL feature such as aggregate functions, group by, having, order by the database created in experiment No. 1.
4. SQL Queries: The queries should involve Set Operations and Set Comparisons the database created in experiment No. 1.
5. Screen design and Report generation: Sample forms and reports should be generated using any front end tools.

GROUP B

1. Write a program to demonstrate different types of JOIN.
2. Write a program to demonstrate use of Trigger.
3. Write a program to demonstrate view.
4. Write a program to demonstrate PL/SQL block.
5. Write a program to demonstrate stored function.
6. Write a program to demonstrate stored procedure.

Guidelines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guide lines for ESE:-

- ESE will be based on the practical assignments submitted by the students in the form of journal.
- In the ESE, the students may be asked to perform the practical assignment with minor modification.
- Evaluation will be based on the paper work understanding of the logic and the syntax, quality of the program, execution of the program, type of input and output for the program.

Reference Books:

1. Rick F. Van der Lans, “Introduction to SQL”, Pearson education.
2. B. Rosenzweig, E. Silvestrova, “Oracle PL/SQL by Example”, Pearson education.
3. Steven Feuerstein, “Oracle PL/SQL Programming”, SPD, O’Reilly.
4. Dr. P. S. Deshpande, “SQL& PL/SQL for Oracle 10g Black Book”, Dreamtech Press
5. M. McLaughlin, “Oracle Database 11g PL/SQL Programming”, TMH.
6. J. J. Patrick, “SQL Fundamentals”, Pearson Education.

Note:-

- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Web Programming Lab

LAB COURSE OUTLINE

Course Title Short Title Course Code

LAB COURSE CONTENT

Teacher should facilitate learning following lab experiments:

(Note: 07 practical assignments from Group A and 03 from Group B)

GROUP A

1. **Develop a complete web page using HTML basic tags, CSS, Table and Layout**
   - A simple web page that includes basic tags such as head, body, text formatting tags, lists, paragraph, image tags, css, table and layout etc.
2. **Design a page web using JavaScript to demonstrate, if statement, if...else statement and Switch statement**
   - A simple web page that include JavaScript statements such as if, if...else and switch.
3. **Design a page web using JavaScript to demonstrate, Alert box Alert box with line breaks, Confirm box and Prompt box**
   - A simple web page that include JavaScript alert box, alert box with line breaks, confirm box and prompt box.
4. **Design a page web using JavaScript to demonstrate, Call a function ,Function with an argument, Function that returns a value**
   - A simple web page that include JavaScript call a function, function with arguments, function that return a value.
5. **Design a page web using JavaScript to demonstrate, For loop, While loop, Do While loop, Break a loop, Break and continue a loop**
   - A simple web page that include JavaScript for loop, while loop , do while loop, break a loop, break and continue a loop.
6. **Design a page web using JavaScript to demonstrate, Acting to the onclick event, Acting to the onmouseover event, onblur , onchange, ondblclick, onkeydown, onkeypress, onkeyup, onresize, onunload**
   - A simple web page that include JavaScript events like onclick, onmouseover, onblur, onchange, ondblclick, onkeydown, onkeypress, onkeyup, onresize, onunload etc.
7. **Design a page web using JavaScript to demonstrate, Sort an array (alphabetically and ascending), Sort numbers (numerically and ascending), Sort numbers (numerically and descending)**
   - A simple web page that include JavaScript to sort an array alphabetically and ascending, sort numbers numerically and ascending and sort numbers numerically and descending.
8. **Design a page web using PHP to demonstrate, variables, echo/print, data types, string functions and operators**
   - A simple web page that include PHP variables, echo/print, data types, string functions and operators.
9. **Design a page web using PHP to demonstrate, if-else-elseif, switch, for loop, while loop, functions and arrays**
   - A simple web page that include PHP if-else-elseif, switch, for loop, while loop, functions and arrays.
10. **Design a page web using PHP to demonstrate, form handling, form validation and form URL/E-mail**

- A simple web page that include PHP form handling, form validation and form URL/E-mail.

GROUP B

1. **Web server installation and configuration**
   - Installation and configuration of any web server like IIS, Apache, WAMP, XAMP etc.
2. **Design a page web using PHP to demonstrate, date, file, file upload, cookies and sessions**
   - A simple web page that include PHP date, file, file upload, cookies and sessions.
3. **Design a page web using PHP to demonstrate, MySQL connect, create DB/Table, insert into, select, where, order by, update and delete**
   - A simple web page that include PHP MySQL connect, create DB/Table, insert into, select, where, order by, update and delete.
4. **Design a Website with the help of HTML and JavaScript with not less than 15 full size pages for a selected topic (Commercial, Institute, Portal or decided jointly by the student and teacher)**
   - Design a website on the above listed topics with the help of HTML and JavaScript.
5. **Design a Website with the help of HTML and PHP for a selected topic (Banking, Commercial, Institute, Portal or decided jointly by the student and teacher)**
   - Design a website on the above listed topics with the help of HTML and PHP.

Guidelines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Reference Books:

1. "Web Technologies HTML, JavaScript, PHP, Java, JSP, XML and AJAX", Black Book, Kogent Learning Solutions Inc., dreamtech press, 2014.
2. Chris Bates, "Web Programming: Building Internet Applications", Third Edition, Wiley India, 2012.
3. Jon Duckett, "Beginning HTML, XHTML, CSS, and JavaScript", John Wiley & Sons publication, 2010.
4. Thomas A. Powell, "HTML & CSS: The Complete reference", Fifth edition, TMH 2010.

Note:

- Concerned faculty should conduct at least 07 practical assignments from group A and 03 from group B out of the above list.
- Every assignment should include print out of program with proper comments and output.

- Every student is required to submit the assignments in the form of journal.
- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Minor Project

COURSE CONTENT

Minor Project	**MIP**	
Course Title	Short Title	Course Code

Semester-VI

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	**10**	**20**	**02**

Examination Scheme
Internal Continuous Assessment (ICA): 50 Marks

- Every student shall undertake the Minor Project in semester VI.
- Each student shall work on an approved project, a group of **05 students (maximum)** shall be allotted for the each minor project.
- Minor project may involve design or investigation of a technical problem that may take design, experimental or analytical character or combine element of these areas. The project work shall involve sufficient work so that students get acquainted with different aspects of design or analysis.
- Each student is required to maintain separate log book for documenting various activities of minor project.
- The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of minor project. Maximum four minor project groups shall be assigned to one teaching staff.
- Assessment of the project for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given in **Table-A.**
- Before the end of semester, student shall deliver a seminar and submit the seminar report (paper bound copy)in following format:
  - Size of report shall be of minimum 25 pages.
  - Student should preferably refer minimum five reference books / magazines/standard research papers.
  - Format of report
    - Introduction.
    - Literature survey.
    - Theory (Implementation, Methodology, Applications, Advantages, Disadvantages. etc)
    - Future scope.
    - Conclusion.

Assessment of Minor Project

Name of the Project: ______________________________

Name of the Guide: ______________________________

Table-A

SN	Exam Seat No	Name of Student	Project Selection	Documentation	Design/Simulation/Logic	PCB/hardware/programming	Result Verification	Presentation	Total
			5	10	10	10	10	5	50

Seminar-I

COURSE CONTENT

Seminar-I **S-I**

Course Title Short Title Course Code

Semester-VI

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**10**	**20**	**2**

Examination Scheme

Internal Continuous Assessment (ICA): 25 Marks

1. For Seminar-I every student will individually study a topic assigned to him / her and submit a report and shall deliver a short lecture / Seminar on the topic during the term.
2. The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of Seminar-I. Seminar shall be related state of the art topic of his choice approved by the committee.
3. Seminar topic should not be repeated and registration of the same shall be done on first come first serve basis.
4. Topic of Seminar shall be registered within a two week from commencement of VI Semester and shall be approved by the committee.
5. Maximum six seminar supervision shall be allotted to each teacher.
6. Before the end of semester, student shall deliver a seminar and submit the seminar report (paper bound copy).

7. **ASSESSMENT OF SEMINAR-I**

Assessment of the Seminar-I for award of ICA marks shall be done by the guide and a departmental committee jointly, as per the guidelines given in **Table- B**

Title of Seminar: ____________________________

Name of Guide: ____________________________

Table-B

SN	Exam Seat No	Name of Student	Topic Selection	Literature survey	Report writing	Depth of understanding	Presentation	Total
			5	5	5	5	5	25

NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Third Year Engineering

(E&TC/E&C)

Faculty of Engineering and Technology

COURSE OUTLINE

Semester – V

W.E.F 2014 – 2015

TE Semester – V

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Electronic Circuit Design (TH)	D	3	---	---	3	20	80	---	---	100	3
Communication System-II (TH)	D	3	---	---	3	20	80	---	---	100	3
Microcontrollers & Peripheral Interface Controller (TH)	D	3	---	---	3	20	80	---	---	100	3
Feedback Control System (TH)	D	3	---	---	3	20	80	---	---	100	3
Electromagnetic Engineering (TH)	D	3	--	---	3	20	80	---	---	100	3
Electronic Circuit Design (LAB)	D	---	---	2	2	---	---	25	25(PR)	50	1
Feedback Control System (LAB)	D	---	---	2	2	---	---	25	---	25	1
Communication System-II (LAB)	D	---	---	2	2	---	---	25	25(PR)	50	1
Microcontrollers & Peripheral Interface Controller (LAB)	D	---	---	2	2	---	---	25	25(PR)	50	1
Computer Programming-III (LAB)	B	1	---	2	3	---	---	50	---	50	2
Industrial Training / EDP / Special Study	D	---	---	---	---	---	---	25	---	25	2
Total		**16**	**---**	**10**	**26**	**100**	**400**	**175**	**75**	**750**	**23**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA: Internal Continuous Assessment**

Note 1: Out of 3 practical ESE heads, at least 1 head should be practical.

TE Semester – VI

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Industrial Economics & Telecom Regulation (TH)	C	3	---	---	3	20	80	---	---	100	3
Power Electronics (TH)	D	3	---	---	3	20	80	---	---	100	3
Electronic Measurement (TH)	D	3	---	---	3	20	80	---	---	100	3
Audio Video Engineering (TH)	D	3	---	---	3	20	80	---	---	100	3
Industrial Management (TH)	C	3	---	---	3	20	80	---	---	100	3
Power Electronics (LAB)	D	---	---	2	2	---	---	25	25(PR)	50	1
Electronic Measurement (LAB)	D	---	---	2	2	---	---	25	25(PR)	50	1
Audio Video Engineering (LAB)	D	---	---	2	2	---	---	25	25(PR)	50	1
Application Software (LAB)	B	---	---	2	2	---	---	25	---	25	1
Minor Project	D	---	---	2	2	---	---	50	---	50	2
Seminar - I	D	---	---	2	2	---	---	25	---	25	2
Total		**15**	**---**	**12**	**27**	**100**	**400**	**175**	**75**	**750**	**23**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA: Internal Continuous Assessment**

Note 1: Out of 3 practical ESE heads, at least 1 head should be practical.

Electronic Circuit Design

COURSE OUTLINE

Electronic Circuit Design	**ECD**	
Course Title	Short Title	Course Code

Course Description:

This course presents the actual concepts of several electronic devices and circuits and the design details, in order to meet a given system specification.

Lecture	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): A background in basic electronics and circuit theory.

COURSE CONTENT

Electronic Circuit Design **Semester-V**

Teaching Scheme

Lecture: 3 hours / week

Examination Scheme

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Design of Power Supplies **No of Lect. – 8, Marks: 16**

a) Design of unregulated power supply (half wave and full wave bridge rectifier with only Capacitor filters)
b) Design of Series Voltage Regulator (with error amplifier), fold back protection circuit. Improvement of Stabilization factor by using Darlington pair for regulator.
c) Design of IC LM317/337 based only adjustable voltage regulator circuits, design of dual tracking power supply using LM317/LM337 with unregulated power supply.
d) Design of switching regulators using IC LM 2575 / 2577 (buck and boost regulators – fixed and adjustable output voltage)

Unit-II: Design of Small Signal Amplifiers using BJT / FET **No of Lect. – 8, Marks: 16**

a) Design of single stage CE / CS amplifier with biasing circuit.
b) Design of single stage CB / CG amplifier with biasing circuit.
c) Design of Single stage CC/ CD amplifier with biasing circuit.
d) Design of current series negative feedback amplifier using BJT / JFET.

Unit-III: Power and Tuned Amplifiers **No of Lect. – 8, Marks: 16**

a) Design of Class A Amplifier (resistive load and transformer coupled load)
b) Design of Class B amplifier.
c) Design of Class AB amplifier.
d) Design of single tuned amplifier BJT / FET

Unit-IV: Design of Oscillators **No of Lect. – 8, Marks: 16**

a) Design RC and LC Oscillators – RC Phase shift oscillator, Hartley, Colpitts and Clapp oscillator
b) Design of multivibrator - Design of collector coupled Astable multivibrator and collector coupled Monostable multivibrator using BJT
c) Design of UJT relaxation Oscillator, Design of Schmitt trigger using BJT.

Unit-V: Design using Analog Integrated Circuits **No of Lect. – 8, Marks: 16**

a) Design of single supply ac inverting and non-inverting amplifier using IC324.
b) Design of FSK modulator using IC555, Design of ramp generator using IC555
c) Design of V/F and F/V convertors using TC9400
d) Study of different ICs available for digital modulation techniques (PAM, PWM, PPI, ASK, FSK).

Reference Books:

1) Bell - Electronics Devices and Circuits, PHI or Pearson 4/e
2) Goyal, Khetan - Monograph on Electronics Design Principles, Khanna Pub.
3) Rashid – Microelectronics Circuits Analysis and Design, Cenage Learning, 2/e
4) M.M. Shah - Design of Electronics Circuits and Computer Aided Design, New Age Int.
5) Bell – Solid State Pulse Circuits, PHI 4/e
6) Michael Jacob - Application and Design with Analog Integrated Circuits, PHI 2/e
7) Sergio Franco – Design with OP-AMP and Analog Integrated Circuits, TMH, 3/e
8) IC datasheets.

Communication System-II

COURSE OUTLINE

Communication System-II	**CS-II**	
Course Title	Short Title	Course Code

Course Description:

This course is aimed at introducing the fundamentals of digital communication to undergraduate students. The background expected includes a prior knowledge of second year course in Communication System-I. The goals of the course are to understand the basic principle of digital communication and application in different era.

	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	**03**	**14**	**42**	**03**

Prerequisite Course(s): Communication System-I.

COURSE CONTENT

Communication System-II **Semester-V**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE): 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Spectra, Probability and Random Variables **No of Lect. –9, Marks: 16**

a) Basic Signal Processing Operation in digital communication
b) Power density spectrum, Energy spectral density
c) Parseval's theorem, Rayleigh Energy theorem
d) Probability and sample space,
e) Random Variables, Random process and Probability Function.
f) Probability Models.

Unit-II: Waveform Coding and Baseband Shaping for Data Transmission **No of Lect. – 8, Marks: 16**

a) Pulse Code Modulation (PCM) & PCM with Noise.
b) Delta Modulation
c) Digital Multiplexing.
d) Discrete PAM Signals and Power Spectra of Discrete PAM Signals.
e) ISI & Nyquist's Criterion for Distortion less Baseband Binary Transmission.
f) Eye Pattern.

Unit-III: Digital Modulation Techniques **No of Lect. –9, Marks: 16**

a) Digital Modulation Formats
b) Coherent Binary Modulation Techniques
c) Coherent Quadrature Modulation Techniques
d) Noncoherent Binary Modulation Techniques
e) M-ary Modulation Techniques
f) Bit Vs symbol Error Probability and Synchronization

Unit-IV: Information and Detection Theory **No of Lect. – 8, Marks: 16**

a) Uncertainty, Information and Entropy
b) Source coding Theory
c) Huffman coding and Discrete Memory less Channels
d) Mutual Information, Channel Capacity and Channel Coding Theory
e) Differential Entropy and Mutual Information
f) Channel Capacity Theorem

Unit-V: Channel Coding **No of Lect. – 8, Marks: 16**

a) Coding introduction, Error probability with repetition in the binary symmetric channel.
b) Linear Block Codes
c) Algebraic Codes
d) Automatic repeat request

Reference Books:

1) S. Haykin, "Digital Communications", Wiley Student Edition, ISBN 9971-51-205-X.
2) A. Carlson, P. Crilly and J. Rutledge, "Communication Systems- An Introduction to Signals and Noise in Electrical Communication", McGraw Hill International Edition, 4th Edition, ISBN 0-07-121028-8.
3) H. Taub, D. Schilling, "Principles of Communication Systems", Tata McGraw Hill, 2nd Edition, 2005, ISBN 0-07-462456-3.

Microcontrollers & Peripheral Interface Controller (PIC)

COURSE OUTLINE

Microcontrollers & PIC	**MC&PIC**	
Course Title	Short Title	Course Code

Course Description:

This course provides an Extensive knowledge about 8051 microcontroller, its programming, interfacing, applications and introduction to PIC.

Lecture	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
	03	**14**	**42**	**03**

Prerequisite Course(s): Course on 8085 Microprocessor and Digital Electronics.

COURSE CONTENT

Microcontrollers & PIC **Semester-V**

Teaching Scheme

Lecture: 3 hours / week

Examination Scheme

End Semester Examination (ESE) :80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: The 8051 Microcontroller **No of Lect. – 8, Marks: 16**

a) Overview of the microcontroller Family, Block diagram description of 8051.
b) Memory and Register organization.
c) Stack and operation of stack. Stack related instructions.
d) Looping, Conditional and Unconditional Jumps, Subroutines, Time delay calculations, CALL and RET Instruction.
e) 8051 pin diagram, understanding the function of each pin.
f) I/O port structure and I/O port programming.

Unit-II: 8051 Programming **No of Lect. – 8, Marks: 16**

a) Addressing Modes in 8051.
b) Instruction set of 8051 microcontroller.
c) Programs based on instructions.

Unit-III: Timer, Serial port and Interrupt programming **No of Lect. – 8, Marks: 16**

a) Structure of Timer mode control register (TMOD register), Mode 1 programming.
b) Generation of large delay, Mode 2 programming
c) Counter programming, Timer control register (TCON register) structure.
d) Serial communication basics, 8051 Serial Port Programming.
e) 8051 interrupts, Interrupts Programming.

Unit-IV: Interfacing **No of Lect. – 9, Marks: 16**

a) Switch interfacing, LED interfacing, LCD interfacing,
b) ADC interfacing, DAC interfacing, Sensors interfacing,
c) Stepper motor, Relay interfacing.
d) DS12887 Real Time Clock (RTC) Interfacing
e) Serial communication protocols Inter Integrated Circuit (I^2C), Serial Peripheral Interface (SPI), MODBUS.

Unit-V: PIC microcontrollers **No of Lect. – 9, Marks: 16**

a) PIC microcontrollers overview and features, PIC 16C6X/7X, PIC 16C6X/7X ALU, CPU registers, status register, File selection register (FSR).
b) Pin Diagram, PIC reset actions, PIC oscillator connections.
c) PIC memory organization
d) PIC 16C6X/7X instructions, Addressing modes, I/O ports, interrupt in PIC 16C61/71, PIC 16C61/71 timers
e) PIC 16C61/71 ADC
f) Introduction to PIC 16F8XX Flash microcontrollers.

Reference Books:

1) M.A. Mazidi, J.C. Mazidi, R.D. McKinlay, The 8051 Microcontroller and Embedded Systems using Assembly and C, Second Edition, Pearson
2) Kenneth Ayala, The 8051 Microcontroller, Third Edition, Delmar Learning, a part of Cengage Learning (India Edition)
3) Ajay Deshmukh, Microcontrollers [Theory and Applications], Tata McGraw hill, New Delhi
4) Mike Predko - Programming and Customizing 8051 micro controller, TMH.
5) N Senthil Kumar, M Saravanan, S Jeevananthan, and Satish Shah- Microprocessors and Interfacing (Series - Oxford Higher Education)

Feedback Control System

COURSE OUTLINE

Feedback Control System	**FCS**	
Course Title	Short Title	Course Code

Course Description:

This course provides an introduction to feedback control system covering: basic concept of open loop and close loop system, types of control system and their components, modeling of physical system, transfer function methods. Time response of different order system. Stability method and frequency method such as bode plot, polar plot, Nyquist criterion analysis of state variables and controllers.

	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	**03**	**14**	**42**	**03**

Prerequisite Course(s): Knowledge of Mathematics at FE and SE level.

COURSE CONTENT

Feedback Control System **Semester-V**

Teaching Scheme	**Examination Scheme**	
Lecture: 3 hours / week	**End Semester Examination (ESE)**	**:80 Marks**
	Paper Duration (ESE)	**:03 Hours**
	Internal Sessional Exam (ISE)	**:20 Marks**

Unit-I: Introduction to control system **No of Lect. – 8, Marks: 16**

a) History and development of Automatic control system.
b) Types of control system & open loop and closed loop system.
c) Transfer function of Block diagram algebra.
d) Masons gain formula and transfer function of signal flow graph.
e) Conversion of Block diagram algebra to Signal flow graph.
f) Conversion of electrical system to Signal flow graph.

Unit-II: Time response and stability of control system **No. of Lect. - 8, Marks: 16**

a) Standard test signals
b) Time response of first and second order system.
c) Steady state error and error constant.
d) Design specifications of second order system.
e) Transient response & its specifications.
f) The concept of stability & Necessary condition of stability
g) Hurwitz stability criterion.
h) Routh stability criterion, Relative stability analysis.

Unit-III: The concepts of Root locus **No of Lect. – 8, Marks: 16**

a) General rule to draw root locus.
b) Construction of root locus.
c) Root counter.
d) Effect of addition of open loop poles.
e) Effect of addition of open loops zeros.
f) Design of lead and lag compensator using root locus.

Unit-IV: Frequency domain analysis **No of Lect. – 8, Marks: 16**

a) Correlation between Time and frequency response.
b) Basics of Magnitude and phase plot.
c) Construction of bode plot.
d) Concept of lead and lag compensator using bode plot.
e) Polar plot.
f) Nyquist stability criterion.
g) Assesment of Relative stability using Nyquist criterion.

Unit-V: state space analysis and controllers. **No of Lect. – 8, Marks: 16**

a) Concept of state (State variable and state model).
b) State model of linear system.
c) Solution of state equation
d) Controllability and observability.
e) Introduction to controller PI, PD and PID.
f) Stepper motor. Servo motor and synchronous motor.

Reference Books:

1) I.J. Nagrath and M. Gopal – Control system Engineering- New age 4th edition.
2) I.J. Nagrath and M. Gopal – Control system Engineering- New age 5h edition
3) Katsuhiko Ogata- Modern Control engineering- Pearson 4th edition.
4) Ashok Kumar- Control system- Tata McGraw Hill Publishing Company.
5) R. Amanda and P. Ramesh Babu- Control system Engineering- SciTech.
6) Smarajit Ghosh – Control systems second edition – PEARSON publishers.

Electromagnetic Engineering

COURSE OUTLINE

Electromagnetic Engineering	**EME**	
Course Title	Short Title	Course Code

Course Description:

This course covers the Basics of Electric field & Magnetic field, properties of conductor, properties of dielectric material & concept of capacitor with various structures. Electromagnetic waves as a UPW, Maxwell's equation in static, time varying & free space. This course deals with basics of antenna & parameters.

	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	**03**	**14**	**42**	**03**

Prerequisite Course(s): Knowledge of Mathematics at FE and SE level.

COURSE CONTENT

Electromagnetic Engineering **Semester-V**

Teaching Scheme

Lecture: 3 hours / week

Examination Scheme

End Semester Examination (ESE) :80 Marks
Paper Duration (ESE) :03 Hours
Internal Sessional Exam (ISE) :20 Marks

UNIT-I **No. of Lect. – 8, Marks: 16**

Coulomb's law and electric field intensity: –

a) Review of vector Analysis and coordinate systems.
b) Coulomb's force law & Numerical based on force law.
c) Concept of electric field intensity.
d) Volume charge density, surface charge density, Line charge density
e) Electric field due to point charge, line charge, surface charge, Volume charge. Numerical based on different configuration of charges.
f) Concept of Electric Flux. Relation between flux density & electric field intensity.

UNIT-II **No. of Lect. – 8, Marks: 16**

Gauss's law, Energy and Potential:-

a) Gauss's law, Application of Gauss's law to symmetrical charge distribution.
b) Divergence Theorem.(Statement & Proof)

c) Maxwell's first equation in electrostatics.
d) Work Done, Concept of Potential & Potential Difference.
e) Potential difference in field of point, Line, Surface, Volume charge.
f) Potential gradient, Relation between Potential gradient & Electric filed intensity.
g) Dipole and its electric field, Dipole movement.
h) Energy density in electrostatic field.

UNIT-III **No. of Lect. – 9, Marks: 16**

Conductor, Dielectrics and Capacitance:-

a) Current and current density. Current continuity equation.
b) Properties of conductors.
c) The nature of Dielectric materials.
d) Boundary Condition for perfect Dielectric materials, free space, conductor.
e) Capacitance, Parallel plate capacitor.
f) Calculation of capacitance of various configurations.
g) Poisson's and Laplace's equations.

UNIT-IV **No. of Lect. – 8, Marks: 16**

Magneto statics:-

a) Biot-Savarts law and its vector form.
b) Magnetic field due to finite, infinitely and circular loop long current carrying conductor.
c) Ampere's Circuital law, Point form of Ampere's circuital Law/Curl operator.
d) Stokes theorem.
e) Magnetic flux & Magnetic flux density.
f) Scalar and Vector magnetic potential.
g) Lorentz's Force equation. Energy stored in magnetic field.

UNIT-V **No. of Lect. – 8, Marks: 16**

Time Varying Fields & Uniform Plane Waves:-

a) Maxwell's equations (Differential, Integral and Phasor forms) for time varying, Static & free space.
b) Uniform plane waves, Transformation of UPW from time varying form into Phasor, Vice versa.
c) Representation of wave motion in free space. (Wave equations).
d) Representation of wave motion in perfect dielectrics and Lossy dielectrics.
e) Poynting's theorem & Wave power.
f) Propagation in good conductor and Skin effect.
g) Introduction to antenna basic parameter-Patterns, Beam area, radiation intensity, Beam efficiency, directivity & gain, antenna aperture, Effective height.

Reference Books:

1) Engineering Electromagnetic-William H. Hayt, J A Buck, Tata McGraw Hill Publication. 7^{th}Edition.
2) K. D. Prasad - Antenna and Wave Propagation, Satya Prakashan.
3) Electromagnetics- Schaum's outline series, 2^{nd} edition, Joseph A Edminister, Tata Mc Graw Hill edition.
4) R K Shevgaonkar, "Electromagnetic Waves", 1st Edition, Tata McGraw Hill.

Electronic Circuit Design Lab

LAB COURSE OUTLINE

Electronic Circuit Design Lab	**ECD LAB**	
Course Title	Short Title	Course Code

Course Description:

In this laboratory course emphasis is on the hand on design practice and implementation and testing of various circuits (discrete and IC based) in laboratory.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**15**	**30**	**1**

Total Semester Credits: 1

Prerequisite Course(s): A background in basic electronics and circuit theory.

LAB COURSE CONTENT

(Note: Minimum five experiments to be perform)

1. **Design and test discrete series voltage regulator (with error amplifier) with unregulated power supply.**

   a. Design and test of series voltage regulator (using error amplifier).
   b. Using step down transformer, full wave rectifier (using diodes) and capacitor filter, design and test unregulated power supply required for series voltage regulator.
   [Design of series voltage regulator is without protection circuit and max output current 500mA- do not use Darlington pair]

2. **Design and test Inverting /Noninverting amplifier.**

   a. Design and test single stage BJT CE / CC amplifier for given Av, S, Ri, Ro, F_L, Vcc, Q points, R_{LW}, Source resis.
   b. Perform DC and AC analysis find theoretical values and compare it with designed circuit values.
   [Design of single stage (use self-biasing) without feedback CE / CC BJT amplifier]

3. **Design and test of single tuned amplifier using BJT for given center frequency.**

   a. Design of biasing circuit (self bias)
   b. Designing of tuned circuit.
   c. Calculation and verification of f_0 and bandwidth.

4. Design of Astable Multivibrator using BJT

a. Selection of transistor and external components.
b. Calculation and verification of desired output frequency and amplitude of output signal.

OR

4. Design and test Schmitt trigger using BJT.

a. Selection of transistor and external components for given UTP and LTP.
b. Calculation and verification of desired UTP and LTP

5. Design and fabricate any one circuit from Syllabus

a. Select the circuit from syllabus (only from Electronic Circuit Design and other than laboratory experiments).
b. Design the circuit.
c. Implement and test the designed circuit on Printed Circuit Board. [Maximum group size to conduct this experiment is Four. Implementation must be on PCB. Students have to write report (design, fabrication method and testing results) in their regular Laboratory manual]

All experiments (except Expt No 5), must perform using breadboard only.

Guide lines for ESE:-

ESE will be based on practical assignment submitted by the student in the form of journal. Evaluation will be based on paper work and performance in the practical.

Feedback Control System Lab

LAB COURSE OUTLINE

Feedback Control System Lab	**FCS LAB**	
Course Title	Short Title	Course Code

Course Description:

In this laboratory course student will be familiar with electrical network, motor and lead and lag controller. Also simultaneously student will be familiar about how to find out the Bode, polar & Nyquist plot with the help of MATLAB.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**15**	**30**	**1**

Total Semester Credits: 1

Prerequisite Course(s): Knowledge of Basic Electronics

LAB COURSE CONTENT

(Note: Minimum FOUR Experiments from each group.)

Group A

1) To Plot the magnitude & phase plot of lead electrical network.
2) To Plot the magnitude & phase plot of lag electrical network.
3) To determine the transient response of RLC electrical network
4) Study of flow control using PID controller.
5) Study of synchronous to observe angular displacement.
6) Study of stepper motor.

Group B

1) Obtain the unit step response of a second order system

a) Zeta= 0.5 and ω_n= 6 rad/sec.
   $(S^2+9s+19)/ (s^3+7S^2+14S+8)$

2) Sketch the polar plot of (Unity f/b system)

a) G(s) = 20s/(s+10(s+10)
b) G(s) = 10/s(s+1)(s+2)

3) Sketch the Bode plot for the transfer function (Unity f/b system)

a) G(s) = 1000/s(1+0.1s)(1+0.001s)

b) $G(s) = 10/s(s+1)(s+2)$

4) Sketch the Nyquist plot for the system

a) $G(s)\,H(s) = 60/(s+1)(s+2)(s+5)$

b) $G(s)H(s) = 1/(s^2+0.8s+1)$

5) The open loop transfer function of a servo system with unity feedback is given by $G(s) = 10/(s+2)\,(s+5)$. Determine the damping ratio, undamped natural frequency of oscillation. What is the percentage overshoot of the response to a unit step input?

6)

a) A system has $G(s) = 0.035/s(1+0.5s)(1+0.04s)$ Design a suitable lag compensator to give velocity error constant 27.3 s^{-1} and phase margin $=45^\circ$

b) The open loop transfer function of a unity feedback system $G(s) = K/s(s+1)(s+2)$ Design suitable lag-lead compensator to achieve the following:
Static velocity error constant = 10 s^{-1}. Phase margin = 50° and Gain margin less than
Or equal to 10dB.

Guide lines for ESE:-

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of Group A and Group B. Evaluation will be based on paper work and performance in the practical.

Communication System-II Lab

LAB COURSE OUTLINE

Communication System-II Lab	**CS-II LAB**	
Course Title	Short Title	Course Code

Course Description:

This laboratory course is an introduction to the most common techniques that are used to build both analog and digital communication systems using a modern digital signal processing approach. Communication systems are introduced by looking first at baseband transmission methods such as pulse amplitude modulation (PAM) signaling, and pulse code modulation (PCM). The combination of AM, FM, PM and PAM or PCM finally leads to the most commonly used digital modulation systems such as frequency shift keying (FSK), phase shift keying (PSK) and more general 2-dimensional signal constellations using quadrature amplitude modulation (QAM). In the majority of cases the goal of a communication system is to transmit information reliably as fast as possible within a given channel bandwidth and power constraint.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**14**	**28**	**1**

Total Semester Credits: 1

Prerequisite Course(s): Communication System-I.

LAB COURSE CONTENT

(Note: Minimum FOUR Experiments from each group.)

Group A

1. **To generate and detect PCM signal.**

   a. Draw input and output waveform.
   b. From sampled output measure quantization level.
   c. Reconstruct PCM waveform from modulated signal.

2. **To understand waveform of Delta Modulation and Demodulation.**

   a. Observation of effect of slope overload.
   b. Observation of Granular noise and SNR.

3. **To understand waveform of Adaptive Delta Modulation and Demodulation.**

    a. Observation of decreasing effect of slope overload.
    b. Observation of Granular noise and SNR.

4. **To generation and detection of FSK input and output waveform.**

    a. Find the FSK frequency when applied logic '1' and '0'.
    b. Reconstruct same signal at receiving side.
    c. Draw detected input and output waveform on graph.

5. **To generation and detection of PSK input and output waveform.**

    a. Find the PSK phase changing when applied logic '1' and '0'.
    b. Reconstruct same signal at receiving side.
    c. Draw detected input and output waveform on graph.

6. **To generation and detection of ASK input and output waveform.**

    a. Find the ASK measure amplitude when applied logic '1' and '0'.
    b. Reconstruct same signal at receiving side.
    c. Draw detected input and output waveform on graph.

Group B

7. **To generation and detection of QPSK/QAM input and output waveform.**

    a. Observed the OPSK/QAM input and output waveform.
    b. Reconstruct same signal at receiving side.
    c. Draw detected input and output waveform on graph.

8. **To Study different line codes (NRZ, RZ, polar RZ, bipolar(AMI),Manchester)**

    a. Describe representation of each code.
    b. Compare each code and made observation.
    c. Draw given input and output waveform on graph.

9. Noise analysis using any software tool (use of any discrete distribution).Find response by changing parameters. (use any open source software)

10. Noise analysis using any software tool (use of any continuous distribution).Find response by changing parameters. (use any open source software)

11. Execute Shannon Fannon algorithm by using any software tool. .(use any open source software)

12. Execute Huffman coding by using any software tool. (use any open source software)

Guide lines for ESE:-

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of Group A and Group B. Evaluation will be based on paper work and performance in the practical.

Microcontrollers & Peripheral Interface Controller Lab

COURSE OUTLINE

Microcontrollers & PIC	**MC&PIC LAB**	
Course Title	Short Title	Course Code

Course Description:

In this laboratory course emphasis is on the understanding the instruction set of 8051 microcontroller and PIC. It provides comprehensive treatment of 8051 microcontroller along with technical knowhow about PIC family. The students can use this knowledge to analyze and build the embedded system for different applications.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**14**	**28**	**1**

Total Semester Credits: 1

Prerequisite Course(s): Course on 8085 Microprocessor and Digital Electronics.

LAB COURSE CONTENT

(Note: Minimum SIX Experiments from group A and TWO experiments from group B.)

Group A

1. Study of 8051 / 8085 assembler and Simulator by writing program for addition and Subtraction.
2. Write and Execute program for multiplication and division.
3. Write and Execute program for Calculation of factorial.
4. Write and Execute program to flash LED.
5. Write and Execute program to interface a switch.
6. Write and Execute program to display 0 to 9 continuously on 7-Segment display.
7. Write and Execute program to demonstrate interfacing of Relay.
8. Write and Execute program to demonstrate interfacing of DAC.
9. Write and Execute program to demonstrate interfacing of ADC.

Group B

10. Write and Execute program to demonstrate interfacing of Stepper Motor.
11. Write and Execute program to demonstrate interfacing of LCD.

12. Two experiments based On PIC 16C6X/7X.
13. Two Experiments to understand the working of serial protocols.

Guide lines for ESE:-

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of Group A and Group B. Evaluation will be based on paper work and performance in the practical.

Computer Programming-III Lab

COURSE OUTLINE

Computer Programming-III Lab	**CP-III Lab**	
Course Title	Short Title	Course Code

Course Description:

This course provides an introduction to computer programming Language MATLAB/Scilab covering: Introduction to MATLAB/Scilab; Handling Arrays and Matrices; Programming in MATLAB/Scilab, M-File Scripts; MATLAB/Scilab Functions and Two-Dimensional Plots; Graphical User Interface and Applications of MATLAB/Scilab.

	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	**01**	**14**	**14**	**02**
Lab	**02**	**14**	**28**	

Prerequisite Course(s): Knowledge of C Language and logical reasoning.

THEORY COURSE CONTENT

Computer Programming-III Lab **Semester-V**

Teaching Scheme
Lecture: 1 hours / week

Examination Scheme
Internal Continuous Assessment (ICA): 50 Marks

Unit-I: Introduction to MATLAB/Scilab **No of Lect. – 2**

a) Getting Started with MATLAB/Scilab. Command Window, Editor Window, Figure Window, Help Window, Command History Window, Current Directory Window, Workspace Window.
b) Data Types in MATLAB/Scilab, Variables, Keywords, Assignment Statement, MATLAB/Scilab System Variables, Semicolon, and Percentage Sign.
c) Commonly Used System MATLAB/Scilab Commands.

Unit-II: Handling of Arrays and Matrices **No of Lect. – 4**

a) Creating an Array, Accessing Elements of an Array, Regular Arrays, Expanding and Reducing an Array, the Length and Size functions.
b) Array Sorting, Mathematical Operations on Arrays (Addition, Substraction, Multiplication by Scalar, and Multiplication of two arrays).

c) Division of Two Polynomials, Relational and Logical operators on Arrays.
d) Creating a Matrix, Accessing Element of a Matrix, Length and Size of a Matrix.
e) Expanding and reducing the size of a Matrix, Shifting and sorting Matrices.
f) Creating Special Matrices (Identity Matrix, Anti-Identity Matrix, 0's Matrix, 1's Matrix, and Magic Square), Transpose, Determinant and Inverse of a Matrix.
g) Mathematical Operations on Matrices.

Unit-III: Programming in MATLAB/Scilab, M-FILE Scripts **No of Lect. – 4**

a) String Operations, String MATLAB/Scilab Functions, Time and Date Functions.
b) Introduction to M-file scripts, Creating, Saving and Running an M-file.
c) Variables of a Script File, disp function, fprintf function, Reading Input from keyboard, sscanf function.
d) The Conditional Control Statements, Nested Conditional Control Statements.
e) The Loop Control Statements, for loop, while loop.
f) Break, continue and return statement.

Unit-IV: MATLAB/Scilab Functions and Two-Dimensional Plots **No of Lect. – 3**

a) Creating MATLAB/Scilab function file, local and global variable, saving and using function file, Inline functions, Comparison between script files and function files.
b) The plot Command, fplot command, Plotting Multiple Graphs in the same plot.
c) Formatting a plot, plot with Logarithmic axis, histograms, and polar plots.
d) Plotting multiple plots on the same page, Examples of MATLAB/Scilab Applications on plots.

Unit-V: Graphical User Interface and Applications of MATLAB/Scilab **No of Lect. – 3**

a) Introduction to GUI, GUI Development Environment, Creating a Simple GUI.
b) GUI Components: textbox, pushbuttons, toggle button, checkbox, radio button, popup Menus, List box and Slider.
c) Dialog Boxes: Error and warning Dialog Boxes, Input Dialog Box, Question Dialog Box, List Dialog Box, and File Dialog Box.
d) Application: Linear Algebra, Curve Fitting and Interpolation, Numerical Integration, Digital Image Processing, etc.

Reference Books:

1) Stephen J. Chapman, "MATLAB Programming for Engineers", Thomsan Learning, 3rd Edition, 2007
2) Y. Kirani Singh and B.B. Chaudhari, "MATLAB Programming", PHI, 1st Edition, 2010
3) Amos Gilat, "MATLAB An Introduction with Applications", Wiley India, 1st Edition, 2010
4) Rudra Pratap, " Getting Started with MATLAB 7", OXFORD, 1st Indian Edition, 2006
5) www.scilab.org

LAB COURSE CONTENT

(NOTE: minimum 6 practical from group A and 2 practicals from group B)

GROUP A (MATLAB/Scilab)

1. **Study of creation of arrays.**
   a. Create a row vector that has different elements
   b. Create a column vector that has different elements
   c. Create a matrix for given elements.

2. **Study of various operations on matrices**
   a. Create two matrices
   b. Perform arithmetic operations like addition, subtraction, multiplication & division on any two matrices
   c. Prove addition of matrices is commutative and associative
   d. Show matrix multiplication is distributive

3. **To plot sinusoidal, triangular and square signal**
   a. Plot all signals in a given range on same figure with suitable naming.

4. **Compute sampling of continuous time signal.**
   a. Plot continuous time signal
   b. Plot signals for different conditions of sampling and verify sampling theorem
   c. All signals plot on one figure.

5. **To find the pole zero plot of the given network.**

   a. Obtain Transfer function
   b. Calculate poles & zeros of given system
   c. Plot the Plot -Zero plot for given function.

6. **To find the Polar /Nyquist plot of the given network.**
   a. Obtain transfer function
   b. Plot Polar/Nyquist plot for given system

7. **Modeling of any one differential equation**
   a. Select any one differential equation and implement it with the help of simulation

GROUP B (MATLAB/Scilab)

Applications of MATLAB/ Scilab to Electronics Engineering subjects (4 Practicals)

Reference Books:

1) Rudra Pratap, “Getting Started With MATLAB 7: A Quick Introduction For Scientists and Engineers”.
2) Amos Gilat , “ MATLAB : An introduction with applications, 4th edition.
3) Stephen Chapman - MATLAB programming for Engineer, Thomson.
4) www.scilab.org

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Industrial Training / EDP / Special Study

COURSE CONTENT

Industrial Training / EDP / Special Study	**IT/EDP/SS**	
Course Title	Short Title	Course Code

Semester-V
Total Semester Credits: 02

Examination Scheme
Internal Continuous Assessment (ICA): 25 Marks

Industrial Training

- Student shall undergo industrial training for a minimum period of **two weeks** during summer vacations between fourth semester and fifth semester.
- The industry in which industrial training is taken should be a medium or large scale industry
- The paper bound report on training must be submitted by the student in the beginning of Fifth semester along with a certificate from the company where the student took training.
- Every student should write the report separately.
- Institute / Department/T&P Cell have to assist the students for finding Industries for the training.
- Students must take prior permission from Department before joining for Industrial Training.

OR

EDP (Entrepreneurship Development Program)

- Student has to participate in Entrepreneurship Development Program for a minimum period of **One week** during summer vacations between fourth semester and fifth semester.
- Every student must submit the paper bound report based on the program in the beginning of Fifth semester along with a certificate (Course / Program completion) from the program organizers.
- Every student should write the report separately.
- Institute / Department may arrange Entrepreneurship Development Program at their campus.
- Students must take prior permission from Department before attending any Entrepreneurship Development Program.

OR

Special Study

- Student has to submit name of three topics of his interest to the department.
- Special study in a group shall not be allowed.
- The three-member committee appointed by Head of Department shall allot one topic out of the three topics submitted by the student.
- Every student must submit the paper bound report based on special study at the end of Firth semester.

- Department should allot guide to all such students, for monitoring their progress and guide them for literature survey / report writing etc.
- Evaluation of special study shall be done based on presentation made by student, followed by brief question answer session.

Evaluation of Industrial Training / EDP / Special Study

ICA: The Internal Continuous Assessment shall be based on the active participation of the students in the training / EDP / Special study and based on knowledge / skill acquired by the student. The three-member committee appointed by Head of Department shall assess the reports and award marks based on following:

(a) Report		10 marks.
(b) Presentation		10 marks.
(c) Viva-voce at the time of presentation		05 marks.
	Total:	**25 marks.**

NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Third Year Engineering

(E&TC/E&C)

Faculty of Engineering and Technology

COURSE OUTLINE

Semester – VI

W.E.F 2014 – 2015

Industrial Economics & Telecom Regulation

COURSE OUTLINE

Industrial Economics & Telecom Regulation | **IETR**
Course Title | Short Title | Course Code

Course Description:

This course includes material from courses in economics, business, and public policy at the graduate level. Additionally, this course has been supplemented with material from investigations and consulting studies at the international level. A wide spectrum of material has been selected, with the purpose of introducing the participants to the important changes that are happening in the telecommunications industry, and the techniques usually used for cost estimations, prices, rates and other elements related to the regulation of telecommunications industry.

Lecture	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
	03	15	45	03

Prerequisite Course(s): General understanding of economics and management.

COURSE CONTENT

Industrial Economics & Telecom Regulation **Semester-VI**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) :80 Marks
Paper Duration (ESE) :03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Basic concepts in economics **No of Lect. – 9, Marks: 16**

Demand, supply, elasticity of demand and supply, competition, monopoly, oligopoly, monopolistic competition, causes creating categories of monopoly organization, price determination under perfect competition and monopoly, price discrimination, equilibrium of firm under competition and monopoly. Functions of money, supply and demand for money, money price level and inflation, black money, consequences, Meaning, magnitude.

Unit-II: Banking and Taxation system of Country. **No of Lect. –9, Marks: 16**

Function of commercial banks, multiple credit creation, banking system in India, shortcomings and improvement. Central banking: Function of central banking illustrated with reference to RBI, monitory policy meaning, objectives and features. Sources of public revenue: principles of taxation, direct and indirect taxes, distribution of incidence, tax structure, reform of tax system.

Unit-III: **No of Lect. – 9, Marks: 16**

International Trade and economic crises of 2008, Theory of international trade, balance of trade and payment, theory of protection, tariffs and subsidies, foreign exchange control, devaluation.
Basic concept of management- Planning, organization, communication, Leadership & motivation.
Marketing management and marketing Mix-Product, Place, price and promotion

Unit-IV: Telecommunications Regulation. **No of Lect. – 9, Marks: 16**

-The Task of Regulation, Markets and market failure, The rules of regulation.
-The Framework for Regulation, Legal frameworks, Instruments of regulation, Enforcement, Dangers of regulation and operational aspects.
-Regulatory Strategy and Price Controls, Market strategies/ structures, Engineering and technology.
-Regulation and the Future (John Buckley, Telecommunications Regulation)

Unit-V: **No of Lect. – 9, Marks: 16**

National Telecom Policy 1994,New Telecom Policy 1999, Guidelines For Up linking From India, Broadband Policy 2004, Guidelines For Obtaining License For Providing Direct-To-Home(DTH) Broadcasting Service In India. TRAI Act 1997, Cable Network Act, TRAI Regulation.
ITU's role in global communications.
(http://www.trai.gov.in/Default.asp
http://www.itu.int/net/home/index.aspx
http://www.itu.int/net/about/index.aspx
Black, Telecommunications Law in the Internet Age, 2002, Elsevier)

Reference Books:

1) R Jayaram, Namita R Kotwani, "Industrial Economics and Telecommunication Regulations", PHI
2) John Buckley, Telecommunications Regulation, Institution of Electrical Engineers © 2003, Published by: The Institution of Electrical Engineers, London, United Kingdom. (ISBN:0852964447)
3) John R McNamara, "The economics of innovation in the telecommunications industry", Quorum Books, Newyork.
4) Hank Intven, McCarthy Tetrault, "Telecommunication Handbook"
5) Indian Economy: A.N Agrawal

Power Electronics

COURSE OUTLINE

Power Electronics **PE**
Course Title Short Title Course Code

Course Description:

This course includes power semiconductor-based devices such as SCR, IGBT and related applications. This course is designed to introduce to the students to the basic principles and applications of power semiconductor devices. It includes fundamentals, operation & characteristics of the power devices. This course provides instruction in the theory and application of power devices in the electronics and electrical industry. Emphasis is placed on the physical characteristics and uses of power devices.

Lecture	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
	03	**14**	**42**	**03**

Prerequisite Course(s): A background in basic electronics and circuit theory.

COURSE CONTENT

Power Electronics **Semester-VI**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Introduction to Power Devices **No of Lect. – 9, Marks: 16**

a) **Silicon Controlled Rectifier (SCR):** Structure, symbolic representation, working principle, two transistor Analogy of SCR, characteristics (Static and Dynamic), Turn-ON methods, Gate triggering circuits of SCR (R,RC,UJT).
b) **Commutation Methods:** Class A, B, C, D, E, F commutation (Circuit diagram, working principle and waveforms)
c) **Protection circuits of SCR:** di/dt and dv/dt protection and Snubber circuit
d) **IGBT, GTO, DIAC, TRIAC:** Structure, symbolic representation, Working principle, characteristics.

Unit-II: Line Frequency Controlled Converters / Rectifiers No of Lect. – 9, Marks: 16

a) **Single phase Half Controlled Bridge Rectifier (R & RL Load)-** Circuit diagram, waveforms, average load voltage, RMS load voltage, average load power, active power, reactive power, current distortion factor, displacement factor, input power factor, efficiency, Ripple factor, Form factor.
b) **Single phase Full Controlled Bridge Rectifier (R&RL Load) -** Circuit diagram, waveforms, average load voltage, RMS load voltage, average load power, active power, reactive power, current distortion factor, displacement factor, input power factor, efficiency, Ripple factor, Form factor.
c) **Three phase half and full controlled converter (R & RL load)** - Circuit diagram, waveforms, average load voltage, RMS load voltage, Average load current, Operating Modes.
d) **Effect of Source Inductance:** 1-Phase and 3-Phase Fully controlled Rectifier

Unit-III: DC – DC Converter No of Lect. – 7, Marks: 16

a) Classification of Choppers, Control strategies of dc - dc- converter
b) **Step down and Step up dc-dc converter**- Circuit diagram, waveform, and output voltage calculations. Continuous conduction mode, Boundary between continuous and discontinuous conduction Mode and Discontinuous Conduction Mode.
c) **Full Bridge dc-dc converter**: PWM with Bipolar voltage switching (Derivation of output voltage.)
d) **Switch mode power supply**: Block diagram and explanation.

Unit-IV: Inverters No of Lect. – 8, Marks: 16

a) **Inverters:** Basic Series and Parallel inverters, construction and principle of operation,
b) **Square and PWM Bridge Inverters:** Single phase half bridge and full bridge inverters with R and R-L load, output voltage calculations. Square wave, quasi-square wave and sinusoidal PWM switching, selection of frequency modulation ratio and amplitude modulation ratio.
c) **Harmonic reduction Techniques**.
d) **Three phase Bridge inverter**: with balanced star resistive load, 120 degree and 180 degree conduction mode for line and phase voltages.

UNIT V: AC Controllers, UPS and simulation of converters No of Lect. – 9, Marks: 16

a) **AC controllers**: Principle of On-Off control or integral cycle and phase angle control**.**
b) 1-Phase Half wave and full wave AC control with R and R -L load, derivation of output Voltage.
c) UPS- Basic principle, Different configurations/ types of UPS – Off-line On-line, Line Interactive, their comparison. , Battery- Ah, back up time and battery charger rating calculations.
d) Simulation of single phase full converter, single phase semi converter, single phase full bridge inverter, single phase AC voltage controller.

Reference Books:

1) Ned Mohan, T. M. Undeland and W. P. Robbins- Power Electronics, converters , Application, and Design, John Wiley and sons , (3rd Edition)
2) M. D. Singh , K. B. Khanchandani - Power Electronics, TMH (3rd Edition)
3) M. H. Rashid - Power Electronics circuits, devices and applications, PHI, 3/e. Or Pearson.
4) Dr. Shailendra Jain, Modeling and simulation using MATLAB-Simulink, Wiley India pvt.Ltd.
5) P. C. Sen Power Electronics Tata Mc-Graw-Hill Publishing Company Limited.
6) Dr. P. S. Bimbhra, Power Electronics, Khanna Publication.
7) M Ramamurthy - An Introduction to Thyristor and their application, Second Edition,
8) M. S. Jamil Asgar, - Power Electronics, PHI, 2004, New Delhi.
9) S. K. Bhattacharya - Industrial Electronics and control , Tata Mc-Graw-Hill (TMH)
10) Deodatta Shingare, Industrial and Power Electronics, Electrotech Pub.
11) MATLAB-SimPowerSystem manuals.

Electronic Measurement

COURSE OUTLINE

Electronic Measurement	**EM**	
Course Title	Short Title	Course Code

Course Description:

The main objective of this course is to introduce and expose the students to various measuring instrument, their block diagram, specifications and applications. It includes analog instruments, digital instruments, generators, analyzers, and C.R.O. & data acquisition system.

	Hours / Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	14	42	04

Prerequisite Course(s): Knowledge of Elements of Electrical & Electronics Engineering and Component Devices and Instrumentation Technology.

COURSE CONTENT

Electronic Measurement **Semester-VI**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week	**End Semester Examination(ESE)**	**: 80 Marks**
	Paper Duration (ESE)	**: 03 Hours**
	Internal Sessional Exam (ISE)	**: 20 Marks**

Unit-I: Analog instruments: **No of Lect. – 8, Marks: 16**

a) Q-meter.
b) True RMS responding voltmeter.
c) Vector voltmeter.
d) Vector impedance meter.
e) Bolometer -Measurement of power.
f) Field strength meter.
g) Automatic bridges.

Unit-II: Digital Instruments **No of Lect. – 8, Marks: 16**

a) Digital Frequency Meter.
b) Digital measurement of time.
c) Universal Counter , Electronic Counter.
d) Digital tachometer, Digital PH meter.
e) Phase meter, Capacitance meter.
f) Automation in digital instruments.

Unit-III: Signal Generators and Analyzers **No of Lect. – 9, Marks: 16**

a) Frequency synthesized signal generator,
b) Random noise generator,
c) Sweep generator, TV Sweep generator, Marker generator, WobbIuscope.
d) Vectroscope,
e) Optical Time-Domain Reflectometer.
f) Frequency selective wave analyzer, Heterodyne wave analyzer.
g) Harmonic distortion analyzer.
h) Spectrum analyzer and its applications.

Unit-IV: Oscilloscope **No of Lect. – 9, Marks: 16**

a) Block diagram of CRO, vertical amplifier, horizontal deflecting systems, triggered sweep and trigger pulse circuit.
b) Delay line and its types.
c) Dual beams CRO, dual trace CRO.
d) Sampling (VHF) oscilloscope, storage oscilloscope and digital read out oscilloscope.
e) Probes for CRO
f) Digital storage oscilloscope

Unit-V: Data Acquisition, Conversion and Transmission **No of Lect. – 8, Marks: 16**

a) Generalized Data Acquisition System, Objectives of DAS, single channel and multi channel DAS.
b) Data loggers.
c) Digital Transducer
d) Data transmission systems, advantages and disadvantages of digital over analog transmitter, TDM.
e) The IEEE 488 bus.
f) Testing of audio amplifier and radio receiver.

Reference Books:

1) H. S. Kalsi, "Electronic Instrumentation", TMH, 2nd Edition, 2007.
2) A. D. Helfric and W. D. Cooper, "Modern Electronic Instrumentation and Measurement Technique", Pearson LPE, 3rd Edition, 2005.
3) A. K. Sawhney, "Electrical and Electronics measurement and Instrumentation", Dhanpat Rai and company, 18th Edition, 2007.
4) K. Lal Kishore, "Electronic Measurement and Instrumentation", Pearson 4th, Edition, 2012.

Audio Video Engineering
COURSE OUTLINE

Audio Video Engineering **AVE**
Course Title Short Title Course Code

Course Description:

This course introducing the fundamentals of Television and Consumer Electronic to undergraduate students. As the follow-up to this course, the reader is advised to the access to this course "Colour television –principal and practices" for further information on CTV principles, detailed coverage of integrated circuits used in color receiver and for alignment and servicing of such receivers.

Lecture	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
	03	15	45	03

Prerequisite Course(s): Physics, Analog Communication, Digital Communication, Electromagnetic Engineering.

COURSE CONTENT

Audio Video Engineering **Semester-VI**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) :80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Methods of sound recording and reproduction **No of Lect. – 9, Marks: 16**

a) Introduction to Disc recording, Magnetic recording, optical recording-CD and DVD.
b) Monophony, stereophony, Hi-Fi (High Fidelity) System.
c) PA system-Basics of aquatics, Block diagram, requirement, Characteristics, its planning for various uses.
d) Introduction to satellite radio reception (word space).
e) Introduction to blue ray disc format.

Unit-II: Basic concept of Television. **No of Lect. – 9, Marks: 16**

a) Scanning methods, Horizontal and vertical synchronization.
b) Camera Tubes-Image Orthicon, Vidicon, Plumbicon, Saticon, Silicon Diode array.
c) Aspect ratio, Kell factor.
d) Horizontal and vertical resolution.
e) Video bandwidth, Positive and negative modulation, Composite video signal.
f) Television Transmission-VSB transmission, TV Channels, TV Standard, TV Channels bands.
g) Basic block diagram of Monochrome TV receiver.

Unit-III: Colour Television receiver **No of Lect. – 9, Marks: 16**

a) Colour fundamental, compatibility, frequency interleaving.
b) Colour mixing, color camera tube. Colour purity.
c) Picture tubes-Static and dynamic convergence.
d) Encoder and decoder and colour different signals comparison.
e) Different system concepts-PAL, SECAM, NTSC system.
f) Colour TV transmitter and receiver block diagram.

Unit-IV: Advanced TV system and techniques **No of Lect. – 9, Marks: 16**

a) Introduction to digital compression techniques.
b) Introduction to JPEG, MPEG techniques.
c) Block diagram of Digital TV-transmitter and receiver.
d) Introduction to Advanced Display, Plasma, LCD, LED, Organic LED.
e) Introduction to HDTV (high-definition TV) transmitter and receiver.

Unit-V: Advanced Broadcasting systems **No of Lect. – 9, Marks: 16**

a) Introduction to digital cable TV conditional access system (CAS).
b) DTH system, Video on demand.
c) Introduction to 3D DTV system, CCTV, digital terrestrial TV (DTV).
d) Introduction to IPTV and mobile TV.
e) Block diagram and working of FAX Machine.

Reference Books:

1) A.M.Dhake-TV and Video Engineering,TMH
2) R. G. Gupta - TV Engineering and Video system , TMH
3) Kelth Jack - Video Demisified , Penram International
4) S. P. Bali - Colour TV Theory and Practice , TMH
5) R.Gulati - Monochrome and colour TV 4th edition , New Age
6) Bernard Grobb, Charles E - Basic TV and Video system, TMH (6Th Ed.)
7) Philips handbooks on audio ,video and consumer electronics application notes
8) Olson-High Quality Sound recording and reproduction

Industrial Management

COURSE OUTLINE

Industrial Management	**IM**	
Course Title	Short Title	Course Code

Course Description:

This course provides an introduction to: basics of management their organizational structures with man power development, financial management, quality management & industrial acts.

Lecture	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
	03	15	45	03

Prerequisite Course(s): General understanding of trade and management

COURSE CONTENT

Industrial Management **Semester-VI**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE):80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Basics of Managements **No of Lect. – 9, Marks: 16**

a) Introduction, definition of management,
b) Scientific management.
c) Function of management.
d) Principles of managements.
e) Level of management, managerial skill/roles.
f) Relation between administration, management and organization.

Unit-II: Organizational Structures **No of Lect. – 9, Marks: 16**

a) Principles of organization. Design of organization.
b) Forms of organization-Line, Lines and staff.
c) Types of ownerships-Partnership, proprietorship
d) Joint stock Company, private limited, Govt. ltd, public limited.
e) Cooperative organization.
f) Public sector and joint ventures.

Unit-III: Personal Management **No of Lect. – 9, Marks: 16**

a) Factors affecting man power planning.
b) Sources of recruitment. Talent acquisition.
c) Education & training methods of training workers.
d) Labor welfare, communication in Industries
e) Suggestion system, discipline in industries.
f) e-business& e-governances.

Unit-IV: Financial management **No of Lect. – 9, Marks: 16**

a) Definition & function of Financial Management
b) Capital Structure. Fixed & working capital. Role of SEBI (Securities & exchange Board of India).
c) Sources of Finance. Loans from Banks. Trade credit. Public deposits.
d) Wants, utility, Demand.
e) Supply, Elasticity of demand & Supply.

Unit-V: Quality management & Industrial Acts. **No of Lect. – 9, Marks: 16**

a) Definition of quality, quality control.
b) Process control. Total quality concepts
c) ISO 9001-2000.
d) Factories Act, industrial accidents, industrial safety.
e) Rights patents, trademarks, copy rights.

Text Book: 1) M. Mahajan: Industrial Engineering & Production Management, Dhanpat Rai& company.

Reference Books:

2) O. P. Khanna: Industrial Engineering & Management, Dhanpat Rai& company.
3) Koontz: Essential of Management, TMH6/e.
4) M.Y.Khan&P.K.Jain : Financial Management, TMH.

Power Electronics Lab

LAB COURSE OUTLINE

Power Electronics Lab	**PE LAB**	
Course Title	Short Title	Course Code

Course Description:

In this laboratory course emphasis is on the understanding of different Power semiconductor devices and their applications like controlled rectifiers, choppers, inverters and ac regulators.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	**14**	**28**	**1**

Total Semester Credits: 1

Prerequisite Course(s): Knowledge of Elements of Electrical & Electronics Engineering.

LAB COURSE CONTENT

(Note: Minimum TWO Experiments from each group.)

Group A

1. Study of R, RC triggering circuits of SCR to plot waveforms for various values of firing angle.
2. Study of UJT triggering circuits of SCR to plot waveforms for various values of firing angle.
3. Study and design of Class A, B, C, D, E and F commutation circuits of SCR.(Any two)

Group B

1. Study of 1 - ϕ Half controlled Bridge rectifier with R and RL Load, plot input and output voltage waveforms, average load voltage v/s firing angle.
2. Study of 1- ϕ full controlled converter with R and R-L load, plot input and output voltage waveforms, average load voltage v/s firing angle.
3. Study of 1- ϕ full controlled Bridge converter with R and R-L load, plot input and output voltage waveforms, average load voltage v/s firing angle.

Group C

1. Study of circuit and waveforms of step-up dc –dc converter and plot output voltage v/s duty ratio and switching frequency.
2. Study of circuit and waveforms of step-down dc –dc converter and plot output voltage v/s duty ratio and switching frequency.
3. Study of SMPS.

Group D

1. Study of Series Inverter and find efficiency.
2. Study of Parallel Inverter and find efficiency.
3. Simulation of single phase full converter, development of model, plotting the waveform on figure and FFT analysis (use MATLAB/Scilab - SimPowerSystem Software).
4. Simulation of single phase full bridge inverter, development of model, obtain frequency spectrum using powergui block (use MATLAB/Scilab - SimPowerSystem Software).

Group E

1. Study and plot V-I characteristics of Diac/Triac/GTO/IGBT(any one).
2. Study of 1- ϕ AC controller with R load and measure load voltage and plot waveforms for different firing angles.
3. Study of UPS.

Guide lines for ESE:

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of 10. Evaluation will be based on paper work and performance in the practical.

Electronic Measurement Lab

LAB COURSE OUTLINE

Electronic Measurement Lab	**EM LAB**	
Course Title	Short Title	Course Code

Course Description:

In this laboratory course emphasis is on the understanding of different instruments front panel of Q meter, true RMS meter, Universal Counter, CRO, DSO, Data logger and Distortion factor meter etc. The students can perform different measurements using these instruments.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	14	28	1

Total Semester Credits: 1

Prerequisite Course(s): Knowledge of Elements of Electrical & Electronics Engineering and Component Devices and Instrumentation Technology.

LAB COURSE CONTENT

(Note: Minimum FOUR Experiments from each group.)

Group A

1. Measurement of reactive and resistive components with LCR-Q meter.
2. Measurement of Vrms signal with true RMS meter / DMM.
3. Measurement of frequency and Time with the help of frequency counter.
4. Measurement of motor speed using Digital Tacho meter.
5. Measurement of various parameters with DATA logger.
6. Measurement of Phase angle with the help of Digital Phase Meter.

Group B

7. Measurement of frequency and phase shift using Lissajous pattern and testing of different components using CRO.
8. Measure and store the frequency and amplitude with the help of DSO.
9. Measurement of distortion and nature of distortion by Harmonic distortion analyzer.

10. Computerized analysis of radio receiver and measurement of power with it.

11. Analysis of test signal with the help of Spectrum analyzer.

12. Measurement of distance with OTDR meter.

Guide lines for ESE:

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of 8. Evaluation will be based on paper work and performance in the practical.

Audio Video Engineering Lab

LAB COURSE OUTLINE

Audio Video Engineering Lab	**AVE LAB**	
Course Title	Short Title	Course Code

Course Description:

This course introducing the fundamentals of Audio Video Engineering to undergraduate students. As the follow-up to this course, the reader is advised to the access to this course "Colour television –principal and practices" for further information on CTV principles, detailed coverage of integrated circuits used in colour receiver and for alignment and servicing of such receivers.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	**8**	**16**	**1**

Total Semester Credits: 1

Prerequisite Course(s): Physics, Analog Communication, Digital Communication, Electromagnetic Engineering.

LAB COURSE CONTENT

(Note: Minimum FOUR Experiments from each group.)

Group A

1. Study of colour TV receiver.
2. Voltage and waveform analysis for colour TV.
3. Alignment and fault finding of colour TV using pattern generator (2 expts.).
4. Study of HDTV .
5. Study of digital TV.
6. Practical visit to TV transmitter/Studio.

Group B

1. Study of DTH and set of box.
2. Study of CD/DVD players.
3. Study of PA system with cordless microphone .
4. Study of audio system ,MP3 player ,satellite radio(Tone controlled).
5. Study of tape recorder.
6. Web page designing.

Guide lines for ESE:-

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of Group A and Group B. Evaluation will be based on paper work and performance in the practical.

Application Software Lab

COURSE OUTLINE

Application Software Lab **AS LAB**
Course Title Short Title Course Code

Course Description:

This laboratory course emphasis is on the understanding of the open source Electronics Design Automation (EDA) tool like gEDA, KiCad, Ngspice and Oscad. But only Oscad is capable of doing circuit design, simulation and layout design together. Oscad is free and open source EDA tool and that can be i installed on Ubuntu 12.04 / 12.10 or windows operating system. Using Oscad student can create circuit schematic, analyze the result using simulation, and design PCB layout.

Laboratory	**Hours per**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	2	**10**	**20**	**1**

Total Semester Credits: 1

Prerequisite Course(s): Basic of analog and digital electronics.

LAB COURSE CONTENT

(Note: Minimum FOUR Experiments from each group.)

Group A

1. **Installation of Oscad on Ubuntu 12.04 /12.10 and windows.**

   a. Compare open source, free version and license version operating system.
   b. Find the steps to install Open source Oscad on Ubuntu 12.04 / 12.10 and windows operating system.

2. **Study of Architecture of Oscad.**

   a. Describe the meaning of Electronic Design Automation (EDA) tool.
   b. Describe the advantages and disadvantages of Oscad.
   c. Use of Oscad in circuit making, simulation and PCB design.

3. Study of schematic creation, simulation and PCB design.

a. Describe the steps to use Oscad in schematic creation, simulation and PCB design on Ubuntu or on windows operating system.
b. Describe the procedure of AC and DC analysis.

4. Simulation of typical circuit using a) R C b) Diode.

a. Develop circuit consist of RC network.
b. Find voltage and current at each node of circuit and compare with the theoretical calculated value.
c. Develop circuit consist of diode. Measure voltage and current of diode.
d. Compare simulated result with the theoretical calculated values.

5. Simulation of typical circuit using a) Transistor b) MOSFET

a. Describe operation and construction simple transistor amplifier.
b. Simulate the circuit and find I_B, I_C, I_E, and V_{CE}.
c. Compare simulated result with theoretical calculated values.
d. Describe operation and construction of simple MOSFET based circuit.
e. Compares all simulated node voltage and current with theoretical calculated values.

Group B

6. **Simulation and PCB design of typical circuit using IC 555.**

a. Identify the timer 555 IC pin configuration and its use.
b. Draw the typical circuit using timer 555 IC.
c. Find out the time when output is high using RC combination.
d. Find out the steps to create PCB layout.

7. Simulation and PCB design of typical circuit using Op-Amp 741 IC.

a. Identify the Op-Amp 741 pin configuration and its use.
b. Draw Inverting or Non-Inverting amplifier using IC 741.
c. Find out the output voltage and gain of Op-Amp.
d. Compare the simulated and theoretical calculated values.
e. Create PCB layout.

8. Simulation and PCB design of typical circuit using 74xx series IC.

a. Describe various IC available in 74xx series
b. Draw the circuit using 74xx series and verify the truth table.
c. Create PCB layout.

9. **Simulation and PCB design of typical circuit using two stage amplifiers.**

   a. Describe operation and construction of simple two stage transistor amplifier circuit.
   b. Simulate the circuit and find I_B, I_C, I_E, and V_{CE}.
   c. Find the AC analysis and compare input and output wave form.
   d. Compare simulated result of I_B, I_C, I_E, and V_{CE} of each transistor with theoretical calculated values.
   e. Create PCB layout.

10. **Simulation and PCB design of simple DC power supply. (DC power supply circuit include transformer- rectifier-filter- regulator.)**

   a. Draw and describe circuit diagram of simple DC power supply.
   b. Describe the use of DC power supply.
   c. Measure the voltage and current at each stage of circuit.
   d. Create PCB layout.
   e. (**Optional**- Implement DC power supply circuit on single side copper clad PCB and compare the all node voltage and current with simulated results).

Reference book-

1) **Oscad**- An open source EDA tool for circuit design, simulation, analysis and PCB design. By "**Kannan M. Moudgalya , IIT Bombay**", Shroff Publication and distributors Pvt. Ltd.
2) **http://oscad.in**

Guide lines for ESE:-

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of Group A or Group B. Evaluation will be based on paper work and performance in the practical.

Minor Project

COURSE CONTENT

Minor Project	**MIP**	
Course Title	Short Title	Course Code

Semester-VI

Laboratory	Hours per	No. of Weeks	Total Hours	Semester Credits
	2	**10**	**20**	**2**

Examination Scheme
Internal Continuous Assessment (ICA): 50 Marks

- Every student shall undertake the Minor Project in semester VI.
- Each student shall work on an approved project, a group of **05 students (maximum)** shall be allotted for the each minor project.
- Minor project may involve fabrication, design or investigation of a technical problem that may take design, experimental or analytical character or combine element of these areas. The project work shall involve sufficient work so that students get acquainted with different aspects of fabrication, design or analysis.
- Each student is required to maintain separate log book for documenting various activities of minor project.
- The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of minor project. Maximum four minor project groups shall be assigned to one teaching staff.
- Assessment of the project for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given in **Table-A.**
- Before the end of semester, student shall deliver a seminar and submit the seminar report (paper bound copy)in following format:
  - Size of report shall be of minimum 25 pages.
  - Student should preferably refer minimum five reference books / magazines/standard research papers.
  - Format of report
    - Introduction.
    - Literature survey.
    - Theory (Implementation, Methodology, Applications, Advantages, Disadvantages. etc)
    - Future scope.
    - Conclusion.

Assessment of Minor Project

Name of the Project: ____

Name of the Guide: ____

Table-A

SN	Exam Seat No	Name of Student	Project Selection	Documentation	Design /Simulation/Logic	PCB/hardware/programming	Result Verification	Presentation	Total
			5	10	10	10	10	5	50

Seminar-I

COURSE CONTENT

Seminar-I	**S-I**	
Course Title	Short Title	Course Code

Semester-VI

	Hours per Week	**No. of Weeks**	**Total Hours**	**Semester Credits**
Laboratory	**2**	**10**	**20**	**2**

Examination Scheme
Internal Continuous Assessment (ICA): 25 Marks

1. For Seminar-I every student will individually study a topic assigned to him / her and submit a report and shall deliver a short lecture / Seminar on the topic during the term.
2. The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of Seminar-I. Seminar shall be related state of the art topic of his choice approved by the committee.
3. Seminar topic should not be repeated and registration of the same shall be done on first come first serve basis.
4. Topic of Seminar shall be registered within a two week from commencement of VI Semester and shall be approved by the committee.
5. Maximum six seminar supervision shall be allotted to each teacher.
6. Before the end of semester, student shall deliver a seminar and submit the seminar report (paper bound copy).

7. ASSESSMENT OF SEMINAR-I

Assessment of the Seminar-I for award of ICA marks shall be done by the guide and a departmental committee jointly, as per the guidelines given in **Table- B**

Title of Seminar: ______________________________

Name of Guide: ______________________________

Table-B

S N	Exam Seat No	Name of Student	Topic Selection	Literature survey	Report writing	Depth of understa nding	Presentation	Total
			5	5	5	5	5	25

NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Syllabus for

Third Year Electrical Engineering

Faculty of Engineering and Technology

COURSE OUTLINE

SEMESTER – V and VI

W.E.F 2014 – 2015

PROGRAM EDUCATIONAL OBJECTIVES. (PEOs)

The Board of Studies in Electrical Engineering of North Maharashtra University, Jalgaon(India) has defined a set of program education objectives. The Program Educational Objectives of Electrical Engineering programs are designed to provide graduates with:

PEO1: Professional Knowledge: Graduates shall acquire the fundamental and advanced knowledge in Electrical Engineering subjects along with additional knowledge about other subjects like Mathematics, Basic Sciences, Inter-disciplinary Engineering, Management and Economics to solve basic and complex engineering problem. Graduates will be able to design system within realistic constraints for sustainable developments.

PEO2: Professional Employability: Graduates will have a successful career in Electrical Engineering. Graduates will succeed in getting the entry-level engineering positions in Generation, Transmission, Manufacturing, Government sectors at regional, national levels and an Entrepreneur.

PEO3: Higher Studies & Life Long Learning: Graduates may pursue their professional development through self learning, advanced degree and continue life-long learning. Graduates will be able to use software and modern engineering tools.

PEO4: Social Engineering: Graduates will aware of social responsibility, ethical values, safety standard, economical and environmental issues so that they serve the society better.

PROGRAM OUTCOMES (POs)

a. An ability to apply knowledge of mathematics, science, and engineering.
b. An ability to design and conduct experiments, as well as to analyze and interpret data.
c. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
d. An ability to function on multidisciplinary teams.
e. An ability to identify, formulates, and solves engineering problems.
f. An understanding of professional and ethical responsibility.
g. An ability to communicate effectively.
h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
i. Recognition of the need for, and an ability to engage in life-long learning.
j. Knowledge of contemporary issues.
k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
l. An ability to work professionally in both software and hardware system areas including the design and realization of such systems.

North Maharashtra University, Jalgaon.

Syllabus Structure For Third Year Electrical Engineering w.e.f year 2014-15

Semester –V

Course Code	**Name of the Course**	**Group**	**Teaching Scheme**				**Evaluation Scheme**				Total	**Credits**
							Theory		**Practical**			
			Theory Hrs /week	**Tutorial Hrs /week**	**Practical Hrs /week**	**Total**	**ISE**	**ESE**	**ICA**	**ESE**		
	Electrical Machines – II (TH)	D	3	--	--	3	20	80	--	--	100	3
	Power System – II (TH)	D	3	--	--	3	20	80	--	--	100	3
	Power Electronics (TH)	D	3	--	--	3	20	80	--	--	100	3
	Electromagnetic Engineering (TH)	D	3	--	--	3	20	80	--	--	100	3
	Industrial Organization & Management (TH)	C	3	--	--	3	20	80	--	--	100	3
	Electrical Machines –II (LAB)	D	--	--	2	2	--	--	25	25 (PR)	50	1
	Power System -II (LAB)	D	--	--	2	2	--	--	25	25 (PR)	50	1
	Power Electronics (LAB)	D	--	--	2	2	--	--	25	25 (OR)	50	1
	Electrical and Electronic Workshop (LAB)	D	--	--	2	2	--	--	25	--	25	1
	Software Application – I (LAB)	B	1	--	2	3	--	--	50	--	50	2
	Industrial Training/EDP/ Special Study	D	--	--	--	-	--	--	25	--	25	2
	Total		**16**	**--**	**10**	**26**	**100**	**400**	**175**	**75**	**750**	**23**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA : Internal Continuous Assessment**

North Maharashtra University, Jalgaon.
Syllabus Structure For Third Year Electrical Engineering w.e.f year 2014-15
Semester –VI

Course Code	Name of the Course	Group	Teaching Scheme				Evaluation Scheme				Total	Credits
							Theory		Practical			
			Theory Hrs /week	Tutorial Hrs /week	Practical Hrs /week	Total	ISE	ESE	ICA	ESE		
	Control System – I (TH)	D	3	--	--	3	20	80	--	--	100	3
	Electrical Measurement – II (TH)	D	3	--	--	3	20	80	--	--	100	3
	Electrical Machine Design (TH)	D	3	--	--	3	20	80	--	--	100	3
	Microprocessor & Microcontroller (TH)	D	3	--	--	3	20	80	--	--	100	3
	Entrepreneurship Development (TH)	C	3	--	--	3	20	80	--	--	100	3
	Control System – I (LAB)	D	--	--	2	2	--	--	25	25 (OR)	50	1
	Electrical Measurement – II (LAB)	D	--	--	2	2	--	--	25	25 (PR)	50	1
	Microprocessor & Microcontroller (LAB)	D	--	--	2	2	--	--	25	25 (PR)	50	1
	Software Application – II (LAB)	B	--	--	2	2	--	--	25	--	25	1
	Minor Project	D	--	--	2	2	--	--	50	--	50	2
	Seminar-I	D	--	--	2	2	--	--	25	--	25	2
	Total		**15**	**--**	**12**	**27**	**100**	**400**	**175**	**75**	**750**	**23**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA : Internal Continuous Assessment**

Course Title	Short Title	Course Code
Electrical Machines – II	**EMC-II**	

Course Description:

This course is an advanced level Electrical Machines-I which will further strengthen the knowledge of the students. The course explores on understanding of construction, basic principles underlying the operation of electrical machines, performance, characteristic and testing of AC Machines, Voltage regulation of synchronous alternator, parallel operation and salient features and characteristic of synchronous motor. It also gives the platform to understand construction, working, performance and application of three phase and single phase motors.

Lectures	Hours/Week	No. of Weeks	Total Hours	Credits
	03	15	42	03

Prerequisite Course(s): Knowledge of Electrical Machine-I at second year Engineering.

General Objectives:

The object of syllabus to impart the fundamental knowledge of Synchronous machines. Students will able to develop their ability to apply the specific procedures for comprehensive treatment of rotating machines. In the earlier stage the machine worked in isolation and its simple analysis was sufficient. Now the electric machines form an integral part of large system comprising of other components as well. The object is not great depth, but presentation through enough to give theory at a level that can be understood by undergraduate. With this beginning, the students will have the foundation to continue his education and able to do better in professional duties in the field of manufacturing, testing operation and control.

Course Outcomes:

After successful completion of this lab students will be able to:

1. Apply basic knowledge of science and engineering to understand electrical machines.
2. Understand construction, concepts, principles of operation, testing and application of synchronous machines, induction motor and special function motors.
3. Understand the behavior of synchronous machine on infinite bus and analyze data for qualitative and quantitative parameters to determine characteristics of machines by performing practical.
4. Perform professional duties in team of manufacturing, testing, operation and maintenance with the sense of safety precautions.
5. Apply knowledge for technological subjects such as utilization of electrical energy, switch gear and machine design for economical and sustainable developments.
6. Do higher studies and able to use updated software and tools for continuous updating of knowledge.

Electrical Machines – II

(Course Contents)

Semester-V	**Examination Scheme:**
Teaching Scheme:	**(ESE) End Semester Examination: 80 Marks**
Lectures : 3 Hrs/Week	**(ISE) Internal Sessional Examination: 20 Marks**
	(ESE) End Semester Exam duration: 03 Hours

UNIT-I: Synchronous Alternator-I **09 Hours, 16 Marks**

Principle of generator, construction, excitation system, Arrangement of armature winding, E.M.F. equation , winding factors.

Alternator on- load , effect of armature current ; armature reaction ;resistance drop; Concept leakage reactance, synchronous reactance and synchronous impedance.

Voltage regulation of non salient pole alternator by direct load testing, synchronous impedance method; (e.g. method), m.m.f. method and potier triangle method

UNIT-II: Synchronous Alternator-II **09 Hours, 16 Marks**

Two reaction theory for salient pole machines, direct axis and quadrature axis reactance; their determination by slip test; Voltage regulation of salient pole alternator.

Power: power angle relation for non salient pole machines and salient pole

Parallel operation of alternator: need, conditions and method of parallel operation, Two alternators working in parallel, Effect of changing mechanical torque and excitation. Load sharing between two parallel connected alternators. Alternator on an infinite bus . induction generator

Unit-III: Synchronous Motors: **08 Hours, 16 Marks**

Motor action , phasor diagram on the basis of synchronous impedance, expression for gross mechanical power develop; power flow. Operation with constant load and variable excitation : locus of tip of current phasor under the above condition and v curve

Operation with const. excitation and variable load : locus of tip of current phasor circle phasor. Starting method, hunting and it causes and remedies.

Unit-IV: Poly Phase Induction Machines **08 Hours, 16 Marks**

Type and construction , working principal of induction motor, induction motor as generalized transformer, ,slip, rotor e.m.f. current, power, torque relations, torque slip characteristics, condition for maximum torque ,power stage in induction motor, losses and efficiency circle diagram and computation, Methods of starting of slip-ring and cage rotor induction motor ,varies types of starters, double squirrel cage motors, cogging, crawling of induction motor , Speed control of induction motor.

Unit-V : Single Phase Motor **08 Hours, 16 Marks**

Classification, production of magnetic field, equivalent circuit, production of toque, speed torque characteristic and application of capacitor start induction motor, split phase induction motor, shaded pole induction motor, AC series and universal motor. Comparison of single phase and three phase induction motor.

Special purpose machines:- single phase synchronous motor, repulsion motor, reluctance motor, hystresis motor, and linear induction motor.

Reference Books:

1. E.W.Clayton. "Design and Performance of D.C. Machines"
2. M.G.Say. "Design and Performance of A.C. Machines" CBS Publication
3. Langsdorf, " A.C.Machines," TMH.
4. Nagrath and Kothari "Electric Machine" –TMH
5. S K Bhaticharya, "Electrical Machines" –TMH
6. B. L. Theraja, "Electrical Technology", Vol – II, S. Chand Publucation
7. P. S Bimbhra, "Electrical Machinery" 2/E, Khanna Publishers
8. Ashfaq Husain, "Electrical Machines", Dhanpat Rai & Co
9. V K Mehta and Rohit Mehta, ' Principles of Electrical Machines" S Chand Publication
10. http://nptel.iitm.ac.in

Course Title	Short Title	Course Code
Power System – II	**PS-II**	

Course Description:

Power System-II explores the knowledge of parameter, characteristic and performances of transmission line. The subject emphasis on different faults calculation and concept of load flow analysis.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	3	**15**	**42**	**3**

Prerequisite Course(s): Knowledge of Power System-I at second year Engineering.

General Objectives:

The approach has always been to develop the thinking process of students in reaching a sound understanding of broad range of topic in power system area of electrical engineering. The object is to promote the students' interest in learning more about the electric power industry. The object is not great depth, but presentation through enough to give theory at a level that can be understood by under graduate. With this beginning, the students will have the foundation to continue his education and able to do better in professional duties in the field of power system.

Course Outcomes:

After successful completion of this course students will be able to:

1. Apply basic knowledge of science and engineering to understand power system.
2. Describe the role of Power System Engineer and necessity of power system analysis to provide good quality, uninterruptable service to the consumer.
3. Represent synchronous machine, transmission line and power transformer to evaluate the performance of power system.
4. Evaluate reactance of synchronous machine on no load and loaded condition.
5. Analyze the power system in terms of symmetrical and unsymmetrical components to calculate the effect of symmetrical and unsymmetrical faults on power system.
6. Understand the concept of load flow analysis for continuous monitoring of power system by using modern computational techniques.
7. Do higher studies in the field of power system analysis and discharge the professional duties as Power System Engineer for economical development through modern technology.

Power System-II
(Course contents)

Semester-V | **Examination Scheme:**
Teaching Scheme: | **(ESE) End Semester Examination: 80 Marks**
Lectures : 3 Hrs/Week | **(ISE) Internal Sessional Examination: 20 Marks**
(ESE) End Semester Exam duration: 03 Hours

Unit I: Line parameters **09 Hours,16 Marks**

Introduction: Constituents of power system and role, necessity of power system analysis Real, reactive , complex power and its direction.

Line parameters: Inductance of three phase line with equilateral and unsymmetrical spacing, Bundled conductor, parallel circuit lines .

Capacitance of transmission line: capacitance of two wire, capacitance of equilateral and unsymmetrical spacing, effect of earth on the capacitance of three phase transmission line, bundled conductors, parallel circuit three phase line.

Unit II: Representation of power system component and characteristic of transmission line: **09 Hours,16 Marks**

Representation of power system: Single phase representation of balance three phase network, one line diagram, impedance diagram (reactance diagram), per unit system, representation of synchronous machine and power transformer.

characteristic and performance of Long transmission line:equivalent circuit of long line, Ferranti effect, power flow through transmission line method of voltage control, receiving end circle diagram.

Unit III: Symmetrical fault analysis **08 Hours,16 Marks**

Transient on transmission line, short circuit current and reactances of synchronous machine on no load and loaded condition, The bus impedance in fault calculations, algorithm for short circuit studies.

Synthesis of unsymmetrical phasors from their symmetrical components, operators, symmetrical components of unsymmetrical phasors, power in terms of symmetrical components.

Unit IV:- Unsymmetrical faults **08 Hours,16 Marks**

Single line to ground fault (LG) on an unloaded generator , line to line fault (LL)on an unloaded generator, double line to ground fault(LLG)on an unloaded generator, unsymmetrical fault on power systems, Single line to ground fault (LG)on a power system, line to line fault (LL)on a power system , double line to ground fault(LLG)on a power system Faults through impedance, analysis of unsymmetrical faults

Unit V:- Load flow analysis: **08 Hours,16 Marks**

Load flow analysis: Introduction, bus classifications, nodal admittance matrix (YBUS), development of load flow equations, load flow solution using Gauss Seidel and Newton-Raphson method, approximation to N-R method,

Traveling Waves: Introduction to surge Impedance loading and its derivation, Introduction to travelling wave on long transmission line

Reference Books:

1. Kothari & Nagrath, "Modern Power System Analysis" 4th edition Tata Mc. Graw Hill
2. W.D. Stevenson, Jr. " Elements of Power System Analysis", Mc Graw Hill.
3. C.L. Wadhwa, "Electrical Power System", New Age International.
4. Stagg and El-Abiad, "Computer Methods in Power System Analysis" TMH.
5. Hadi Sadat; "Power System Analysis", Tata McGraw Hill.
6. L. P. Singh; "Advanced Power System Analysis & Dynamics", New Age International
7. Chakraborthy, Soni, Gupta & Bhatnagar, "Power System Engineering", Dhanpat Rai & Co.
8. T.K Nagsarkar & M.S. Sukhija, "Power System Analysis" Oxford University Press,2007.
9. http://nptel.iitm.ac.in

Course Title	Short Title	Course Code
Power Electronics	**PE**	

Course Description:

Technology has improved by lips and bounds making the power devices more closely to an ideal switch. Power electronics has already found an important place in modern technology and has revolutionized control of power and energy. As the voltage and current ratings and switching characteristics of power semiconductor devices keep improving, the range of applications continues to expand in areas such as lamp controls, power supplies to motion control, factory automation, transportation, energy storage, multimegawatt industrial drives, and electric power transmission and distribution. The greater efficiency and tighter control features of power electronics are becoming attractive for applications in motion control by replacing the earlier electro-mechanical and electronic systems. Applications in power transmission include high-voltage dc (HVDC) converter stations, flexible ac transmission system (FACTS), and static-var compensators. In power distribution these include dc-to-ac conversion, dynamic filters, frequency conversion, and Custom Power System. The syllabus of Power Electronic deals with constructional and operational characteristic of power semiconductor devices, ac to dc , dc to ac converters, choppers and ac to ac converters.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**3**	**15**	**42**	**3**

Prerequisite Course(s) : Knowledge first year subject Elements of Electrical & Electronics Engineering and second year subject Analog and Digital Electronic .

General Objectives:

Power Electronics is the art of converting electrical energy from one form to another in an efficient, clean, compact, and robust manner for convenient utilization. The objectives of Power electronic is to create an awareness about the general nature of Power electronic devices, key features of the principal Power Electronic Devices, operational analysis of single phase uncontrolled half wave and full wave rectifiers supplying resistive, inductive, capacitive and back emf type loads. The objectives intended to understand the different configurations of inverters , coppers and cycloconverters.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Describe the role of Power Electronics as an enabling technology in various applications such as flexible production systems, energy conservation, renewable energy, transportation etc.
2. Understand the behavior of semiconductor devices operated as power switches.
3. Learn the basic concepts of operation of dc-dc converters in steady state in continuous and discontinuous modes and be able to analyze basic converter topologies.
4. Ability to analyze and design ac-to-dc circuits.
5. Ability to analyze and design dc-to-ac inverters.
6. Design power factor correction (PFC) circuits to draw sinusoidal currents at unity power factor.
7. Understand and design single-phase and three-phase thyristor converters.
8. Ability to design, set up, and test power electronic circuits in the laboratory
9. Learn the role of Power Electronics in utility-related applications which are becoming extremely important.

Power Electronics
(Course Contents)

Semester-V | **Examination Scheme:**
Teaching Scheme: | **(ESE) End Semester Examination: 80 Marks**
Lectures : 3 Hrs/Week | **(ISE) Internal Sessional Examination: 20 Marks**
(ESE) End Semester Exam duration: 03 Hours

UNIT-I: **Modern Power Semi-conducting Devices** **09 Hours, 16 Marks**

Thyristors: Introduction, Basic Structure, Operating Characteristics of SCR (Static Characteristics and Dynamic Characteristics during Turn-on and Turn-off), Thyristor Turn-on Methods, Thyristor Protection, $di\ /\ dt$, dv/dt Protection, Design of Snubber Circuits,
Introduction, Basic Structure, ON-OFF Control and Operational characteristics and Applications: DIAC, TRIAC, Gate turn-off thyristor (GTO), PUT, Light Activated thyristor (LASCR), MOS Controlled Thyristors (MCT)

UNIT-II: **Firing circuits, Commutation Techniques, Multi-Connections of SCRs**
09 Hours, 16 Marks

Introduction, Basic Structure, ON-OFF Control and Operational characteristics and Applications Insulated Gate Bipolar Transistor (IGBT), Metal- Oxide Field Effect Transistor (MOSFET), MOS Controlled Thyristors (MCT),
Gate Triggering Circuits/ Firing circuits: R, RC firing circuits(half wave and full wave firing circuits), Ramp and Pedestal triggering,
Commutation Techniques/ Turn-off methods: Forced and Natural, Classification of Forced Commutation- Class A, Class B, Class C, Class D, Class E, Class F
Multi-Connections of SCRs: Series, Parallel connection, String Efficiency

Unit-III: Full Wave controlled Rectifiers **08 Hours, 16 Marks**

Single phase Full Wave Bridge Rectifiers (B-2) connection: With Resistive and Inductive load (R-L load in rectifying and inverting mode), Single phase Full Wave Mid-point converters(Rectifiers) (M-2) connection: With Resistive and Inductive load (R-L load in rectifying and inverting mode), Single phase Symmetrical and Asymmetrical Semiconverters (Half Controlled Bridge Circuits): With Resistive and Inductive load, Three phase Full Wave Full-Controlled Bridge Rectifiers (B-6) connection: With Resistive and Inductive load, Effect of Source Impedance and Effect of Overlap angle (Single phase and Three phase Full Wave Full-Controlled Bridge Rectifiers)

UNIT-IV: **Inverters** **08 Hours, 16 Marks**

Inverters classification, Series inverter, Single Phase Parallel inverter, Single Phase Half Bridge and Full Bridge Voltage Source Inverters (With Resistive and Inductive load), Harmonic reduction, Three Phase Bridge Inverters (180-Degree and 120-Degree mode Voltage source inverters)
Dual Converters: Principle of Operation Ideal and Non-ideal, Dual Converters With and Without circulating current Schemes
Cycloconveters: Principle, Single Phase Cycloconveters

Unit-V: **Choppers** **08 Hours, 16 Marks**

Principle of Operation, Step Down, Step Up Chopper, Multi-Phase Choppers, AC Choppers, Chopper Configuration: Class A, Class B, Class C, Class D, Class E,
AC Regulators**:** Single Phase Half and Full wave with Resistive and Inductive load, Three Phase AC regulators
Speed Control of DC motors: Chopper fed Separately Excited DC motors and DC Series Motors

Reference Books:

1. M. Rashid, "Power Electronics", PHI Pub.
2. M.D. Singh and Khanchandani, "Power Electronics", TMH Pub.
3. M. Rammamurty, "An Introduction to Thyristors and its Applications", East-West Press
4. Mohan , Undeland and Riobbins, "Power Electronics", Wiley India Pvt. Ltd.
5. L Umanand, "Power Electronics Essentials & Applications", Wiley India Pvt. Ltd.
6. P S Bhimbra, "Power Electronic" Khanna Publishers
7. http://nptel.iitm.ac.in

Course Title	Short Title	Course Code
Electromagnetic Engineering	**EME**	

Course Description:

Electromagnetic field theory is an important fundamental course with great academic relevance progress in this exciting theory has made possible the advent of many technologies, such as wireless communication, antennas and wave propagation, micro wave engineering, etc. Interference and electrical noise problems that affect industry can also be better understood and their solutions can be provided using field theory.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	**3**	**15**	**42**	**3**

Prerequisite Course(s): knowledge of H.S.C. and first year subject Elements of Electrical & Electronics Engineering.

General Objectives: Electromagnetic field theory is the subject of great research, academic and industrial importance and has a large number of applications**.** The objectives to understand basic concepts of static electric field and its associated quantities, Know the boundary condition particularly a boundary between conducting material and free space. The course also deals with significance of moving charges, force between two current carrying conductors, time varying field and radiation and antennas.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Apply basic concepts of scalars and vector quantities to evaluate the impact of electromagnetic fields.
2. Understand the basic concepts of static electric field and its associated quantity to evaluate the force between two point charges using Coulomb's Law.
3. Know the boundary condition, particularly a boundary between conducting material and free space.

a. Use Poisson's and Laplacian equations to calculate potential, capacitance and electric field.

4. Understand the magnetization principle and Biot-savart law and its importance.
5. Analysis how a time varying magnetic field induces an electric field and apply Maxwell's equation for analysis of static , dynamic field conditions.
6. Understand of different antennas, parameters, principle pattern multiplication

Electromagnetic Engineering
(Course contents)

Semester-V | **Examination Scheme:**
Teaching Scheme: | **(ESE) End Semester Examination: 80 Marks**
Lectures : 3 Hrs/Week | **(ISE) Internal Sessional Examination: 20 Marks**
(ESE) End Semester Exam duration: 03 Hours

Unit – I: Electrostatics **09 Hours, 16 Marks**

a. Coulomb's Law, Concept of electric field and field due to point charge.
b. Concept of volume charge density: electric field due to line charge, sheet of charge
c. Electric flux-density, Gauss's law and Divergence theorem
d. Energy expanded in moving a point charge in electric field, Concept of potential difference between two points and potential due to point charge
e. Potential-gradient and relationship between electric field and potential

Unit – II: Dipoles, Conductors, Dielecrics And Capacitance **09 Hours, 16 Marks**

b. Dipole and its electric field and dipole-moment, Energy-density in electrostatic field
c. Concept of current-density, Current continuity equation, properties of conductors
d. Boundary conditions between conductor and free-space, Boundary conditions between two perfect dielectrics
e. Capacitance between parallel plates, co-axial cable and spherical shells, Energy stored in capacitors
f. Poisson's and Laplace's equations to calculate potential, capacitance and electric field

Unit – III: Magnetostatics **08 Hours, 16 Marks**

a. Biot-savart law and its vectorial form
b. Ampere's circuital law and its applications to co-axial law
c. Curl operator, magnetic flux-density.
d. Scalar and Vector magnetic potential
e. Magnetic flux-density, Stoke's theorem
f. Lorentz's force equation, Energy stored in magnetic field

Unit – IV: Time Varying Fields **08 Hours, 16 Marks**

a. Maxwell's equations in integral and differential form in time-varying fields, free-space, phasor form
b. Uniform plane-wave, Wave motion in free-space, perfect conductor, skin-effect
c. Wave motion in perfect dielectric and lossy dielectric medium
d. Poynting theorem

e. Reflection of uniform plane wave by perfect dielectric (Normal and oblique incidence)
f. Reflection of uniform plane wave by perfect conductor (Normal and oblique incidence)

Unit – V: **Radiation and Antennas** **08 Hours, 16 Marks**

a. Antenna fundamentals: Radiation intensity, Directive gain and Directivity, Power gain and efficiency, Effective length, Effective aperture, Radiation resistance
b. Reciprocity between transmitting and receiving antennas
c. Vector retarted potential, Radiation pattern
d. Antenna Arrays: Broadside arrays, End-fire Array, Binomial Array, Tchebyscheff Array
e. Principle of pattern multiplication
f. Types of Antennas: Folded dipole, Yagi-Uda Antenna, Horn Antenna, Parabolic and Cassegain Antenna

Reference Books:

1. W.H. Hyat, "Engineering Electromagnenic", Tata Mc Graw Hill.
2. S. P. Seth, "Elements of Electromagnetic fields", Dhanpat Roy and Sons
3. R G Kaduskar, " Principles of Electromagnetics", Publication- Wiley
4. Gottapu Sasibhushana Rao, " Electromagnetic Field Theory and Transmission Lines", Publication- Wiley
5. Edward C. Jordan & K. G. Balmain, Electromagnetic Waves & Radiating Systems Second Edition, PHI
6. K.D. Prasad, Antenna and Wave Propagation, Satya Publication
7. http://nptel.iitm.ac.in

Course Title | Short Title | Course Code

Industrial Organization & Management **IOM**

Course Description:

The course explores concepts of management and functioning of organizations. It introduces both theoretical concepts and empirical applications, focusing particularly on production industries. Management studies have influenced every aspect of business thinking and planning. Apart from this, it also influenced our day-today lives in the form of technological advancements. The syllabus explores the knowledge of principle of management, financial management, human resource management, operational management and marketing management.

	Hours per Week	No. of Weeks	Total Hours	Semester
Lecture	**3**	**15**	**42**	**3**

Prerequisite Course(s) : knowledge basic science and Electronics Engineering .

General Objectives: This subject is designed to expose the students to fundamental concepts of management, its processes and behavioral dynamics in organizations. It will also look at recent developments in business in the context of economic theory. It also aims at making students understand concepts, philosophies, and processes of managing the marketing & financial operations of a firm.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Understand various aspects of management.
2. Understand the concepts of human resource management, marketing management, financial management, production and operation management.
3. Estimate the financial feasibility of business and identify the various sources of financing Understand different industrial laws in views of safety, pollutions and societal developments.
4. Discharge professional duties in field of manufacturing and operational management.
5. Function on multidisciplinary teams and able to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
6. Do higher study in various new disciplines in the area of management like entrepreneurs in view of economic objectives of country, such as industrial development, regional growth, employment generation and development.

Industrial Organization & Management

(Course Contents)

Semester-V | **Examination Scheme:**

Teaching Scheme: | **(ESE) End Semester Examination: 80 Marks**

Lectures : 3 Hrs/Week | **(ISE) Internal Sessional Examination: 20 Marks**

(ESE) End Semester Exam duration: 03 Hours

UNIT I: Principles of Management **09 Hours, 16 Marks**

- **a.** Basic Concepts: Definition, Nature, Importance, Management: Art and Science & as a Profession, Management Vs Administration, Evolution of Management: Introduction to Scientific Management by Taylor, Administrative, Management by Fayol, Contribution of Peter Drucker, Levels & Functions of Management, Forms of Business Organization.
- **b.** Approaches to Management: Decision Theory Approach, Contingency Approach, Systems Approach.
- **c.** Organization: Formal & Informal, Line & Staff relationship, Centralization vs. Decentralization, Span of Management, Departmentation, MBO.

UNIT II:- Managerial Economics: **09 Hours, 16 Marks**

- **a.** Introduction:Meaning & Scope of Economics, Basic Theories, Law of Demand & Supply, Elasticity of Demand & Supply.
- **b.** Consumer Theories: Meaning of Utility & Law of Diminishing Utility.
- **c.** Cost Concepts: Opportunity Costs, Sunk Costs, Marginal Cost, Total & Variable Costs, Fixed Costs, Contribution, Law of Diminishing Return.

UNIT III: Operational Management **08 Hours, 16 Marks**

- a. Plant location and layout: Factor affecting plant location, different type of plant layout, CPM PERT, quality control manufacturing system, store and inventory control
- b. Work study –techniques of work study method study, work measurement, different charts and diagrams used in method study.

UNIT IV: Human Resource Management **08 Hours, 16 Marks**

- a. Human resource planning, Recruitment, Selection, Placement & Induction, Performance Appraisal & Development, Employee Training, Internal & External Mobility & Retention Management, Wage & Salary Administration, Fringe Benefits & Incentives Payments, Collective Bargaining, Performance appraisal , compensation
- **b.** Industrial Laws: The factories Act 1947, The Workmen's Compensation Act 1923, Maternity Benefit Act The Payment of Wages Act 1936, The Apprentices Act 1961, industrial safety, prevention of accidents pollution control act

UNIT V: Marketing Management & Financial Management 08 Hours, 16 Marks

a. Introduction to Marketing: Concept of Market, Types of Market, Definition, Nature & Scope of Marketing, Marketing Approaches, Marketing Process, Functions of Marketing Management, 7 P's of Marketing. Advertising media of advertising market forecasting.

b. New trends in Marketing: Green Marketing, e- marketing & Viral Marketing.

c. Introduction to Financial Management: Meaning, Nature & Scope of Financial Management, Capital Structure, Types & Sources of Finance, Money Market & Capital Market, Role of Financial Institutions in Industry.

Reference Books:

1. O P Khanna, "Industrial Engineering Managements"
2. L.M.Prasad, "Principles of Management", Himalaya Publications Ltd
3. D.N. Dwivedi, "Managerial Economics", Vikas Publications
4. S.Chand by S.S.Khanka "Human resource Management"(Text & Cases),
5. P.Subba Rao "Essentials of HRM & IR" (Text, Cases & Games), Himalaya Publishing House
6. R.S.N. Pillai, Bhagavathi , "Legal Aspects of Business" (Mercantile Laws including Industrial & Company Laws)
7. Philip Kotler, "Marketing Management", Tata McGraw Hill
8. Ravi M. Kishor, "Financial Management", Taxmann Publication.

Course Title | Short Title | Course Code

Electrical Machines – II Lab **EMC – II Lab**

Course Description:

In this laboratory course emphasis on imparting the practical knowledge and understanding of basic principles, determination of characteristic , performance and testing of AC Machines, Voltage regulation of synchronous alternator. Application of single phase motors

Practical	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	15	28	1

Prerequisite Course(s): Knowledge of Electrical Machine-I at second year Engineering.

General Objectives:

The objective of the laboratory is to impart the fundamental knowledge of Synchronous machine and AC motors. Students will able to develop their ability to apply the specific procedures for analyze the experimental results. The students will able to understand the characteristic of Synchronous alternator and motor, application in process and manufacturing. Application of different methods to find voltage regulation of synchronous alternator. In this lab course, students will be familiar with the use of different equipments, safety precautions on work place. This makes bridge on theoretical knowledge and practical practices.

Course Outcomes:

After successful completion of this lab course students will be able to:

1. Apply basic knowledge of science and engineering to understand electrical machine
2. Understand construction, concepts, and principles of operation, testing of synchronous machines and special function motors.
3. Analyze data for qualitative and quantitative parameters to determine characteristics of machines by performing practical
4. Apply knowledge for technological subjects such as utilization of electrical energy, switch gear & protection, manufacturing processes and safety precautions.
5. Discharging duties in technical field for economical, societal and sustainable developments.
6. Do higher studies and able to use updated software and tools for continuous updating of knowledge.

Electrical Machines-II Lab

(Lab Course Contents)

Semester-V **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 25 Marks**

Practical : 2 Hrs/Week **(ESE) End Semester Examination(PR): 25 Marks**

Teacher should facilitate learning following lab experiments:

1. Determination of voltage regulation and efficiency of three phase alternator by direct load test.
2. Open and short circuit test on three phase alternator: determination of its regulation by e.m.f. method and m.m.f. method.
3. Zero power factor test on three phase alternator: determination of regulation by Potier trangle method.
4. Determination of direct axis and quadrature axis reactance by slip test on synchronous machine. Determination of voltage regulation by two reactance theory.
5. Synchronizing alternators: lamp methods and use of synchroscope.
6. Synchronous alternator on infinite bus: behavior of machine under change in mechanical power and excitation.
7. Characteristic of synchronous motor at constant load and variable excitation.
8. Characteristic of synchronous motor at constant excitation and variable load.
9. Determination of performance of three phase induction motor by direct load test.
10. Determination of performance of three phase induction motor by no load, blocked rotor test and construction of circle diagram.
11. No load and blocked rotor tests on capacitor start single phase induction motor and determination of parameters of equivalent circuit.
12. Load test on single phase induction motor.
13. Speed control of three phase Slip Ring Induction Motor.

Note: Lab file should consist of minimum **Eight** experiments.

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

In ESE the student may be asked to perform any one practical. Evaluation will be based on paper work , performance and oral in the practical examination.

Course Title	Short Title	Course Code
Power System – II Lab	**PS – II Lab**	

Course Description:
Power System-II explores the knowledge of parameter, characteristic and performances of transmission line. The subject emphasis on different faults calculation and concept of load flow analysis.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Practical	**2**	**15**	**28**	**1**

Prerequisite Course(s): Knowledge of Power System-I at second year Engineering.

General Objectives: The approach has always been to develop the thinking process of students in reaching a sound understanding of broad range of topic in power system area of electrical engineering. The object is to promote the students' interest in learning more about the electric power industry. The object is not great depth, but presentation through enough to give theory at a level that can be understood by under graduate. With this beginning, the students will have the foundation to continue his education and able to do better in professional duties in the field of power system.

Course Outcomes:
After successful completion of this lab students will be able to:

1. Apply basic knowledge of science and engineering to understand practical behavior of power system.
2. Describe the role of Power System Engineer and necessity of power system analysis to provide good quality, uninterruptable service to the consumer.
3. Evaluate the performance of long and medium transmission line using ABCD parameter, and effect of Var compensation on voltage profile.
4. Evaluate reactance of synchronous machine on no load and loaded condition.
5. Analyze the power system in terms of symmetrical and unsymmetrical components to calculate the effect of symmetrical and unsymmetrical faults on power system.
6. Understand the concept of load flow analysis for continuous monitoring of power system by using modern computing tools.
7. Do higher studies in the field of power system analysis and discharge the professional duties as Power System Engineer for economical development through modern technology.

Power System-II Lab

(Lab Course Contents)

Semester-V **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 25 Marks**

Practical : 2 Hrs/Week **(ESE) End Semester Examination(PR): 25 Marks**

Teacher should facilitate learning following lab experiments:

1. Measurement of ABCD parameters of a medium transmission line.
2. Measurement of ABCD parameters of a long transmission line.
3. Plotting of receiving end circle diagram to evaluate performance of medium transmission line.
4. Study of the effect of VAR compensation on the profile of receiving end voltage using capacitor bank.
5. Static measurement of sub-transient reactance of a salient-pole alternator.
6. Measurement of sequence reactance of a synchronous machine.
7. Determination of steady state power limit of a transmission line.
8. Unsymmetrical fault analysis for LL,LG, LLG FAULT ON A.C / D.C network analyzer
9. Formulation and calculation of Y- bus matrix of a system using software.
10. Solution of a load flow problem using Gauss-Seidal method using asoftware.
11. Solution of a load flow problem using Newton-Raphson method using software.
12. Unsymmetrical fault analysis of a 3-bus system using a software.
13. Calculation of inductance and capacitance for symmetrical and unsymmetrical configuration of transmission line using software.

Note: Lab file should consist of minimum **Eight** experiments out of eight experiments any two experiments using professional software such as MALAB, Matpower,PSIPCE etc.

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

In ESE the student may be asked to perform any one practical. Evaluation will be based on paper work , performance and oral in the practical examination.

Course Title	Short Title	Course Code
Power Electronics Lab	**PE Lab**	

Course Description:

The greater efficiency and tighter control features of power electronics are becoming attractive for applications in motion control by replacing the earlier electro-mechanical and electronic systems. Applications in power transmission include high-voltage dc (HVDC) converter stations, flexible ac transmission system (FACTS), and static-var compensators. In power distribution these include dc-to-ac conversion, dynamic filters, frequency conversion, and Custom Power System.

Practical	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	**15**	**28**	**1**

Prerequisite Course(s) : Knowledge first year subject Elements of Electrical & Electronics Engineering and second year subject Analog and Digital Electronic .

General Objectives:

Power Electronics is the art of converting electrical energy from one form to another in an efficient, clean, compact, and robust manner for convenient utilization. The objectives of Power electronic is to create an awareness about the general nature of Power electronic devices, key features of the principal Power Electronic Devices, operational analysis of single phase uncontrolled half wave and full wave rectifiers supplying resistive, inductive, capacitive and back emf type loads. The objectives intended to understand the different configurations of inverters , coppers and cycloconverters.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Understand the behavior of semiconductor devices operated as power switches.
2. Learn the basic concepts of operation of dc-dc converters in steady state in continuous and discontinuous modes and be able to analyze basic converter topologies by conducting practical.
3. Ability to analyze the performance of ac-to-dc circuits and dc-to-ac inverters.
4. Understand and design single-phase and three-phase thyristor converters.
5. Ability to design, set up, and test power electronic circuits in the laboratory
6. Learn the role of Power Electronics in utility-related applications which are becoming extremely important.

Power Electronics - Lab

(Lab Course Contents)

Semester-V **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 25 Marks**

Practical : 2 Hrs/Week **(ESE) End Semester Examination(OR): 25 Marks**

Teacher should facilitate learning following lab experiments:

1. Triggering Circuit of SCR
2. Characteristics of SCR,MOSFET,
3. Commutation circuit class C, class D
4. Single phase full wave controlled rectifiers R, R-L characteristics
5. Single phase semi-converter
6. Three phase full wave controlled rectifiers
7. Step up chopper
8. Step down chopper
9. Series and parallel inverter
10. Three phase inverter

Note: Lab file should consist of minimum **Eight** experiments.

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

In ESE the student may be asked questions on practical. Evaluation will be based on answers given by student in oral examination.

Course Title	Short Title	Course Code
Electrical and Electronic Workshop	**EEW Lab**	

Course Description:
This course provides the basic practical knowledge about the electrical electronics engineering. The course includes the study of different electrical symbols, electrical shocks and safety precautions, equipments used for the measurement and testing of electrical and electronics devices, different types of electronic circuits, The course may includes visit to the electrical industries or power plant for the enhancement of practical knowledge.

	Hours per Week	No. of Weeks	Total Hours	Semester
Practical	**2**	**15**	**28**	**1**

Prerequisite Course(s) : knowledge of H.S.C. and first year subject Elements of Electrical & Electronics Engineering .

General Objectives:
The objective of the course is to provide knowledge about practical practices used in electrical engineering. This course will help students to use various tools for measurement and testing of electrical apparatus. The subject provides scope for practical applications of electrical engineering. The course will also help students to use and implement efficient and techno commercial aspect of maintenance and installation.

Course Outcomes:
Upon successful completion of this course the students will be able to:
1. Understand various electrical symbols and their use in electrical electronics drawing.
2. Familiar with the safety precautions and practices while working in industrial and domestic premises.
3. Understand various maintenance schemes such as preventive, breakdown maintenance.
4. Select correct size and type of cables and wires for different applications.
5. Use different types of measuring instrument and instrumentation and testing equipments.
6. Select correct rating of fuse and MCB for protection scheme and safety.
7. Discharge the professional duties in technical field of maintenance and installation.

Electrical and Electronics Workshop

(Lab Course contents)

Semester: V **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 25Marks**

Practical: 2 Hrs/Week

Teacher should facilitate learning following lab experiments:

1. Details and Layout of DC Armature Windings.
2. Details and Layout of AC Armature Windings.
3. Study of substation equipment:
    a. Classification and use of Lightening arrester
    b. Different type of isolators.
    c. Substation earthing
4. Transformer
    a. Standard rating, vector group of power transformer.
    b. Standard rating of instrument transformer
    c. Class of accuracy for instrument transformer.
5. Study of Starters:
    a. Three phase induction motor starter.
    b. Study of three phase induction motor reverse forward starter.
6. Study of different contactor ,relay and timer with switching demonstration.
7. Study of automatic star delta and soft starter for three phase induction motor.
8. Study and Testing of:
    a. Diode
    b. BJT
    c. MOSFET
    d. IGBT
9. Study of Electronic ballast and fan regulator:
10. Fabrication of single phase capacitor filter rectifier circuit. Or fabrication of any small electronic circuit for domestic and commercial application.

Note: The term work should include a minimum **eight** experiments. Workshop practical practices should be based on above mentioned topics.

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Reference Books:

1. A. K .Sawhney, Electric Machine Design Tenth Edition, Danpat Ray and Sons.
2. L Umanand, " Power Electrical Essential and Application", Willey Publication.
3. S L Uppal, "Electrical Wiring, Estimation and Costing"
4. Surjit Singh, "Electrical wiring, Estimation and Costing"
5. S K Bhattacharya, "Electrical wiring, Estimation and Costing"
6. B R Gupta, "Electrical Wiring, Estimation and Costing"

Course Title	Short Title	Course Code
Software Application-I	**SA-I**	

Course Description:
The objective of this course is to introduce the students to the fundamental concepts of MATLAB and enable them to apply these concepts for solving real world problems. This course includes the basic structure and statements required for simple mathematical problems in MATLAB. This course provides the basic concepts of plot and other useful tools required to solve the problems.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**1**	**15**	**14**	**2**
Practical	**2**	**15**	**28**	

Prerequisite Course(s): Knowledge of mathematics and subject computer programming at first year engineering.

General Objectives: The objective of the course is to provide students with the essential knowledge of C language and MATLAB programming. This course will help students to use various modern tools for solving the problems of electrical engineering. The subject provides scope for practical applications of electrical engineering. The course will help students to analyze the electrical systems using the software. The course provides the effective approach for the higher studies in the efficient system design.

Course Outcomes:
Upon successful completion of this course the students will be able to:

1. Know use of the appropriate statements available in the C and C++ language and MATLAB.
2. Implement small and medium programs of varying complexity using the most commonly used features of the language.
3. Employ good programming style, standards and practices during program development.
4. Solve the different numerical techniques and perform Matrix operations.
5. Understand and use of MATLAB for solving simple mathematical problems.
6. Plot simple, 2-D and 3-D plots using MATLAB.
7. Use modern engineering tools in MATLAB which are useful for analyzing and designing of electrical power system.

Software Application-I

(Course Contents)

Semester-V **Examination Scheme:**

Teaching Scheme:

Lectures : 1 Hrs/Week

Unit-I Introduction to Matlab **03 Hours**

1. Standard Matlab windows
2. Operations with variables : naming ,checking existence, clearing and operations
3. Arrays : columns and rows: creation and indexing , size & length , multiplication, division, power and operations

Unit-II Writing script **02 Hours**

1. Writing script files : logical variables and operators , flow control and loop operators
2. Writing functions : input/output arguments , function visibility, path and Matlab startup.
3. Simple graphics : 2D plots and figures and subplots

Unit-III Data and data flow in Matlab **02 Hours**

1. Data types: Matrix, string, cell and structure, creating, accessing elements and manipulating of data of different types.
2. File Input-Output: Matlab files , text files , binary files , mixed text-binary files

Unit-IV Function minimization and parameters search. **02 Hours**

Polynomial fit : 1D and 2D fits , Data windowing , Error bounds

Unit-V Handle graphics and user interface **03 Hours**

Pre-defined dialogs: handle graphics : graphics objects , properties of objects and modifying properties of graphics objects

Reference Books:

1. Rudra Pratap, “Getting Started With Matlab: A Quick Introduction For Scientists And Engineers” Oxford University Press.
2. Dr. Shailendra Jain, “Modeling & Simulation using MATLAB-Simulink”, Wiley India.
3. Yashavant Kanetkar, “Let Us C”, BPB Publications, 10/E, 2010.
4. Stephen G Kochan “Programming in C”, Pearson Education, 3/E, 2004.
5. Using MATLAB, Version 6, The Math Works, Inc., 2000.
6. MATLAB function reference, The Math Works, Inc., 2000.
7. Using MATLAB Graphics, Version 6, The Math Works, Inc., 2000.
8. MATLAB Release Notes for Release 12, The Math Works, Inc., 2000.

Software Application-I
(Lab Course Contents)

Semester-V **Examination Scheme:**
Teaching Scheme: **(ICA) Internal Continuous Assessment: 50 Marks**
Practical : 2 Hrs/Week

Teacher should facilitate learning following lab experiments:

1. A. Simple Arithmetic Calculation: Perform simple arithmetic calculations: Addition, subtraction, multiplication, division and exponentiation.
   B. Assign values to variables.
   C. Suppress screen output.
   D. Control the appearance of floating point numbers on the screen.
2. A. Compute the Y-Coordinates of line with given slope m and the intercept c at the x coordinates.
   B. Create a vector t with 10 elements: 1, 2, 3,…….., 10 and compute the following quantities: X= t sin(t), Y=(t-1)/(t+1), Z=sin(t^2)/ t^2
   C. Create Matrices, Vectors for finding the size of matrices and perform the addition, subtraction, multiplication, transpose and inverse operation.
3. Create : Simple sine plot, line plot, an exponentially decaying sine plot, space curve, log scale plot, Overlay plot and Fancy plots.
4. Create Polynomial curve fit and compare different fits.
5. A. Create a line along with an explicit handle and then use set command to change the line style, its thickness, and values of some y-coordinates.
   B. Write some text at a specified position, create its handle, and then use the set command to change the font size, font, and string of the text.
6. Study of different types of errors.
7. Write program to find voltage and power in voltage divider circuit.
8. Write a program to calculate voltage across any resistance in a circuit.
9. Write a program to find transient response in RC circuit.
10. Write a program to find transient response in RL circuit.
11. Write a program to plot voltage and current in resistive circuit.
12. Write a program to plot voltage and current in inductive and capacitive circuit.

Note: Lab file should consist of minimum **Eight** experiments.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and assignment submitted by the student in the form of journal.

Course Title	Short Title	Course Code
Industrial Training/EDP/Special Study	**IT/EDP/SS**	

Course Description:

Industrial training and special study is very essential for understanding the latest advancement in electrical engineering. It makes bridge between theoretical knowledge and its implementation. The industrial training provides platform to understand general organization and its functions.

	Semester Credits
Two week Industrial Training/One week EDP/ Special Study	**2**

Course Objectives:

The objective of industrial training is to prepare students to work on multidisciplinary team. Student will be able to understand the use of modern tools and technique for testing and maintenance in electrical utilities.

Course outcomes:

Upon successful completion of industrial training/special study students will be able to:

1. Understand basic organizational structure of industry.
2. Work on multidisciplinary teams and understand the impact of engineering solutions in a global, economic, environmental, and societal context.
3. To analyze the different types of Case studies and Estimate the financial feasibility of project.
4. To develop Innovative ideas and implement the theoretical concepts in practical fields.
5. Use latest testing and measuring instrument and safety precaution at work place.
6. Communicate effectively and able to write detailed project report.

Industrial Training/EDP/Special Study

(Course Content)

Semester: V **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 25Marks**

Industrial Training

- Student shall undergo industrial training for a minimum period of **two weeks** during summer vacations between fourth semester and fifth semester.
- The industry in which industrial training is taken should be a medium or large scale industry
- The paper bound report on training must be submitted by the student in the beginning of Fifth semester along with a certificate from the company where the student took training.
- Every student should write the report separately.
- Institute / Department/T&P Cell have to assist the students for finding Industries for the training.
- Students must take prior permission from Department before joining for Industrial Training.

OR

EDP (Entrepreneurship Development Program)

- Student has to participate in Entrepreneurship Development Program for a minimum period of **One week** during summer vacations between fourth semester and fifth semester.
- Every student must submit the paper bound report based on the program in the beginning of Fifth semester along with a certificate (Course / Program completion) from the program organizers.
- Every student should write the report separately.
- Institute / Department may arrange Entrepreneurship Development Program at their campus.
- Students must take prior permission from Department before attending any Entrepreneurship Development Program.

OR

Special Study

- Student has to submit name of three topics of his interest to the department.
- Special study in a group shall not be allowed.
- The three-member committee appointed by Head of Department shall allot one topic out of the three topics submitted by the student.
- Every student must submit the paper bound report based on special study at the end of Firth semester.
- Department should allot guide to all such students, for monitoring their progress

and guide them for literature survey / report writing etc.

- Evaluation of special study shall be done based on presentation made by student, followed by brief question answer session.

Evaluation of Industrial Training / EDP / Special Study

ICA: The Internal Continuous Assessment shall be based on the active participation of the students in the training / EDP / Special study and based on knowledge / skill acquired by the student. The three-member committee appointed by Head of Department shall assess the reports and award marks based on following:

(a) Report		10 marks.
(b) Presentation		10 marks.
(c) Viva-voce at the time of presentation		05 marks.
	Total:	**25 marks.**

NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Syllabus for

Third Year Electrical Engineering

Faculty of Engineering and Technology

COURSE OUTLINE

SEMESTER –VI

W.E.F 2014 – 2015

Course Title	Short Title	Course Code
Control System-I	**CS-I**	

Course Description:

The study of Control System Engineering is essential for the students of Electrical, Electronics, Mechanical, Aerospace & Chemical Engineering. It has applications ranges from Electrical Power System to process Control System. The course explores the knowledge of basic control systems, control system components, mathematical modeling, time response & frequency response analysis. The course also deals in concept of design & its preliminary consideration.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	3	15	42	3

Prerequisite Course(s): Mathematics and electrical engineering subject

General Objectives:

Control system engineering is an exciting field in which to apply engineering talents. The object of course to derive mathematical modeling , transfer –functions, time response and frequency response. The objectives are to find transient response and steady state error in given system.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Apply basic mathematical for modeling of control system and responses of first and second order system.
2. Describe the role of control system as an enabling technology in various applications such as in power systems, automation, renewable energy, etc.
3. Understand the response of control system subjected to different input signals, design, set up, and test control system in the laboratory.
4. Analyze and design open and closed control system.
5. Design dc servo motor and stepper motor to meet the characteristics of control system application.
6. Become proficient with computer skills (e.g., PSPICE and MATLAB) for the simulated analysis and design of control system and able to use control system in utility-related applications .

Control System -I

(Course Contents)

Semester-VI **Examination Scheme:**

Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**

Lectures : 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**

(ESE) End Semester Exam duration: 03 Hours

Unit –I **09 Hours, 16 Marks**

The Control System:

Open loop & closed control; servomechanism, Physical examples. Transfer functions, Block diagram algebra, Signal flow graph, Mason's gain formula Reduction of parameter variation and effects of disturbance by using negative feedback

Unit –II **09 Hours, 16 Marks**

Time Response analysis:

Standard test signals, time response of first and second order systems, time response specifications, steady state errors and error constants. Design specifications of second order systems: Derivative error, derivative output, integral error and PID compensations, design considerations for higher order systems, performance indices

Unit –III **08 Hours, 16 Marks**

Control System Components:

Constructional and working concept of ac servomotor, synchros and stepper motor. Stability and Algebraic Criteria concept of stability and necessary conditions, Routh-Hurwitz criteria and limitations. Root Locus Technique: The root locus concepts, construction of root loci

Unit –IV **08 Hours, 16 Marks**

Frequency response Analysis:

Frequency response, correlation between time and frequency responses, polar and inverse polar plots, Bode plots

Stability in Frequency Domain: Nyquist stability criterion, assessment of relative stability: gain margin and phase margin, constant M&N circles.

Unit –V **08 Hours, 16 Marks**

Introduction to Design:

The design problem and preliminary considerations lead, lag and lead-lag networks, design of closed loop systems using compensation techniques in time domain and frequency domain. Review of state variable technique: Review of state variable technique, conversion of state variable model to transfer function model and vice-versa, diagonalization, Controllability and observability and their testing.

Reference Books:

1. Nagrath & Gopal, "Control System Engineering", 4th Edition, New age International.
2. K. Ogata, "Modern Control Engineering", Prentice Hall of India.
3. B.C. Kuo & Farid Golnaraghi, "Automatic Control System" Wiley India Ltd, 2008.
4. Norman s Nise, "Control System Engineering" Wiley India Pvt Ltd
5. Dr. Rajeev Gupta, "NISE's Control System Engineering" Wiley India Pvt Ltd
6. D.Roy Choudhary, "Modern Control Engineering", Prentice Hall of India.
7. Ajit K Mandal, "Introduction to Control Engineering" New Age International,2006.
8. R.T. Stefani, B.Shahian, C.J.Savant and G.H. Hostetter, " Design of Feedback Control Systems".
9. Narendra Singh Beniwal and Beniwal,"Automatic control system with Matlab Programming "University Science Press.
10. Eugene Xavier S.P. and Joseph Cyril Babu,J.,"Principles of control systems "S.Chand
11. S.Sivangaraju,L.Devi ,"Control Systems Engineering "New Age International Publishers.
12. http://nptel.iitm.ac.in

Course Title	Short Title	Course Code
Electrical Measurement-II	**EM-II**	

Course Description:

This course provides a brief introduction to transducers and its response. This course also explores the knowledge of measurement of pressure, temperature and displacement by transducers. Construction, principle of working, characteristics, error and adjustment of different types measuring instruments.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	3	**15**	**42**	**3**

Prerequisite Course(s) : Knowledge of second year subject Electrical Measurement-I.

General Objectives:

To expose the students to a broad knowledge of experimental methods and measurement techniques. To train the students in the skill of operation of instruments in the electrical & electronic engineering applications. To understand the basic working of instruments. To understand the errors in measurements and their rectification. To gain proficiency in the use of common measuring instruments. To compare theoretical predictions with experimental results and to resolve any apparent differences.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Understand the basic concepts in measurement and measuring instruments.
2. Understand the need and process of standardization, calibration of instruments, their significance in process and manufacturing industries for international acceptance.
3. Select instruments on basis of accuracy, sensitivity and response time in generation, transmission, manufacturing, power system, testing and energy auditing purposes.
4. Perform technical and professional duties in any type of industries.
5. Do higher studies and use of modern instruments for automation, process control for sustainable developments.

Electrical Measurement-II

(Course Contents)

Semester-VI **Examination Scheme:**

Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**

Lectures: 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**

End Semester Exam duration: 03 Hours

Unit-I: **09 Hours, 16 Marks**

Introduction to instrumentation:

Definition, purpose, measurement – definitions, types and Classification of instruments, generalized measurement system, standards, and calibrations

Instrument Response :Instrument Response to step, ramp, sinusoidal i/p up to second order system. Errors – types – gross, systematic, random, limiting, sources of errors, techniques to minimize them.

Unit-II: **09 Hours, 16 Marks**

Introduction to transducers:

Definition, classification, selection of transducer**.** Measurement of temperature**:** using R T D, thermocouple, bimetallic, thermocouple. Pressure thermometers, pyrometers**.** Pressure Measurement: Bourdon Tubes, bellows, diaphragms. Vacuum Measurement**:** McLeod gauge, pirani gauge.

Unit-III: **08 Hours, 16 Marks**

Flow measurement-:

Rota meter, electromagnetic flow meter, hot wire anemometer, ultrasonic flow meter.

Displacement measurement : LVDT, strain gauge, -types, working principles, measurement circuitry Level measurement :mechanical, pneumatic methods , electrical methods- capacitance level gauge, hot wire / carbon resistance method nucleonic level gauge, ultrasonic method.

Unit-IV: **08 Hours, 16 Marks**

A .C. Bridges:

Classification, Maxwell, Anderson, hay, Schering, Campbell, and Wein Bridge , Special measuring instruments- construction and principles of 1 Ø & 3 Ø p.f.meters ,frequency meters ,synchronoscope, trivector meter , max. Demand Indicators, C.R.O.

Unit-V: **08 Hours, 16 Marks**

Recorders:

Necessity, construction, working, types- strip chart, circular chart, self balance potentiometric, X-Y recorder, ultraviolet recorder. Electronic technique : for measurement of voltage, current, power, energy, phase angle and rms values.

Reference Books:

1. E. W. Golding. , “Electrical Measurements and Measuring instruments”, Reem Publication.
2. C. T. Baldwin. , “Fundamentals of Electrical Measurements”, Kalyani Publication
3. Cooper and Derfllick, “Electronic Instrumentation and Measurements Techniques”, 3rd edition, Prentice-Hall of India.
4. A. K. Sawney. “Electrical & Electronic Measurement and Instrumentation” Danpant Rai & Co.
5. J.B. Gupta, “Electrical & Electronic Measurement and Instrumentation”, S K Kataria & Son.
6. R K Rajput, “Electrical & Electronic Measurement and Instrumentation”, S Chand.
7. http://nptel.iitm.ac.in

Course Title	Short Title	Course Code
Electrical Machine Design	**EMD**	

Course Description:
The course consists of general factor of machine design, material classification, temperature rise and rating of machines. It explores the design concept of transformer core, winding overall dimension performance and cooling design of transformer. The course also provides sound understanding and basic concepts of rotating machine design.

	Hours per Week	**No. of Weeks**	**Total Hours**	**Semester Credit**
Lecture	**3**	**15**	**42**	**3**

Prerequisite Course(s) : Knowledge of Electrical Machines-I and Electrical Machines-II
General Objectives: The approach has always been to develop the thinking process of students in reaching a sound understanding of broad range of topic in electrical machine design. The object is to promote the students' interest in learning more about latest trend in electrical machine design. The object is not great depth, but presentation through enough to give theory at a level that can be understood by undergraduate. With this beginning, the students will have the foundation to continue his education and able to do better in professional duties in the field of design and manufacturing industries.

Course Outcomes:
Upon successful completion of this course the students will be able to:

1. Apply knowledge of mathematics, science, and engineering for design of electrical machines.
2. Understand the electrical engineering material characteristic for designing an energy efficient electrical machine.
3. Understand the temperature rise in electrical machines and impact on rating and duty of machines.
4. Ability to design an electrical machines and components to meet desired needs within realistic constraints such as economic, environmental, social, safety, manufacturability, and sustainability.
5. Function on multidisciplinary teams with professional and ethical responsibility.
6. Discharge duties in the field of design and manufacturing industries and able to do higher studies in optimal design and use latest software and engineering tools.

Electrical Machine Design
(Course Contents)

Semester-VI **Examination Scheme:**

Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**

Lectures : 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**

(ESE) End Semester Exam duration: 03 Hours

Unit-I **09 Hours, 16 Marks**

Introduction- principles of design and design factors, rating, specifications, standards, brief study of magnetic, electric, insulating and other material. Theory of solid body heating, heating and cooling time curve, rating of machines, and type of duty.
Design of Starters-Shunt Motors, Series Motor, Slip ring induction motor.

Unit – II: **09 Hours, 16 Marks**

Design of Transformer- Design of distribution and power Transformer,-types, classifications, specifications, core construction, transformer winding, design of transformer, output equation of single phase and three phase transformer ,overall dimension, design of core, winding, estimation of leakage reactance for H.V. and L.V. winding, resistance of winding, calculation of losses, determination of voltage regulation.

Unit III: **08 Hours, 16 Marks**

Design Performances of Transformer-

No Load Current of –single phase, Three phase, Magnetizing Volt-ampere, change of parameters with change of frequency, Temperature rise of transformers , transformer oil as a cooling medium, temperature rise in plain walled tanks, design of tank with tubes ,air blast cooling, forced oil circulation , thermal rating , heating time constant of transformers.

Unit –IV: **08 Hours, 16 Marks**

Induction motors:

Relation between rating and dimensions of rotating Machines-symbols, Main dimensions , total loading, specific loading , output equation , factor affecting size of rotating machines , choice of specific magnetic loading , choice of specific electric loading , variation of output & losses with Linear dimensions , separation of D and L- d.c. Machines, Induction Motors , Synchronous Machines, standard Frames.
Design of three phase Induction Motors-design output equation, choice of average flux density in air gap, choice of ampere conductors per metre, efficiency & power factor, main dimensions.

Unit –V: **08 Hours, 16 Marks**

D.C.Machine Windings- types of D.C. Windings, choice and design of simplex and duplex lap and wave Windings, equalizer connections, dummy coils, concept of multiplex Windings, reason for choosing them.

A.C. Machine Windings- single and double layer, single phase ac Windings with integral and fraction slots, three phase Windings.

Reference Books:

1. A. K .Sawhney, Electric Machine Design Tenth Edition, Danpat ray and sons.
2. A. E .Clayton, Performance and Design Of DC Machine, Third Edition, ELBS, ISAAC Pitman Sons.
3. A. E. Clayton Performance and Design Of AC Machine, Third Edition, ELBS, ISAAC Pitman Sons.
4. N. Vinogradov, Electric Machine Winder, MIR Publication.
5. Say and Taylor, D.C. Electric Machine, ELBS, Pitman Sons.
6. Feinberg,Macmillan,Modern Power Transformer Design Practices.First Edition, Feinberg, Macmillan,
7. Transformers BHEL.
8. http://nptel.iitm.ac.in

Course Title	Short Title	Course Code
Microprocessor and Microcontroller	**MPMC**	

Course Description:
The course explores knowledge of microprocessor and microcontroller. The course comprises of architecture, assemble language programming and interfacing of peripherals and their applications.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**3**	**15**	**42**	**3**

Prerequisite Course(s) : Analog and digital electronic and software application at second year engineering.

General Objectives:
To meet the challenges of growing technology , student will be conversant with the programmable aspect of microprocessor and microcontroller. Programming is a process of problem solving and communication in language of mnemonics. The object of course is to understand microprocessor and microcontroller demand, concept and develop skill in two discipline hardware and programming.

Course Outcomes:
Upon successful completion of this course the students will be able to:
1. Apply basic electronic subject and software algorithm application for understanding architectures assemble language of microcontroller and microprocessor.
2. Know the pin configuration and memory organization of a typical microprocessor and microcontroller.
3. Develop assemble language programming and interfacing peripherals for wide application in electrical engineering.
4. Develop assembly language source code for applications that use I/O ports, timer and single/multiple interrupts
5. Apply techniques for measurement of electrical quantities by microprocessor.
6. Apply the knowledge of microprocessor and microcontroller in application of microprocessor and microcontroller based electrical protection system.
7. Do higher study in the field of automation, operation and control of power system by microprocessor and microcontroller.

Microprocessor and Microcontroller

(Course Contents)

Semester-VI | **Examination Scheme:**

Teaching Scheme: | **(ESE) End Semester Examination: 80 Marks**

Lectures : 3 Hrs/Week | **(ISE) Internal Sessional Examination: 20 Marks**

(ESE) End Semester Exam duration: 03 Hours

Unit – I: **09 Hours, 16 Marks**

8085 Microprocessor: Organization, architecture, Generation of control signal, Addressing modes, Instruction format classification of instructions, Instruction set, interrupt.- interrupt structure . Serial data transfer program using RIM and SIM

Unit-II **09 Hours, 16 Marks**

Programming Memory Interfacing: Introduction to assembly language programming , stack , subroutine, types of subroutine , I/O Mapped I/O and memory mapped I/O, Memory module chip capacity, address space,. Memory specification, Types of memory- ROM, RAM: static & dynamic, PROM, EPROM, EEPR0OM, memory organization & interfacing of RAM and ROM.

Unit-III **08Hours, 16 Marks**

Interfacing Peripherals and Applications: Study of common peripheral devices, their architecture ,control words and control register & different modes of operation 8155: static RAM, I/O ports, timers, 8255 PPI, 8279 keyboard display interface.

Unit-IV **08 Hours, 16 Marks**

Data Conversion and Applications :D to A – types, Ladder, R-2R , A to D converters, SAR type, dual slope. ADC 0808 architecture, interfacing with 8085 microprocessor.
Microprocessor Applications: Frequency measurement, phase angle and power factor measurement , current voltage measurement, KVA , KW and Maximum demand measurement**.**

Unit-V **08 Hours, 16 Marks**

Microcontroller:

8051microcontroller:architecure:, registers, SFRs pins, memory organization, I/O port structure, interrupts, timer and counter circuit, serial port.
8051Instruction set classification, addressing mode, simple assembly language programs. Programming related to Timer/Counter

Reference:

1. R.S. Gaonkar .”Microproccer Architecture, Programming, & Applications with 8085”, Third edition, Penram International Publication (India) Pvt. Ltd.
2. Leventhal, “8085 Assembly Languages Programming” Tata McGraw Hill.
3. B. Ram ,”Fundamentals of Microprocessors & Microcontrollers” Dhanpat Rai Publication.
4. Muhammad Ali Mazidi, Janice Gillispie Mazidi andRolin D. McKinlay, “The 8051 Microcontroller and Embedded SystemsUsing Assembly and C”, Second Edition.
5. Kenneth J.Ayala “The 8051 Micro Controller :Architecture, Programming,”, Penram International, Mumbai.
6. http://nptel.iitm.ac.in

Course Title	Short Title	Course Code
Entrepreneurship Development	**ED**	

Course Description: Last few decades have seen the advent of various new disciplines in the area of management. One such discipline, Entrepreneurship has emerged quite recently. The syllabus explore the concept of entrepreneurship, financial requirements of a new enterprise, Expansion strategies of an enterprise, challenges for small enterprises and Institutional Support for small enterprises

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	**3**	**15**	**42**	**3**

Prerequisite Course(s) : knowledge of subject Industrial Organization And Management.

General Objectives:

The economic objectives of country, such as industrial development, regional growth, employment generation and development of small scale industries entirely depend on the growth of entrepreneurship. As concept, Entrepreneurship poses a challenge for entrepreneurs to select and implement business strategies to tread the glorious path of success and growth. Successful entrepreneurship requires passion of an entrepreneur and thus, it is more than the money and luck. In the contemporary world, the study of this discipline become of umpteen importance to understand the complexities of business environment at national and international levels.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Understand the various new disciplines in the area of management.
2. Understand concept of entrepreneurship and learn the procedure of setting up an enterprise.
3. Understand the concepts of human resource management, marketing management, financial management, production and operation management in a new enterprise.
4. Function on multidisciplinary teams and understand the impact of engineering solutions in a global, economic, environmental, and societal context.
5. Estimate the financial feasibility of business and identify the various sources of financing.
6. Understand the role of small scale enterprises in economic development of a country and understand the linkage between small and large scale enterprises.
7. Develop skills to become an entrepreneurs in view of economic objectives of country, such as industrial development, regional growth, employment generation and development of small scale industries through technological developments.

Entrepreneurship Development

(Course Contents)

Semester-VI **Examination Scheme:**

Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**

Lectures: 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**

(ESE) End Semester Exam duration: 03 Hours

Unit I **09 Hours, 16 Marks**

Introduction to Entrepreneurship

Introduction, Concept of entrepreneurship: Significance of entrepreneurship, Theories of entrepreneurship, Models of entrepreneurship development

Definition of entrepreneur: Traits and characteristics of successful entrepreneur , Functions of an entrepreneur , Types of entrepreneurs, Factors influencing entrepreneur, Professional vs. family entrepreneurs, Entrepreneurial leaders vs. managers,

Entrepreneurial process: Entrepreneurial motivation, Entrepreneurial barriers, Women as entrepreneur , Role of woman entrepreneurs in society, Barriers to women entrepreneurs , Myths of entrepreneurship, Problems faced by entrepreneurs and capacity building for entrepreneurship, Profiles of successful entrepreneurs.

Unit –II **09 Hours, 16 Marks**

Financial requirements of a new Enterprise: Estimating financial requirements, Estimation of fix capital requirements, Estimation of working capital requirements

Identifying the sources of finance –sources of long-term financing: Sources of medium-term financing , Sources of short-term financing

Institutions providing financial assistance: Venture capital funding- venture capital funding in the Indian scenario, Venture capital funding process, Importance of financial management, Working capital management, Accounting and book keeping, Financial statement, Financial ration analysis

Unit –III **08 Hours, 16 Marks**

Expansion strategies of an Enterprise

Expanding and enterprise: Expansion through concentration, Expansion through integration, Expansion through diversification , Expansion through cooperation, Expansion through internationalization, Expansion through digitalization , Organization life cycle, Strategic management, The essence of business ethics

Unit –IV **08 Hours, 16 Marks**

Challenges for small Enterprises

Problem faced by small enterprises: Managerial problems, Marketing management, Human resource, Production management, Technological problems

Role of central and state governments in promoting small enterprises: Fiscal and tax concessions for small enterprises, Industrial policies for small enterprises, Importance of marketing, Customer relationship management (CRM), Marketing services

Unit- V **08 Hours, 16 Marks**

Institutional Support for small enterprises and decision support system

Institutions supporting small scale enterprises: Small scale industries (SSI) board, Khadi and village industries commission (KVIC), Micro, small and medium enterprises development organization (MSME-DO), National small industries corporation limited (NSIC), National institute for entrepreneurship and small business development (NIESBUD)' Indian institute of entrepreneurship (IIE), State industrial development / Investment Corporation (SIDCs/SIICs), State directorate of Industries (SDIs), District industry centers (DICs) ,Industry associations , Non-Governmental organization

Institutions providing financial association: Small industries development bank of India (SIDBI), State financial corporation (SFCs)

Technological up gradation and moderation of small enterprises: ISO 9000/14001 certification fee reimbursement scheme,

Reference Books:

1. Alpana Trehan, "Entrepreneurship" Published –Dreamtech Press.
2. Jack M. Kaplan, "Patterns of Entrepreneurship" Published -WILEY.
3. Poornima M. Charantimath, "Entrepreneurship Development –Small Business Enterprises" Publisher –Pearson.
4. Thomas W. Zimmerer & Norman M. Scarborough, "Essential Of Entrepreneurship and Small Business Management" 4th Edition , Publisher –Pearson.

Course Title	Short Title	Course Code
Control System-I Lab	**CS-I**	

Course Description:

The study of Control System Engineering is essential for the students of Electrical, Electronics, Mechanical, Aerospace & Chemical Engineering. It has applications ranges from Electrical Power System to process Control System. The course explores the knowledge of basic control systems, control system components, mathematical modeling, time response & frequency response analysis. The course also deals in concept of design & its preliminary consideration.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Practical	**2**	**15**	**28**	**1**

Prerequisite Course(s): Mathematics and subjects of electrical engineering

General Objectives: Control system engineering is an exciting field in which to apply engineering talents. The object of practical to derive mathematical modeling, transfer – functions, time response and frequency response. The objectives are to find transient response and steady state error in given system.

Course Outcomes:

Upon successful completion of this practical course the students will be able to:

1. Apply basic of mathematical modeling of control system and responses of first and second order system.
2. Describe the role of Control system as an enabling technology in various applications such as in power systems, energy conservation, renewable energy, transportation etc.
3. Understand the response of control system subjected to different input signals, design, set up, and test control system in the laboratory.
4. Analyze and design open and closed control system.
5. Design dc servo motor and stepper motor to meet the characteristics of control system application.
6. Become proficient with computer skills (e.g., PSPICE and MATLAB) for the simulated analysis and design of control system and able to use control system in utility-related applications.

Control System-I Lab

(Lab contents)

Semester-V I **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 25 Marks**

Practical : 2 Hrs/Week **(ESE) End Semester Examination(OR): 25 Marks**

Teacher should facilitate learning following lab experiments:

1. To determine speed-torque characteristics of an ac servomotor.
2. To study potentiometer as an error detector.
3. To study DC position control system
4. To determine time response of second order control system
5. To determine speed-torque characteristics of dc servomotor.
6. To study PID Controller.
7. To study synchro-transmitter and receiver and obtain output V/S input characteristics.
8. To Study Stepper Motor.
9. To determine time domain response of a second order system for step input and obtain performance parameters by using software .
10. To convert transfer function of a system into state space form and vice-versa, by using software .
11. To plot root locus diagram of an open loop transfer function and determine range of gain 'k' for stability by using software.
12. To plot a Bode diagram of an open loop transfer function by using software.
13. To draw a Nyquist plot of an open loop transfer functions and examine the stability of the closed loop system by using software

Note: The minimum eight experiments are to be performed from the following list of experiments. Any Six experiments compulsorily to be performed from no 1 to 8 and any two from 09 to 15.

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

In ESE the student may be asked questions on practical. Evaluation will be based answers given by student in oral examination.

Course Title	Short Title	Course Code
Electrical Measurement– II Lab	**EM- II Lab**	

Course Description:
In this laboratory, course emphasis on imparting the practical knowledge and understanding of basic principles, characteristic, performance of different measuring instruments and measurement of different electrical quantities. It also gives the platform to understand need and importance of calibration and standardization.

Practical	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	15	28	1

Prerequisite Course(s): Knowledge of Electrical Measurement-I

General Objectives:
The objective of the laboratory is to impart the fundamental knowledge of measuring instruments. Students develop their ability to select the specific instrument in reference of ranges and resolution of instruments for proper and correct analysis. The students will able to understand the characteristic of measuring instruments. In this lab course, students will be familiar with the use of different equipments, safety precautions on work place. This makes bridge on theoretical knowledge and practical practices.

Course Outcomes:
Upon successful completion of this lab students will be able to:

1. Conduct practical and able to analyze the practical data for various purposes.
2. Measure various electrical quantities and circuit parameters
3. Able to select the measuring instrument with proper range and type for practical uses.
4. Calibrate various types of instruments as per IS .
5. Do professional duties in technical field and able to use advance measuring instruments.

Electrical Measurement-II LAB

(Lab Course Contents)

Semester: VI **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 25Marks**

Practical: 2 Hrs/Week **(ESE) End Semester Examination Practical (PR) : 25Marks**

Teacher should facilitate learning following lab experiments:

1. Strain Measurement using strain gauge .
2. Study of CRO of it's different types and Applications.
3. Measurement of temperature by RTD/Thermocouple.
4. Study of pressure transducers.
5. Study of recorders.
6. Study of LVDT.
7. Measurement of inductance by Andersons Bridge.
8. Measurement of capacitance and loss angle of capacitor by Schering bridge.
9. Step response of meters.
10. Measurement of systematic errors of wattmeter.

Note: The term work should include a minimum **eight** experiments from the above list

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

In ESE the student may be asked to perform any one practical. Evaluation will be based on paper work , performance and oral in the practical examination.

Course Title | Short Title | Course Code

Microprocessor and Microcontroller Lab **MPMC- Lab**

Course Description:

The practical course explores knowledge of microprocessor and microcontroller. The course comprises of architecture, assemble language programming and interfacing of peripherals and their applications.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Practical	**2**	**15**	**28**	**1**

Prerequisite Course(s) : Analog and digital electronic and software application at second year engineering.

General Objective:

To meet the challenges of growing technology, student will be conversant with the programmable aspect of microprocessor and microcontroller. Programming is a process of problem solving and communication in language of mnemonics. The object of practical course is to understand microprocessor and microcontroller demand, concept and develop skill in two discipline hardware and programming.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Know the pin configuration and memory organization of a typical microprocessor and microcontroller.
2. Develop assemble language programming and interfacing peripherals for wide application in electrical engineering.
3. Develop assembly language source code for applications that use I/O ports, timer and single/multiple interrupts
4. Apply techniques for measurement of electrical quantities by microprocessor.
5. Apply the knowledge of microprocessor and microcontroller in application of microprocessor and microcontroller based electrical protection system.
6. Do higher study in the field of automation, operation and control of power system by microprocessor and microcontroller.

Microprocessor and Microcontroller LAB

(Lab Course Contents)

Semester: VI **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 25Marks**

Practical: 2 Hrs/Week **(ESE) End Semester Examination Practical (PR) : 25Marks**

Teacher should facilitate learning following lab experiments:

1. Study of architecture and instructions of 8085 along with opcodes.
2. Study of architecture and instructions of 8051..
3. 8255 interfacing
4. Memory interfacing
5. Microprocessor 8085 assembly language programs based on data transfer instruction
6. Microprocessor 8085 assembly language programs based on arithmetic instruction
7. Microprocessor 8085 assembly language programs based on logical instruction
8. Applications of microprocessor 8085 in measurement of electrical quantity.
9. Applications of microprocessor 8085 in Electrical drives and speed control for stepper motor.
10. Microcontroller 8051 assembly language programs based on data transfer instruction.
11. Microcontroller 8051 assembly language programs based on arithmetic and logical instructions.
12. Generation of delay using Timers of 8051 in mode 0, 1 and 2.

Note: The term work should include a minimum **eight** experiments on hardware kits and simulation.

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

In ESE the student may be asked to perform any one practical . Evaluation will be based on paper work, performance and oral in the practical examination.

Course Title	Short Title	Course Code
Software Application-II	**SA-II**	

Course Description:
The objective of this course is to introduce the students to the fundamental concepts of MATLAB and enable them to apply these concepts for solving real world problems. This course includes the basic structure and statements required for simple mathematical problems in MATLAB. This course provides the basic concepts of plot and other useful tools required to solve electrical the problems.

	Hours per Week	**No. Of Weeks**	**Total Hours**	**Semester Credits**
Practical	**2**	**15**	**28**	**1**

Prerequisite Course(s): Knowledge of mathematics and subject computer programming at first year engineering.

General Objectives: The objective of the course is to provide students with the essential knowledge of C language and MATLAB programming. This course will help students to use various modern tools for solving the problems of electrical engineering. The subject provides scope for practical applications of electrical engineering. The course will help students to analyze the electrical systems using the software. The course provides the effective approach for the higher studies in the efficient system design.

Course Outcomes:
Upon successful completion of this course the students will be able to:
1. Know use of the appropriate statements available in the C and C++ language and MATLAB.
2. Implement small and medium programs of varying complexity using the most commonly used features of the language.
3. Employ good programming style, standards and practices during program development.
4. Solve the different numerical techniques and perform Matrix operations.
5. Understand and use of MATLAB for solving simple mathematical problems.
6. Plot simple, 2-D and 3-D plots using MATLAB.
7. Use modern engineering tools in MATLAB which are useful for analyzing and designing of electrical power system.

Software Application-II

(Lab Course Contents)

Semester-VI **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 25 Marks**

Practical : 2 Hrs/Week

Teacher should facilitate learning following lab experiments:

1. Build a simple circuit with Power System blocks and connect it to other Simulink blocks
2. Use the Powergui block and analyze static and frequency-domain response.
3. Create an electrical subsystem, simulate transients, and discretize simple circuits.
4. Single phase fully controlled converter using R and RL load using MATLAB / SIMULINK
5. Single phase AC voltage regulator using MATLAB / SIMULINK
6. Formation of Y bus matrix by inspection / analytical method using MATLAB Software
7. Formation of Z bus using building algorithm using MATLAB Software
8. Gauss Seidal load flow analysis using MATLAB Software
9. Newton Raphson method of load flow analysis using MATLAB Software
10. Fast decoupled load flow analysis using MATLAB Software
11. Fault analysis using MATLAB Software

Note: Lab file should consist of minimum **Eight** experiments.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and assignment submitted by the student in the form of journal.

Reference Books:

1. Rudra Pratap, “Getting Started With Matlab: A Quick Introduction For Scientists And Engineers” Oxford University Press.
2. Dr. Shailendra Jain, “Modeling & Simulation using MATLAB-Simulink”, Wiley India.
3. Yashavant Kanetkar, “Let Us C”, BPB Publications, 10/E, 2010.
4. Stephen G Kochan “Programming in C”, Pearson Education, 3/E, 2004.
5. Using MATLAB, Version 6, The Math Works, Inc., 2000.
6. MATLAB function reference, The Math Works, Inc., 2000.
7. Using MATLAB Graphics, Version 6, The Math Works, Inc., 2000.
8. MATLAB Release Notes for Release 12, The Math Works, Inc., 2000.

Course Title	Short Title	Course Code
Minor Project	**MP**	

Course Description:
The course explores the knowledge of design, experiment and analysis of data. The course develops ability to work on multidisciplinary teams, Identify, formulate, and solve engineering problems in view of economic, environmental and societal context.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**15**	**28**	**2**

Prerequisite Course(s): Knowledge of science, mathematics, computer programming and core subject of engineering.
General Objectives: The objectives of project are to develop ability to work in group. The scope of work is design and conduct experiments, as well as to analyze and interpret data within realistic constrain such as economic, environmental, social, safety and manufacturability. The project work provides plate form for planning, material procurement, preparing specification and execution of work. The project also develop to work on multidisciplinary teams, communicate effectively and Knowledge of contemporary issues.
Course Outcomes:
Upon successful completion of this course the students will be able to:

1. Apply knowledge of mathematics, science, and engineering for innovative ideas.
2. Design and conduct experiments, as well as to analyze and interpret data.
3. Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
4. Function on multidisciplinary teams, communicate effectively and Knowledge of contemporary issues.
5. Identify, formulate, and solve engineering problems by understanding professional and ethical responsibility.
6. Understand the impact of engineering solutions in a global, economic, environmental, and societal context.
7. Recognition of the need for, and an ability to engage in life-long learning.
8. Use the techniques, skills, modern engineering tools and software necessary for engineering practice.

Minor Project

(Lab Course Contents)

Semester-VI **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 50 Marks**

Practical : 2 Hrs/Week

- Every student shall undertake the Minor Project in semester VI. It is expected that the broad area of major project shall be finalized by the student in the beginning of the VI semester and Minor project undertaken may be a part of Major Project.
- Each student shall work on an approved project, a group of **05 students (maximum)** shall be allotted for the each minor project and same group may be continued for major project.
- Minor project may involve fabrication, design or investigation of a technical problem that may take design, experimental or analytical character or combine element of these areas. The project work shall involve sufficient work so that students get acquainted with different aspects of fabrication, design or analysis.
- Each student is required to maintain separate log book for documenting various activities of minor project.
- The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of minor project. Maximum four minor project groups shall be assigned to one teaching staff.

Guide lines for ICA : Assessment of the project for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given in **Table-A.**

Assessment of Minor Project

Name of the Project: ______________________________

Name of the Guide: ______________________________

Table-A

SN	Exam Seat No	Name of Student	Project Selection	Documentation	Design /Simulation/Logic	PCB/hardware/programming	Result Verification	Presentation	Total
			5	10	10	10	10	5	50

Course Title | Short Title | Course Code

Seminar-I

Course Description: The course explores the knowledge of design, experiment and analysis of data. The course develops ability to work on multidisciplinary teams, Identify, formulate, and solve engineering problems in view of economic, environmental and societal context.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Practical	**2**	**14**	**28**	**2**

Prerequisite Course(s): Knowledge of science, mathematics, computer programming and core subject of engineering.

General Objectives: The objectives of project are to develop ability to work in group. The scope of work is design and conduct experiments, as well as to analyze and interpret data within realistic constrain such as economic, environmental, social, safety and manufacturability. The project work provides plate form for planning, material procurement, preparing specification and execution of work. The project also develop to work on multidisciplinary teams, communicate effectively and Knowledge of contemporary issues.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Apply knowledge of mathematics, science, and engineering.
2. Design and conduct experiments, as well as to analyze and interpret data.
3. Function on multidisciplinary teams, communicate effectively and Knowledge of contemporary issues.
4. Identify, formulate, and solve engineering problems by understanding professional and ethical responsibility.
5. Understand the impact of engineering solutions in a global, economic, environmental, and societal context.
6. Use the techniques, skills, modern engineering tools and software necessary for engineering practice.
7. Practice the use of various resources to locate and extract information using offline & online tools, journals.
8. Practice the preparation and presentation of scientific papers and seminars in an exhaustive manner.

Seminar-I

(Course Contents)

Semester-VI **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 25 Marks**

Practical : 2 Hrs/Week

1. For Seminar-I every student will individually study a topic assigned to him / her and submit a report and shall deliver a short lecture / Seminar on the topic during the term.
2. The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of Seminar-I. Seminar shall be related state of the art topic of his choice approved by the committee.
3. Seminar topic should not be repeated and registration of the same shall be done on first come first serve basis.
4. Topic of Seminar shall be registered within a two week from commencement of VI Semester and shall be approved by the committee.
5. Maximum six seminar supervision shall be allotted to each teacher.
6. At the end of semester, student should submit the seminar report (paper bound copy)in following format:
    a. Size of report shall be of minimum 25 pages.
    b. Student should preferably refer minimum five reference books / magazines/standard research papers.
    c. Format of report
        i. Introduction.
        ii. Literature survey.
        iii. Theory 1) Implementation 2) Methodology
        3) Application 4) Advantages, Disadvantages.
        iv. Future scope.
        v. Conclusion.

ASSESSMENT OF SEMINAR-I

Guide lines for ICA : Assessment of the Seminar-I for award of ICA marks shall be done by the guide and a departmental committee jointly, as per the guidelines given in **Table-B**

Title of Seminar: ____

Name of Guide: ____

Table-B

SN	Exam Seat No	Name of Student	Topic Selection	Literature survey	Report writing	Depth of understanding	Presentation	Total
			5	5	5	5	5	25

NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Third Year Engineering

(Information Technology)

Faculty of Engineering and Technology

COURSE OUTLINE

Semester – V

W.E.F 2014 – 2015

Annexure - I

TE Semester – V

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Software Engineering*	D	3	---	---	3	20	80	---	---	100	3
Formal Language & Automata Theory*	D	3	---	---	3	20	80	---	---	100	3
Computer Network*	D	3	---	---	3	20	80	---	---	100	3
System Programming*	D	3	---	---	3	20	80	---	---	100	3
Principles of Management*	C	3	---	---	3	20	80	---	---	100	3
Software Engineering Lab*	D	---	---	2	2	---	---	25	25 **(OR)**	50	1
Linux Lab*	D	---	---	2	2	---	---	25	---	25	1
Computer Network Lab*	D	---	---	2	2	---	---	25	25 **(PR)**	50	1
System Programming Lab*	D	---	---	2	2	---	---	25	25 **(OR)**	50	1
Java Programming Lab*	B	1	---	2	3	---	---	50	---	50	2
Industrial Training / EDP / Special Study*	D	---	---	---	---	---	---	25	---	25	2
Total		**16**	**---**	**10**	**26**	**100**	**400**	**175**	**75**	**750**	**23**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA : Internal Continuous Assessment**

*** Common Subjects with TE Comp**

TE Semester – VI

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Operating System*	D	3	--	---	3	20	80	---	---	100	3
Object Oriented Modeling & Design*	D	3	---	---	3	20	80	---	---	100	3
Database Management System*	D	3	---	---	3	20	80	---	---	100	3
E-Commerce	D	3	---	---	3	20	80	---	---	100	3
Management Information System*	C	3	---	---	3	20	80	---	---	100	3
Operating System Lab*	D	---	---	2	2	---	---	25	25 **(OR)**	50	1
Object Oriented Modeling & Design Lab*	D	---	---	2	2	---	---	25	25 **(OR)**	50	1
Database Management System Lab*	D	---	---	2	2	---	---	25	25 **(PR)**	50	1
Web Programming Lab*	B	---	---	2	2	---	---	25	---	25	1
Minor Project*	D	---	---	2	2	---	---	50	---	50	2
Seminar – I*	D	---	---	2	2	---	---	25	---	25	2
Total		**15**	**---**	**12**	**27**	**100**	**400**	**175**	**75**	**750**	**23**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA: Internal Continuous Assessment**

*** Common Subjects with TE Comp**

Software Engineering

COURSE OUTLINE

Course Title	Short Title	Course Code
Software Engineering	**SE**	

Course Description:
The objective of this course is to introduce students the knowledge of Software Development Life Cycle, application of analysis, design, testing principles and project planning & management concepts to develop quality software economically.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Knowledge of programming languages and data structures.

COURSE CONTENT

Software Engineering **Semester-V**

Teaching Scheme **Examination Scheme**

Lecture: 3 Hours/Week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Introduction to Software Engineering (08Hrs, 16 Marks)

a. Nature of Software
b. Software Process
c. Software Engineering Practice
d. Software Myths
e. Generic Process model
f. Process Assessment and Improvement
g. Perspective Process Models
h. Specialized Process Models
i. Personal and Team Process Models
Agile Process models:
j. Agile process
k. Extreme programming

2. Requirements Engineering (08Hrs, 16 Marks)

Requirements Engineering:
a. Eliciting Requirements
b. Building the Requirements Model
c. Negotiating requirements
d. Validating requirements
e. Requirements Analysis

f. Scenario-Based Modeling
g. Requirements modeling strategies
h. Flow-Oriented Modeling
i. Data modeling Concepts
j. Class based modeling
k. SRS.

3. Design Engineering (08Hrs, 16 Marks)

a. Design Process
b. Design Concepts
c. The Design Model
Architectural Design:
d. Software Architecture
e. Architectural Styles
f. Architectural Design
User Interface Design:
a. Rules
b. User Interface Analysis and Design
c. Interface Analysis
d. Interface Design Steps
e. Pattern Based Design
f. Design Patterns
g. Pattern Based software Design
h. Component Level Design patterns
i. User Interface Design patterns
j. WebApp Design patterns

Introduction to UML Diagrams.

4. Software Testing (08Hrs, 16 Marks)

Testing Strategies:

a. A Strategic approach to Software Testing
b. Strategic Issues
c. Testing Strategy for Conventional Software
d. Testing Strategy for Object-Oriented Software
e. Testing strategies for Web App
f. Validation Testing
g. System Testing
Testing Tactics:
h. Testing Fundamentals
i. White Box Testing
j. Basis Path Testing
k. Control Structure Testing
l. Black Box Testing

5. Software Project Planning & Management Concepts (08Hrs, 16 Marks)

a. Management Spectrum
b. People
c. Product

d. Process
e. Project
f. Critical Practices

Estimation for software project:

g. Project Planning Process
h. Software scope and feasibility
i. Resources
j. Decomposition Techniques
k. Empirical Estimation Models
l. Make/Buy Decision

Project Scheduling:

a. Task set for Software project
b. Defining a task network
c. Scheduling
d. Earned Value Analysis

Product Metrics:

e. A framework for product metrics
f. Software Quality
g. Software Quality Factors

Text Books:

1. Pressman R., "Software Engineering, A Practitioners Approach", 7th Edition, Tata McGraw Hill.

Reference Books:

1. Rajib Mall, "Software Engineering", 3rd Edition, PHI.
2. Pankaj Jalote, "An Integrated Approach to Software Engineering", 3rd Edition, Springer.
3. Sommerville, "Software Engineering", 8th Edition, Pearson.
4. Fairly R. , "Software Engineering", Tata McGraw Hill.
5. Davis A. , "Principles of Software Development", Tata McGraw Hill.
6. Shooman, M.L., "Software Engineering", Tata McGraw-Hill.

Formal Language and Automata Theory

COURSE OUTLINE

Course Title	Short Title Course Code
Formal Language and Automata Theory	**FLAT**

Course Description:
The objective of this course is to introduce the students the knowledge of automata Theory, principles of Grammars, Push down Automata, Turing Machines and enable them to apply these concepts for solving real world problems.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Knowledge of Discrete Structure & Graph Theory and Data Structures.

COURSE CONTENT

Formal Language and Automata Theory — **Semester-V**

Teaching Scheme
Lecture: 3 hours / week

Examination Scheme
End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Finite State Machines: **(08 Hrs, 16 Marks)**

Mathematical Preliminaries:

a. Sets , Relations and Functions
b. Alphabets, Words / Strings, their Properties and operations
c. Graphs and trees
d. Basic machine

Finite State Machines:

e. State tables, Transition graph
f. Adjacency matrix
g. Description of a Finite automaton
h. Transition Systems
i. Properties of Transition functions
j. Acceptability of a string by a FA
k. Deterministic and Non-deterministic FSM's
l. Equivalence of DFA and NFA
m. Moore and Mealy Models
n. Minimization of Finite Automata
o. FSM with Epsilon moves

2. Regular Expressions: (08 Hrs, 16 Marks)

a. Definition, Identities for Regular Expressions
b. Finite Automata and Regular Expressions

   Transition System Containing ^-moves, NDFAs with ^-moves and Regular Expressions, Conversion of Nondeterministic Systems to Deterministic Systems
c. Building RE
d. Construction of Finite Automata Equivalent to a Regular Expression
e. Conversion of RE to FA
f. Converting FA to RE
g. Equivalence of two FA
h. Pumping lemma for regular sets
i. Applications of Pumping lemma
j. Closure properties of Regular sets

(08 Hrs, 16 Marks)

3. Grammars:

a. Definition
b. Derivation trees
c. Leftmost and Rightmost Derivations
d. Ambiguous grammar
e. Removal of ambiguity
f. Chomsky hierarchy
g. Construction of Reduced Grammar
h. Eliminating Useless symbols
i. Eliminating Epsilon productions
j. Eliminating Unit productions

Normal Forms for Context – free Grammars

k. Chomsky Normal Form
l. Greibach Normal Form
m. Reduced Forms – CNF and GNF
n. Reduction to CNF and GNF
o. Pumping Lemma for Context – free Languages
p. Decision Algorithms for Context- free Languages

4. Pushdown Stack Memory Machines & Production Systems (08 Hrs, 16 Marks)

Pushdown Stack Memory Machines:

a. Definition, PDM examples
b. Acceptance by PDA
c. Power of PDM
d. Deterministic and Non-deterministic PDM
e. Construction of PDA from CFG
f. Construction of CFG from PDA

Production Systems:

a. Definition, Post canonical system
b. PMT systems
c. Markov algorithm

5. Turing Machine: **(08 Hrs, 16 Marks)**

a. Turing Machine Model
b. Representation of Turing Machines
c. Language Acceptability By Turing Machines
d. Design of Turing Machines
e. Techniques for TM Construction
f. Variants of Turing Machines
g. Composite and Iterated TM
h. Universal TM
i. TM limitations
j. The Halting problem

Text Books -

1. E V Krishnamurthy, S.K.Sen, "Introductory Theory of Computer Science", Second Edition, EWP.
2. John E. Hopcroft, Rajeev Motwani, Jeffery D. Ullman, "Introduction to Automata Theory, Languages and Computation", Third Edition, Pearson.
3. K.L.P.Mishra, N. Chandrasekaran, "Theory of Computer Science Automaton, Languages and Computation", Third Edition, PHI.

Reference Books -

1. Daniel Cohen, "Introduction to computer Theory", Wiley India.
2. John Martin, "Introduction to Languages and the Theory of Computation", TMH.
3. Lewis H., Papadimitriou C., "Elements of Theory of Computation", Second Edition, Pearson.
4. Moret B., "The Theory of Computation", Pearson Education.

Computer Network

COURSE OUTLINE

Course Title — Short Title — Course Code

Computer Network — **CN**

Course Description:

This course is aimed at introducing the fundamentals of Computer Networking to undergraduate students. The objective of the course is to understand the basics and knowledge about the Computer Network concepts and different protocols.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	14	42	03

Prerequisite Course(s): Data Communications.

COURSE CONTENT

Computer Network — **Semester-V**

Teaching Scheme — **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. TCP/IP Protocol Suit, Data Link Layer and Ethernet
(08 Hours, 16 marks)

TCP/IP Protocol Suit: Physical and Data Link Layers, Network Layer, Transport Layer, Application Layer. Addressing: Physical Addresses, Logical Addresses, Port Addresses, Specific Addresses.
Data Link Layer: Framing: Fixed size and variable size framing.
Ethernet: IEEE Standards: Data Link Layer, Physical Layer. Standard ETHERNET: MAC Sublayer, Physical Layer. Changes in the standard: Bridged Ethernet, Switched Ethernet, Full-Duplex Ethernet. Fast Ethernet: MAC Sublayer, Physical Layer. Gigabit Ethernet: MAC Sublayer, Physical Layer, Ten-Gigabit Ethernet.

2. Network Layer: Logical Addressing, Internet Protocol and Address Mapping
(08 Hours, 16 marks)

Logical Addressing: IPv4 Addresses: Address Space, Notations, Classful Addressing, Classless Addressing, Network Address Translation (NAT).
Internet Protocol: IPv4: Datagram, Fragmentation, Checksum, Options. IPv6: Structure, Address Space, Advantages, Packet Format, Extension Headers, Transition from IPv4 to IPv6: Dual Stack, Tunneling, Header Translation.
Address Mapping: Mapping Logical to Physical Address: ARP, Mapping Physical to Logical Address: RARP, BOOTP and DHCP.

3. Network Layer: Error Reporting, Delivery, Forwarding and Unicast 7 Mulicast Routing Protocols **(08 Hours, 16 marks)**

Error Reporting: ICMP: Types of Messages, Message Format, Error Reporting, Query, Debugging Tools.

Delivery: Direct Versus Indirect Delivery.

Forwarding: Forwarding Techniques, Routing Table.

Unicast Routing Protocols: Optimization, Intra and Interdomain Routing, Distance Vector Routing, Link State Routing, Path Vector Routing.

Multicast Routing Protocols: Source-Based Tree and Group-Shared Tree, MOSPF, Core-Based Tree (CBT).

4. Transport Layer: UDP and TCP

(08 Hours, 16 marks)

Transport Layer: Transport-layer services: Process-to-Process Communication, Addressing: Port Numbers, Encapsulation and Decapsulation, Multiplexing and Demultiplexing, Flow Control and Error Control.

User Datagram Protocol (UDP): User Datagram, UDP Services: Process-to-Process Communication, Connectionless Services, Flow Control and Error Control.

Transmission Control Protocol (TCP): Services, Features, Segment, Connection, Flow Control, Error Control and Congestion Control: open-loop congestion control and closed-loop congestion control.

5. Wireless Networks: 802.11 and Network Security

(08 Hours, 16 marks)

Introduction to Wireless Network: Why Wireless? A Network by Any Other Name.

Overview of 802.11 Networks: IEEE 802 Network Technology Family Tree, 802.11 Nomenclature and Design, 802.11 Network Operations, Mobility Support.

Network Security: Introduction to cryptography, symmetric-key and asymmetric-key cryptography. Symmetric-Key cryptography: Introduction, traditional ciphers, simple modern ciphers: XOR Cipher, Rotation Cipher, Substitution Cipher: S-box, Transposition Cipher: P-box. Asymmetric-Key cryptography: RSA, Diffie-Hellman algorithms.

Text Books:

1. B. A. Forouzan, "Data Communications and Networking", TMH, Fourth Edition.
2. A. S. Tanenbaum, "Computer Networks", Pearson Education, Fourth Edition.
3. Matthew S. Gast, "802.11 Wireless Networks: The Definitive Guide", O'Reilly, Second Edition.

Reference Books:

1. B. A. Forouzan, “TCP/IP Protocol Suite", TMH, Fourth Edition.
2. W.R. Stevens, “Unix Network Programming”, Vol.1, Pearson Education.
3. S. Keshav, “An Engineering Approach to Computer Networking”, Addison Wesley.
4. Comer, “Internetworking with TCP/IP", Vol. 1, Pearson Education, Fourth Edition.
5. W. Stallings, “Data and Computer Communications", Pearson Education, Fifth Edition.

System Programming

COURSE OUTLINE

Course Title	Short Title	Course Code
System Programming	**SP**	

Course Description:
The objective of this course is to introduce the students to the fundamentals of System Programming. In this basic system programs are studied in order to understand the working of system software.

	Hours per week	No. of Weeks	Total Hours	Semester Credits
Lectures	**03**	**14**	**42**	**03**

Prerequisite Course(s): Discrete Structure and Graph Theory, Data Structures.

COURSE CONTENT

System Programming **Semester-V**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Introduction to System Programs and Assembler: (08 Hours, 16 marks)

a. Introduction to system programming, Types of software and application software, System programming and system programs, Need of system software. Assemblers, Loaders, Compilers, Interpreters, Macros, Operating system and formal system, Translators and its types.
b. Assemblers: Structure of assembler, basic function, Machine dependent and machine independent features of assembler, Types of assemblers – single pass, multi-pass, cross assembler.
c. General design procedure of assembler, Design of Pass-I and Pass-II assembler (with reference to 8086 assembler).
d. Operating System:- concept, services, types (brief introduction only).

2. Macro processor & Loader: (08 Hours, 16 marks)

a. Macros and Macro Processors: Definition and function of Macro Processor, Macro expansion, Features of macro facility.
b. Design of macro processor – single pass and two pass macro processor, detailed design of two pass macro processor.
c. Loaders and Linkage Editors: Basic loader functions, Relocation and linking concepts, various loader schemes (Compile and go loader, Absolute loader, Relocating loader, general loading scheme) with their advantages and disadvantages.

3. Loader, Linker & Grammar: (08 Hours, 16 marks)

a. Design of direct linking loaders, specification of problem, specification of data structures, format of databases.
b. Design of a linker, A linker for MS DOS, Linking for overlays.
c. Other loader schemes – Binders, Linking loaders, Overlays, Dynamic binders.
d. Grammar and scanner, Programming language grammar, Derivation, Reduction and Syntax tree, Ambiguity, Regular grammar and Regular expression.

4. Parser and Parsing Techniques (08 Hours, 16 marks)

a. Parsing Techniques: - Concept, Top Down and Bottom up Parsing.
b. Top Down Parsing :- limitations of Top Down Parsing -Recursive descent and Predictive Parsing
c. Bottom Up Parsing:- Concept, Shift Reduce Parser, LR Parser, LALR, SLR Parser
d. Operator Precedence Parser, Syntax directed translation (Concept and introduction only).
e. Introduction to software development tools LEX & YACC.

5. Compiler & Inter Process Communication (08 Hours, 16 marks)

a. Overview of compilation process, Basic functions of complier, Machine dependent and machine independent features of compiler.
b. Types of compilers – single pass, multi-pass, cross compiler and pseudo code compiler,
c. Phase structure of compiler.
d. Introduction to inter process communication in windows(DLL, DDE, OLE, Clipboard:- concept and introduction only).

Reference Books:

1. John J. Donovan, "System Programming", 2nd Edition, TATA Mc GRAW HILL.
2. D. M. Dhamdhere, "System Programming and Operating Systems", Second Revised Edition, TATA Mc GRAW HILL.
3. Aho Alfred V, Sethi Rav and Ullman D, "Compiler Principles Techniques and Tools", 2nd Edition, Pearson Education.

Principles of Management

COURSE OUTLINE

Course Title	Short Title	Course Code
Principles of Management	**POM**

Course Description:
The objective of this course is to introduce the students to the Knowledge of Functions of Management and Project management, life-cycle of project, its scheduling and total quality management enable them to Understood and gain for further study.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

COURSE CONTENT

Principles of Management **Semester- V**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Basic Concepts of Management (08 Hours, 16 marks)

a. Management :Definition, classification, Characteristics and Importance of management, Principles of Management
b. Management objectives, Types of objectives
c. Functions of managers, Managerial accounting
d. Development of management thoughts : Functional approach to management by Henry Foyal
e. Scientific Management Approach by Taylor, Gilbreth, Gantt
f. Human Relation Approach by Elton Mayo,Follet
g. Schools of management Thoughts
h. Tools of Management science, Managerial economics

2. Functions of Management and Organisations

(08 Hours, 16 marks)

a. Functions of Management: Planning, Organising
b. Staffing - Concept, Nature, Importance, Steps, Concept of Knowledge worker
c. Directing– Concept, Nature, Importance
d. Controlling-Concept, Nature, Importance, Process of controlling Leadership theories, characteristic and styles of leaderships
e. Management by objectives: steps in setting up M.B.O, Problem in the approach of M.B.O., Management of participation, management by exception, quantitative and qualitative objectives
f. Organisation and its Concept: Nature, Importance, Principles, Centralization, Decentralization
g. Organization Structures- Line and Staff, Functional, Organizations.

3. Human Resource Management

(08 Hours, 16 marks)

a. Function and objective Personnel Management
b. Manpower Planning, Selection and Recruitment of Employees
c. Needs & Types of Training, Objective and Benefits of training, Training for Craftsman, supervisor and Executive
d. Motivation and motivators: motivations, perspective: self-motivation
e. Motivation: the carrot and the sticks, kinds of Motivation, Herzberg's motivation, Hygien Theory
f. Personal management: concept, principles of good personal policy
g. Communication in industry, suggestion system, discipline in industry, promotion, transfer, layout and discharge

4. Project and Quality Management

(08ours, 16 marks)

a. Introduction, Project Management Terminology, Concept of project Management
b. Role and Responsibilities of Project Manager
c. Types of project, Project Life Cycle Phase
d. Project Planning, Project Scheduling, Project Monitoring and Control
e. Basic tools and Techniques for Project Scheduling
f. Total quality management: Introduction, factors affecting quality,
g. product quality analysis, product quality analysis, causes of quality failure
h. elements of T.Q.M , requirements of T.Q.M, Aims of T.Q.M., quality circles, ISO 9000

5. Industrial Psychology, Ethics and MIS

(08 Hours, 16 marks)

a. Industrial Psychology: Definition and Concepts, Industrial psychology Vs Personal Management
b. Aims and Objectives of Industrial Psychology, Scope
c. Individual difference in behavior, Group Dynamics
d. Theory X and Y, Working Environmental Conditions, Industrial Fatigue
e. Professional and Business Ethics: Concepts, Ethics and Morals, Business Ethics, Professional Ethics
f. Need and Importance of ethics, Ethical problems and business, Ethical Issues, How to make business ethical
g. Definition, Evolution of MIS, Need/Objective/Functions of an MIS, Need for Information, Qualities of Good information
h. Information as an Organizational Resource, Management Information Categories, Application of MIS

Text Books:

1. T.R.Banga & S.C.Sharma , "Industrial Organization and Management Economics" Twenty-Third Edition, Hanna Publishers.

2. O.P.Khanna, “Industrial Organization and Management Economics”, Dhanpat Rai Publications, 2006.

Reference Books:

1. Koontz and Weihrich, “Management –A Global Perspective”, Tenth Edition, Mc Graw-Hill International Editions.
2. Tritaphy and Reddy, “Principles of Management”, Second edition, TMH.
3. Hill and Steven, “Principles of Management”, McGraw Hill, Special Indian Edition, 2007.
4. M.S.Mahajan,” Industrial Engineering and Production Management” Dhanpat Rai and Co.
5. W.S.Jawadekar, “Management Information System”, TMH.

Software Engineering Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code

Software Engineering **SE**

Course Description:
This laboratory provides students an ability to apply analysis & design concepts to develop quality software economically.

Laboratory	Hours/Week	No. of Weeks	Total Hours	Semester Credits
	02	14	28	01

Prerequisite Course(s) : Knowledge of Object Oriented Concepts and any system programming language.

LAB COURSE CONTENT

The Software Engineering Lab must include any five of following software Mini-Projects covering Problem Definition, Analysis & Design using a CASE Tool and Documentation for each.

1. ATM System
2. Library Management System
3. Inventory Control System
4. Railway Reservation System
5. College Admission System
6. University Result Management System
7. Vehicle Navigation System
8. Hospital Management System
9. Banking System
10. Web based/Online Auction System

Guidelines for ICA:
Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guidelines for ESE:
The oral examination will be based on the assignments performed by the candidates as part of ICA. Questions will be asked during the oral examination to judge the understanding of the student. It is expected that student knows theoretical (Software Engineering) aspect of the problem.

Reference Books:

1. Timonthy C. Lethbridge and Robert Laganiere, “Object Oriented Software Engineering – A Practical Software Development using UML and JAVA”, 2nd Edition, Tata McGraw-Hill.

2. Mike O'Docherty, "Object-Oriented Analysis & Design – Understanding System Development with UML 2.0", Wiley.

Note:-

- Use of Open Source Tool / Technology is recommended for laboratory assignments of concern subject.

Linux Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Linux	**Linux**	

Course Description:

This laboratory provides students with a basic knowledge of the linux programming environment. So that students able to use basic commands of linux as well as they will able to perform basic operations.

Laboratory	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	02	14	28	01

Total Semester Credits: 01

Prerequisite Course(s): Fundamental knowledge of Operating system.

LAB COURSE CONTENT

Outline of Content:

Teacher should facilitate learning following lab experiments:

Group A

1 **Installation of Linux OS.**
Installing latest version of Linux. Observing each step of installation and notice the differences.

2 **Study and execution of various Linux Commands.**
Studying various basic commands of Linux. Use of commands.

3 **Study of vi editor.**
Studying basic working and use of vi editor.

4 **Configuration of Linux Server (any two)**
It shows step by step Configuration of various types of servers
1) Web Server
2) Mail Server
3) Proxy Server
4) Telnet Server
5) FTP Server

5 **Shell script for finding out factorial of a number.**
To calculate the Factorial of number.

6 **Shell script for finding out file type and displaying list of a directory.**
To find out file type and displaying list of directory.

7 **Shell Script for File Handling.**
Demonstrates the various file operations such as :
1) Create a File.
2) Read a File.
3) Add a record into a File.
4) Delete a record from File.
5) Delete a file.
6) Update a File.

Group B

1 **Write shell script for displaying user process and system related information using environment variables.**
Displays a user process and system related information using environment variables.

2 **Write a shell script to find the largest among the 3 given numbers.**
To find out largest number among 3 given numbers.

3 **Write a shell script to reverse the contents of a String.**
To print contents of string in reverse order.

4 **Write a shell script to print date and time.**
To print date and time along with greetings depend on time.

5 **Shell script to perform arithmetic operations.**
To perform arithmetic operations such as – Addition, Subtraction, Multiplication, Division **.**

Guidelines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Reference Books:

1. Stevens Richard W, Rago Stephen A "Advanced programming in the unix environment", Pearson 2008.
2. Gopalan N P,Sivaselvan B "Beginners guide to unix", PHI Learning: New Delhi, 2009.
3. Richard Blum, Christine Bresnahan, "Linux Command Line and Shell Scripting Bible, 2nd Ed ", Wiley India, 2011.
4. Dayanand Ambawade, Deven N. Shah, "Linux Lab: Hands on Linux", Dreamtech Press
5. "Linux Administration", Kogent Learning Solutions Inc.
6. Evi Nemeth, Garth Snyder, Trent R. Hein, Ben Whaley, "Unix and Linux System Administration Handbook" 4th Edition, Pearson.
7. Neil Matthew, Richard Stones ,"Beginning Linux Programming", 4th Edition, Wiley.
8. K. L. JAMES, "Linux -Learning the Essentials", PHI,2011.

Note:

- Concerned faculty should suitably frame at least **10 practical** assignments **(SIX from PART – A and FOUR from PART – B)** out of the above list.
- Every assignment should include syntax, use of commands/functions used for coding & print out of code with proper comments and output.
- Every student is required to submit the assignments in the form of journal.
- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Computer Network Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Computer Network	**CN**	

Course Description:

This laboratory provides students with a comprehensive study of the Computer Networking and protocols. Classroom lectures stress the strengths of Computer Networks, which provide students with the means of writing efficient, maintainable, and portable code and simulating protocols and networks.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**14**	**28**	**01**

Total Semester Credits: 01

Prerequisite Course(s): Fundamental knowledge of Computers and Data Communication, C, C++ and Java Programming.

LAB COURSE CONTENT
Outline of Content:

(Note: Minimum SIX Experiments from PART A and TWO from PART B.)

PART - A

1. Implementation of Character count/Bit-Stuffing/Byte stuffing framing methods.
2. Implementation of Dijkastra's Shortest Path Network routing algorithm.
3. Implementation of TCP checksum.
4. Socket programming for TCP.
5. Socket programming for UDP.
6. Encryption/Decryption using XOR symmetric-key cryptography algorithm.
7. Encryption/Decryption using RSA asymmetric-key cryptography algorithm.
8. Implementation of RLE data compression algorithm.

PART – B

1. Simulate the Ethernet LAN for wired networks.
2. Simulate the point-to-point wired network.
3. Simulate any Wireless network.

Guidelines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guidelines for ESE:

ESE will be based on the practical assignments submitted by the students in the form of journal. In the ESE, the students may be asked to perform the practical assignment with minor modification.

Evaluation will be based on the paper work of algorithm, understanding of the logic and the syntax, quality of the program, execution of the program, type of input and output for the program.

NOTE: -

- Concerned faculty should use any network simulator software like NS-2/NS-3/ OPNET/ NetSim/ OMNeT++ to perform **PART-B** assignments.
- Concerned faculty should suitably frame at least **08 practical** assignments **(SIX from PART – A and TWO from PART – B)** out of the above list.
- Every assignment should include, theory, algorithm, print out of code with proper comments and output. Every student is required to submit the assignments in the form of journal.
- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

System Programming Lab

LAB COURSE OUTLINE

Course Title | Short Title | Course Code

System Programming | **SP** |

Course Description:

The objective of this course is to introduce the students to the fundamentals of System Programming. In this basic system programs are studied in order to understand the working of system software.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	02	14	28	01

Total Semester Credits: 01

Prerequisite Course(s): Fundamental knowledge of Discrete Structures and Graph Theory, Data Structures.

LAB COURSE CONTENT
Outline of Content:

1 **Develop an application to simulate pass-I of Two Pass Assembler.**
To analyse the source program for finding Pseudo–opcode, Machine opcode, Literals and symbols.

2 **Develop an application simulate pass- II of Two pass Assembler.**
To analyse the output of pass-I to generate the machine operation code.

3 **Develop an application to create simple text editor.**
Develop a text editor for creation, opening, editing and saving the content into a file.

4 **Develop an application for simulating Lexical Phase of compiler.**
Develop a Lexical Analyser for generating keywords, symbols, operators and identifires within the source code.

5 **Develop an application for simulating Syntax Analysis Phase of compiler.**
Develop a Syntax Analyser for generating a Parse tree from source code.

6 **Develop an application for simulating Pass-I of Macro Processor.**
Develop Pass-I of Macro processor for recognizing macro definition specified within a program.

7 **Develop an application for simulating Pass-II of Macro Processor.**
Develop Pass-II of an Macro processor for expanding a macro definition specified within a program

8 **Develop an application for simulation of any one of parsing techniques.**
Develop a parser from the grammar specified within a source code.

Guidelines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guidelines for ESE:

- ESE will be based on the practical assignments submitted by the students in the form of journal.
- In the ESE, the students may be asked to perform the practical assignment with minor modification.

Note:

- Concerned faculty should suitably frame at least **06 practical** assignments out of the above list.
- Every assignment should include theoretical concept, algorithm, print out of code with proper comments and output.
- Every student is required to submit the assignments in the form of journal.
- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Java Programming Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Java Programming	**JPL**	

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**14**	**28**	**01**

Group-A

1 **Write a program that demonstrates string operations.**

2 **Write a program that demonstrate package creation and use in program.**

3 **Write a program to demonstrate the abstract class and abstract method.**

4 **Write a Java program that illustrates the concepts of Java class that includes**
  (a) constructor with and without parameters.
  (b) Overloading methods.
  (c) Overriding methods

5 **Write a Java program to demonstrate inheritance by creating suitable classes.**

6 **Create a Java package, interface and implement in Java program.**

7 **Write a program to demonstrate**
  - Use of implementing interfaces.
  - Use of extending interfaces.

Group- B

1 **Write a program to implement the concept of threading.**

2 **Write a program to demonstrate the predefined and User defined exception handling.**

3 **Write a program using Applet**
  - to display a message in the Applet.
  - for configuring Applets by passing parameters.

4 **Write programs for using Graphics class**
  - to display basic shapes and fill them.
  - draw different items using basic shapes
  - set background and foreground colors.

5 **Write a program in Java that demonstrates JDBC**

6 **Write a program that demonstrates JDBC on applet/application**

Guidelines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Reference Books:

1. Herbert Schildt, "Java2:The Complete Reference" , Tata Mc GrawHill, 5th edition.
2. E. Balagurusamy , "Programming with Java A primer", 3rd Edition.
3. Horstman Cay and Cornell Gary, "Core JavaTM2", Vol.1, Pearson education.
4. Kathey Sierra and Bert Bates, "Head First Java", SPD Publication.
5. Steven Holzner, "JAVA 2 Programming Black Book", Wiley India.

Note:

- Concerned faculty should suitably frame at least **08 practical** assignments **(FIVE from PART – A and THREE from PART – B)** out of the above list.
- Every assignment should include algorithm, print out of code with proper comments and output.
- Every student is required to submit the assignments in the form of journal.
- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Industrial Training / EDP / Special Study

COURSE CONTENT

Industrial Training / EDP / Special Study | **IT/EDP/SS** |
Course Title | Short Title | Course Code

Semester-V | **Examination Scheme**
Total Semester Credits: 02 | **Internal Continuous Assessment (ICA): 25 Marks**

Industrial Training

- Student shall undergo industrial training for a minimum period of **two weeks** during summer vacations between fourth semester and fifth semester.
- The industry in which industrial training is taken should be a medium or large scale industry
- The paper bound report on training must be submitted by the student in the beginning of Fifth semester along with a certificate from the company where the student took training.
- Every student should write the report separately.
- Institute / Department/T&P Cell have to assist the students for finding Industries for the training.
- Students must take prior permission from Department before joining for Industrial Training.

OR

EDP (Entrepreneurship Development Program)

- Student has to participate in Entrepreneurship Development Program for a minimum period of **One week** during summer vacations between fourth semester and fifth semester.
- Every student must submit the paper bound report based on the program in the beginning of Fifth semester along with a certificate (Course / Program completion) from the program organizers.
- Every student should write the report separately.
- Institute / Department may arrange Entrepreneurship Development Program at their campus.
- Students must take prior permission from Department before attending any Entrepreneurship Development Program.

OR

Special Study

- Student has to submit name of three topics of his interest to the department.
- Special study in a group shall not be allowed.
- The three-member committee appointed by Head of Department shall allot one topic out of the three topics submitted by the student.
- Every student must submit the paper bound report based on special study at the end of Firth semester.
- Department should allot guide to all such students, for monitoring their progress and guide them for literature survey / report writing etc.
- Evaluation of special study shall be done based on presentation made by student, followed by brief question answer session.

Evaluation of Industrial Training / EDP / Special Study

ICA: The Internal Continuous Assessment shall be based on the active participation of the students in the training / EDP / Special study and based on knowledge / skill acquired by the student. The three-member committee appointed by Head of Department shall assess the reports and award marks based on following:

(a) Report		10 marks.
(b) Presentation		10 marks.
(c) Viva-voce at the time of presentation		05 marks.
	Total:	**25 marks.**

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Third Year Engineering

(Information Technology)

Faculty of Engineering and Technology

COURSE OUTLINE

Semester – VI

W.E.F 2014 – 2015

Operating System

COURSE OUTLINE

Course Title	Short Title	Course Code
Operating System	**OS**	

Course Description:
The objective of this course is to introduce the students to the concepts of Operating Systems functions, types and their working details.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	**14**	**42**	**03**

Prerequisite Course(s): Computer Organization, System Programming.

COURSE CONTENT

Operating System **Semester-VI**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Operating System Overview

(08 Hours, 16 marks)

a. Introduction: Computer system organization, Architecture, Evolution of OS, Need of OS, User view and System view of OS.
b. Types of Operating System: Batch, Timesharing, Multiprogramming, Multitasking, RTOS, Distributed.
c. Operating System Services and Components: Different OS services and OS components, System calls and its types.
d. Operating System Structures: Monolithic, Layered, Kernel, Microkernel, Virtual Machine.
e. Threads: Overview, Benefits, Models (Introduction Only).

2. Process and Process Management

(08 Hours, 16 marks)

a. Process Concept: The process, Process states, Process Control Block, Context Switching, SPOOLING, CPU & I/O burst.
b. Scheduling: Concept, Objectives, Queuing diagram.
c. Types of Schedulers: Long term Scheduler, Middle term Scheduler, Short term Scheduler.

d. Scheduling Algorithm (For Uniprocessor System): FCFS, SJF (preemptive & non preemptive), Priority (preemptive & non preemptive), Round Robin, MLQ with and without feedback.
e. IPC: Concept and Types.
f. Critical Section: Critical section problem, Solution to critical section problem, Mutual exclusion with busy waiting, TSL, Peterson's solution for two processes, Dijkstra's semaphore.
g. Problem in Concurrent Programming: Producer-Consumer problem, Readers–Writers problem, Dinning Philosopher problem, Monitors.

3. Deadlocks

(08 Hours, 16 marks)

a. Deadlock: System Model, Deadlock Characterization, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.
b. Memory Management: Memory Management Requirements.
c. Memory Partitioning: Fixed and Dynamic Partitioning.
d. Memory Allocation: Allocation strategies (First Fit, Best Fit and Worst Fit), Fragmentation, Swapping, Paging and Segmentation.
e. Virtual Memory Management: Background, Demand Paging, Page Replacement (FIFO, LRU, Optimal LRU), Thrashing.

4. Storage Management

(08 Hours, 16 marks)

a. File concept: File Organization, Access Methods and Directory Structure.
b. Allocation of Disk Space: Contiguous allocation, Non-contiguous allocation (chaining and indexing).
c. Disk Scheduling: FCFS, SSTF, SCAN, C-SCAN, LOOK.

5. Secondary Storage Structure, Protection and Security, Introduction to UNIX.

(08 Hours, 16 marks)

a. Disk Management: Disk formatting, Boot block, Bad blocks.
b. Swap Space Management: Swap Space Use, Swap Space.
c. System Protection: Goals of protection, Domain of protection, Threats, Security attacks.
d. Introduction to UNIX: History, System architecture.
e. Internal Representation of File: Inode, Structure of regular file, Super block, Pipes (No Algorithms).
f. Process Control: Process creation, Process States and Transitions, Process system calls (exec, fork).

Text Books:

1. A. Silberschatz, P. B. Galvin, G. Gagne, “Operating Systems Concepts”, 7th/ 8th edition, John Wiley Publications, 2008.
2. William Stalling, “Operating System Internals and Design Principles”, 6th edition, Pearson Publication, 2013.

Reference Books:

1. Maurice J. Bach, “The Design of the Unix Operating System”, 1st edition, PHI.
2. Dhananjay M. Dhamdhere, “Operating Systems-A Concept-Based Approach”, 3rd edition, TMH, 2012.
3. A. S. Tanenbaum, “Modern Operating System”, 2nd edition, Pearson publication”, 2001.
4. H. M. Deitel, P. J. Deitel, D. R. Choffnes, “Operating System”, 3rd edition, Pearson publication, 2013.
5. Rajiv Chopra, “Operating Systems-A Practical Approach”, 1st edition, S. Chand Publication, 2009.
6. Sibsankar Haldar, Alex A. Arvind, “Operating Systems”, 1st edition, Pearson Publication, 2009.

Object Oriented Modeling & Design

Course Title | Short Title Course Code
Object Oriented Modeling and Design | **OOMD**

Course Description:
The objective of this course is to introduce students the knowledge about Modeling and Design of Software firmware and business processes. It introduces UML 2.0 and its diagrams as a modeling tool for large and complex systems. It also gives understanding of the concepts being modeled in UML.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Knowledge of software engineering and object oriented concepts.

COURSE CONTENT

Object Oriented Modeling and Design **Semester-VI**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Introduction of Object Oriented Modeling **(08 Hrs, 16 Marks)**
Introduction:
a. What is object-oriented?
b. What is Object oriented development? : Modeling Concept , Not Implementation , Object- Oriented Methodology , Three Models
c. Object oriented themes

Why We Model:
d. The Importance of Modeling
e. Principles of Modeling
f. Object-Oriented Modeling

4+1 View architecture,
Architectural approaches: Use case driven, Architecture-centric, Iterative and Incremental,
Rational Unified Process:
g. Characteristics of the process

Phases and Iterations:
h. Inception Phase
i. Elaboration Phase
j. Construction Phase
k. Transition Phase
l. Iterations
m. Process Workflows
n. Artifacts
o. Other Artifacts

2. Introduction to UML **(08 Hrs, 16 Marks)**
a. An Overview of the UML: Visualizing, Specifying, Constructing, Documenting
b. Background , UML Basics

c. Introducing UML 2.0

A Conceptual Model of the UML:

d. Building Blocks of the UML
e. Rules of the UML
f. Common Mechanisms in the UML: Specifications, Adornments, Common divisions
g. Extensibility Mechanisms: stereotypes, tagged values, constraints

Object Constraint Language:

h. OCL Basics, OCL Syntax, Advanced OCL Modeling

3. Class Diagram and Composite Structure Diagram (08 Hrs, 16 Marks)

Object Diagram:

a. **Terms and Concepts:**
   Common Properties, Contents, Common Uses
b. **Common Modeling Techniques:** Modeling Object Structures

Class Diagram:

c. Classes, Attributes, Operations, Abstract Classes
d. **Relationships:** Dependency, Association, Aggregation, Composition, Generalization, Association Classes, Association Qualifiers
e. **Advanced Relationships:**
   Stereotypes on Dependency, Stereotypes and Constraints on Generalization, Constraints on Association, Realization
f. Interfaces
g. Templates
h. Class Diagram: Common Properties, Contents, Common Uses
i. Common Modeling Techniques : Modeling Simple Collaborations, Modeling a Logical Database Schema
j. Forward and Reverse Engineering

Composite Structures Diagram:

k. Connectors, Ports, Structured classes and Properties

4. Behavioral Diagrams (08 Hrs, 16 Marks)

a. **Use case Diagram**
   Names, Use Cases and Actors, Use Cases and Flow of Events, Use Cases and Scenarios, Use Cases and Collaborations, Organizing Use Cases, Common Properties, Contents, Common Uses
b. **Sequence Diagram**
c. **Communication Diagram**
d. **Timing Diagram**
e. **State chart Diagram:**
   Behavioral State Machines, States, Composite States, Submachine States, Transitions, Activities, Protocol State Machines ,Pseudo States , Event Processing
f. **Activity Diagram:**
   Common Properties, Contents, Action States and Activity States, Transitions, Branching, Forking and Joining, Swimlanes, Object Flow, Common Uses

5. Package Diagram, Component Diagram, Deployment Diagram (08 Hrs, 16 Marks)

Package Diagram:

a. **Terms and Concepts**
   Names, Owned Elements, Visibility, Importing and Exporting
b. **Common Modeling Techniques:** Modeling Groups of Elements, Modeling Architectural Views

Component:

c. **Terms and Concepts**
   Names, Components and Classes, Components and Interfaces, Kinds of Components

Component Diagram:

d. Common Properties, Contents, Common Uses
e. **Common Modeling Techniques:** Modeling Source Code, Modeling an Executable Release, Modeling a Physical Database, Modeling Adaptable Systems
f. Forward and Reverse Engineering

Deployment:

g. **Terms and Concepts**
   Names, Nodes and Components, Connections

Deployment Diagram:

h. Common Properties, Contents, Common Uses
i. **Common Modeling Techniques:** Modeling an Embedded System, Modeling a Client/Server System, Modeling a Fully Distributed System
j. Forward and Reverse Engineering

Text Books:

1. James Rumbaugh , Michael Blaha , William Premerlani, Frederick Eddy, William Lorensen ,"Object- Oriented Modeling and Design", Pearson Education.
2. Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", Pearson Education.
3. Dan Pilone, Neil Pitman, "UML 2.0 in a Nutshell", SPD ,O'Reilly.

Reference Books:

1. Martin Fowler, "UML Distilled: A Brief Guide to the Standard Object Modeling Language", Third Edition ,Addisioh Wesley.
2. Tom Pender, "UML 2 Bible", Wiley.
3. Meilir Page-Jones, "Fundamentals of Object Oriented Design in UML", Pearson Education.
4. Pascal Roques, "Modeling Software Systems Using UML2", Wiley.
5. Atul Kahate, "Object Oriented Analysis & Design", The McGraw-Hill Companies.
6. Mark Priestley, "Practical Object-Oriented Design with UML", TATA McGraw-Hill.
7. Craig Larman, "Appling UML and Patterns: An introduction to Object–Oriented Analysis and Design and Iterative Development", Pearson Education.
8. Mike O'Docherty, "Object-Oriented Analysis & design understanding system development with UML 2.0", John Wiley and Sons.

Database Management System

COURSE OUTLINE

Course Title	Short Title Course Code
Database Management System	**DBMS**

Course Description:
The objective of this course is to introduce the students to Learn and practice data modeling using the entity-relationship and developing database designs, apply normalization techniques to normalize the database, learn techniques for controlling the consequences of concurrent data access also understand the needs of Object based Database and Database System Architecture.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Knowledge of data structures.

COURSE CONTENT

Database Management System **Semester-VI**

Teaching Scheme

Lecture: 3 hours / week

Examination Scheme

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1) Introduction to DBMS **(08 Hrs, 16 Marks)**

a. Database-System Applications
b. Purpose of Database Systems
c. View of Data: Data Abstraction ,Instances and Schemas, data independence
d. Data Models: Relational Model , Entity-Relationship Model ,Object-Based data model, Semistructured Data Model
e. Database Languages
f. Data Storage and Querying
g. Transaction Management
h. Database Architecture
i. Database Users and Administrators

Database Design and E-R Model

j. Overview of the Design Process
k. The Entity Relationship Model: Entity Sets , Relationship Sets, Attributes, Constraints
l. Entity-Relationship Diagram: Basic Structure , Mapping Cardinality, Roles, Weak Entity sets
m. Extended E-R Features: Specialization, Generalization, Attribute Inheritance, Constraints on Generalizations, Aggregation

2) Structured Query Language **(08 Hrs, 16 Marks)**

a. Introduction to relational Model: structure of relational Databases, Database Schema, Keys, Schema Diagrams
b. Overview of the SQL Query Language
c. SQL Data Definition

d. Basic Structure of SQL Queries
e. Additional Basic Operations
f. Set Operations
g. Null Values
h. Aggregate Functions
i. Nested Subqueries
j. Modification of the Database

Intermediate SQL:

k. Joined Expressions: Join Conditions , Outer Joins
l. Views
m. Integrity Constraints

3) Formal Relational Query Languages (08 Hrs, 16 Marks)

The Relational Algebra:

a. Fundamental Operations:
   The select Operation, The Project Operation, The Union Operation, The Set-Difference Operation, The Cartesian-Product Operation, The Rename Operation, Formal definition of Relational Algebra
b. Additional Algebra Operations:
   The Set-Intersection Operation, The Natural-Join Operation, The Assignment Operation, Outer Join Operations
c. Extended Relational-Algebra Operations:
   Generalized Projection, Aggregation

The Tuple Relational Calculus:

d. Formal Definition
e. Example Queries

The Domain Relational Calculus:

f. Formal Definition
g. Example Queries

Functions and Procedures

Triggers

4) Relational Database Design and Transaction Management (08 Hrs, 16 Marks)

Relational Database Design:

a. Features of Good Relational Designs
b. Atomic Domains and First Normal Form
c. Decomposition Using Functional Dependencies:
   Keys and Functional Dependencies, Boyce-Codd Normal Form, BCNF and Dependency Preservation, Third Normal Form
d. Decomposition Using Multivalued Dependencies: Multivalued Dependencies, Fourth Normal Form

Transaction Management:

e. Transaction Concept
f. A simple Transaction Model
g. Transaction Atomicity and Durability

Concurrency Control:

h. Lock-Based Protocols: Locks, Granting of Locks, The Two Phase Locking protocol
i. Timestamp–Based Protocols: Timestamps , The Timestamps-Ordering Protocol

Recovery System:

j. Failure Classification
k. Storage
l. Recovery and Atomicity: Log records, Database Modification, Concurrency Control and Recovery ,Transaction Commit , Using the Log to Redo and Undo Transactions

5) Object–Based Databases and Database- System Architectures (08 Hrs, 16 Marks)
Object–Based Databases

a. Overview,
b. Complex Data Types
c. Structure Types and Inheritance in SQL
d. Table Inheritance
e. Array and Multiset Types in SQL: Creating and Accessing Collection Values, Querying Collection-Valued Attributes
f. Object–Identity and Reference Types in SQL
g. Persistent Programming Languages: Persistence of Objects, Object Identity and Pointers

Database-System Architectures

h. Centralized and Client–Server Architectures
i. Server System Architectures
j. Parallel Systems
k. Distributed Systems

Text Book:

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, “Database System Concepts”, 6th Edition, McGraw-Hill.

Reference Books:

1. R. Ramkrishnan , J. Gehrke, "Database Management Systems", 3rd Edition, McGraw-Hill.
2. C. J. Date, “Introduction to Database Management Systems”, 8th Edition, Pearson.
3. V.K.Jain, “ Database Management System”, Dreamtech Press (Wiley India).
4. Atul Kahate, “Introduction to Database Management System”, 3rd Edition, Pearson.
5. G. K. Gupta, “Database Management Systems”, McGraw–Hill.
6. S. K. Singh, “Database Systems Concepts, Design and Applications”, Pearson.
7. Bipin Desai, “Introduction to database management systems”, Galgotia.

E-Commerce

COURSE OUTLINE

Course Title	Short Title	Course Code
E- Commerce	**E-Com**	

Course Description:

The aim of this course is to equip students with the range of technical and business skills needed to study and understand e-commerce concepts and practices in a business environment. The student gains an overview of all aspects of E-Commerce. The course provides different types of e-commerce, concepts of C2C, P2P, M-Commerce business models. Major security threats in the e-commerce environment along with technology solutions are discussed. Later part of course is devoted to e-commerce payment, marketing communications, ethical issues in e-commerce and online content.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	15	45	03

Prerequisite Course(s): Principles of Management

COURSE CONTENT

E-commerce **Semester-IV**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week
End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. **Introduction to E-Commerce and Business Models**
(08 Hours, 16 marks)
   I. Introduction to E-Commerce
      a. What is E-Commerce
      b. The difference between E-commerce and E-business
      c. Why study E-Commerce?
      d. Eight unique features of E-Commerce technology
      e. Types of E-commerce
   II. E-commerce Business Models
      a. Introduction
      b. Eight Key Elements of a Business Model
      c. Business Models in Emerging E-commerce Areas
2. **Security Issues and Technology Solutions**
(08 Hours, 16 marks)

I. **Major Security Threats in the E-Commerce Environment**
   a. Malicious Code
   b. Unwanted Programs
   c. Phishing and Identity Theft
   d. Hacking and Cybervandalism
   e. Credit Card Fraud/Theft
   f. Spoofing (Pharming) and Spam (Junk) Web Sites
   g. Denial of Service (DoS) and Distributed Denial of Service (DDoS) Attacks
   h. Sniffing
   i. Insider Attacks
   j. Poorly Designed Server and Client Software

II. **Technology Solution**
   a. Protecting Internet Communications
   b. Securing Channels of Communication
   c. Protecting Servers and Clients

3. Management Policies And E-Commerce Payment Systems

(08 Hours, 16 marks)

I. **Management Policies, Business Procedures, and Public Laws**
   a. A Security Plan: Management Policies
   b. The Role of Laws and Public Policy

II. **E-Commerce Payment Systems**
   a. Online Credit Card Transactions
   b. Digital Wallets
   c. Digital Cash
   d. Online Stored Value Systems
   e. Digital Accumulating Balance Payment Systems
   f. Digital Checking Payment Systems
   g. Wireless Payment Systems

4. Communication and Online Marketing

(08 Hours, 16 marks)

I. **Marketing Communications**
   a. Online Advertising
   b. E-mail Marketing and the Spam Explosion
   c. Online Catalogs
   d. Social Marketing: Blogs, Social Networks and Games
   e. Targeted Marketing: Getting Personal
   f. Mixing Offline and Online Marketing Communications

II. **Understanding the Costs and Benefits of Online Marketing Communications**
   a. Online Marketing Metrics: Lexicon
   b. How Well Does Online Advertising Work?
   c. The Costs of Online Advertising

d. Software for Measuring Online Marketing Results

5. Ethical Issues and Online Content

(08 Hours, 16 marks)

I. Understanding Ethical Issues in E-commerce

a. A Model for Organizing the Issues
b. Basic Ethical Concepts: Responsibility, Accountability, and Liability
c. Analyzing Ethical Dilemmas
d. Candidate Ethical Principles

II. Online Content

a. Content Audience and Market: Where Are the Eyeballs and the Money?
b. Media Industry Structure
c. Media Convergence: Technology, Content, and Industry Structure
d. Online Content Revenue Models and Business Processes
e. Key Challenges Facing Content Producers and Owners

Text Book:

1. Kenneth C. Laudon, Carol Guercio Traver, "E-Commerce - Business, Technology, Society 2008", Fourth Edition, Pearson Education.

Reference Books:

7. Harvey M. Deitel, Paul J. Deitel, Kate Steinbuhler, "E-Business and E-Commerce for Managers", Prentice Hall.
8. Greenstein, Feinnon, " Electronic Commerce", Tata McGraw Hill Edition.
9. Ravi Kalakota, et al, "Electronic Commerce – A Manager's Guide", Addison Wesley Longman.

Management Information System

COURSE OUTLINE

Course Title	Short Title	Course Code
Management Information System	**MIS**	

Course Description:

This course provides an introduction to information systems for business and management. It is designed to familiarize students with organizational and managerial foundations of systems, the technical foundation for understanding information systems, the role of information systems in enhancing business processes and management decision making across the enterprise, and the process of building and managing systems in organizations. The course will focus on topics such as Management of the Digital Firm, Internet and Internet technology, the Electronic Business and Electronic Commerce, the Information Technology (IT) Infrastructure, the Ethical and Security Issues related to Information Systems, and the Enterprise Applications. The course will provide students with information systems knowledge that is essential for creating successful and competitive firms.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Principles of Management.

COURSE CONTENT

Management Information Systems **Semester-VI**

Teaching Scheme
Lecture: 3 hours / week

Examination Scheme
End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Information Systems

(08 Hours, 16 marks)

i. Introduction

a) Data Vs Information
b) Functions of Management
c) Managerial Roles
d) Levels of Management
e) Classification of Information System
f) Framework for Information System

ii. Systems

a) System concepts
b) System and their Environments
c) How system works
d) System approach for problem solving

2. E Business Enterprise:

(08 Hours, 16 marks)

i. **E Business Technology**

a) Introduction to E Business
b) Models of E Business
c) Internet and WWW
d) Security in E Business
e) Electronic Payment System
f) Web Enabled Business Management
g) Enterprise Portal
h) MIS in Web Environment

ii. **Organization of Business in Digital Firm**

a) E Business
b) E Commerce
c) E Communication
d) E Collaboration
e) Real Time Enterprise

3. Applications To Functional Business Areas

(08 Hours, 16 marks)

i. **Operational Information System**

a) Accounting / Finance
b) Marketing
c) Production
d) Human Resource

ii. **Tactical Information System**

a) Accounting / Finance
b) Marketing
c) Production
d) Human Resource

iii. **Strategic Information System**

a) Accounting / finance
b) Marketing
c) Production
d) Human Resource

4. DSS, EMS And ES:

(08 Hours, 16 marks)

i. **Decision Support System**

a) Characteristics of Decision Making Process
b) Features of DSS
c) Development of DSS
d) Benefits and Risks of DSS
e) GDSS

ii. **Enterprise Management System**

a) ERP System
b) ERP Model and Modules
c) Benefits of ERP
d) Supply Chain Management
e) Customer Relationship Management

iii. **Expert Systems**

a) Characteristics
b) How an Expert System Works
c) Advantages
d) Expert System and DSS
e) Expert Systems and AI.

5. **Information Security and Information Technology**

(08 Hours, 16 marks)

i. **Information Security Challenges in E Enterprise**

a) Risks
b) Common Threats
c) Common Controls
d) Protection of information system

ii. **IT: Impact on Society**

a) Impact of IT on Privacy
b) Ethics
c) Technical Solution for Privacy Protection
d) Intellectual Property
e) Copyright and Patents
f) Impact of IT on the Workplace
g) Impact of quality on Life

Text Books:

1. Robert Schultheis and Mary Sumner, "Management Information Systems The Managers View", 4th Edition Tata McGraw Hill
2. Waman S. Jawadekar, "Management Information Systems", 4th Edition Tata McGraw Hill.

Reference Books:

1. Sahil Raj "Managament Information Systems" PearsonEducation
2. Kenneth C Laudon and Jane Laudon, "Management Information System", Pearson Education
3. James A. O'Brien, "Management Information Systems", Tata McGraw Hill
4. S. Sadagopan, "Management Information System", PHI.

Operating System Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Operating System	**OS**	

Course Description:

This laboratory provides students with a comprehensive study of the operating system functions, its working details and implementation of various algorithms used in the operating systems.

Laboratory	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	02	14	28	03

Total Semester Credits: 03

Prerequisite Course(s): C Programming, Basic Knowledge of Linux Operating System.

LAB COURSE CONTENT

Outline of Content:

(Note: Minimum FOUR Experiments each from group A and B)

Group A

1. **Study of Commercial and Open Source Operating Systems (01 each) and Design structure of these of Operating Systems.**
   a. Study the basic structures.
   b. Study the File systems.
   c. Study the Security aspects of Operating Systems.
   d. e. g. Windows OS, Linux OS.
2. **Write a program to implement Command Interpreter using system calls.**
   Implementation of Command Interpreter using various system calls showing working of Command Line Interpreter.
3. **Write a program to implement concept of Threading.**
   Demonstrate the concept of Threading in process. (Without using System Call / Kernel Functions).
4. **Write a program to implement CPU Scheduling algorithms**
   Demonstrate the working of CPU Scheduling algorithms (any two).
   a. FCFS
   b. SJF(Preemptive & non-preemptive)
   c. Round Robin
   d. Priority(Preemptive & non-preemptive)

5. **Write a program to implement algorithmic solution for Critical Section Problem**
   Demonstrate solution to overcome the critical section problem.

Group B

1. **Write a program to implement Memory Management algorithms – best fit, first fit, worst fit**
   Demonstrate the working of Memory Management algorithms (any two).
   a. First Fit
   b. Best Fit
   c. Worst Fit
2. **Write a program to implement Page Replacement algorithms**
   Demonstrate the working of Page Replacement algorithms (any two).
   a. FIFO(First In First Out)
   b. LRU(Least Recently Used)
   c. Optimal
3. **Write a program to implement Inter process communication**
   Demonstrate the working of Inter Process Communication (any one).
   a. Full Duplex pipes
   b. Half Duplex pipes
4. **Write a program for Banker's algorithm**
   Demonstrate the working of Banker's algorithm.
5. **Write a program to demonstrate disk scheduling algorithms**
   Demonstrate the working of the Disk Scheduling algorithms (any two).
   a. FCFS
   b. SSTF
   c. SCAN
   d. C-SCAN

Guidelines for ICA:
Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guide lines for ESE:-

- ESE will be based on the practical assignments submitted by the students in the form of journal.
- In the ESE, the students may be asked to perform the practical assignment with minor modification.
- Evaluation will be based on the paper work of algorithm, understanding of the logic and the syntax, quality of the program, execution of the program, type of input and output for the program.

Reference Books:

1. A. Silberschatz, P. B. Galvin, G. Gagne, "Operating Systems Concepts", 7th / 8th edition, John Wiley Publications, 2008.

2. William Stalling, “Operating System Internals and Design Principles”, 6th edition, Pearson Publication, 2013.
3. Maurice J. Bach, “The Design of the Unix Operating System”, 1st edition, PHI.
4. Dhananjay M. Dhamdhere, “Operating Systems-A Concept-Based Approach”, 3rd edition, TMH, 2012.
5. A. S. Tanenbaum, “Modern Operating System”, 2nd edition Pearson publication, 2001.
6. H. M. Deitel, P. J. Deitel, D. R. Choffnes, “Operating System” 3rd edition, Pearson publication, 2013.
7. Rajiv Chopra, “Operating Systems-A Practical Approach”, 1st edition, S. Chand Publication, 2009.
8. Sibsankar Haldar, Alex A. Arvind, “Operating Systems”, 1st edition, Pearson Publication, 2009.

Note:-

- Use of Open Source Tool /Technology is recommended for laboratory assignments of concern subject.

Object Oriented Modeling & Design Lab

LAB COURSE OUTLINE

Course Title	Short Title Course Code
Object Oriented Modeling and Design	**OOMD**

Course Description:
The objective of this course is to introduce the students to learn how to understand the requirements of a system, its analysis, its scope, good design and good modeling practices and to document them. Students are being able to discuss the pros and cons of system design and issues in modeling large and complex systems. It explores UML 2.0 Basic and advanced concepts and notation for the same & diagrams for modeling different aspects of a system throughout the SDLC lifecycle.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	02	14	28	01

Total Semester Credits: 01
Prerequisite Course(s): Knowledge of software engineering.

LAB COURSE CONTENT
Outline of Content:
(Note: Minimum Six Experiments out of eight)

To meet above objectives teachers will help students choose a following system for modeling. The students will try and identify scope of such a system as realistically as possible. Students will learn to draw, discuss different UML 2.0 diagrams, concepts, notation, advanced notation, forward and reverse engineering aspects. As far as possible draw as many diagrams for one single system, unless they are not applicable for the chosen system in which case other systems may be chosen for specific diagrams.

1. Design ATM system using Structural and Behavioral UML diagram.
2. Design Coffee vending machine using Structural and Behavioral UML diagram.
3. Design College Admission Process using Structural and Behavioral UML diagram.
4. Design Library Management system using Structural and Behavioral UML diagram.
5. Design Hospital Management system using Structural and Behavioral UML diagram.
6. Design Railway Reservation system using Structural and Behavioral UML diagram.
7. Design Online Shopping system using Structural and Behavioral UML diagram.
8. Design Hotel Management system using Structural and Behavioral UML diagram.

Guidelines for ICA:
Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guide lines for ESE:-

- ESE will be based on the practical assignments submitted by the students in the form of journal.

Reference Books:

1. Pascal Roques, “Modeling Software Systems Using UML 2”, Wiley.
2. Russ Miles and Kim Hamilton, “Learning UML 2.0, SPD”, O’Reilly.
3. Craig Larman, “Applying UML and patterns: An introduction to Object-Oriented Analysis and Design and Iterative Development”, Pearson Education.
4. Mike O’Docherty “Object-Oriented Analysis & design understanding system development with UML 2.0”, John Wiley and Sons.
5. Jim Arlow, Ila Neustadt, “UML 2 and the Unified Process: Practical Object-Oriented Analysis and Design”, 2nd Edition, Addison-Wesley Professional.
6. Mark Priestley, “Practical Object-Oriented Design with UML”, TATA McGraw-Hill.

Note:-

- Use of Open Source Tool / Technology is recommended for laboratory assignments of concern subject.

Database Management System Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Database Management System	**DBMS**	

Course Description:

The objective of this course is to introduce the students to learn and practice Structure Query Language for creation, Manipulation, controlling database, apply normalization techniques to normalize the database also learn different types of Join, view, PL/SQL, Trigger, Stored Procedure, Stored function and enable them to apply these concepts for solving real world problems.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	02	**14**	**28**	**01**

Total Semester Credits: 01

Prerequisite Course(s): knowledge of Data Structures

LAB COURSE CONTENT

Outline of Content:

(Note: Group A is Mandatory and Minimum Three experiments from Group B.)

GROUP A

1. Creating a sample database using any client server RDBMS (Oracle/ Open Source Database) package using SQL DDL queries. This will include constraints (Primary key, Foreign key, Unique, Not Null, and Check) to be used while creating tables.
2. SQL DML queries: Use of SQL DML queries to retrieve, insert, delete and update the database created in experiment No. 1.
3. SQL Queries: The queries should involve SQL feature such as aggregate functions, group by, having, order by the database created in experiment No. 1.
4. SQL Queries: The queries should involve Set Operations and Set Comparisons the database created in experiment No. 1.
5. Screen design and Report generation: Sample forms and reports should be generated using any front end tools.

GROUP B

1. Write a program to demonstrate different types of JOIN.
2. Write a program to demonstrate use of Trigger.
3. Write a program to demonstrate view.
4. Write a program to demonstrate PL/SQL block.
5. Write a program to demonstrate stored function.
6. Write a program to demonstrate stored procedure.

Guidelines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guide lines for ESE:-

- ESE will be based on the practical assignments submitted by the students in the form of journal.
- In the ESE, the students may be asked to perform the practical assignment with minor modification.
- Evaluation will be based on the paper work understanding of the logic and the syntax, quality of the program, execution of the program, type of input and output for the program.

Reference Books:

1. Rick F. Van der Lans, "Introduction to SQL", Pearson education.
2. B. Rosenzweig, E. Silvestrova, "Oracle PL/SQL by Example", Pearson education.
3. Steven Feuerstein, "Oracle PL/SQL Programming", SPD, O'Reilly.
4. Dr. P. S. Deshpande, "SQL& PL/SQL for Oracle 10g Black Book", Dreamtech Press
5. M. McLaughlin, "Oracle Database 11g PL/SQL Programming", TMH.
6. J. J. Patrick, "SQL Fundamentals", Pearson Education.

Note:-

- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Web Programming Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Web Programming	**WPL**

LAB COURSE CONTENT

Teacher should facilitate learning following lab experiments:

(Part A)

1. **Develop a complete web page using HTML basic tags, CSS, Table and Layout**
   - A simple web page that includes basic tags such as head, body, text formatting tags, lists, paragraph, image tags, css, table and layout etc.
2. **Design a page web using JavaScript to demonstrate, if statement, if...else statement and Switch statement**
   - A simple web page that include JavaScript statements such as if, if...else and switch.
3. **Design a page web using JavaScript to demonstrate, Alert box Alert box with line breaks, Confirm box and Prompt box**
   - A simple web page that include JavaScript alert box, alert box with line breaks, confirm box and prompt box.
4. **Design a page web using JavaScript to demonstrate, Call a function ,Function with an argument, Function that returns a value**
   - A simple web page that include JavaScript call a function, function with arguments, function that return a value.
5. **Design a page web using JavaScript to demonstrate, For loop, While loop, Do While loop, Break a loop, Break and continue a loop**
   - A simple web page that include JavaScript for loop, while loop , do while loop, break a loop, break and continue a loop.
6. **Design a page web using JavaScript to demonstrate, Acting to the onclick event, Acting to the onmouseover event, onblur , onchange, ondblclick, onkeydown, onkeypress, onkeyup, onresize, onunload**
   - A simple web page that include JavaScript events like onclick, onmouseover, onblur, onchange, ondblclick, onkeydown, onkeypress, onkeyup, onresize, onunload etc.
7. **Design a page web using JavaScript to demonstrate, Sort an array (alphabetically and ascending), Sort numbers (numerically and ascending), Sort numbers (numerically and descending)**
   - A simple web page that include JavaScript to sort an array alphabetically and ascending, sort numbers numerically and ascending and sort numbers numerically and descending.
8. **Design a page web using PHP to demonstrate, variables, echo/print, data types, string functions and operators**
   - A simple web page that include PHP variables, echo/print, data types, string functions and operators.
9. **Design a page web using PHP to demonstrate, if-else-elseif, switch, for loop, while loop, functions and arrays**
   - A simple web page that include PHP if-else-elseif, switch, for loop, while loop, functions and arrays.
10. **Design a page web using PHP to demonstrate, form handling, form validation and form URL/E-mail**
    - A simple web page that include PHP form handling, form validation and form URL/E-mail**.**

(Part B)

1 **Web server installation and configuration**
  - Installation and configuration of any web server like IIS, Apache, WAMP, XAMP etc.

2 **Design a page web using PHP to demonstrate, date, file, file upload, cookies and sessions**
  - A simple web page that include PHP date, file, file upload, cookies and sessions.

3 **Design a page web using PHP to demonstrate, MySQL connect, create DB/Table, insert into, select, where, order by, update and delete**
  - A simple web page that include PHP MySQL connect, create DB/Table, insert into, select, where, order by, update and delete.

4 **Design a Website with the help of HTML and JavaScript with not less than 15 full size pages for a selected topic (Commercial, Institute, Portal or decided jointly by the student and teacher)**
  - Design a website on the above listed topics with the help of HTML and JavaScript.

5 **Design a Website with the help of HTML and PHP for a selected topic (Banking, Commercial, Institute, Portal or decided jointly by the student and teacher)**
  - Design a website on the above listed topics with the help of HTML and PHP.

Guidelines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Reference Books:

1. "Web Technologies HTML, JavaScript, PHP, Java, JSP, XML and AJAX", Black Book, Kogent Learning Solutions Inc., dreamtech press, 2014.
2. Chris Bates, "Web Programming: Building Internet Applications", Third Edition, Wiley India, 2012.
3. Jon Duckett, "Beginning HTML, XHTML, CSS, and JavaScript", John Wiley & Sons publication, 2010.
4. Thomas A. Powell, "HTML & CSS: The Complete reference", Fifth edition, TMH 2010.

Note:

- Concerned faculty should conduct at least 07 practical assignments from part A and 03 from part B out of the above list.
- Every assignment should include print out of program with proper comments and output.
- Every student is required to submit the assignments in the form of journal.
- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Minor Project
COURSE CONTENT

Minor Project **MIP**

Course Title Short Title Course Code

Semester-VI

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	02	**10**	**20**	**02**

Examination Scheme

Internal Continuous Assessment (ICA): 50 Marks

- Every student shall undertake the Minor Project in semester VI.
- Each student shall work on an approved project, a group of **05 students (maximum)** shall be allotted for the each minor project.
- Minor project may involve design or investigation of a technical problem that may take design, experimental or analytical character or combine element of these areas. The project work shall involve sufficient work so that students get acquainted with different aspects of design or analysis.
- Each student is required to maintain separate log book for documenting various activities of minor project.
- The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of minor project. Maximum four minor project groups shall be assigned to one teaching staff.
- Assessment of the project for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given in **Table-A.**
- Before the end of semester, student shall deliver a seminar and submit the seminar report (paper bound copy)in following format:
    - Size of report shall be of minimum 25 pages.
    - Student should preferably refer minimum five reference books / magazines/standard research papers.
    - Format of report
        - Introduction.
        - Literature survey.
        - Theory (Implementation, Methodology, Applications, Advantages, Disadvantages. etc)
        - Future scope.
        - Conclusion.

Assessment of Minor Project

Name of the Project: ________________________________

Name of the Guide: ________________________________

Table-A

SN	Exam Seat No	Name of Student	Project Selection	Documentation	Design /Simulation/Logic	PCB/hardware/programming	Result Verification	Presentation	Total
			5	10	10	10	10	5	50

Seminar-I
COURSE CONTENT

Seminar-I	**S-I**	
Course Title	Short Title	Course Code

Semester-VI

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**10**	**20**	**02**

Examination Scheme
Internal Continuous Assessment (ICA): 25 Marks

1. For Seminar-I every student will individually study a topic assigned to him / her and submit a report and shall deliver a short lecture / Seminar on the topic during the term.
2. The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of Seminar-I. Seminar shall be related state of the art topic of his choice approved by the committee.
3. Seminar topic should not be repeated and registration of the same shall be done on first come first serve basis.
4. Topic of Seminar shall be registered within a two week from commencement of VI Semester and shall be approved by the committee.
5. Maximum six seminar supervision shall be allotted to each teacher.
6. Before the end of semester, student shall deliver a seminar and submit the seminar report (paper bound copy).

7. **ASSESSMENT OF SEMINAR-I**

Assessment of the Seminar-I for award of ICA marks shall be done by the guide and a departmental committee jointly, as per the guidelines given in **Table- B**

Title of Seminar: ______________________________
Name of Guide: ______________________________

Table-B

SN	Exam Seat No	Name of Student	Topic Selection	Literature survey	Report writing	Depth of understanding	Presentation	Total
			5	5	5	5	5	25

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Third Year Engineering

(Mechanical Engineering) Faculty of

Engineering and Technology

Course Outline

Semester- V &VI

TE Semester - V

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
		Theory		PR	Total						
		TH Hr/W	Tut Hr/W	PR Hr/W	Total	ISE	ESE	ICA	ESE	Total	
Heat Transfer	D	3	---	---	3	20	80	---	---	100	3
Internal Combustion Engine	D	3	---	---	3	20	80	---	---	100	3
Machine Design - I	D	3	---	---	3	20	80	---	---	100	3
Theory of Machine - II	D	3	---	---	3	20	80	---	---	100	3
Industrial Safety and Engineering	C	3	---	---	3	20	80	---	---	100	3
Heat Transfer Lab.	D	---	---	2	2	---	---	25	25	50	1
Internal Combustion Engine Lab.	D	---	---	2	2	---	---	25	---	25	1
Machine Design - I Lab.	D	---	---	2	2	---	---	25	25	50	1
Theory of Machine - II Lab.	D	---	---	2	2	---	---	25	25	50	1
Computer Graphics Lab.	B	1	---	2	3	---	---	50	---	50	2
Ind Training /EDP/ Special Study	D	---	---	---	---	---	---	25	---	25	2
Total	16	---	10	26	100	400	175	75	750	23	

TE Semester - VI

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
		Theory		PR	Total						
		TH Hr/W	Tut Hr/W	PR Hr/W	Total	ISE	ESE	ICA	ESE	Total	
Machine Design - II	D	3	--	---	3	20	80	---	---	100	3
Numerical Analysis and Computational Methods	D	3	---	---	3	20	80	---	---	100	3
Metrology and Quality Control	D	3	---	---	3	20	80	---	---	100	3
Turbomachinery	D	3	---	---	3	20	80	---	---	100	3
Project and Business Management	C	3	---	---	3	20	80	---	---	100	3
Machine Design – II Lab.	D	---	---	2	2	---	---	25	25	50	1
Turbomachinery Lab.	D	---	---	2	2	---	---	25	25	50	1
Metrology and Quality Control Lab.	D	---	---	2	2	---	---	25	25	50	1
Programing in C++ Lab.	B	---	---	2	2	---	---	25	---	25	1
Minor Project	D	---	---	2	2	---	---	50	---	50	2
Seminar-I	D	---	---	2	2	---	---	25	---	25	2
Total	15	---	12	27	100	400	175	75	750	23	

ISE: Internal Sessional Examination **ESE:** End Semester Examination **ICA:** Internal Continuous Assessment

Note : Out of 3 practical ESE heads, at least 1 head should be practical.

Course Outline

Heat Transfer **HT**

Course Title: Short Title Course Code

Branch - Mechanical / Automobile Engineering **Year – Third Year**

Course Description: This course introduces undergraduate students to Heat Transfer. The background required includes a sound knowledge of Mathematics (Calculus), Engineering Thermodynamics, Applied Thermodynamics and Fluid Mechanics of second year Level. The course aims at imparting knowledge of Heat Transfer and modes of Heat Transfer.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	**3**	14	40	3
Practical	**2**	14	28	1

Examination scheme:

End semester exam (ESE) 80 Marks Duration: 03 hours

Internal Sessional exam (ISE) 20 Marks

Purpose of Course: Degree Requirement

Prerequisite Course(s): Mathematics (Calculus) at first year level and Engineering Thermodynamics, Applied Thermodynamics and Fluid Mechanics at Second Year Level.

Outline of Content: This course contains:

UNIT-I

1.	**Heat Conduction**	**No. of Lectures - 8 Marks : 16**
	a	Concepts and Mechanism of heat flow: Steady and unsteady state heat transfer, Modes of heat transfer, their physical mechanism.
	b	Laws of heat transfer, thermal conductivity, heat transfer coefficient, radiation heat transfer coefficient.
	c	Isotropic and an-isotropic materials, Insulation materials, Thermal resistance and thermal conductance.
	d	Generalized one dimensional heat conduction equation and reduction to Fourier, Poisson and Laplace equations, Boundary conditions, Steady state heat conduction without heat generation in plane wall, cylinder and sphere, Thermal contact resistance, critical thickness of insulation on cylindrical bodies.

UNIT-II

2.	**Heat Transfer in Extended Surfaces**	**No. of Lectures - 8 Marks : 16**
	a	Steady state heat conduction with heat generation in plane and composite wall, hollow cylinder, hollow sphere.
	b	Extended Surface: Types of fins, governing equation for pin fin for infinite long fin and fin with negligible heat loss, Fin performance, fin efficiency, fin effectiveness, overall fin effectiveness, approximate solution of fins.
	c	Error in temperature measurement by thermometer.

UNIT-III

3.	**Convection Heat Transfer**	**No. of Lectures - 8 Marks : 16**
	a	Principle of heat convection: mechanism, natural and forced convection.
	b	Non Dimensional Numbers, Dimensional analysis for Natural and Forced Convection.
	c	convection boundary layers: laminar, turbulent, momentum and energy equation, Laminar flow over bodies, turbulent flow inside circular and non-circular ducts, Reynolds Colburn analogy for flow over flat plate and flow inside

		tube, coefficient of friction and friction factor
	d	Heat transfer in fully developed flow, Natural convection over vertical planes, use of empirical correlation for convection, Principle of condensation and boiling (No numerical treatment).

UNIT-IV

4.	**Radiation Heat Transfer** **No. of Lectures - 8 Marks : 16**	
	a	Thermal radiation: Concept, Black body radiation, Spectral and total emissive power, Stefan Boltzmann law, Radiation laws.
	b	Irradiation and radiosity, Surface absorption, reflection and transmission, emissivity.
	c	Radiation view factor, Properties of view factor, (*No numerical treatment on view factor*), radiation heat exchange between two diffuse gray surface, radiation shield.

UNIT-V

5.	**Heat Exchangers** **No. of Lectures - 8 Marks : 16**	
	a	Classification of heat exchangers, temperature distribution in parallel, counter flow arrangement, condenser and evaporator, Overall heat transfer coefficient, fouling factor.
	b	Log-mean temperature difference method and NTU –effectiveness method of analysis for rating and sizing of heat exchangers.
	c	Requirement of good heat exchanger and heat exchanger and design and selection, practical applications, heat pipe.

- **Note-** Use of Heat transfer data book is allowed in the examination.
- **Note for paper setter:**

Paper setter should provide the required data for numerical problems in question paper itself.

Experiment must be set simultaneously and the no. of student in each group working on a setup should not exceed 05 (five) student.

References

1. J.P.Holman 1992 “Heat Transfer”Mc Graw Hill VII Edition.
2. P.Kothandaraman”Fundamentals of Heat and Mass Transfer”.
3. R.K.Rajput”Heat and Mass Transfer”, S.Chand & Company Ltd., New Delhi.
4. D.S.Kumar “Heat and Mass Transfer” D.S.Kumar S.K.Kataria & Sons, Delhi.
5. P.K.Nag “Heat Transfer” Tata McGraw Hill Publishing Company Ltd., New Delhi.
6. Sachdeva R.C., “Fundamentals of Heat and Mass Transfer” Wiley Eastern Limited, Third Edition.
7. Sukhatme S.P, “A Text Book on Heat Transfer” (1989), IIIrd Edition, Orient Longmans Ltd., New Delhi.
8. Arora S.C. & Domkundwar S., “A Course in Heat and Mass Transfer” (1994), Dhanpat Rai & Sons, IVth Edition.
9. Chapman A.J., “Heat Transfer” (1989), IVth Edition.
10. Yunus A. Cengel, “Heat Transfer –A Practical Approach” (Tata McGraw Hill)
11. M. M. Rathore “Engineering Heat and Mass Transfer”, 2nd Edition, Laxmi Publications, New Delhi.
12. M. Thirumalseshwar,”Fundamentals of Heat and Mass Transfer” Pearson Education.
13. R. Rudramoorthy, K. Mayilsomy, “Heat Transfer”, Pearson Education.

Lab - Course Outline

Heat Transfer	**HT LAB**	
Course Title:	Short Title	Course Code

Branch - Mechanical / Automobile Engineering **Year – Third Year**

Course Description:

This lab includes different practical of Heat Transfer. The course aims at imparting knowledge of Heat Transfer and its modes.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**2**	14	28	1

Evaluation scheme:

Internal Continuous Assessment (ICA)	25 Marks	50 Marks
End Semester exam (ESE) (Practical)	25 Marks	

Prerequisite Course(s): Mathematics (Calculus) at first year level and Engineering Thermodynamics, Applied Thermodynamics and Fluid Mechanics at Second Year Level.

Outline of Content: This course contains:

1. Determination of thermal conductivity of metal rod.
2. Determination of thermal conductivity of insulating powder.
3. Determination of thermal conductivity of composite wall.
4. Determination of heat transfer coefficient in natural convection.
5. Determination of heat transfer coefficient in forced convection.
6. Determination of temperature distribution, fin efficiency in natural and forced convection.
7. Determination of emissivity of a test surface.

8. Determination of Stefan Boltzmann constant.
9. Study of pool boiling phenomenon and determination of critical heat flux.
10. Determination of LMTD, overall heat transfer coefficient and effectiveness of heat exchanger in parallel and counter flow arrangement.
11. Determination of heat transfer from a heat pipe.
12. Calibration of thermocouple.

Note: Lab file should contain at list EIGHT experiments from above mentioned list.

ESE (Practical Examination)

The Practical Examination will comprise of performing the experiment and viva on the Practical's.

Instructions for practical Exam. :-

1. Five experiments should be selected for Practical Examination.
2. The Number of Students for each Practical set up should not be more than 5 Students.
3. Oral will be based on the Practical Performed in the examination and the experiments included in the Journal.

Internal Combustion Engine (Theory)

Internal Combustion Engine	**ICE**	
Course Title	Short Title	Course Code

Branch- Mechanical Engineering **Year- Third Year**

Course Description:
This course provides the knowledge of Internal Combustion Engine. Course includes different engine cycles its performance analysis, Various systems in IC Engine such as fuel feed, lubrication, cooling, ignition, supercharging and turbo charging. Fundamental of combustion in I C Engine, types and design of combustion chambers. Various emission control norms.

Teaching Scheme:

Lecture hours per Week	No. of Weeks	Total hours	Semester Credits
03	14	40	03

Examination Scheme:

End semester exam (ESE)	80 Marks	Duration: 03 Hours
Internal Sessional Exam (ISE)	20 Marks	

Prerequisite Course(s): Mathematics (calculus), Basic thermodynamics cycles, various ideal gas processes, Engineering Thermodynamics, Applied Thermodynamics.

Objectives:

1. Analysis of air standard cycles in the regard of I C Engine.
2. Understanding of induction system along with fuel feed system.
3. To impart insight in various operating systems like cooling, lubrication, Ignition system.
4. To be familiar with combustion chamber design and pollution control norms.
5. Performance analysis of I C Engine.

Unit. I

1	**BASIC CONCEPTS AND ENGINE CYCLES No. of Lect.-8, Marks-16**
	a)Introduction: Classification, engine components and their functions, Terminology, Work (indicated and brake), mean effective pressure, torque and power (brake and indicated), mechanical efficiency, thermal and volumetric efficiencies of engine, air fuel ratio, specific fuel consumption. **b) Air Standard Cycles**: Assumptions, Otto, Diesel, Dual Combustion cycle, derivation of their efficiency equation, work done and mean effective pressure. Comparison on the basis of heat input, compression ratio, Maximum pressure and temperature, Actual cycle, deviation from theoretical cycles. Pumping losses, time losses.

Unit. II

2	**FUEL FEEDING SYSTEMS No. of Lect.-8, Marks-16**
	a) Charge, intake valve and manifold, valve timing diagram, valve overlap, choked flow. **Carburetion**: Requirement, types of carburetors according to fluid flow, simple carburetor, Air fuel ratio calculation, effect of altitude, disadvantages of simple carburetor, compensating devices for starting, economy range, acceleration, compensating jet etc. additional systems in modern carburetors, Solex carburetor. Disadvantages of carburetion and gasoline injection, MPFI. **b) Fuel feeding systems in CI engines**: Requirement, classification, fuel feed pump, jerk type injection fuel pump, distributor type pump, injection pump governor, fuel injector and nozzles.

Unit. III

3	**OPERATING SYSTEM No. of Lect.-8, Marks-16**
	a) Cooling systems: requirement, types of cooling systems, thermostat and additives. **b) Lubrication**: Mechanism of lubrication, different methods, important properties of lubricating oils. **c) Ignition Systems**: requirement, battery ignition, magneto ignition, electronic ignition system, Ignition timing, spark timing advance. **d) Starting methods of engines**: Types of superchargers, Super charging, effect of

	super charging, limitations and advantages of supercharging, and turbo charging of engines.

Unit. IV

4	**COMBUSTION IN SI AND CI ENGINES** **No. of Lect.-8, Marks-16**
	a) Homogeneous and heterogeneous mixtures, **Combustion in SI engines**: Stages in combustion, Ignition lag, velocity of flame propagation, factors influencing flame speed, rate of pressure rise, Detonation, factors affecting the detonation, pre-ignition. Rating of SI engines fuels, Dopes, combustion chamber of SI engines. **b) Combustion in CI engine**; stages of combustion, factors affecting the delay period. Diesel knock, Effect of engine variables on Diesel knock , Rating of CI engine fuels: Cetane number, performance number, comparison of knock in SI and CI engines. Combustion chamber for CI engines.

Unit. V

5	**ENGINE TESTING AND PERFORMANCE** **No. of Lect.-8, Marks-16**
	a) Measurement of indicated power, brake power, Morse test, energy balance and efficiency calculations. **b)** BIS specification. Recent trends in internal combustion engines. Engine emission, air pollution due to engines, various Euro norms, Unburnt hydrocarbon emission in two stroke and CI engines, CO and Nox emission, particulate traps, EGR, emission control methods catalytic converters (Introductory), crank blow by losses

TERM WORK-

Practical: 2Hrs/week **ICA: 25 Marks**

Minimum **EIGHT** experiment should be performed form the following lists:

1) Study of cooling systems.
2) Study of lubrication systems.
3) Study of simple and Solex carburetors.
4) Study of fuel pump and fuel injector.
5) Trial on a petrol engine and calculation of air/fuel ratio, volumetric,

thermal and mechanical efficiencies.
6) Trial of a Diesel engine and calculation of air/fuel ratio, volumetric,
thermal and mechanical efficiencies.
7) Morse test and determination of bsfc and isfc.
8) Study of combustion chambers of SI engines.
9) Study of combustion chambers of CI engines.
10) Study and demonstration of mechanical and Pneumatic governors.
11) Study and analysis of exhaust emission from the engine (PUC).

RECOMMENDED BOOKS:

1) V. Ganeshan, “Internal Combustion Engines”, 2/e, Tata McGraw Hill, New Delhi.
2) R. K. Rajput , “Internal Combustion Engines”’, Laxmi Publications, New Delhi.
3) W. W. Pulkrabek , “Fundamentals of Internal Combustion Engines”, Prentice Hall of India (P) Ltd., New Delhi.
4) E. F. Obert , “Internal Combustion Engines and Air Pollution”, Harper and Row, New York.
5) Ferguson C. R , “Internal Combustion Engines”, Wiley Inc. New York.
6) Sharma R.P. and Mathur M.L., “Internal Combustion Engines”, Standard Publications, New Delhi.
7) Domkundwar, ., “Internal Combustion Engines”, Dhanpat Rai & Co. New Delhi.
8) Willard W Pulkrabek. “Internal Combustion Engines”, Pearson Education
9) Shyam K. Agrawal, “Internal Combustion Engines”, New Edge International Publication.
10) K.K. Ramalingam, “Internal Combustion Engines”, Scitech Publication.

Course Outline

Machine Design - I	**MD-I**	
Course Title:	Short Title	Course Code
Branch - Mechanical Engineering	**Year – Third Year**	

Course Description: This course introduces undergraduate students to Machine Design. The background required includes a sound knowledge of Mathematics (Calculus), Engineering Mechanics, SOM and TOM.

Objective: - The course aims at to familiarize the various steps involved in the Design Process to understand the principles involved in evaluating the shape and dimensions of a component to satisfy functional and strength requirements. To learn to use standard practices and standard data learn to use catalogues and standard machine components

Teaching Scheme

	Hours Per Week	**No. of Week**	**Total Hours**	**Semester Credits**
Lecture	03	14	40	3
Practical	02	14	28	1

Examination scheme:

End semester exam (ESE)	80 Marks	Duration: 04 hours
Internal Sesstional exam (ISE)	20 Marks	
Internal Continues Assessment (ICA)	25 Marks	
End Semester Exam (ESE) oral	25 Marks	

Purpose of Course: Degree Requirement

Course Description: A degree holder engineer is expected to design and draw simple machine components. Fundamental knowledge of Mathematics, Applied Mechanics, Strength of Materials, Engineering Materials and Theory of Machines, Manufacturing Process are essential. Subject aims at developing analytical abilities to give solutions to engineering design problems.

Objectives:

Students should be able to:

1. Analyze the various modes of failure of machine components under different load patterns.
2. Design and prepare part and assembly drawings.
3. Use design data books and different codes of design.
4. Select standard components with their specifications from manufacturer's catalogue

UNIT:-I

1.	**Introduction and Design of Simple Machine Parts No. of Lectures – 08 Marks: 16**	
	a	Introduction of Machine Design, Basic procedure of Machine Design, Requisites of design engineer, Design of machine elements, Sources of design data, Use of standards in design, Selection of preferred sizes.
	b	Simple Stress, Thermal Stresses, Impact Stress, tortional stress, Poisson's Ratio, Volumetric Strain, Young's Modulus, Maximum principal Stress Theory, Maximum shear stress theory, Maximum principal strain Theory, Maximum strain energy Theory, Maximum Distortion energy Theory . Stress Concentration – Causes & Remedies.
	c	Design of Simple parts – Knuckle joint & Cotter joint

Numerical Should be asked on Preferred sizes and Theories of Failure (b,c)

UNIT:-II

2.	**Design of Shafts, Keys and Couplings No. of Lectures – 08 Marks: 16**	
	a	*Shafts :*-Material, Design on the basis of strength considering shaft subjected to, twisting moment only, bending moment only, Combine twisting and bending moment, axial load in addition to twisting and bending. Design on the basis of

		rigidity. A.S.M.E. code for shaft design,
	b	*Keys:-*Classification of keys, Design considerations in parallel and tapered sunk keys, Design of square, flat and Kennedy keys, Splines.
	c	*Couplings:-*Design considerations, Classification, Design of Rigid, Muff coupling, Flange coupling and Flexible bushed pin coupling.

*Numerical Should be asked on Shafts, coupling (*Flange coupling and Flexible bushed pin coupling) *(a,c)*

UNIT: - III

3.	**Design of Temporary and Permanent Joints No. of Lectures – 08 Marks: 16**	
	a	Threaded Joints:- Different Forms of Threads, Bolts of uniform strength, Locking devices, I.S.O. metric screw threads, Stresses in threaded joint, eccentrically loaded bolted joint, Torque requirement for bolt tightening.
	b	Welded Joints: - Types of welding and joints, strength of transverse and parallel fillet welded section, axially loaded unsymmetrical welded section, eccentrically loaded joint.

Numerical should be asked on eccentrically loaded bolt joint and axially loaded unsymmetrical welded section, eccentrically loaded joint. *(a,b)*

UNIT:-IV

4.	**Design of Energy Storing Elements No. of Lectures – 08 Marks: 16**	
	a	Flywheel: - Function and material, Torque Analysis, coefficients of fluctuation of energy, Solid disk Flywheel, Rimmed Disk flywheel, stresses in flywheel rim.
	b	Spring:- Types, Applications and materials of springs, Stress and deflection equations for helical springs, Style of ends, Wahl's Stress Factor, Design of helical compression and tension springs, Springs in series and parallel, Concentric helical springs, leaf spring, Shot peening

Numerical should be asked on Solid Disk and Rimmed Disk Flywheel and Design of Helical springs and Leaf spring. *(a,b)*

UNIT: - V

5.	***Design for Fluctuating Loads and Statistical consideration in Design*** **No. of Lectures – 08 Marks: 16**	
	a	*Design for Fluctuating Loads:* Stress concentration - causes and remedies, Fluctuating stresses, Fatigue failure, Endurance limit, Notch sensitivity, Reversed stresses, Solderberg and Goodman diagrams, Fatigue design of components under combined stresses such as shafts, bolts and springs.
	b	*Statistical consideration in design:* - Design and natural tolerances –Design for assembly- Statistical analysis of tolerances – Mechanical reliability and factor of safety.

Numerical should be asked on Fatigue design of components under combined stresses such as shafts, bolts and springs. *(a)*

Recommended Books:

[1] Shigley J.E. and Mischke C.R., "Mechanical Engineering Design", Tata McGraw Hill Publication Co. Ltd.

[2] Spotts M.F. and Shoup T.E. , "Design of Machine Elements", Prentice Hall International.

[3] Bhandari V.B., "Design of Machine Elements", Tata McGraw Hill Publication Co. Ltd.

[4] FArzdak Haideri, "Machine Desig", Nirali Prakashan, Pune.

[5] Willium C. Orthwein, "Machine Components Design", West Publishing Co. and Jaico Publications House.

[6] Design Data", P.S.G. College of Technology, Coimbatore.

[7] Juvinal R.C., "Fundamentals of Machine Components Design", John Wiley and Sons.

[8] Hall A.S., Holowenko A.R. and Laughlin H.G., "Theory and Problems of Machine Design", Schaum's Outline Series.

[9] A. H. Burr and J. B. Cheatham, Mechanical Analysis and Design, 2 nd Ed., Prentice Hall.

Lab - Course Outline

Machine Design-I	**MD-I LAB**	
Course Title:	Short Title	Course Code

Branch - Mechanical / Automobile Engineering **Year – Third Year**

Course Description:

This lab includes different practical of Heat Transfer. The course aims at imparting knowledge of Machine Design procedure for different elements.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	02	14	28	1

Evaluation scheme:

Internal Continuous Assessment (ICA) 25 Marks
End Semester exam (ESE) (Oral) 25 Marks

Prerequisite Course(s): Fundamental knowledge of Mathematics, Applied Mechanics, Strength of Materials, Engineering Materials and Theory of Machines, Manufacturing Process are essential. Subject aims at developing analytical abilities to give solutions to engineering design problems.

Outline of Content: This course contains:

Term Work:

1. Term work shall consist of "ONE" design project. The design project shall consist of assembly drawing with a part list and overall dimensions and the other sheet involving drawing of individual components using AUTO CAD on A3 size paper. Manufacturing tolerances, surface finish symbols and geometric tolerances should be specified so as to make it working drawing. A design report giving all necessary calculations of the design of the components and assembly should be submitted in a separate file.

2. Design projects should include selection of prime mover and design of mechanical systems comprising of machine elements: Design data book shall be used extensively for the selection of the components.

3. Total five assignments (One on each unit - only Numerical)

ESE (Practical Examination)

The Oral Examination will be based on the all five units of Machine Design – I.

Recommended Books:

[1] Shigley J.E. and Mischke C.R., "Mechanical Engineering Design", Tata McGraw Hill Publication Co. Ltd.

[2] Spotts M.F. and Shoup T.E. , "Design of Machine Elements", Prentice Hall International.

[3] Bhandari V.B., "Design of Machine Elements", Tata McGraw Hill Publication Co. Ltd.

[4] FArzdak Haideri, "Machine Desig", Nirali Prakashan, Pune.

[5] Willium C. Orthwein, "Machine Components Design", West Publishing Co. and Jaico Publications House.

[6] Design Data", P.S.G. College of Technology, Coimbatore.

[7] Juvinal R.C., "Fundamentals of Machine Components Design", John Wiley and Sons.

[8] Hall A.S., Holowenko A.R. and Laughlin H.G., "Theory and Problems of Machine Design", Schaum's Outline Series.

[9] A. H. Burr and J. B. Cheatham, Mechanical Analysis and Design, 2 nd Ed., Prentice Hall.

Course Outline

Theory of Machines – II TOM-II

Course Title:	Short Title	Course Code
Theory of Machines – II	**TOM-II**	

Branch - Mechanical / Automobile Engineering	**Third Year**	**First**
Branch	Year	Semester

Course Description:

The course under Theory of Machine-II has been designed to cover the concepts of force analysis, construction, working and applications of important components of machines. The students will understand the overall working of machines and able to understand constructional and working features of important machine elements. The students should be able to understand the basic theoretical and numerical methods, which is the pre-requisites to design and selection of these components of machines for different applications.

Course Objectives:

1. To understand various types of machine components, its working & applications.
2. To understand the force analysis of power train components gears.
3. To study the need and different methods of balancing of rotating and reciprocating masses.
4. To aware about the speed regulating components such as governors, flywheel, etc.
5. To describe graphical and analytical methods.

Course Outcomes:

Development of concepts and logics about machine components.
Development of problem solving approach by graphical and analytical methods.
Understanding of functional requirements of machine components for designing purpose.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	3	14	40	3

Examination scheme:		
End semester exam (ESE)	80 Marks	Duration : 03 hours
Internal Sessional exam (ISE)	20 Marks	

Purpose of Course: Degree Requirement

Prerequisite Course(s): Mathematics (Calculus), Engineering Drawing & Element of Mechanical Engineering, Engineering Mechanics at first year level and Theory of Machine-I at Second Year Level.

Course Contents:

UNIT-I

1.	**Flywheel and CAM**	**No. of Lectures - 8 Marks : 16**
	a	Turning moment diagram and fluctuation of the crankshaft speed, D' Alemberts principle Equivalent offset inertia force
	b	Determination of flywheel size for different types of engine and machine.
	c	Types of cams and followers, Analysis of motion of follower
	d	Determination of cam profile for given follower motion
	e	Analysis of cam with specified counters – Circular arc cam, Tangent cam

UNIT-II

2.	**Brakes & Dynamometer**	**No. of Lectures - 8 Marks : 16**
	a	**Brakes:** Types of brakes, Force analysis of brakes, external and internal expanding shoe brakes, block brakes.
	b	Band brakes, Band and block brakes, Breaking torque.
	c	**Dynamometer:** Absorption dynamometers: Prony brakes, Rope brake, Band brake
	d	Transmission dynamometer- belt transmission type, Fluid coupling

UNIT-III

3.	**Governor & Gyroscope**	**No. of Lectures - 8 Marks : 16**
	a	**Governor**: Types of governors – Watt, Porter, Proell, Hartnell, Sensitiveness of governors, Hunting, Isochronisms, Stability.
	b	Effect of governor, Power of governor, Controlling force.
	c	**Gyroscope**: Angular velocity and acceleration, Gyroscopic forces and couple, Gyroscopic effect on naval ships
	d	Gyroscopic stabilization, Stability of two wheel vehicle.

UNIT-IV

4.	**Balancing**	**No. of Lectures - 8 Marks : 16**
	a	Balancing of rotating masses in one and several planes.
	b	Balancing of reciprocating masses in single and multi-cylinder engine, radial and V-types.
	c	Primary and secondary balancing analysis, Concept of direct and reverse cranks.
	d	Balancing of locomotive engines and effect of partial balancing. , Static and dynamic balancing machine.

UNIT-V

5.	**Gears**	**No. of Lectures - 8 Marks : 16**
	a	**Spur Gears**:- Terminology used in gears, conjugate action,.
	b	Involute and cycloidal profile, Path of contact, Arc of contact, Contact ratio.
	c	Interference, Undercutting, Methods to avoid undercutting and interface, Gear standardization,
	d	Effect of center distance variation on the velocity ratio for involute profile tooth gears, Friction between gear teeths.

References:

1. Theory of Machines, S. S. Rattan, Tata McGraw Hill, New Delhi.
2. Theory of Mechanisms & Machines, Jagdish Lal, Metropolitan Book Co.
3. Theory of Machines, Longman's Green & Co., London.
4. Theory of Machines, W. G. Green, Blackie & Sons, London.
5. Theory of Machines, V.P. Singh, Dhanpat Rai & Co.
6. Theory of Machines – II, H. G. Phakatkar, Nirali Publication.
7. Theory of Machines and Mechanisms, Shigley, J.E and Uicker, J.J, McGraw45 Hill International Book Co.
8. Mechanisms and Machines theory, Rao J.S. and Dukkipati R.V, Wiley Eastern Ltd.
9. The Theory of Machines through solved problems , J.S.Rao. New age international publishers.
10. A text book of Theory of Machines, Dr.R.K.Bansal. Laxmi Publications
11. Theory of Machines, Sadhu Singh, Pearson Publication.
12. Theory of machine, P. L. Ballaney, Khanna publication.

Lab - Course Outline

Theory of Machines -II **TOM-II LAB**

Course Title: Short Title Course Code

Branch - **Mechanical / Automobile Engineering** Year – **Third Year**

Course Description:

This lab includes drawing sheets related to cam profile & balancing of rotating & reciprocating masses. Experiments on determination of characteristic curves of the centrifugal governor and verification of principle of working of gyroscope are also included. In addition study of gear boxes and Balancing machine.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Evaluation Scheme:

Internal Continuous Assessment (ICA)		: 25 Marks
End Semester exam (ESE) ORAL		: 25 Marks

Prerequisite Course(s): Engineering Mathematics, Theory of machine-I

Outline of Content:

This practical contains

1. To determine the characteristic curves of the centrifugal governor and find its coefficient of insensitivity and stability.
2. To study various types of gear boxes.
3. To verify the principle of working of gyroscope.
4. To study the static & dynamic balancing machine & balancing of masses in different planes.
5. To study graphical methods and prepare drawing sheets for – Drawing sheet 1:- Balancing of rotating masses and reciprocating masses. (2 Problems)
6. To study graphical methods and prepare drawing sheets for Drawing sheet 2: Draw cam profile for various types of follower motion.

Guide lines for ESE:-
ESE (Oral Examination)
The Oral Examination will comprise of viva on the above six experiments.

Course Outline

Industrial Engineering & Safety	**IES**	
Course Title	Short Title	Course Code

Mechanical Engineering	**Third Year**	**First**
Branch	Year	Semester

Course Description:

The course is intended to:

- build up necessary background for understanding the Industrial knowledge
- understand the applications of knowledge and correlation of various departments
- get acquainted with various acts, role of consultant and safety auditor
- acquire managerial skills of handling Industrial environment and human behavior
- develop awareness about industrial Engineering and safety Engineering

(Course outcomes)

Student will be able to:

- seek opportunity to work in the field of Industrial Engineering and safety
- contribute in a better way towards enhancing the productivity
- play the role of industrial and safety manager effectively

Teaching scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	3	14	40	3

Examination scheme:

End semester exam (ESE)	80 Marks	Duration: 03 hours
Internal Sessional exam (ISE)	20 Marks	20 Marks

Outline of Content: This course contains:

Unit - I

1	**No. of Lectures – 08, Marks: 16**	
	a	Introduction to Industrial Engineering, origin & growth, contribution of Taylor, Tools & Techniques of Industrial Engineering.
	b	Work study- Method Study- Aims, objectives, scope & applications.
	c	Select criteria for selecting assignments; record charting symbols. Flow process chart, multiple activity chart. Examine- questioning technique, Develop motion economy, work place layout, improvement and working condition, implement and maintain
	d	Work Measurement Aims objectives scope and application
	e	Stop watch study- equipment and procedure, rating allowance and standard time; activity sampling- principle, procedure and applications.

Unit-II.

2	**No. of Lectures – 08, Marks: 16**	
	a	Criteria for plant location, site selection, types of plant layout, planning for utilities
	b	Material Handling- necessity of material handling, procedure for analyzing material handling system, methods and equipment of material handling. Effect of layout and material handling system on productivity and profitability
	c	Safety in material handling & factory operation.

Unit-III

3	**No. of Lectures – 08, Marks: 16**	
	a	Definition, concept, Aims, objectives and Scope of Industrial Psychology.
	b	Individual and Group, Individual differences in behavior
	c	Group Dynamics, Theory X and Y
	d	Hawthorne Experiment, Morale
	e	Motivation, Working Environmental Conditions
	f	Industrial Fatigue

Unit-IV

4	**No. of Lectures – 08, Marks: 16**	
	a	Definition of safety, safety engineering, human factor engineering, anthropometry
	b	Principles of safety management ,industrial hygiene and occupational health
	c	Safety education and training: Importance of training – identification of training needs, training methods, motivation communication, safety campaign
	d	Safety performance monitoring, safety audit ,accident investigation and reporting

Unit-V

5	**No. of Lectures – 08, Marks : 16**	
	a	Safety in chemical industries, food processing ,textile, explosives
	b	Safety in mines, nuclear plants ,cement plants
	c	Safety in hydro and thermal power plants, ship building and repair
	d	Safety in mechanical ,electrical industries' equipments"
	e	Disaster management

References:-

1) Maynard, Industrial Engineering. Hand book, McGraw Hill book company
2) ILO, Introduction to Work Study
3) Krishnan N.V. "Safety Management in Industry" Jaico Publishing House,
4) Khanna O.P. , Industrial Engineering. and Management, Dhanpat Rai Publication, New Delhi.
5) Factory Act -1948
6) Indian Boiler Act- 1923 (Revised 1983)
7) L.C. Jhamb " A text book of Industrial Engineering", Everest Publishing House, India.
8) Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, (1999.
9) M.Mahajan "Industrial Engineering and Production Management". Dhanpat Rai & CO (P)LTD Publication, New Delhi

Lab - Course Outline Cover Page

Computer Graphics **CG**

Course Title Short Title Course Code

Branch - Mechanical / Automobile Engineering **Year – Third Year**

Course Description: This course includes design and drafting related to mechanical elements. Lab's related to elementary level knowledge of drafting and Auto-LISP program. Sketching and computer aided design tools are used to create the various types of views needed for design and documentation.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	01	14	14	01
Practical	02	14	28	01

Purpose of Course: Degree Requirement

Prerequisite Course(s): Engineering Graphics, Essential Computer Knowledge Required.

Outline of Content: This course contains:

AUTOCAD

1	**No. of Lectures – 07**	
	a	Introduction to CAD. Advantages and Applications of CAD. Difference between conventional drafting methods and CAD.
	b	Introduction to Auto-cad (Latest Version). Details of various menu bars and tool bars, Drawing Area etc.
	c	Draw Toolbar- Line, Arc, Rectangle, Circle, Polygon, Text, Boundary Hatching etc.
	d	Modify Toolbar – Copy, Move, Erase, Mirror, Chamfer, Fillet, Array, Trim etc.
	e	Dimension Toolbar – Linear, Angular, Radius, Diameter, etc
	f	Properties Toolbar – Line Types, Colors, Line Weight, Text, etc
	g	Settings - Snap settings, Grid settings, parameter settings, print settings, etc

AUTO-LISP

2	**No. of Lectures – 07**	
	a	Introduction to Auto-LISP. Advantages and Applications of Auto-LISP .
	b	Auto-LISP commands
	c	Auto-LISP Programs for simple geometric shapes-line, circle, rectangle, pentagon, etc
	d	Auto-LISP Programs for elements geometric shapes such as circle in rectangle, triangle in rectangle, etc.
	e	Auto-LISP Programs for simple machine elements. (Nut, Bolt, Stud, Flange, etc)
	f	Auto-LISP Programs for simple machine elements. (Nut, Bolt, Stud, Flange, etc)
	g	Auto-LISP Programs for simple machine elements (Nut, Bolt, Stud, Flange, etc)

Course Objectives:

This course includes design and drafting related to mechanical elements. This lab related to elementary level knowledge of drafting and Auto-LISP program. Sketching and computer aided design tools are used to create the various types of views needed for design and documentation.

Course Outcomes: Upon successful completion of these practical the student will be able to

1. Demonstrate and understand the basic concepts of geometric modeling and computer graphics.
2. Design and Drafting of mechanical elements.
3. Programs for mechanical elements in Auto-LISP.

Assignment:

1. Two assignments on AutoCAD (preferably latest version).
2. Two assignments on Auto LISP (such as Design and drafting of any mechanical component through Auto LISP)

REFERENCES:

1. AutoCAD reference manual
2. Auto-LISP Developer's Guide
3. George Omura, ABCs of Auto LISP, BPB. Publication
4. H.G. Phakatkar, Engineering Graphics, Nirali publication

COURSE CONTENT

Industrial Training / EDP / Special Study	**IT/EDP/SS**	
Course Title	Short Title	Course Code

Semester-V **Examination Scheme**

Total Semester Credits: 02 **Internal Continuous Assessment (ICA): 25 Marks**

Industrial Training

- Student shall undergo industrial training for a minimum period **of two weeks** during summer vacations between fourth semester and fifth semester.
- The industry in which industrial training is taken should be a medium or large scale industry
- The paper bound report on training must be submitted by the student in the beginning of Fifth semester along with a certificate from the company where the student took training.
- Every student should write the report separately.
- Institute / Department/T&P Cell have to assist the students for finding Industries for the training.
- Students must take prior permission from Department before joining for Industrial Training.

OR

EDP (Entrepreneurship Development Program)

- Student has to participate in Entrepreneurship Development Program for a minimum period of **One week** during summer vacations between fourth semester and fifth semester.
- Every student must submit the paper bound report based on the program in the beginning of Fifth semester along with a certificate (Course / Program completion) from the program organizers.
- Every student should write the report separately.
- Institute / Department may arrange Entrepreneurship Development Program at their campus.
- Students must take prior permission from Department before attending any Entrepreneurship Development Program.

OR

Special Study

- Student has to submit name of three topics of his interest to the department.
- Special study in a group shall not be allowed.
- The three-member committee appointed by Head of Department shall allot one topic out

of the three topics submitted by the student.

- Every student must submit the paper bound report based on special study at the end of Firth semester.
- Department should allot guide to all such students, for monitoring their progress and guide them for literature survey / report writing etc.
- Evaluation of special study shall be done based on presentation made by student, followed by brief question answer session.

Evaluation of Industrial Training / EDP / Special Study

ICA: The Internal Continuous Assessment shall be based on the active participation of the students in the training / EDP / Special study and based on knowledge / skill acquired by the student. The three-member committee appointed by Head of Department shall assess the reports and award marks based on following:

(a) Report		10 marks.
(b) Presentation		10 marks.
(c) Viva-voce at the time of presentation		05 marks.
	Total:	**25 marks.**

Course Outline

Machine Design II	**MD-II**	
Course Title	Short Title	Course Code

Branch- Mechanical Engineering **Year- Third Year**

Course Description:

This course provides the knowledge of machine design. Course includes Design of Clutches, Design of Gears, Design of bearing & pressure vessels etc.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	14	40	3
Practical	02	14	28	1

Examination Scheme:

End semester exam (ESE) 80 Marks Duration: 04 Hours

Internal Sessional Exam (ISE) 20 Marks

Prerequisite Course(s): This course is aimed at introducing the Design of various mechanical components e.g. - clutches, gears, pressure vessels, bearing etc to the undergraduate students. The background expected familiar with Strength of Material, Theory of machine & Machine Drawing etc.

Objectives:

1 Analyze the various modes of failure of machine components under different load patterns.

2 Design and prepare part and assembly drawings.

3 Use design data books and different codes of design.

4 Select standard components with their specifications from manufacturer's catalogue.

UNIT-I

Friction Clutches	No. of Lect.-8, Marks-16
a)	**Friction Clutches:** Classification and selection friction clutches, Torque transmitting capacities and Design of single-plate, multi-plate, cone and centrifugal clutches, Type of friction materials-their advantages, limitation and selection criteria.
b)	**Aesthetic and Ergonomic considerations in Design** Aesthetic considerations- Basic type of product form, design features like shape, colour, materials and finishes, quality etc. Ergonomic considerations- Man-Machine closed loop system, design of display panels, design of controls etc.

UNIT-II

Pressure Vessels	No. of Lect.-8, Marks-16
a)	**Design of Cylinders and pressure vessels:** Thick and thin cylinders- Thin cylindrical and spherical vessels- Lame's equation-Clavarino's and Birnie's equation- Auto frottage and compound cylinders- Gasketed joints in cylindrical vessels. Unfired pressure vessels- Classification of pressure vessels as per I.S. 2825- categories and type of welded joints- weld joints efficiency- Corrosion, erosion and protection vessels, stresses induced in pressure vessels, material of construction. Thickness of cylindrical and spherical shells and design of end closures as per code- Nozzle and Opening in pressure vessels- Reinforcement of opening in shell and end closures. Area compensation method.

UNIT-II

Spur and Helical Gear Drives	**No. of Lect.-8, Marks-16**
a)	Classification of gears, Selection of type of gears, Standard system of gear tooth. **Spur Gears:** Number of teeth and face width, Type of gear tooth failure, Desirable properties and selection of gear material, Force analysis, Beam strength (Lewis) equation, Velocity factor, Service factor, Load concentration factor, Effective load on gear, Wear strength equation, Estimation of module based on beam and wear strengths, Estimation of dynamic tooth load by velocity factor and Buckingham's equation,
b)	**Helical Gears:** Transverse and normal module, Virtual number of teeth, Force analysis, Beam and Wear strengths, Effective load on gear tooth, Estimation of dynamic load by velocity factor and Buckingham's equation, Design of helical gears.

UNIT-IV

Bevel and Worm Gear Drives	**No. of Lect.-8, Marks-16**
a)	**Bevel Gears** Straight tooth bevel gear terminology and geometric relationship, Formative number of teeth, Force analysis, Design criteria of bevel gears, Beam and wear strengths, Dynamic tooth load by velocity factor and Buckingham's equation , Effective load, Design of straight tooth bevel gears, Selection of material for bevel gears,
b)	**Worm Gear** Worm and worm gear terminology and geometrical relationship, Standards dimension, Force analysis of worm gear drives, Friction in worm gears and its efficiency, Worm and worm-wheel material, Beam strength and wear strength of worm gears, Thermal consideration in worm gear drive, Methods of Gears lubrication.

UNIT-V

Rolling Contact Bearings **No. of Lect.-8, Marks-16**	
a)	**Rolling contact Bearings** Type of rolling contact bearing, Static and dynamic load carrying capacities, Striback’s equation, Equivalent bearing load, Load-life relationship, Selection of bearing life, Selection of rolling contact bearings from manufacturer’s catalogue. Design for cyclic loads and speed, Bearing with probability of survival other than 90%, Lubrication and mounting of bearing, Type of failure in rolling contact bearing- causes and remedies.
b)	**Statistical consideration in design** Frequency distribution-Histogram and Frequency polygon – Normal distribution. Standard variable – population combinations.

RECOMMENDED BOOKS:

1) Shigley J.E. and Mischke C.R., “Mechanical Engineering Design” McGraw Hill Pub. Co. Ltd.
2) Spott’s M.F. and Shoup T.E. “Design of Machine Elements”, Printice Hall International.
3) Bhandari V.B., “Design of Machine elements”, Tata McGraw Hill Pub. Co. ltd.
4) Black P.H. and O. Eugene Adams, “Machine Design”, McGraw Hill Book Co. Ltd.
5) Willium C. Orthwine, “Machine Component Design”, West Pub. Co. an Jaico Pub. House.
6) “Design Data”, P.S.G. College of Technology, Coimbatore.
7) Juvinal R.C. “Fundamental of Machine Component Design ”, John Wiely and sons.
8) Hall A.S., Holowenko A.R. and Laughlin H.G., “Theory and Problems of Machine Design”, Schaum’s Outline Series.
9) P.Kannaiah, “Machine Design”, Scitech Publication

Lab - Course Outline

Machine Design-II	**MD-II LAB**
Course Title:	Short Title Course Code

Branch - Mechanical / Automobile Engineering **Year – Third Year**

Course Description:

This lab includes different practical of Machine Design. The course aims at imparting knowledge of Machine Design procedure for different elements.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	02	14	28	1

Evaluation scheme:

Internal Continuous Assessment (ICA)	25 Marks
End Semester exam (ESE) (Oral)	25 Marks

Prerequisite Course(s): Fundamental knowledge of Mathematics, Applied Mechanics, Strength of Materials, Engineering Materials and Theory of Machines, Manufacturing Process are essential. Subject aims at developing analytical abilities to give solutions to engineering design problems.

Outline of Content: This course contains:

TERM WORK-

Practical: 2Hrs/week **ICA: 5 Marks**
ESE: 25 marks

1. Term work shall consist of "ONE" design project. The design project shall consist of two imperial size sheets- one involving assembly drawing with a part list and overall dimension and the other sheet involving drawing with of individual components & also using AUTO CAD on A3 size paper. Manufacturing tolerances, surface finish symbols and

geometric tolerances should be specified so as to make it working drawing. A design report giving all necessary calculation of the design of the components and assembly should be submitted in a separate file.

Design projects should be in the form of ‘Design of Mechanical System’ comprising of machine elements studied and topics covered in the syllabus.

Design data book shall be used extensively for the selection of the component.

2. Total five assignments (One on each unit - only Numerical)

ESE **(Practical Examination)**

The Oral Examination will be based on the all five units of Machine Design **-II.**

RECOMMENDATION

As far as possible, preference should be given to prepare drawing sheets using computer.

RECOMMENDED BOOKS:

1) Shigley J.E. and Mischke C.R., “Mechanical Engineering Design” McGraw Hill Pub. Co. Ltd.

2) Spott’s M.F. and Shoup T.E. “Design of Machine Elements”, Printice Hall International.

3) Bhandari V.B., “Design of Machine elements”, Tata McGraw Hill Pub. Co. ltd.

4) Black P.H. and O. Eugene Adams, “Machine Design”, McGraw Hill Book Co. Ltd.

5) Willium C. Orthwine, “Machine Component Design”, West Pub. Co. an Jaico Pub. House.

6) “Design Data”, P.S.G. College of Technology, Coimbatore.

7) Juvinal R.C. “Fundamental of Machine Component Design ”, John Wiely and sons.

8) Hall A.S., Holowenko A.R. and Laughlin H.G., “Theory and Problems of Machine Design”, Schaum’s Outline Series.

9) P.Kannaiah, “Machine Design”, Scitech Publication

Course Outline

Numerical Analysis & Computational Methods **NACM**

Course Title **Short title** **Course ode**

Branch: Mechanical Engineering Third Year

Course Description:

Course Objectives:

1. To introduce numerical methods for solving linear and non-linear equations.
2. To apply the knowledge of these methods to solve practical problems with suitable software.
3. To introduce numerical methods for evaluating definite integrals.

Course Outcome

At the end of the course the students are able to-

1. Identified, classified and choose the most appropriate numerical method for solving the problem.
2. Developed Numerical skills to Mechanical Engineering Problems.

Teaching Scheme

	Hrs per week	No. of weeks	Total hour	Semester Credits
Lecture	03	14	40	03
Tutorial	--	--	--	--

Examination Scheme:

End semester scheme(ESE)	**80 marks**	**Duration : 03 Hrs.**
Internal Sessional Examination (ISE)	**20 marks**	

Purpose of Course: Degree Requirement

Prerequisite Courses: Fundamental knowledge about the mathematics.

Outline of the content: This course contains:

Unit- I

1.	Title: Software development & Solution of transcendental equation **No. of Lecture:08 ,Marks: 16**	
	a	Software development principles, mathematical modeling problem solving, Algorithm, Flowchart, Errors, Graphical method,
	b	Solution of transcendental equation - Bisection method, False position method, successive approximation method, Newton-Raphson method, Horner's method, rate of convergence

Unit- II

2.	Title: Numerical Integration & Solution of ordinary Differential Equation **No. of Lecture:08 ,Marks: 16**	
	a	Numerical Integration Trapezoidal rule, Simpson's 1\3rd rule, Simpson's 3\8th rule, Gauss Quadrature method: 2 point.
	B	Solution of ordinary Differential Equation Taylor's series method, Euler's method, Improved & modified Euler's method, Fourth order Range- Kutta method.

Unit- III

3	Title: Interpolation & Curve Fitting **No. of Lecture:08 ,Marks: 16**	
	a	Interpolation Linear and quadratic interpolation, Lagrange's interpolation, Newton's forward interpolation, Newton's backward interpolation, Newton's divided difference interpolation, Stirling interpolation,
	b	Curve fitting Linear & quadratic regression, Logarithmic curve fitting, Exponential curve fitting.

Unit- IV

4.	Title: Solution of Linear Algebraic Equation & Iterative method **No. of Lecture:08 ,Marks: 16**	
	a	Solution of Linear Algebraic Equation - Gauss elimination method, Gauss Jordan method LU- decomposition method.
	b	Iterative method - Jacobi iteration method, gauss seidel interactive method, Cholesky method.

Unit- V

5	Title: Finite Element Analysis & FDM **No. of Lecture:08 ,Marks: 16**	
	a	Finite Element Method: Introduction, Steps used in finite element Analysis , general approach, interpolation function, & Finite element application on one dimension, Solution of elliptical equations for various boundary conditions, Solution of parabolic equation by explicit, implicit
	b	Introduction to Finite Difference method, Comparison with Finite Element Analysis, crank-Nicholson method,

References:

1 Chapra, Canale," Numerical Method for Engineer",McGraw Hill Co.

2 Joh. H. Mathews," Numerical Methods", Pearson Education

3 P. Kandaswamy," Numerical Methods",S. Chand & Co. New Delhi

4 J. N. Reddy," Finite Element Method",McGraw Hill Co.

5 S. S. Shastri," Introductory Method of Numerical Analysis ", Prentice Hill India.

6 Belegundupatla," Introduction to Finite Element Method",Prentice Hill India.

Course Outline

Metrology and Quality Control **MQC**

Course Title: Short Title Course Code

Branch - Mechanical Engineering **Year** **Third Year**

Course Description: This course introduces undergraduate students to Metrology and Quality Control. The background required includes a sound knowledge to Measurements, (calculus), applied thermodynamics, Industrial management at second year level.

Course Objective: The course aims at imparting knowledge of metrology and quality control. The course aims at to familiarize to understand the principles metrology of screw threads, gear measurement, study of measuring machines, recent trends in engineering metrology. To learn to use standard practices and standard data, learn to use statistical concept, control chart for variables, control chart for attributes, acceptance sampling

Teaching Scheme

	Hours Per Week	**No. of Week**	**Total Hours**	**Semester Credits**
Lecture	03	14	42	3
Practical	02	14	28	

Examination scheme:

End semester exam (ESE) 80 Marks Duration: 03 hours

Internal Sectional exam (ISE) 20 Marks

Internal Continues Assessment (ICA) 25 Marks

End Semester Exam (ESE) 25 Marks

Practical Examination

Purpose of Course: Degree Requirement

1.	**Metrology**	**No. of Lectures – 08, Marks: 16**
	a	Definition: Measurement, precision, accuracy, sensitivity, Classification of method of measurement
	b	Linear Measurement:-Standards, line standards, end standards, classification of standards, precision measurement, precision measuring instruments and their characteristics, slip gauge
	c	Straightness, flatness and squareness:-Surface plates, measurement of straightness, flatness testing, squareness testing, roundness testing, machine tool metrology, Measurement by light wave interference:- Basic principle, sources of light, optical

		flats, fringe patterns and their interpretation, testing of flat, convex and concave and irregular surface, checking of slip gauges.

UNIT:-II

2.	Design of gauges &Metrology No. of Lectures – 08, Marks: 16	
	a	Design of gauges:- Types of gauges, limits, fits, tolerences, Taylor's principle
	b	Comparators:-Characteristics, application, types, construction and working of different mechanical, optical, electrical, pneumatic comparators
	c	Angle measurement:-Sine bars, Sine centers, Use of sine bar, angle gauges, autocollimator angle dekkor, constant deviation prism, Measurement of surface finish:-Types of Surface texure, elements of surface texture, measuring surface finish by stylus probe, Tomlinson & Taly-surf

UNIT: - III

3.	Metrology of Screw thread, Gear & recent trend in metrology. No. of Lectures – 08, Marks: 16	
	a	Metrology of screw threads:-Terminology, errors and their effects, thread gauges, measurement of elements of external and internal threads, Gear measurement:-calipers measurements, involute testing, roller measurements, tool makers microscope, profile projectors
	b	Study of measuring machines:-Universal measuring machine, coordinate measuring machine, Errors in CMM, electronic inspection and measuring machine, Recent trend in engineering metrology:-precision instrument based on laser, probes, telemetric systems, Isometric viewing of surface defects, Machine vision

UNIT:-IV

4.	Quality control No. of Lectures – 08, Marks: 16	
	a	Introduction to quality :- factors controlling quality of design and conformance, balance between cost of quality and value of quality, Introduction to quality tools: Demings PDCA,PDSA cycles & Juran triology approach, Seven quality tools, Pareto

		analysis, cause &effect diagram, brainstorming, concurrent engineering
	b	Total quality management:, zero defect concept 5S,Kaizen,Kanban,,Poka yoke, TPM ,ISO 9000&TQM, Quality assurance ;-QFD, difference between inspection, quality control and quality assurance, quality survey

UNIT: - V

5.	**Statistical Quality Control**	**No. of Lectures – 08, Marks: 16**
	a	Statistic concept:-Concept of variation, variable & attribute data, the frequency distribution, quantitative description of distribution, normal curve, concept of six sigma, Control chart for variables:-definition of control chart, objective of control chart chart, R chart, Problems on X & R chart
	b	Control chart for attributes:-practical limitations of the control charts for variables charting chart chart, Problems on P & C chart
	c	Acceptance sampling:-Sampling inspection Vs hundred percent inspection, basic concept of sampling inspection, OC Curve, conflicting interests of consumer and producer, producer's and consumer's risk, AQL LTPD, Sampling plans

Recommended Books :

[1] R.K.Jain: Engineering Metrology: Khanna Publishers.
[2] Handbook to industrial metrology: ASTME: Printice Hall Pub
[3] G.M.Juran: Handbook of quality control, McGraw Hill Pub.
[4] M.Mahajan: Statistical quality control
[5] K.C.Jain:TQM & ISO 9000;Khanna publishers
[6] I.C.Gupta: A textbook of Engg Metrology: Khanna Publishers.
[7] M.Mahajan : A textbook of metrology :Dhanpat rai & co.

Lab - Course Outline

Metrology and Quality Control	**MQC**	
Course Title	Short Title	Course Code
Branch- Mechanical/Automobile Engineering	**Year**	**Third Year**

Course Description:
This lab includes performance practical and study practical related to metrology and quality control

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Evaluation Scheme:

Internal Continuous Assessment (ICA) 25 Marks

End Semester Exam (ESE) (Oral) 25Marks

Prerequisite Course(s): General mathematics, 11t^{h} Physics & 12th physics

Outline of content:

This practical contains following experiments

1 Determination of linear/angular dimensions of part using precision & non precision instrument.

2 Machine tool alignment tests on any machine tool like Lathe,Drilling,Milling.

3 Interferometer-Study of surfaces using optical flat.

4 Surface finish measurement.

5 Measurement of roundness/circularity using mechanical comparator.

6 Measurement of screw parameters

7 Measurement of Gear parameters i) gear tooth thickness ii)constant chord iii)PCD

8Study and applications of tool makers microscope

9 Use of profile projector

10 Study and use of control charts

Note: Any EIGHT practical from Mechanical Measurement and Metrology Lab shall be conducted during 14 weeks available during semester.

ESE (Practical Examination)

• The Practical Examination will comprise of performing the experiment and viva on the practical's.

Course Outline

Turbo Machinery	**Turbo M/C**	
Course Title	Short Title	Course Code

Branch: - Mechanical Engineering **Year** **Third Year**

Course Description:-

This course introduces undergraduate students to Turbo Machinery. The background required includes a sound knowledge to Mathematics (Calculus), Engineering Thermodynamics, Applied Thermodynamics and Fluid Mechanics at Second Year Level. The Course aims at imparting knowledge of Turbo Machinery.

Teaching Scheme:-

	Hours per week	**No. of weeks**	**Total Hours**	**Semester Credits**
Laboratory	3	14	42	3
Practical	2	14	28	1

Evaluation Scheme:-

End Semester exam (ESE)	80 Marks	Duration: 03 hours
Internal Sessional exam (ISE)	20 Marks	

Prerequisite Course (S):- Mathematics (Calculus) at first year level and Engineering Thermodynamics, Applied Thermodynamics and Fluid Mechanics at Second Year Level.

Outline of Content:- The Course Contains :

UNIT-I

1.	**Steam Turbines** **No. of Lectures-08 Marks-16**	
	a	Types of turbines, Constructional details impulse turbine.
	b	Compounding of turbine, Velocity diagrams, Output efficiency.
	c	Reaction turbine, Velocity, Diagrams, Degree of reaction.
	d	Governing of turbines, Application of turbines, Losses in turbines.

UNIT-II

2.	**Gas Turbines** **No. of Lectures-08 Marks-16**	
	a	Theory and fundamentals of gas turbines, principles, classification.
	b	Joule's cycles, Assumptions for simple gas turbines, Cycle analysis, Work ratio, Concept of maximum and optimum pressure ratio, Actual cycle.
	c	Effect of operating variable on thermal efficiency, Regeneration, Intercooling, reheating, their effects on performance.
	d	Closed cycle and semiclosed cycles gas turbine plant, Applications of gas turbines.

UNIT-III

3.	**JET PROPULSION** **No. of Lectures-08 Marks-16**	
	a	Introduction, Theory of jet propulsion, Types of Jet Engines.
	b	Energy flow through Jet Engines, Thrust, Thrust power, and Propulsive efficiency.

	c	Turbo jet, Turbo Prop, Turbo fan engines, Pulse jet and ram jet engines.
	d	Performance characteristics of these engines, Thrust segmentation application of jet engines, Concept of rocket propulsion.

UNIT-IV

4.	**HYDRAULIC TURBINES No. of Lectures-08 Marks-16**	
	a	Impulse momentum principle, Fixed and moving flat plate and curve vanes, Series of plates & vanes, Velocity triangles and their analysis, Work done, Efficiency etc.
	b	Classification of hydraulic turbines, Heads & various efficiencies.
	c	Impulse turbine: Main components and constructional features of pelton wheel,
	d	Velocity diagrams & work done, Condition for max. hyd. Efficiency, Number of buckets, Jets, Non dimensional parameters (speed ratio, jet ratio).

UNIT-V

5.	**HYDRAULIC TURBINES (REACTION TYPE) No. of Lectures-08 Marks-16**	
	a	Reaction turbine, Main components & Constructional Features.
	b	Types of reaction turbine (Francis, Kaplan), Velocity Digrams.
	c	Unit quantities, Selection of turbine considering various factors, Specific speed, Types of characteristic curves.

	d	Draft tube types, Efficiency, Cavitations, Governing mechanisms for pelton wheel, Francis, Kaplan turbines.

References:-

1. Domkundwar, “Thermal Engineering”, Dhanpat Rai and Co Ltd. Delhi
2. P L Ballaney , “Thermal Engineering”. Khanna Publications, Delhi.
3. R K Rajput , “Thermal Engineering”, Laxmi Publication ltd. New Delhi.
4. Dr. R. K. Bansal, “Fluid Mechanics and Hydraulic M/c”, Laxmi publication Ltd. New Delhi.
5. Dr. Jagdish Lal, “Hydraulic Machine”. Metro politan book co. pvt Ltd. Delhi
6. Dr Modi seth, “Hydraulics & Fluid Machine”. Standard book house Delhi.
7. R. Yadav “Steam & Gas turbine”, Central Publications, Allahbad.
8. J. K. Jain “Gas Turbine Theory & Jet Populsion”, Khanna Publications, New Delhi.
9. Cohen, Roger “Gas Turbine theory”, Longman Publications.
10. Gopalkrishnan “A Treatise on Turbomachines”, Scitech Pub. (India)pvt.Ltd,Chennai
11. Kadambi V. & Prasrd M, “Turbo Machinery”, New Age International Publication New Delhi.

Lab: - Course Outline

Turbo Machinery **Turbo M/C Lab**

Course Title Short title Course code

Branch: - Mechanical Engineering

Course Description:-

This lab includes different practical of Turbo Machinery. The Course aims at imparting knowledge of Turbo Machinery.

Teaching Scheme:-

	Hours per week	No. of weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Evaluation Scheme:-

Internal Continuous Assessment (ICA) 25 Marks

End Semester exam (ESE) (ORAL) 25 Marks

Prerequisite Course (S) :- Mathematics (Calculus) at first year level and Engineering Thermodynamics, Applied Thermodynamics and Fluid Mechanics at Second Year Level.

Outline of Content:- This Course Contains:

1. Study of steam turbine power plant.
2. Study of steam turbine systems.
    a) Methods of compounding
    b) Methods of governing
    c) Losses in steam turbine
    d) Lubrication system.
3. Trial on steam turbine.
4. Study of gas turbines.
5. Study of hydraulic turbines.
6. Trial on pelton wheel.
7. Trial on Francis turbine.
8. Trial on Kaplan turbine.
9. Trial on gas turbine plant.
10. Study of various jet propulsion devices / engine.
11. Visit to hydraulic power plant.

Note: Lab file should contain at list EIGHT experiments from above mentioned list.

ESE (Oral Examination)

The Oral Examination will comprise of viva on the above Eight Experiments.

Course Outline

Project and Business Management	**PBM**	
Course Title	Short title	Course Code
Branch: Mechanical Engineering	**Year**	**Third Year**

Course Description: This course introduces undergraduate students to imparting knowledge of project & business management. The background required a sound knowledge of network technique, organization structure, Financial and material management.

Course Objectives

1. To provide about project and its management.
2. To develop knowledge about organization and impart knowledge about functioning of management.
3. To develop knowledge about financial management techniques.

Course Outcome

At the end of the course the students are able to-

1. Develop knowledge of project management and statistical tools used in its.
2. Helped to understand the various functions of management along with its types.
3. Develop knowledge about Capital cost and cost control.

Teaching Scheme

	Hrs per week	No. of weeks	Total hour	Semester Credits
Lecture	03	14	40	03

Examination Scheme:

End semester scheme(ESE)	**80 marks**	**Duration : 03 Hrs.**
Internal Sessional Examination (ISE)	**20 marks**	

Purpose of Course: Degree Requirement

Prerequisite Courses: Fundamental knowledge about the mathematics.

Outline of the content: This course contains:

Unit- I

1.	Title: **Project Management** **No. of Lecture:08 ,Marks: 16**	
	a	Introduction to project management, Concept of project management, Managerial function at different organizational levels, Types of projects,
	b	Project identification, scheduling, Monitoring, Control, Basic tool & techniques for projects scheduling Bar chart, Project life cycle curves, Line balancing, Problems on Line balancing.

Unit- II

2.	Title: **Project statistic technique** **No. of Lecture:08 ,Marks: 16**	
	a	Introduction of Network technique, Fundamental concept and network models, construction of network diagrams,
	b	Application of network analysis, definition of PERT and CPM, comparison between CPM and PERT, Critical path method with problem, programme evaluation and review techniques with problem, time cost problem (crash) with PERT.

Unit- III

3	**Business management** **No. of Lecture:08 ,Marks: 16**	
	a	Introduction to management, Concept of management, The function of management, importance of management Forms of business organsation, Concept of Ownership Organization, Types of ownership, Individual Ownership, Partnership organization, joint stock companies, types of stock companies,
	b	Co-operative Organisations, various types of co-operative societies, Public sector organization,State ownership, public cooperation, choice of form of organisation, comparative evaluation of different forms of business ownership.

Unit- IV

4.	Title: **Financial Management** **No. of Lecture:08 ,Marks: 16**	
	a	Introduction, Definition of financial management, functions of financial management, Sources of Funds, Capital, classification of capital, working capital, need for working capital, assessment of working capital, Factors affecting working capital, Sources of finance (Shares, debentures, loans from banks, trade credit public deposits financial institutions).
	b	Cost and cost control: Elements of cost, direct cost, indirect cost, variable and fixed cost, cost control technique, marginal costing, break even analysis.

Unit- V

5	Title: **Material & Purchase Management** **No. of Lecture:08 ,Marks: 16**	
	a	Scope of material management, function of material management, objectives of scientific purchasing, functions of purchase department, , 5R's Of Buying, Methods of buying, source selection (vendor),vendor rating, just in time purchasing
	b	Inventory management, Objective of inventory management, types of inventory, selective inventory technique (ABC,VED), Inventory model (Economic lot size with fixed price, EOQ with quantity discount).

References:

1) L.C.Jhamb ,"Production(Operation)Management", Everest publishing house
2) Chary," Theory And Problems in Production and Operations Management",2nd Reprint, Tata McGraw Hill Publishing Co. New Delhi., 1996.
3) Nair,N.G.,"Production & Operations Management",Tata McGraw Hill Publishing Co. New Delhi.,1997.
4) Chadra Presanna,"Fundamentals of Financial Management" Tata McGraw Hill New Delhi.,1994.
5) Kolter Philip,"Marketing Management",Prentice-hall of India,1988.
6) Vyuptakesh Sharan.,"Fundamental of Financial Management", Pearson Education
7) Martand telsang,"industiral engineering and production management",1st Edition reprint 2013- S.chand & company ltd. New Delhi.2013
8) S.M.Inamdar, "Cost and Management Acounting"
9) M.K.Khan &P.K.Jain,"Financial Management", Tata McGraw Hill Publishing Co. New Delhi.
10) J.P.Bose, S.Talukdar, "Business Management", New Central Agencies (P) Ltd.

Lab - Course Outline

COMPUTER PROGRAMMING IN C / C++ **C/C++**

Course Title	Short title	Course code

Branch - Mechanical / Automobile Engineering **Year – Third Year**

Course Description:

This course provides students with a comprehensive study of the C /C++ programming language. Introduction to program design and problem solving using the C /C++ programming language. Programming topics include control structures, functions, arrays, pointers, and file I/O.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Prerequisite Course(s): Algebra and Trigonometry

Outline of Content: This course contains

a) One assignment on introduction to computer

b) To develop and Run "C/C++" programs for machine elements like

(Any two on C and two on C++)

a) Design of knuckle joint or turnbuckle joint

b) Design of power screw

c) Design of helical spring

d) Design of splines

e) Design of muff coupling

f) Theories of failure etc.

Recommended Books:

1) Balgurusamy, "Programming in C" Tata McGraw Hill Publication Co. Ltd.

2) Y. Kanitkar, “Let us C” BPB Publications.

3) M. P. Grover and Zimmer, “CAD/CAM” PHI Pvt. Ltd.

4) Shigley J.E. and Mischke C.R. “Mechanical Engineering Design” McGraw Hill Publication Co. Ltd.

5) Spotts M.F. and Shoup T.E. “Design of Machine Elements” Prentice Hall International.

6) Bhandari V.B. “Design of Machine Elements” Tata McGraw Hill Publication Co. Ltd.

7) Balgurusamy, “Object Oriented Programming with C++” Tata McGraw Hill, New Delhi

8) Ravi Chandran, “Programming in C++” Tata McGraw Hill Publication Co. Ltd.

COURSE CONTENT

Minor Project	**MIP**	
Course Title	Short Title	Course Code

Semester-VI

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	10	20	2

Examination Scheme **Internal Continuous Assessment (ICA): 50 Marks**

- Every student shall undertake the Minor Project in semester VI.
- Each student shall work on an approved project, a group of **05 students (maximum)** shall be allotted for the each minor project.
- Minor project may involve fabrication, design or investigation of a technical problem that may take design, experimental or analytical character or combine element of these areas. The project work shall involve sufficient work so that students get acquainted with different aspects of fabrication, design or analysis.
- Each student is required to maintain separate log book for documenting various activities of minor project.
- The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of minor project. Maximum four minor project groups shall be assigned to one teaching staff.
- Assessment of the project for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given in **Table-A.**
- Before the end of semester, student shall deliver a seminar and submit the seminar report (paper bound copy)in following format:
    - Size of report shall be of minimum 25 pages.
    - Student should preferably refer minimum five reference books / magazines/standard research papers.

- Format of report
  - Introduction.
  - Literature survey.
  - Theory (Implementation, Methodology, Applications, Advantages, Disadvantages. etc)
  - Future scope.
  - Conclusion.

Assessment of Minor Project

Name of the Project: ______________________________

Name of the Guide: ______________________________

Table-A

SN	Exam Seat No	Name of Student	Project Selection	Documentation	Design /Simulation/Logic	PCB/hardware/programming	Result Verification	Presentation	Total
			5	10	10	10	10	5	50

COURSE CONTENT

Seminar-I	**S-I**	
Course Title	Short Title	Course Code

Semester-VI

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	10	20	2

Examination Scheme **Internal Continuous Assessment (ICA): 25 Marks**

1. For Seminar-I every student will individually study a topic assigned to him / her and submit a report and shall deliver a short lecture / Seminar on the topic during the term.
2. The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of Seminar-I. Seminar shall be related state of the art topic of his choice approved by the committee.
3. Seminar topic should not be repeated and registration of the same shall be done on first come first serve basis.
4. Topic of Seminar shall be registered within a two week from commencement of VI Semester and shall be approved by the committee.
5. Maximum six seminar supervision shall be allotted to each teacher.
6. Before the end of semester, student shall deliver a seminar and submit the seminar report (paper bound copy).

ASSESSMENT OF SEMINAR-I

Assessment of the Seminar-I for award of ICA marks shall be done by the guide and a departmental committee jointly, as per the guidelines given in **Table- B**

Title of Seminar: ____

Name of Guide: ____

Table-B

SN	Exam Seat No	Name of Student	Topic Selection	literature survey	Report writing	Depth of understanding	Presentation	Total
			5	5	5	5	5	25

Syllabus of 3rd Year B. Tech.
Chemical Engineering
w.e.f. 2016-17

Third Year B. Tech. (Chemical Engineering) Revised Syllabus w.e.f. 2016-17							
Course Code	**Title of Course**	**Teaching Hours**	**Tutorial**	**Credits**	**Practical Hours**	**Credits**	**Total Credits**
Fifth Sem.							
HML-301	Industrial Management and Economics	03		03	-	-	03
CHC-301	Mass Transfer-I	04		04	03	1.5	5.5
CHC-302	Instrumentation & Instrumental Analysis	04		04	02	1	5
CHC-303	Chemical Reaction Engg.-I	04		04	03	1.5	5.5
HML-302	Managerial Behavior : Psychosocial Dimensions	03		03	-	-	03
ELECTIVE	Elective-I	04		04	-	-	04
Total		**22**	**-**	**22**	**08**	**4**	**26**
	Sixth Sem						
CHC-304	Mathematical Methods in Chemical Engg.	3		3	-	-	3
CHC-305	Chemical Reaction Engg.-II	04		04	03	1.5	5.5
CHC-306	Mass Transfer-II	04		04	03	1.5	5.5
CHC-307	Process Equipment Design & Drawing	03		03	02	1	4
ELECTI	Elective-II	04		04	-	-	4

VE							
ELECTI VE	Elective-III	04		04	-	-	4
Total		**22**	**-**	**22**	**08**	**04**	**26**

SEMESTER- V

Department : Department of Chemical Engineering
Course code : HML-301
Course Title : Industrial Management and Economics (TH)
Course Type : Theory
Total Hrs : 03
Course credit : 03

Objective

Upon successful completion of this course the student will be able to:

1. Identification and selection of management & administration with aspect towards the Production planning and management Quality control and maintenance. Processes/operations according to job requirement in various departments.
2. Identification, selection and understanding of Financial Management capital structure Sources of Industrial finance including institutional feature inside the organisation as well as outside the organisation.
3. Understanding Cost Analysis Cost statement and sheet Cost control and various type of approach of the Industrial relation Quality management techniques Entrepreneurship Development Management information
4. Identification, understanding Micro and Macro economics Demand and Supply factors of market economy Functions of money w.r.t. organisation

Course Content:

Unit-I

Introduction meaning management & administration Functions of Management Planning and ,Organising staffing c monitoring and leading co-ordinating & communication tool Functional of management Production Material Finance personnel Marketing Management concept of productivity wages .Production planning and management Quality control and maintenance.

Unit-II

Types of management Different approaches of management Functional areas of management Forms of business organisation production management work study productivity measurement material management Inventory analysis Financial Management capital structure Sources of Industrial finance including institutional feature.

Unit-III

Marketing management consumer satisfaction sales and advertising Marketing Research personnel management Industrial relation Quality management techniques Entrepreneurship Development Management information system Information technology In Management Cost Analysis Cost statement and sheet Cost control , Cost projection.

Unit-IV

Nature and significance of Economics Basic problem in Economics Introduction of Micro and Macro economics Demand and Supply factors of market economy Functions of money Banking types and Functions

Unit-V

Indian Economy Liberalisation privatisation and Globalisation Mixed Economy Public Sector Reforms National income determinants Economic planning nature and Entrepreneurship small scale Industries and SSI.

References:

1) Modern Economics by H.L.Ahuja.

2) Modern economics theory by K.K.Dewett.

3) Monitory economics by M.L.Seth.

4) Industrial Management by I.K. Chopde, A.M. Sheikh.

5). Business Organisation and Management by S.A. Sherlekar.

6) Marketing Management by Philip Kotler

Outcomes:

Upon successful completion of this course the student will be able to:

1. Identification and selection of management & production management work study productivity with aspect towards the material management &Inventory analysis Production planning Quality control and maintenance. Processes/operations according to job requirement in various departments in organisation.

2. Identification, selection and understanding the meaning and utility of Marketing management, consumer satisfaction, sales and advertising Marketing Research personnel management features of the organisation.

3. Understand the importance of Cost Analysis Cost statement and sheet Cost control and various type of approach of the Industrial relation Quality management techniques Entrepreneurship Development Management information system

4. Identification, understanding Micro and Macro economics Demand and Supply factors of market economy National income determinants Economic planning nature and Entrepreneurship Functions of money w.r.t. organisation

5. Identification, selection and understanding according to requirement in

Different organisation Financial Management, capital structure Sources of Industrial finance including institutional feature. Understanding of the working principle of Entrepreneurship Development and S.S.I.

Department	**: Department of Chemical Engineering**
Course code	**: CHC-301**
Course Title	**: Mass Transfer-I (TH)**
Course Type	**: Theory**
Total Hrs	**: 04**
Course credit	**: 04**

Objective:

At the end of the course student will understand the basic fundamental of mass transfer operations carried out in chemical industries, design of plate and packed column used for mass transfer operations, drying operation and fundamental of cooling tower.

Course Content:

Unit-I **(10hrs)**

Diffusion (Gas)

Introduction to Mass Transfer Operation:

Principles of diffusion, steady and unsteady state Operation, Fick's law, diffusion in binary mixture, equimolecular counter diffusion, diffusivities in liquid, vapor and gases, mass transfer through stationary gas, mass transfer velocities, gas phase mass transfer cases, thermal diffusion, Maxwell law, Diffusion in solids, individual and overall mass transfer coefficients concept.

Unit-II **(10hrs)**

Diffusion (Liquid)

Mass transfer across phase boundary, penetration theory, two film theory, surface renewal theories, film- penetration theory of mass transfer, mass transfer coefficients & correlation, counter current mass transfer and transfer units, Mass transfer and chemical reaction, simultaneous mass and heat transfer, diffusion in solids, types of solid diffusion.

Unit-III **(10hrs)**

Absorption

Mechanism of absorption, and application of mass transfer theories, choice of solvent for absorption, rate of absorption & material balance over absorption tower-counter current and concurrent flow, minimum gas-liquid ratio for absorber. Transfer coefficients in wetted wall column, packed and spray towers. The absorption with & without chemical reaction, Brief Introduction to Desorption or stripping.

Unit-IV **(10hrs)**

Equipments for Gas-liquid Operation:

Mechanically agitated vessels of single phase liquid and gas-liquid contacts.

Packed towers: General construction & working, types of packing merits & demerits, operational difficulties, pressure drop & limiting G-L flow rates, heat liberation & temp. Variation in packed towers. Determination of height of columns, transfer units, capacity.

Plate towers: General characteristics, General construction & working, types of plate, merits and demerits, operational difficulties.

Unit-V **(10hrs)**

Humidification & Drying

Humidification: Principle, humidification terms and charts, adiabatic saturation temperature, wet bulb temperature humidification & dehumidification methods, design procedures and selection criteria along with mass transfer calculations. Types of cooling towers, cooling tower operational characteristics.

Drying: Principle, Rate of drying, constant rate and falling rate periods, equilibrium moisture contents, drying equipments, rotary dryers, drum dryers, vacuum dryers, Spray dryer, fluidized bed dryers, dryer calculations and dryer selection criteria.

References:

1. Treybal R.E. “Mass Transfer Operations” McGraw Hill Book Co., New York 1980
2. McCabe W.L. and Smith J.C. & Harriot, “Unit Operations of Chemical Engineering”, McGraw Hill Book Co., New York 1980
3. Principles of Unit Operations: Foust A.S.
4. Coulson J.M. and Richardson J.F., “Chemical Engineering Vol. I, II & III”, Pergamon Press, New York 1977
5. Unit Operation: Mc Cetta Vol. I
6. Badger W.L. and Banchero J.T., “Introduction to Chemical Engineering”, Tata McGraw Hill Book Co.
7. Chattopadyay P., “Unit Operations of Chemical Engineering”, Vol. 1 & 2, Khanna Publishers, New Delhi.

Course Outcomes:

1. Students will learn about the fundamentals of diffusional mass transfer in solids and fluids.
2. Student will understand the application of mass transfer theories in various unit operations.
3. Student will understand the mechanism and operation of absorption/stripping column.
4. Students will gain the knowledge about the equipments/columns used in various unit operation eg. Absorption, drying, humidification etc.
5. Student will understand Operation of Dryer and cooling tower.

Department	**: Department of Chemical Engineering**
Course code	**: CHC-301**
Course Title	**: Mass Transfer-I (PR)**
Course Type	**: Practical**
Total Hrs	**: 03**
Course credit	**: 1.5**

Objective:

To enhance the knowledge and clear the theoretical concepts in the subject by performing the hands on experiments in the laboratory for detail understanding of the topic.

Course Content:

List of Experiments:

1. Determination of vapour diffusivity
2. Study of Liquid –liquid diffusion through porous pot.
3. Solid -liquid diffusion.
4. Solid-air diffusion
5. Absorption with/ without chemical reaction.
6. Batch drying.
7. Tray dryer.
8. Fluidised bed tower.
9. Humidification study/ Cooling tower.
10. Wetted wall column.

(Minimum 8 experiments).

Outcomes:

Student will be able to solve basic piratical calculations of mass transfer operation.

Student will be able to design Absorption column, dryers, and cooling tower.

Department	**: Department of Chemical Engineering**
Course code	**: CHC-302**
Course Title	**: Instrumentation & Instrumental Analysis (TH)**
Course Type	**: Theory**
Total Hrs	**: 04**
Course credit	**: 04**

Course Objectives:

To impart the thorough knowledge about analysis, measurements of various parameters along with the advance controlled systems in chemical engineering and how to use them on the field in professional life. To make the student to be able to understand and solve the problems in measurement and controlled systems by using standard methods.

Course Content:

Unit-I **(10hrs)**

Measuring instruments:

Elements of measuring instruments

Static and dynamic characteristics of measuring instruments

Dynamic characteristics of 1^{st} order and 2^{nd} order tyope measuring instruments.

Unit-II **(10hrs)**

Temperature Measurements: -

Expansion thermometers

Thermocouples, Thermistors, R.T.D

Radiation based temperature-measuring instruments.

Unit-III **(10hrs)**

Manometers

Measuring elements for gauge pressure and vacuum

Indicating elements for pressure and vacuum gauges

Measurement of absolute pressure etc.

Unit-IV **(10hrs)**

Measurement of Head and Level

Direct and indirect methods: float type, bubbler systems, air purge method

Measurement of Chemical Composition:

Spectroscopic analysis: Absorption spectroscopy. Emission spectroscopy, mass spectroscopy, x-ray diffraction, colour, measurement by spectrometers.

Unit-V **(10hrs)**

Other special methods of analysis including:

Heat of combustion method , Chemical methods for analysis of hydrogen sulfide, carbon dioxide etc., Magnetic susceptibility method, Polarizing cell method, Dilatometer, Interferometer

Introduction to single loop control.

Feed back control system.: Concept of FBC , Block diagram development, Classical FBC controller.

Feed back control design: Preliminary considerations choice of sensors, Transmitters, and final control element,

Introduction to more advanced control system :-

Feed forward, cascade, Augmented feed forward control, ratio control, override controllers, spit range, Auctioneering control. Introduction to digital control system

References:

1. Industrial instrumentation : Eckman, Donald P.

2. Instrumentation devices & Systems: Rangan C. S., Sarma G.R.

3. Principle of Industrial instrumentation: Patranbis d.

4. Process control and instrumentation :vyas R.P.

5. Process Systems Analysis and control :Donald R. Couighanowr.

6. Process Dyanamics modeling and control by Harmon Ray.

Course Outcomes:

a) To get the students well acquainted with basic principles of operation, static and dynamic characteristics of various pressure and temperature measuring instruments.

b) To get the students well acquainted with basic principles of operation, static and dynamic characteristics of various level & chemical composition measuring instruments.

c) To enhance the knowledge of students about various spectroscopic and chromatographic techniques for analysis.

d) The get the students well acquainted with basic knowledge of various sensors, controllers and their application in the control systems, advance control systems.

e) To enhance the ability of students to identify and solve various engineering problems in control systems during operation.

Department	**: Department of Chemical Engineering**
Course code	**: CHC-302**
Course Title	**: Instrumentation & Instrumental Analysis (PR)**
Course Type	**: Practical**
Total Hrs	**: 02**
Course credit	**: 01**

Objective:

To enhance the knowledge and clear the theoretical concepts in the subject by performing the hands on experiments in the laboratory for detail understanding of the topic.

Course Content:

List of Experiments:

1. Study of bimetallic thermometers, Thermocouples, Thermistors, R.T.D, manometer,
2. To study the dynamic characteristics of 1st order system.
3. To study the dynamic characteristics 2nd order system.
4. To study of different pressure gauges.
5. To study control valve characteristics

Outcome:

Student will be able to explain working principle of bimetallic thermometer, Thermocouples, Thermistors, R.T.D and manometer

Student will be able to explain the basics of control valve characteristics.

Department	**: Department of Chemical Engineering**
Course code	**: CHC-303**
Course Title	**: Chemical Reaction Engineering-I (TH)**
Course Type	**: Theory**
Total Hrs	**: 04**
Course credit	**: 04**

Course Objectives:

To impart the thorough knowledge about examining the reaction rate data using various techniques to determine rate laws, and to use them to design chemical reactors.

Course Content:

Unit- I **(10hrs)**

Review of chemical reaction equilibrium, Temperature Dependent term of a rate equation: from Arrhenius classification of chemical reaction, homogeneous & heterogeneous systems, rates of reaction, order of reaction, and rate constant. Theories of reaction rate. Development of kinetics based reaction mechanism, determination of frequency factor & energy of activation.

Unit- II **(10hrs)**

Collection and interpretation of kinetic data using integral , differential half life etc., technique for constant & variable volume reactor , use of linear & nonlinear least square technique . Techniques for determination of kinetics of fast ractions.

Unit- III **(10hrs)**

Ideal reactions: Concept of ideality, Development of design expression for batch, tubular and stirred tank reactors. Combined reactor system, comparison between mixed and plug flow reactor advantages and limitation in application. Series and parallel combination of PFR & CSTR , Reactor set up for autocatalytic reactor .

Unit- IV **(10hrs)**

Thermal characteristics of rectors: Isothermal, adiabatic and non adiabatic conditions.

Principles of reactor stability and optimization: Multiple study state in CSTR.

Simplified objective functions. Kinetics & reactor design foe series, parallel, and complex reaction.

Unit- V **(10hrs)**

Residence time distribution: Residence time function and relation amongst their application to ideal reactors. The modeling of real systems. Non-ideality parameters, prediction of reactor performance. Concept of micro and macro mixing.

References:

1. Chemical Reaction Engineering : Leaven Spiel O
2. Chemical Reaction Engineering: : Fogler
3. Principles of Reaction Engineering : S.D. Dawande

Course Outcome:

a) To enhance the ability of students to understand the classification of reactions, effects of various parameters on rate of reactions with different reaction rate theories.

b) To get the students well acquainted with collection and analysis of rate data using integral, differential, half-life method of analysis of rate data. To understand the kinetics of fast reactions.

c) To enhance the knowledge of students about ideal reactors, autocatalytic reactor, various parameters affecting the reactor performance, combine reaction system and comparison of various reactors.

d) The get the students well acquainted with thermal characteristics of reactors, residence time distribution and modelling of real systems.

e) To enhance the ability of students to identify and solve various engineering problems during product optimization.

Department	**: Department of Chemical Engineering**
Course code	**: CHC-303**
Course Title	**: Chemical Reaction Engineering-I (PR)**
Course Type	**: Practical**
Total Hrs	**: 03**
Course credit	**: 1.5**

Objective:

To impart the thorough knowledge about examining the reaction rate data using various techniques to determine rate laws, and to use them to design chemical reactors.

Course Content:

Experiments based on chemical reaction engg. Such as Study of kinetics reaction, Residence time distribution, Study of various reactors (Batch reactor, PFR , CSTR ,)
Minimum eight experiments based on theory

Course Outcome:

To enhance the knowledge and clear the theoretical concepts in the subject by performing the hands on experiments in the laboratory for detail understanding of the topic.

Department : Department of Chemical Engineering
Course code : HML-302
Course Title : Managerial Behaviour and Psychosocial Dimension (TH)
Course Type : Theory
Total Hrs : 03
Course credit : 03

Course Objectives:

This subject aims at developing students with the required commitment and competencies for working towards the objectives within an organizational framework in order to improve both individual and organizational performance.

Course Content:

Unit- I

Psychosocial dimension of work in organisation Introduction and background

Unit- II

Approaches in Organisational analysis Organisational behaviour approach

Unit- III

Early practises in Management Theories of Organisation Organisational process and Function The structural variables context. Environment of work organisation Socio-cultural Environment Its impact on Organisation Social dimension of organisational and Behaviour Formal and Informal organisation Group Dynamics and terms

Unit- IV

Motivational Process and Theories Communication Technology and Interpersonnel process Leadership process and style. and T.Q.M.

Unit- V

Decision making behaviour, Decision making techniques creativity.

References:

1) Psychosocial Dimensions for management by T.V.Rao

2) Appraising and Developing Managerial Performance Management and Organisational Behaviour by Laurie J. Mullins

3) Managerial Behaviour and Effectiveness by E Ananda Raja, N R V Prabhu, P Kameshwara Rao

4) Managerial Behaviour by O.P. Khanna

Course Outcome:

1) It emphasis on understanding of the issues, problems and practice of managing, working and organising across cultures in organisations.

2) It develops the understanding of psychosocial dimensions in people of organization to sustain relationship.

3) It contributes in developing interpersonal behaviours.

4) The subjects helps students to learn organizational whesiveness, pursuing goal and understand behaviour.

Department	**: Department of Chemical Engineering**
Course code	**: Elective-I PTL-308**
Course Title	**: Specialty Pigments and Additives in Coatings (Th)**
Course Type	**: Theory**
Total Hrs/week	**: 04**
Course credit	**: 4**

Course Content:

Unit -I Metallic, Interference and Cholesteric Pigments **(10 hrs)**

Aluminium, copper, zinc dust, bronze, nickel stainless steel, lead powders and pastes,

Nacreous, luminescent (fluoresecent/phosphorescent) pigments-optical principles, substrate free pearlescent pigments, Special effect pigments based on mica (pigments formed by coating of substrates), pigments based on liquid crystal polymer

Unit -II Functional and Nano pigments **(10 hrs)**

Antifouling pigments-cuprous oxide, other copper compounds, mercuric oxide, barium metaborate, organotin pigments,

Manufacture and properties of nanopigments: alumina, silica, titanium dioxide, iron oxides, zinc oxides, silver, $CaCO_3$, etc. on Nano scale; Bimodally porous nanoparticles (e.g. titanium tetraisopropexide), variables affecting particle size aggregation and crystal structure. Their use as spacing extenders / functional pigments in paints, reinforcing agent in polymers, heat & wear resistant materials, etc.

Unit - III Surfactants **(10 hrs)**

Anionic, cationic, non-ionic and amphoteric surfactants; polymeric surfactants, Gemini surfactants, HLB value, CMC, Kraft point.

Role of surfactants as- emulsifier, wetting agents, dispersing agents.

Unit - IV **(10 hrs)**

Mechanism, dosing and Trade information of coating additives: Antisettling agents, additives for rheology control, flow and levelling control agents, slip additives, adhesion promoters, antiskinning agents, light stabilizers (UV absorbers, antioxidants, HELS), moisture scavengers, hammer and wrinkle finish additives, conductivity control additives etc.

Unit - V **(10 hrs)**

Mechanism, dosing and Trade information of Additives for Water Borne Coating: - Auxiliary and coalescing solvents, neutralization agents, thickeners, flow and levelling control agents, antifoam, antifreeze-thaw, Preservatives (In- can/film)-fungicides, mildew agents, corrosion inhibitors etc.

Department	**: Department of Chemical Engineering**
Course code	**: Elective-I, PLL-308**
Course Title	**: Technology of Elastomers and Additives (TH)**
Course Type	**: Theory**
Total Hrs	**: 04**
Course credit	**: 04**

Course Objectives:

a. To provide knowledge on various additives used in polymer for various applications.
b. To understand about the natural rubber with its history from latex collection to processing of various types of natural rubber.
c. To dessiminate knowledge of various types of synthetic rubber in terms of synthesis, processing, properties and applications.
d. To understand the physical properties of elastomers in terms of vulcanization and testing parameters.

Course Content:

Unit-I **(10 hrs)**

Additives in plastics, types of stabilizing additives (antioxidants, light emitting stabilizers, metal deactivators, heat stabilizers, flame retardance etc.), selection and properties of stabilizing additives, function and level of addition examples, types of processing aids (lubricants, high polymer impact mixture processing aids, slip, antislip, antiblock, mould release agent), their function and level of addition.

Unit-II **(10 hrs)**

Types of fillers and reinforcement, choice of fillers and properties theory of plasticizers, types of plasticizers, reinforcement of plasticizers, function of blowing agent and examples, pigments and dies.

Section-B

Unit-III **(10 hrs)**

Sources and history of natural and synthetic rubber, natural rubber vs. synthetic rubber, significance of structure of natural rubber. Production of different grades of natural rubber from latex and its classification, mastication, compounding and processing of natural rubber synthetic rubbers, compounding ingredients and method of compounding.

Unit-IV **(10 hrs)**

Manufacturing processes, properties and application of elastomers based on butadiene and its copolymers, acrylonitrile, butyl, ethylenepropylene, silicons, and polycholoprene Rubbers etc.

Unit-V **(10 hrs)**

Mechanism of reinforcement of rubbers, chemistry and technology of vulcanization, processing of rubbers, physical testing of rubbers. Industrial fabrication of rubber articles such as transmission belts, hoses, tyres, tubes, proofed fabrica, moulded goods etc.

Reference books

1) Chemistry and Technology of Rubber: Morton
2) Polymer Chemistry of Synthetic Elastomers Vol: I &II: Kennedy
3) Chemistry of Rubber: Mounten

Course Outcomes:

1. The Students will be able to understand the various application of additives for improvement in mechanical, chemical, physical and environmental properties of the product.
2. This course abreast the students with collection of latex, processing of latex and its characterization for classification of natural rubber.
3. The synthetic rubber and their synthesis, processing and properties are also known to the students at the end of the course

Department : **Department of Chemical Engineering**

Course code : **Elective-I, OTL-307**

Course Title : **Technological Advances in Perfumery and Cosmetics. (TH)**

Course Type : **Theory**

Total Hrs : **04**

Course credit : **04**

Course Objectives:

This course will cover the raw material and characterizations of different cosmetics and perfumery materials along with production. The perfume blending for different applications will also be studied.

Course Content:

Unit - I

General Chemistry of essential oils. Raw materials for essential oils, general methods of their manufacture. Different types of essential oil bearing materials.

Unit -II

Physical and Chemical characteristic of essential oils-colour, specific gravity, refractive index, optical rotation, solubility, acid value and ester value. Analysis of essential oils for free alcohols, aldehyde and ketones. Grading and standardization of essential oils, common adulterants and their detection.

Unit- III

Production, properties and composition of important Indian Essential Oils viz Rose, jasmine, khus, sandalwood, keora, palmarosa, lemongrass, peppermint, lemon, clove oil, orange oil, eucalyptus oil, etc.

Unit- IV

The history of perfumery, Perfumery and its function, the mechanism of smelling, classification of perfume ingredients. Blending of perfumes. Important isolates, synthetic perfumery materials and fixatives e.g. menthol, camphor, thymol, citral, geraniol, terpin oil, vanillin, cumarin, musk, benzyl acetate, benzyl benzoate etc.

Unit -V:

Production techniques, functions of ingredients and desirable characteristics of cosmetic products like: Face creams, Face powders, Talcum powders, Hair oil & dyes, Shampoos, Tooth pastes & powders, Shaving creams, Lipsticks, Nail polishes, Depilatories, etc

Course Outcome:

1. Describe the general chemistry of essential oils including the different types of essential oil bearing materials and the method of their manufacture.
2. Understand the principles behind the physical and chemical analytical techniques associated with essential oils.
3. Understand the principles and current practices of production of essential oils.
4. Explain the concepts of perfumery, blending of perfumes and outline the use of synthetic perfumery materials.
5. Describe the production techniques and functions of ingredients in cosmetic products.
6. Use the knowledge acquired from the course for set-up of small and medium scale industries.

Department	**: Department of Chemical Engineering**
Course code	**: Elective-I, FTL-306**
Course Title	**: Advanced Technology in Food Packaging (Elective-I)**
Course Type	**: Theory**
Total Hrs	**: 04**
Course credit	**: 04**

Course Objectives:

1. To study basic packaging materials and their types and functions .
2. To study various packaging systems used for food products.
3. Estimation of shelf life of packaged products.
4. To acquire knowledge of recent trends in food packaging.
5. To acquire knowledge of sealing and lamination techniques.

Course Content:

Unit -I **(10 hrs)**

Principle of food packaging, types and functions of packaging materials, filling and sealing of metallic, glass and plastic containers.

Unit- II **(10 hrs)**

Flexible packaging laminated packaging and retortable pouches, concept and determination of ERH, calculation of shelf life and requirement for packaging. Testing of packaging materials.

Unit- III **(10 hrs)**

Active packaging system: - Packaging requirement for different moisture level food products, Aseptic packaging of fruits & veg. milk and milk products, high barrier plastic

Unit- IV **(10 hrs)**

Product- Package compatibility: - Packaging of microwavable food, MAP of fresh fruit and veg. vacuum and MAP of meat and meat products. Packaging of breakfast cereals, bakery and confectionary products

Unit -V **(10 hrs)**

Packaging requirement for soft drink, alcoholic beverages, distilled spirits fermented food, frozen food, future trends in food packaging.

Books Recommended:

1. Handbook of food packaging edited by F. A Paine and H.Y paine.
2. Modern processing and distribution system for food edited by F. A Paine.
3. Chemical engg. Thermodynamics by Daubert.
4. Chemistry of Food Packaging by Swalam C.M., American Chemical Society, Washington D. C. 1974.
5. Packaging by Neubaner R.G. Van Nostrand Co. New York.
6. Food Packaging Principles and Practice : Gordon L. Robertson

Course Outcomes:

Students learnt following regarding the food packaging:

1. Students learnt basics of food packaging materials, systems and packaging types and functions.
2. Students learnt Flexible packaging, Active packaging system, Aseptic packaging, MAP (fruits and vegetables, meat and poultry),vacuum packaging, smart packaging and sensors for various food products.
3. Students learnt estimation of Shelf life of packaged products
4. Students learnt Packaging of microwavable food, soft drink, alcoholic beverages, frozen food.
5. Students are able to learn sealing and lamination techniques.

SEMESTER- VI

Department	**: Department of Chemical Engineering**
Course code	**: CHC-304**
Course Title	**: Mathematical Methods in Chemical Engineering (TH)**
Course Type	**: Theory**
Total Hrs/ Week	**: 04**
Course credit	**: 04**

Objective

To make the students to apply mathematical techniques for solving set of various types of equations come across during learning of various chemical engineering courses.

Course Content:

Unit- I **(10hrs)**

Matrices properties & classification, eigen value, eigen vector, Hanilton – Caley theorem, Sylvester's formula, determination of A^{-1} (3X3) & (4X4) matrix & Root finding method – Transcendental equation:- 1) Bisection method, 2) Netwon Rapson method, 3) Mullers method, 4) Intention method (method of successive Approximation), 5) Regula falsi method.

Unit- II **(10hrs)**

Solution of simultaneous Linear equation using elimination methods

1) Gausses Jorden method, 2) Gausses elimination method

3) Gauss- Seidal method, 4) Matrix inversion method

5) Relaxation method 5) Augmented matrix method

Unit- III **(10hrs)**

Solution of ordinary differential equation

1) Taylor series method, 2) Piccards method, 3) Euler's method, 4) Euler's modified method, 5) Ranga Kutta method, 6) Ranga Kutta (Forth order) method.

[10 hrs]

Unit- IV **(10hrs)**

Numerical differentiation

1) Newton forward differential formula

2) Newton Backward differential Formula

3) 3) Differentiation at a non- tabular value near the beginning or near the end

4) Central differential formula

a. Bessels formula

b. Starlings formula

5) Dividend different formula & Numerical integration

a. Trapezodial Rule, b. Simpson's 1/3 rule

c. Simson's 3/5 rule d. Weddle's Rule

Numerical based on acted integrated & actual applying the rules

Unit- V **(10hrs)**

Optimisation

A) Mathematical Technique essential for optimization such as linear programming using

1. Graphical method, 2. Trial & Error Method

3. Simplex method,

a. Primary technique, b. Duel Technique

B) Application to equipment

1. Reactor system (Temp optimization in a catalytic reactor)
2. Kinetics of complex retion
3. Distillation (Optimisation of Reflux ratio for a binary distillation column)
4. Dryer Rotary (Optimisation of Dimensions)
5. Optimum of dimensions & outlet temp. of air preheater
6. Optimum design of a packed absorber

Outcomes

Ability to develop and convert chemical engineering problem in terms of mathematical equation and to solve those series of equations using various mathematical techniques.

To learn about optimization techniques for optimization of various parameters of unit operations and processes.

Department	**: Department of Chemical Engineering**
Course code	**: CHC-305**
Course Title	**: Chemical Reaction Engineering-II (TH)**
Course Type	**: Theory**
Total Hrs/ Week	**: 04**
Course credit	**: 04**

Course Objectives:

To impart the thorough knowledge about heterogeneous reacting systems and its design, fluid-fluid reactions, catalysis, solid-catalyzed reactions and design of heterogeneous catalytic reactor.

Course Content:

Unit- I **(10hrs)**

Heterogeneous reacting systems. Rate equations for heterogeneous reactions containing pattern for two phase system.

Fluid-particle reaction, selection of model, unreacted core model for particles of unchanging size, rate of reaction for shrinking spherical particles, determination of the rate controlling steps. Application to design ; particle single size, plug flow solids, uniform gas composition, mixed flow of particles of single unchanging size, mixed flow of size mixture of particle entrainment of solid fines. Instantaneous reaction.

Unit- II **(10hrs)**

Fluid- Fluid Reaction: Rate equation for instantaneous fast, intermediate and for slow reaction, slurry reaction kinetics, Rate equation for infinitely slow reaction, film conversion parameter, Aerobic fermentations, application to design – towers for fast, slow reactions. Mixer settlers, semi-batch contacting patterns, Reactive distillation and extractive reactions.

Unit- III **(10hrs)**

Catalysis:

Concept of catalyst selection, classification and characteristics of catalyst, preparation of a catalyst and its deactivation, poisoning of catalyst and regeneration. Adsorption and its classification, different types of isotherms determination of catalyst surface area By BET method.

Unit- IV **(10hrs)**

Solid-catalyzed reaction:

Rate equations, diffusion within porous catalyst, experimental methods for finding rates, product distribution in multiple reactions.

Application to design staged adiabatic, packed bed reactors and fluidized bed reactors. Fluid-solid catalytic fixed-bed reactors.

Unit- V **(10hrs)**

Design of Heterogeneous catalytic reactors:

Fixed bed reactors, isothermal and adiabatic fixed bed reactor, non-isothermal, non-adiabatic fixed bed reactors, fluidized bed reactors, slurry reactors. Trickle-bed reactors.

Mechanical features, details of mass transfer , heat transfer, fluid flow across reactors. Design problems.

References:

1) O Levenspiel – Chemical Reaction Engineering
2) Dawande S.D.: Chemical Reaction Engineering
3) Fogler : Elements of Chemical Reaction Engineering
4) Smith J.M.: Chemical Engineering Kinetics, M

Course Outcome:

a) To enhance the ability of students to understand the heterogeneous reacting systems and its design, contacting patterns and effects of parameters on rate of reactions.
b) To get the students well acquainted with detail study of fluid-fluid reactions and the reactors for conducting the reactions. to understand the kinetics of slow reactions.
c) To enhance the knowledge of students about catalysis, catalyst activation, deactivation, poisoning of catalyst, determination of surface area by using isotherms.
d) The get the students well acquainted with solid-catalyzed reactions, experimental methods for finding rates, product distribution and heterogeneous catalytic reactors.
e) To enhance the ability of students to identify and solve various engineering problems during product optimization.

Department	**: Department of Chemical Engineering**
Course code	**: CHC-305**
Course Title	**: Chemical Reaction Engineering-II (PR)**
Course Type	**: Practical**
Total Hrs/ Week	**: 03**
Course credit	**: 1.5**

Objectives:

To impart the thorough knowledge about heterogeneous reacting systems and its design, fluid-fluid reactions, catalysis, solid-catalyzed reactions and design of heterogeneous catalytic reactor.

Course Content:

Practical's based on chemical reaction engg. Such as Study of kinetics reaction, Residence time distribution , Study of various reactors (Packed Bed, Fluidised Bed) Study of adsorption isotherm, Study of catalytic reactor, etc. Minimum eight expt. Based on theory

Course Outcome:

To enhance the knowledge and clear the theoretical concepts in the subject by performing the hands on experiments in the laboratory for detail understanding of the topic.

Department	**: Department of Chemical Engineering**
Course code	**: CHC-306**
Course Title	**: Mass Transfer-II (TH)**
Course Type	**: Theory**
Total Hrs/ Week	**: 04**
Course credit	**: 04**

Objective:

To understand the fundamental of Distillation, Liquid-liquid extraction, Solid-liquid operation, Crystallization and Adsorption.

Course Content:

Unit- I **(10hrs)**

Distillation

Vapour liquid equilibria, ideal and non-ideal systems, minimum and maximum boiling azeotropes, relative volatility, X-Y, T-X-Y, H-X-Y diagram, partial vaporisation / condensation, differential distillation and equilibrium distillation, steam, azeotropic and extractive distillation, vacuum distillation, steam distillation.

Fractionation, binary distillation, plate and packed columns for distillation,

Unit- II **(10hrs)**

Various graphical methods for estimation of number of stages in binary distillation column, Importance of reflux ratio, minimum reflux ratio, optimum reflux ratio. Murphree plate efficiency and overall plate efficiency. Effect of feed condition of ‘q’ line. Concept of HETP, HTU, NTU in distillation

Unit- III **(10hrs)**

Liquid-Liquid Extraction: Principle, selection of solvent for extraction, estimation of mass transfer coefficients, triangular diagram representation, Equipment for liquid-liquid extraction. (Mixer settler, Rotating Disc Contractor, Packed column, spray column) design procedures and equipment selection criteria. Single stage, multistage operations etc.

Unit- IV **(10hrs)**

Solid–Liquid Extraction fundamentals, Solvent selection, equilibrium relationship, triangular diagram representation, single stage, multistage concurrent and counter current operation, equipments for solid – liquid extraction, their design procedure and selection criteria.

Unit- V **(10hrs)**

Crystallization:- Principle, Super saturation, methods of achieving super saturation, phenomenon of crystal formation, crystal structure, equipment for crystallization (agitated vessel, Oslo, vacuum Swenson walker crystalliser), material & heat balance over crystalliser & related problems.

Adsorption: Fundamentals, adsorbent, adsorption equilibria and isotherms.

References:

1. Treybal R.E. “Mass Transfer Operations” McGraw Hill Book Co., New York 1980
2. McCabe W.L. and Smith J.C. & Harriot, “Unit Operations of Chemical Engineering”, McGraw Hill Book Co., New York 1980
3. Principles of Unit Operations; Foust A.S.
4. Coulson J.M. and Richardson J.F., “Chemical Engineering” Vol. I, II & III, Pergamon Press, New York 1977
5. Brown G.G., “Unit Operations”, John Wiley & Sons, New York
6. Lyderson A.L. “Mass Transfer in Engineering Practice”, John Wiley Co. (1983)
7. Badger W.L. and Banchero J.T., “Introduction to Chemical Engineering”, Tata McGraw Hill Book Co.

Course Outcomes:

1. The students will develop understanding of implications of factors affecting column operation, and design, effect of reflux ratio, feed conditions, and operational difficulties and thus will demonstrate the calibre of product design according to the standards.

2. Students will understand basic of various phase equilibrium based separation processes such as distillation, liquid-liquid extraction, leaching and adsorption.

3. The students will develop ability to apply mass transfer principles to perform graphical calculations for binary distillation.

4. The students will understand and apply knowledge for calculation of single and liquid-liquid, solid liquid extraction,

Department	**: Department of Chemical Engineering**
Course code	**: CHC-306**
Course Title	**: Mass Transfer-II (PR)**
Course Type	**: Practical**
Total Hrs/ Week	**: 03**
Course credit	**: 1.5**

Objective:

To understand the fundamental of Distillation, Liquid-liquid extraction, Solid-liquid operation, Crystallization and Adsorption.

Course Content:

List of Experiments:

1. To verify Rayleigh's equation,
2. To study boiling point diagram/ vapour-liquid equilibria.
3. Binary Distillation,
4. Estimation of HETP.
5. To study distribution coefficient in liquid-liquid. Extraction.
6. To Construct bimodal curve for ternary system.
7. Study of Solid liquid extraction,
8. Liquid - Liquid extraction (Batch),
9. Liquid - Liquid extraction (column)
10. Laboratory Batch Crystallisation,

(minimum 8 experiments)

Outcome:

At the end of the course student will be able to :

1. To design binary plate and packed distillation column
2. To able to design liquid-liquid and solid-liquid extraction column.
3. To design crystallization and adsorption column.

Department	**: Department of Chemical Engineering**
Course code	**: CHC-307**
Course Title	**: Process Equipment Design & Drawing (TH)**
Course Type	**: Theory**
Total Hrs/ Week	**: 03**
Course credit	**: 03**

Objective-

To study the design procedure for designing chemical equipment and selection of proper material of construction by considering different mechanical and physical properties. To study the behavior of material under stresses. The student should be able to understand the designing of pressure vessels, storage vessels, high pressure vessels, supports, calendria evaporator,shell and tube heat exchanger ,sieve tray and bubble cap tray for distillation column, agitators, rotary dryers. The students should be able to do the proportioning of pressure vessels.

Course Content:

Unit- I **(10hrs)**

Mechanical properties of materials, Selection of materials, general design procedure for designing chemical equipment protective coating, corrosion causes and prevention. Theory of failure, factor of safety. The material behavior under stresses. Fabrication Methods. Unfired pressure vessel subjected to internal and external pressure. Design of shell, nozzle, different types of head.

Unit- II **(10hrs)**

Design for atmospheric storage vessel, types of storage vessel, and different types of roofs for storage vessels. Vessels for high pressure operation, constructional features, multi shell construction, determination of thickness of shell applying various theories of failures.

Unit- III **(10hrs)**

Agitators, design of agitator components, selection, types application, power required for agitation. Drying equipments, Design of rotary dryers in details

Unit- IV **(10hrs)**

Types of support for vertical and horizontal vessels, Design of skirt support in detail, process design for short tube calendria type of evaporator, Design for sieve tray and bubble cap tray for distillation column.

Unit- V **(10hrs)**

Design for heat exchanger, shell and tube heat exchanger construction and design in details. Heating and cooling arrangements for reaction vessel. The proportioning of pressure vessels. Selection of L/D ratio. Optimization.

References:

1 B.C. Bhattacharya, Introduction to Chemical Equipment Design (Mechanical Aspects), CBS Publisher and Distributors, New Delhi.

2 Coulson & Richardson Chemical Engineering (Vol. VI), Butterworth-Heinmann (Elsevier)

3 M.V.Joshi, V.V. Mahajani Process Equipment Design, Macmillan Publishers India Ltd.

4 S.D. Dawande, Process Equipment Design (Vol. I), Denett & Co., Nagpur.

Course Outcomes-

1.From the course the students will able to know the general design procedure for designing chemical equipment and selection of proper material of construction by considering different mechanical and physical properties. They will study the behavior of material under stresses.

2. The student will understand the method for designing of pressure vessels and its components subjected to internal and external pressure. Design for atmospheric storage vessel, vessels for high pressure operation. Design of support for pressure vessel, process design for short tube calendria type of evaporator, Design for sieve tray and bubble cap tray for distillation column.

3.Students understand various types of Agitators, design of agitator components, selection, types application, power required for agitation. Drying equipments, Design of rotary dryers .

4. Students should be able to know Design for heat exchanger, shell and tube heat exchanger construction and design in details. Heating and cooling arrangements for reaction vessel. The proportioning of pressure vessels. Selection of L/D ratio.

Department	**: Department of Chemical Engineering**
Course code	**: CHC-307**
Course Title	**: Process Equipment Design & Drawing (PR)**
Course Type	**: Practical**
Total Hrs/ Week	**: 02**
Course credit	**: 01**

Objective-

To study the design procedure for designing chemical equipment and selection of proper material of construction by considering different mechanical and physical properties. To study the behavior of material under stresses. The student should be able to understand the designing of pressure vessels, storage vessels, high pressure vessels, supports, calendria evaporator,shell and tube heat exchanger ,sieve tray and bubble cap tray for distillation column, agitators, rotary dryers. The students should be able to do the proportioning of pressure vessels.

Students will be required to do process design and submit drawings of at least six equipments such as pressure vessels, heat exchangers, agitators, short tube calendria type evaporator etc. Types of agitators, supports. Design of bubble cap tray , sieve tray, different types of packing

Course Outcomes:

a) At the end of the course the student exhibits how to design and draw in a competitive manner various process equipment with proper scale and each components with detail dimensions.
b) Learn how to draw from the design problem solved in theory the exact Drawings of Pressure vessel, Reaction vessel, Shell and Tube Heat Exchanger, Short Tube Calendria Evaporator.
c) Understands the constructional features with the help of drawings of high Pressure vessels, Rotary Drier, Detail arrangement of Sieve tray and bubble cap trays.
d) Understand how to read drawings to know details about process equipment, which can be utilized for fabrication, maintenance, assembling and dismantling.

Department : Department of Chemical Engineering

Course code : Elective-II PTL-311

Course Title : Technology of Printing Inks

Course Type : Theory

Total Hrs/week : 04

Course credit : 4

Course Content:

Unit-I **(10 hrs)**

Nature of Printing ink, Visual characteristics of inks, Major printing systems, classification and characteristics of printing inks, mechanism of ink drying, adhesive nature of printing inks, resistance properties of printing inks, physical chemistry of printing inks, rheological properties of inks principles of printing

Unit- II **(10 hrs**

Description and schematic diagram of printing processes, it's press configuration and applications e.g. Flexographic, lithographic, gravure, letterpress, planographic, screen , Inkjet printing, substrate selection principles of ink formulations, colour matching and process printing.

Unit-III **(10 hrs)**

Manufacture of inks, manufacturing process, mixing equipments such as High speed impeller, butterfly mixer, Rotar and stator high speed mixer and milling equipments such as three roll mill, bead mill etc. handling, storage and manufacture of UV ink, news paper inks, modern production trends and future of inks.

Unit-IV **(10 hrs)**

Inks for various substrates: paper, plastic, fabric, leather, glass and metal. Testing & Evaluation of finished ink and raw materials for ink manufacture. Inks for News paper (rotary and well offset), publication work, posters, labels, and packaging materials, heat set and quick set inks for multicolour printing.

Unit-V **(10 hrs)**

Metal decorating inks, after print varnishes and lacquers, magnetic inks, ceramic inks, inks for printed circuit boards, inkjet printing, laser printing, dot-matrix printing, and other miscellaneous inks. Various ink trembles and remedial measures

General Textbook

1 . 'Organic coatings : Science and Technology'**,** Edited by Zeno W. Wicks, Jr., Frank N. Jones, S. Peter Pappas; Douglas A. Wicks,Third Edition, John Wiley & Sons, Inc., Hoboken, New Jersey. 2007.

2. Morgans, W.M., 'Outline of Paint Technology', 3rd Edition, CBS Publishers and Distributors, New Delhi, 1996

3 . " Surface Coatings" Volume 1 " Raw material and their usages" Oil and Colour Chemists' Association, TAFE Educational Books, NSW, Australia,1987.

4 . Paul Swaraj, "Surface Coatings – Science and Technology", Wiley Interscience Publishers, John Wiley and Sons, Inc.1986.

5. 'Paints, Coatings and Solvents', Dieter Stoye; Werner Freitag (ed.), 2nd. Edition, Wiley-VCH. Weinheim ; (1998).

Reference Books

1. 'Paint Technology Handbook', Rodger Talbert, CRC Press,Taylor and Francis Group, 2008.
2. Feist, W. C., Finishing Exterior Wood, Federation of Societies for Coatings Technology, Blue Bell, PA, 1996.
3. 'Surface Coatings', Vol. I & II, Oil and Colour Chemists' Association, Tafe Educational Books, NSW, Australia,1987.
4. 'Coating Technology Handbook', Edited by D. Satas and A. A. Tracton, Second Edition, Marcel Dekker, Inc., New York, 2001.
5. 'Automotive Paints and Coatings'Edited by Hans-Joachim Streitberger and Karl-Friedrich Dossel,, Second Edition, WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim 2008.
6. McBane, B. N., Automotive Coatings, Federation of Societies for Coatings Technology, Blue Bell, PA, 1987.

'Surface Coatings', Vol. I & II, Oil and Colour Chemists' Association, TAFE Educational Books, NSW, Australia,1987.

1. ‘Polymers for Electrical Insulations’, Edited by Horst Sulzbach, Ser. 314, DIE BIBLIOTHEK DER TECHNIK, Elantas GmbH, 2008.
2. ‘Powder coatings : chemistry and technology’, Misev, T. V., Third Edition, John Wiley & Sons, New York, 1991.
3. ‘Powder Coating Systems’, Wiliam D. Lehr, McGraw-Hill, New York 1991.
4. Kearne, J. D., Ed., Steel Structures Painting Manual, Vol. I, Good Painting Practices, 3rd ed., 1993; Vol. II, Systems and Specifications, 7th ed., Steel Structures Painting Council, Pittsburgh, PA, 1995. Hare, C. H., Protective Coatings, Steel Structures Painting Council, Pittsburgh, PA, 1995.
5. Martin, J. W.; et al., Methodologies for Predicting Service Lives of Coating Systems, Federation of Societies for Coatings Technology, Blue Bell, PA, 1996.
6. ‘Chemistry and Technology of formulating UV Cure Coatings, Inks, and Paints’, Edited by PKT Oldring, Vol.1-5, Sita Technology Limited, London UK 1991-94.
7. ‘Photoinitiated Polymerization’, Belfield, K. D.; Crivello, J. V., Eds., ACS Symp. Ser. 847, American Chemical Society, Washington, DC, 2003.
8. Koleske, J. V., ‘Radiation Curing of Coatings’, ASTM International, West Conshohocken, PA, 2002.
9. Scranton, A. B.; et al., Eds., Photopolymerization Fundamentals and Applications, ACS Symp. Ser. 673, American Chemical Society, Washington, DC, 1997.
10. ‘Radiation Curing of Polymers’, Edited by D. R. Randell, Ser. 89, The Royal Society of Chemistry, Cambridge 1991.
11. A Window to Paints & Coatings Technology by Dr. N.R. Kondekar, COLOUR PUBLICATIONS PVT. LTD., Mumbai2010
12. Essentials of Pigments - Application and Selection by Dr. Ashok B. Karnik, COLOUR PUBLICATIONS PVT. LTD., Mumbai

19 Glass, J. E., Ed., Technology for Waterborne Coatings, American Chemical Society, Washington,
DC, 1997.

20. Karsa, D. R.; Davies, W. D., Eds., Waterborne Coatings and Additives, Royal Society of Chemistry,Cambridge, 1995.

21. Pruskowski, S. J., Jr., Ed., Waterborne Coatings Technology, Federation of Societies for Coatings Technology, Blue Bell, PA, 2005.

22. G. Buxbaum (Ed.) Industrial Inorganic Pigments, Second, Completely Revised Edition1998 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim.

23. H. M. Smith (Ed.) High Performance Pigments 2002 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim.
24. J. Bieleman (Ed.) Additives for Coatings 2000 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim.
25. Willy Herbst, Klaus Hunger, Industrial Organic Pigments- Production, Properties,Applications.
Third, Completely Revised Edition (With Contributions by Gerhard Wilker, Heinfred Ohleier,
and Rainer Winter) 2004 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim

Department : **Department of Chemical Engineering**
Course code : **Elective-II, FTL-308**
Course Title : **Treatment and Disposal of Food Industrial Waste (Elective–II)**
Course Type : **Theory**
Total Hrs : **04**
Course credit : **04**

Course Pre-requisite:

To learn the basic knowledge of treatment and disposal of food industrial waste, requires pre-knowledge of Microbiology and molecular biology (FTC-302), instrumentation and process control (CHC-309) and physical chemistry (BSC-103).

Course Objectives:

1. To learn Primary, secondary and tertiary process for treatment of industrial effluent
2. To learn composition and health hazards of pollutants in effluent
3. To learn principle, design and working of various biological process for treatment of industrial effluent
4. To learn value addition to waste through effluent treatment
5. Estimation of kinetic coefficients for treatment.

Course Content:

Unit-I **(10 hrs)**

Physical, chemical and biological characteristics of food industry waste. Composition of food industry waste.

Unit-II **(10 hrs)**

Classification and application of waste water treatment methods. Treatment process flow sheets. Process design criteria.

Unit-III **(10 hrs)**

Role of micro-organisms in food industry waste. Application of kinetics to biological treatment. Determination of kinetic coefficients.

Unit -IV **(10 hrs)**

Activated sludge process. Suspended-Growth nitrification. Aerobic Aerated Lagoons.

Aerobic digestion. Aerobic stabilization ponds.

Unit-V **(10 hrs)**

Trickling filters, Roughing filters, Rotating biological contactors, Packed bed reactors, Byproduct recovery and value addition to the waste.

Books Recommended:

Waste Water Engineering: Treatment, Disposal and Reuse by Metcalf & Eddy (Second Edition)

Course Outcomes:

1. The students will learn and gain the basic knowledge of composition of industrial effluent and health hazards of pollutants in effluent
2. The students will learn various Primary, secondary and tertiary process for industrial effluent treatment
3. The students will learn principle, design and working of various biological process for treatment of industrial effluent
4. The students will learn various value addition to waste through effluent treatment
5. The students will be able to calculate kinetic coefficients for waste water treatment.

Department : **Department of Chemical Engineering**

Course code : **Elective- II, OTL-309**

Course Title : **Modified and Tailor Made Oils. (TH)**

Course Type : **Theory**

Total Hrs : **04**

Course credit : **04**

Course Objectives:

To apply the basic principles of chemistry and technology for the modification of oils and fats. This helps in producing w.r.t. effective and better tailormade products for edible and non-edible applications.

Course Content:

Unit – I

Chemistry of drying oils, natural and synthetic drying oil, modification of oils for surface coating industry, thermal and chemical modifications methods, properties of modified oils such as blown, stand oil, boiled oil, malenized, isomerised oil , etc. Process & plant employed for their commercial production. Chemistry & Technology of Alkyd resins: Classification on the basis of oil length, Selection of ingredients. Fatty acids & monoglyceride routes, fusion & Solvent process. Their merits & demerits.

Unit – II

Plants & process of manufacture of alkyd resin. Modification of alkyd resin. Oil modified synthetic resin: Chemistry, formulation & manufacture, oleoresinuous varnishes, epoxy esters, urethane oils, polyamides, polyester amides, etc.

Unit – III

Application of oils, modified oils, oil modified resins in surface coating industry. Brief review of paint formulation & application. Plants, Processes & applications of metallic soaps, lubricating oils and greases, cutting oil, Hydraulic oils, etc.

Unit – IV

Transesterification: Classification of transesterification: Acidolysis, Alcoholysis, Interesterification / Intraesterification. Mechanism of interesterification (directed and random). Different types of chemical and enzyme catalysts for transesterification. Plants for production of methyl ester, monoglyceride, interesterification products, etc.

Unit – V

Confectionery and Bakery Fats: Raw material for confectionery fats: Cocoa butter, processing of Cocoa butter, composition and properties of Cocoa butter, polymorphism and crystal behaviour of cocoa butter. Methods of obtaining cocoa butter substitutes, replacer, equivalents and extenders. Plastic shortening agents: different types of plastic shortening agents, selection of blends with reference to specific requirements and application in bakery products.

Course Outcome:

1. Understand the chemistry underlying the drying mechanism of oils.
2. Describe the plant and process for modifications of oil for surface coating industry.
3. Outline the paint formulation and applications of lubricating oils, metallic soaps etc.
4. Understand the classification and mechanism of major esterification reactions for synthesis of industrially important products like MG, ME etc.
5. Distinguish between the terminologies related to confectionary and bakery fat; describe the polymorphism and crystal behavior of cocoa butter and discuss the methods of cocoa butter substitute preparations.

Department	**: Department of Chemical Engineering**
Course code	**: Elective - II, PLL-311**
Course Title	**: Plastic Waste Management (TH)**
Course Type	**: Theory**
Total Hrs	**: 04**
Course credit	**: 04**

Course Objective:

a. To understand the concept of plastics recycling.
b. To understand about various sources of plastics waste.
c. To understand various identification and separation method for waste plastics.
d. To learn about different recycling methods for plastics recycling**.**

Course Content:

Unit- I

Introduction, Sources of plastics waste (Industrial waste, post consumer waste, scrap waste and nuisancewaste), Plastic identification and Separation techniques – (density - float sink and froth floatation methods,optical, spectroscopic, electrostatic, sorting by melting temperature, sorting by size reduction, sorting by selective dissolution and other methods), recycling codes.

Unit- II

Plastics Waste Management - 4R's approach (reduce, reuse, recycle – mechanical and chemical, recover),recycling classification- - primary - secondary - tertiary - quaternary recycling with examples. Energy from waste – incinerators-pyrolysis, factors affecting incineration.

Unit- III

Recycling of polyolefins - PVC, PET, polystyrene, polyamides-nylon-6 and nylon-6,6, polyurethanes,mechanical process, applications of recycled materials.

Unit- IV

Recycling of rubber – comparison of thermoset and thermoplastic composites, reclaiming of rubber – fuel source – pyrolysis, Depolymerization of scrap rubber, tyre retreading, uses of recycled rubber – asphalt andother uses.

Unit- V

Recycling of plastics by surface refurbishing - coating application, influence on plastics properties by coating, polishing of the plastics surface, commercial process. Plastics aging - environmental aging, thermal aging, weathering of plastics, mechanical degradation, chemical degradation and environmental stress cracking, wear and erosion, influence of plastic aging in recycling, energy from waste - incinerators

Text books

1. John Scheirs., - “Polymer Recycling” John Wiley and Sons,1998

2. Nabil Mustafa – “Plastics Waste Management” Marcel Dekker Inc.,1998.

3. Steven Blow, Handbook of Rubber Technology, Galgotia Publicatins Pvt. Ltd., New Delhi, 1998.

4. Chandra R. and Adab A., Rubber and Plastic Waste, CBS Publishers & Distributors, New Delhi, 1994.

Reference books

1. Muna Bitter, Johannes Brandup, Georg Menges “Recycling and Recovery of plastics” 1996

2. Attilio.L.Bisio,Marino Xanthos, “ How to manage plastics waste: Technology and market Opportunities”

Hanser Publishers, 1994

3. Francesco La Mantia., “ Handbook of Plastics Recycling” Chem Tec Publishing,2002

Course Outcomes:

At the end of the course students will have knowledge of:

1. Sources of plastics waste, its identification and separation methods.
2. Approaches of plastic waste management
3. Mechanical and chemical recycling of polymers.
4. Recycling of plastics by surface refurbishing.

Department	**: Department of Chemical Engineering**
Course code	**: Elective-III, CHL-312**
Course Title	**: Energy Resources & Utilization (TH)**
Course Type	**: Theory**
Total Hrs/ Week	**: 04**
Course credit	**: 04**

Course Content:

Unit- I **(10hrs)**

Fuels - Classification, Properties, tests and analysis.

Solid Fuels - Coal, origin, classification, storage and handling, carbonization, gasification and briquetting - gasification of biomass.

Unit- II **(10hrs)**

Liquid fuels - Petroleum based fuels, synthetic fuels, alcohol and blended fuels, storage and handling.

Gaseous fuels - Water gas, carbureted water gas, producer gas, coal gas and natural gas.

Unit- III **(10hrs)**

Combustion - Air requirement for solid, liquid and gaseous fuels, Combustion equipment

Solar energy, Wind energy, Tidal energy

Unit- IV **(10hrs)**

Geothermal energy, Magneto hydrodynamics, Nuclear energy. Energy Management- Principles need, initiating and managing an energy management program.

Unit- V **(10hrs)**

Energy audit – elements, and concepts, types of energy audits, energy audit with respect to industries like sugar, paper etc.,

Energy Conservation-Thermodynamics of energy conservation, cogeneration, waste heat recovery technologies. Industrial insulation - material selection, economical thickness

References:

1. S.P.Sharma and ChanderMohan, “Fuels and Combustion”, Tata McGraw Hill, 2004.

2. J.K.Harker and J.R.Backhurst, “Fuel and energy”, Academic Press, 1981.

3. D.A.Raey, “Industrial Energy Conservation”, Pergomon Press, 1980.

4. J.D.Gilchrist, “Fuels, Furnaces and Refractories”, Pergamon Press, 1977.

Department	**: Department of Chemical Engineering**
Course code	**: Elective-III CHL-313**
Course Title	**: Advance Heat Transfer (TH)**
Course Type	**: Theory**
Total Hrs/ Week	**: 04**
Course credit	**: 04**

Course Content:

Unit-I **(10hrs)**

Steady State Heat Conduction with Heat Generation:

Introduction to Steady State Heat Conduction with Heat Generation, conduction in solid, hollow cylinder with uniform heat generation. Temperature distribution & heat flux in an infinite slab, hollow cylinder with uniform heat generation. Heat generation in nuclear fuel rod.

Unit-II **(10hrs)**

Thermal insulation, insulating materials, design factor, properties of insulating material, economic thickness of insulation, optimum thickness of lagging. Specific heat and thermal diffusivity of insulation. Critical thickness of insulation on minimum heat transfer rate. Determination of thermal conductivity of insulating material. Insulation of hot surface. Thermal insulation of cryogenic services.

Unit-III **(10hrs)**

Transient Heat Conduction:

Introduction to Transient Heat Conduction, classification of transient heat conduction processes, system with negligible internal resistance. Introduction to lumped heat capacity system, transient heat conduction in a plane walls-chart solution, long cylinder of radius r_o, and sphere of radius r_o, Transient heat flow in semi-infinite solid. Unsteady state heat transfer for food and biological materials.

Unit-IV **(10hrs)**

Multiple effect evaporator, Heat transfer area for multiple effect evaporator, criteria for selection of evaporator, factor related to mechanical design, economy of multiple effect evaporator, Optimum number of effect on cost basis, Empirical approach to steam requirement, wate evaporation distribution approach, resistance time control ring, Multiple effect evaporatordesign, vapour compression technique.

Unit-V **(10hrs)**

Spiral coil and plate tupe heat exchanger, finned tube heat exchanger. Single and multi phase condenser. Designe of reboilers, veporisors, Kettle type and thermosiphon reboilers, forced circulation vaporizers. Heat transfer in agitated vessels both jacketed and with coil, transient heating or cooling, Heat transfer in packed and fluidized beds.

Referneces:

1. J. M. Colson and J. F. Richardson, “Chemical Engineering”, 6th Ed. Vol-1. Elsevier Pub.

2. J. M. Colson and J. F. Richardson, “Chemical Engineering”, 6th Ed. Vol-6. Elsevier Pub.

3. W. L. McCabe Smith and P. Harriot, “Unit Operation of Chemical Engineering”, 6th ed. McGraw Hill,

4. S. D. Davande, “Principals of Heat and Mass Transfer”

5. Fundamentals of Heat and Mass Transfer, Sixth Edition, by F.P. Incropera and B. Lavine, Wiley, 2006.

6. Heat Transfer, A. F. Mills, 1998 (Prentice Hall). TJ260.M52 1998

7. A Heat Transfer Textbook, J. H. Lienhard, 2nd edition, 1987 (Prentice Hall, Englewood Cliffs). TJ260.L445

8. D. Q. Kern, “process Heat Transfer”, McGraw Hill

9. Desmon and Karlekar, “Heat and Mass Transfer”

10. P. K. Nag, “Heat Transfer”

11. R. C. Sachdeva, “Fundamentals of Engineering-Heat and Mass Transfer”

Department	**: Department of Chemical Engineering**
Course code	**: Elective-III CHL-314**
Course Title	**: Plant Utility and Safety (TH)**
Course Type	**: Theory**
Total Hrs/ Week	**: 04**
Course credit	**: 04**

Course Content:

Unit -I **(10hrs)**

Various plant utilities, their role and importance in chemical process, Water Sources, Sources of water and their characteristics ;Treatment, storage and distribution of water; water for use in boilers, cooling purposes, drinking and process; Reuse and conservation of water; Water resource management.

Unit -II **(10hrs)**

Steam Generation and Utilization

Steam generation and its application in chemical process plants, distribution and utilization; Design of efficient steam heating systems; steam economy, Steam condensers and condensate utilization, Expansion joints ,flash tank design, steam traps their characteristics, selection and application, waste heat utilization.; Lagging, selection and thickness .Selection and sizing of boilers; waste heat boilers.

Unit- III **(10hrs)**

Compressors, blowers and Vacuum Pumps

Compressors, blowers and vacuum pumps and their performance characteristics; Methods of developing vacuum and their limitations, material handling under vacuum, Piping systems; Lubrication and oil removal in compressors and pumps, Air filters, Air and gas leakage. Inert gas systems, compressed air for process, Instrument air.

Insulation

Importance of insulation for meeting the process requirement, insulation materials and their effect on various material of equipment piping, fitting and valves etc. insulation for high intermediate, low and sub zero temperatures, including cryogenic insulation.

Unit- IV **(10hrs)**

Elements of Safety

Elements of safety, safety and site selection; Plant layout and unit plot planning; Definition of risk and hazard, Identification and assessment of the hazards, distinction between hazards and risk, Hazard operability (HAZOP) hazard analysis (HAZAN); Assessment of the risk, fault tree, event tree, scope of risk assessment; Control of hazards, controlling toxic chemicals and controlling flammable materials.

Prevention of losses

Prevention of losses, Pressure relief, Provision of fire fighting equipments, Technology selection and transfer, Choosing the right process.

Unit -V **(10hrs)**

Control of Process

Control of process, Prevention of hazardous deviation in process variables, e.g. pressure, temperature flow by provision of automatic control systems- interlocks, alarms, trips together with good operating practices and management.

Regulations

Regulations and legislation, Role of government role, risk management routines and tackling disaster.

References:

1. Lees, F. P., “Loss Prevention in Process Industries 3 volume set” Butterwort -Heinemann, Oxford (1996).

2. Nordell, Eskel, “Water Treatment for Industrial and Other Uses”, Reinhold Publishing Corporation, New York.(1961).

3. Crowl, D.A. & Louvar, J.F.. “Chemical Process Safety: Fundamentals with Applications”. New Jersey: Prentice-Hall. (1989).

4. Goodall, P. M., “The Efficient Use Of Steam” IPC Science and Technology (1980).

Department : **Department of Chemical Engineering**
Course code : **Elective-III CHC-315**
Course Title : **Petroleum Refining Engineering (TH)**
Course Type : **Theory**
Total Hrs/ Week : **04**
Course credit : **04**

Objective:

To study about crudes, different petroleum products, properties, testing method, use and applications and petroleum processes.

Course Content:

Unit- I **(10hrs)**

Crude oil & outline of its formation ,Hydrocarbon group wise composition of Petrolium & their structures , sulfur,nitrogen,oxygen & metal-organic compound in petroleum.

Unit- II **(10hrs)**

Characterization & properties of Crude oil, Preteatment of crude, removal of moisture, salt . Refinery flow diagram, equipment & tank layout.

Unit- III **(10hrs)**

Crude Distillation , Atmospheric Topping unit, Vacuum distillation ,TBP distillation of Petroleum fraction & construction of property midpercent ,Residue yield, distillate yield curve.

Unit- IV **(10hrs)**

Major petroleum product & their specifications like Liquified Petroleum Gas , Gasoline, Naptha, Kerosene, Aviation turbine fuel, High Speed Diesel , LDO, furnace fuels, lubricants,base oil,tar & biumen.

Unit- V **(10hrs)**

Catalytic Cracking and thermal processes, Fluidised bed Catalytic Cracking, Catalytic Reforming, cracking process.

References:

1) J.H Gary, & G.E .Handwerk, Petroleum Refining: Technology & Economic 3rd edition, Marcel Dekker Inc.1994

2) J. H. Speight, The chemistry & Techonogy of Petroleum Hydrocarbon, 3rd edition.
3) G.N. Sarkar, Advanced Petroleum Refining, Khanna Publisher,1998.

Outcomes:

a) Students able to know the composition of crudes, types of crudes and crude analysis.

b) Students will understand what are paraffins, napthalenes, aromatics,acetylenes and other hydrocarbons present in petroleum, their composition , properties and structures.

c) Students understand the methods like ASTM distillation, flash and fire point, aniline point, diesel index, pour point, cetane and octane.

Department	**: Department of Chemical Engineering**
Course code	**: Elective-III CHL-316**
Course Title	**: Biofuel (TH)**
Course Type	**: Theory**
Total Hrs/ Week	**: 04**
Course credit	**: 04**

Course Content:

Unit- I **(10hrs)**

Various biofuels, gasoline, biodiesel, bioethanol, market-supply & demand, foreign oil dependency

Unit- II **(10hrs)**

Biodiesel production from oil seeds, waste oils & algae, advantages and disadvantages of generating ethanol from corn, cellulose and sugar cane etc. value added processing of biofuel residues and co-products

Unit- III **(10hrs)**

Thermal gasification of biomass, gases from biomass, composition and properties of wood gas, water gas, producer gas, methane gas, syn gas

Unit -IV **(10hrs)**

Combustion process, nature of combustion process, types of combustion process, kinetics of liquid fuel combustion, kinetics of solid fuel combustion.

Unit -V **(10hrs)**

Biofuels and the environment, impact of biofuels in global change and food production, biomass, bagasse and product of wood carbonization.

References:

1) Anaerobic Biotechnology for bioenergy production; Principles and applications, Samir K. Khanal. Wiley-Blackwell Publishing (2008)
2) Fuel and combustion, Samir Sarkar, Second edition, Orient Longman.

Department	**: Department of Chemical Engineering**
Course code	**: Elective-III CHL-317**
Course Title	**: Industrial Pollution Control (TH)**
Course Type	**: Theory**
Total Hrs/ Week	**: 04**
Course credit	**: 04**

Course Objectives:

To provide detailed knowledge on the discharge of pollutants, either of natural or of anthropogenic origin, into the environment that can induce severe stresses on ecosystems and their inhabitants.

To train students to act as experts in the area of reducing and remediating the impact of wastewater and air pollution.

To introduce theoretical and practical principles of natural purification processes and technological processes to control discharges which drive purification and remediation technologies, with reference to the legislative framework concerned with safeguarding the environment and human health.

To impart knowledge to enable students to critically review modern technology and practices for the monitoring, prevention, treatment and disposal of wastewater and air pollutants.

Course Content:

Unit- I **(10hrs)**

Characterization and control of Air Pollution

Sources and pathological effects of COx, SOx, NOx, H_2S and volatile organic emissions; Methods of sampling and analysis of SOx, NOx, & COx, ; classification of particulate matter on the basis of particle size ; standards for clean air ; Sinks of Atmospheric gases; Factors affecting stability of Dispersion & temperature inversion; Mechanism and remedial measures of photochemical Smog, Green House Effect and Ozone layer depletion. Removal of gaseous pollutants by absorption by liquids and adsorption by solids, control of volatile organic emission.

Unit- II **(10hrs)**

Methods for control of particulate matter

Design, construction and operation of Gravity Settler, Cyclone separators, Electrostatic precipitators, Fabric Filters, Venturi scrubbers, Spray and Packed bed tower. Problems on Design, Comparative performance evaluation.

Unit- III **(10hrs)**

Wastewater characterization and Primary and secondary wastewater Treatment Techniques:

Physical characterization of wastewater (Colour, odour, turbidity, MLSS, Dissolved solids etc.); Principle and significance of determination of BOD, COD, DO, TOC; Use of electrochemical analyzer and atomic absorption spectrometer in determination of elements; estimation of phosphorous and nitrogen. Standards for Drinking water.

Primary Treatment Techniques (Neutralization, equalization, segregation, flocculation, micros trainers etc.)

Unit- IV **(10hrs)**

Mechanism and kinetics of Biological oxidation of pollutants. Design, construction of operation of Activated sludge process, Anaerobic Lagoons, Trickling Filters, Rotating Disc Contactors, fluidized bed contactors; Remedial measures for problems in operation of Secondary Treatment Techniques.

Unit- IV **(10hrs)**

Tertiary/ Advanced Waste Water Treatment Techniques and Solid Waste Pollution :

Principle and utilization of Adsorption, Ion Exchange, Electrodialysis, reverse osmosis, ultra filtration in wastewater treatment. Overall layout of Municipal (Domestic) and Industrial Effluent Treatment Plant Techniques for handling , disposal and control of solid waste pollutants (Composting, dumping , incineration, physical and chemical recycling).

Unit- V **(10hrs)**

Overall pollution control in selected Food , Pharmaceutical & Chemical Industries :

Beverages, Distillery, Sugar, Canning, Dairy; Antibiotics (Penicillin, Cephalosporin; etc.), Sulpha Drugs, Petroleum Refinery and Petrochemical Industries.

References:

1. "Pollution Control in Process Industries" by S.P. Mahajan MC Graw Hill
2. " Wastewater Treatment" M. Narayanrao & A.K. Dutta, IBH Publicaiton Co Pvt. Ltd., Delhi.
3. "Wastewater Engineering" Mc Catta , Mc Gvaw Hill.
4. "Air Pollution Control", P. Pratap Mouli and N. Venkata, Diva Jyoti Prakashan, Jodhpur.

5. Physico- Chemical Process for water quality control, W.J. Weber, Wiley Interscience-1972.

Course Outcomes:

After successfully passing the course, graduate will be able to:

a) Build a scientific literacy which will permit a greater understanding industrial processes, products and environmental concerns and how everyday life depends on chemical phenomena
b) Identify sources, types and quantities of pollutants and determine their impact on the environment
c) Recognize and interpret quality parameters of water and air
d) Analyse pollutant transport issues in the environment
e) Identify and propose strategies and techniques for the management and control of pollution.

BE CGPA pattern syllabus

B.E. Biotechnology

Semester-VII

Faculty of Engineering and Technology

North Maharashtra University, Jalgaon

Course Outline

Bio Process Equipment Design	**BPED**	**BTL-701**
Course Title	Short Title	Course Code

Lecture	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	03	15	40	03

Course Description:

The aim of this course is to introduce the fundamentals followed in the design of Bioprocess equipments and basic understanding of design parameter.

Prerequisite Courses: Heat transfer, Mass transfer and Chemical reaction engineering.

General Objectives:

1. To study the safety measures in equipment design.
2. To study design of various Bioprocess Equipments.
3. To study to design the suitable equipment for a desired bioprocesses.
4. To study the mechanical design of various bioprocess equipments.

Learning Outcomes:

At end of the course Student will able to

1. Use basic standard equipment symbols in bioprocess industry.
2. To perform the task by identifying, formulating, designing and providing the solution to various biochemical engineering problems.
3. Design various bioprocess equipments used in bioprocess industries.
4. Show the capacity of designing the equipment to meet economical and societal requirements.
5. Learn software for equipment design.

Course Outline

Bio Process Equipment Design	**BPED**	**BT-701**
Course Title	Short Title	Course Code

Course Description:

This course is aimed at introducing the fundamentals followed in the design of Bioprocess equipments and basic understanding of design parameter.

Lecture	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	03	15	40	03

Prerequisite Courses: SE and TE Biotechnology Subjects

General Objectives:

1. To study the safety measures in equipment design.
2. To study design of various Bioprocess Equipments.
3. To study to design the suitable equipment for a desired bioprocesses.
4. To study the mechanical design of various bioprocess equipments.

Learning Outcomes:

At end of the course Student should able to

1. Use basic standard equipment symbols in Bioprocess industry.
2. To perform the task by identifying, formulating, designing and providing the solution to various biochemical engineering problems.
3. Design various bioprocess equipments used in bioprocess industries.
4. Show professional and ethical responsibilities formally and informally.
5. Show the capacity of designing the product to meet economical and societal requirements.

Course Content

BE Biotechnology **Semester – VII**

Bioprocess Equipment Design

Teaching Scheme **Examination Scheme**

Theory : 3 hours/ week

End Semester Examination (ESE) : 80Marks:
Paper Duration (ESE) : 03 Hours
Internal Sessional Examination (ISE) : 20 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Process Hazards and Safety Measures in Equipment Design: Introduction, Hazards in Process Industries, Hazards Analysis, Safety Measures, Safety Measures in Equipment Design, Pressure relief Devices.

UNIT-II **No. of Lect. – 08, Marks: 16**

Process Design of Reaction Vessels: Introduction, Materials of Construction, Agitation, Classification of Reaction Vessels, Design of batch bioreactor.

UNIT-III **No. of Lect. – 08, Marks: 16**

Process Design of Evaporator: Introduction, Types of Evaporator, Methods of Feeding of Evaporator, Design of Calendria type Evaporator.

UNIT-IV **No. of Lect. – 08, Marks: 16**

Heat exchange equipment : Introduction , Working and Construction and Design of Shell and tube Heat Exchanger.

UNIT-V **No. of Lect. – 08, Marks: 16**

Process Design of Rotary Dryer: Introduction, Types of Dryer, Design of Rotary Dryer, Design of Sieve Tray and Bubble Cap for Distillation Column.

Textbooks:

1. M.V. Joshi, V.V. Mahajani Process Equipment Design, Macmillan Publishers India Ltd.
2. S.D. Dawande, Process Equipment Design (Vol. I),Denett & Co., Nagpur.
3. R. S. Khurmi, J.M. Gupta, A Text Book of Machine Design, S. Chand & Company Ltd, New Delhi.

Reference book:

1. Bioprocess Engineering Principles (1995) Doran PM, Academic Press Ltd, USA
2. B.C. Bhattacharya, Introduction to Chemical Equipment Design (Mechanical Aspects), CBS Publisher and Distributors, New Delhi.
3. Coulson & Richardson Chemical Engineering (Vol. VI), Butterworth- Heinmann Elsevier.

Bioinformatics

Course Outline

Bioinformatics	Bioinfo.	BTL-702
Course Title	**Short Title**	**Course Code**

Lecture	Hours per week	No. Of weeks	Total hours	Semester credits
	03	15	40	03

Course Description:
This course aims to provide students with a practical and hands-on experience with common bioinformatics tools and databases.

Prerequisite Course(s): Microbiology, Genetic engineering &Molecular Biology.

General objective :
1. To introduce students to the fundamentals of evolution, molecular biology, and molecular evolution.
2. These principals underlie much of modern bioinformatics, and students will be shown how they apply to the basic predictive methods that are of common use in the field.
3. Students will be trained in the basic theory and application of programs used for database searching, protein and DNA sequence analysis, prediction of protein function, and building phylogenetic trees. Specific types of analysis discussed in the course will include but is not limited to: Detection of homology with BLAST, prediction of transmembrane segments, multiple alignment of sequences, prediction of protein domains, prediction of protein localization, and building phylogenetic trees.

Learning outcomes:
By completion of this course students will able:
1. To understand the theoretical basis behind bioinformatics.
2. Search databases accessible on the WWW for literature relating to molecular biology and biotechnology.
3. Manipulate DNA and protein sequences using stand-alone PC programs and programs available on the WWW. Find homologues, analyse sequences, construct and interpret evolutionary trees.
4. View and interpret these structures.
5. Understand homology modelling and computational drug design.
6. Students will be able to query biological data, interpret and model biological information applies this to the solution of biological problems in any arena involving molecular data.
7. Explore the options for bioinformatics in higher study.

Course content

BE Biotechnology **Bioinformatics** **semester VII**

Teaching Scheme

3hrs/week

Examination scheme

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03.00 hr
Internal Sessional Examination (ISE) : 20Marks

Unit -I
Introduction: **No. of Lecture: 8 Hours, Marks: 16**

Introduction to bioinformatics, bioinformatics and internet, Databases:Introduction, primary and secondary databases, format v/s contents, the Genbank flat files and its format, database at NCBI, Databases : DDBJ, EMBL, Genbank, submitting DNA sequence to database; Structure database: PDB, Molecular modelling database at NCBI, structure file format.

Unit-II **No. of Lecture: 8 Hours, Marks: 16**
Sequence alignment:

Introduction, types of sequence alignment, Algorithms for sequence alignment: Needlemen-Wunsch and Smith-Waterman algorithm, Methods of pair wise sequence alignment, Database similarity searching: FASTA, BLAST, Substitution Score and Gap penalties, PAM matrix, Multiple sequence alignment, Hidden markov models and threading methods.

Unit-III **No. of Lecture: 8 Hours, Marks: 16**
Phylogenetic analysis:

Introduction, Elements of phylogenetic models, Phylogenic data analysis, Relation between Phylogenetic analysis and multiple sequence alignment, Evolutionary trees, Methods for Phylogenetic prediction: Maximum Parsimony method, Distance methods, Phylogenetic software.

Unit-IV **No. of Lecture: 8 Hours, Marks: 16**
Gene prediction:

Introduction, Open reading frame based gene prediction, Procedure for gene prediction, Gene prediction in microbial genomes, Gene prediction in eukaryotes, Promoter prediction in E.Coli, Promoter prediction in eukaryotes, Gene finding methods: GRAIL, GENSCAN, PROCRUSTES, Gene parser.

Unit-V
Structure prediction: **No. of Lecture: 8 Hours, Marks: 16**

Prediction of RNA structure:

Introduction, Sequence and base pairing patterns for structure prediction, Methods predicting RNA structure: Energy minimization and identification of base covariation, Prediction of protein structure :- Introduction, Protein structure description, Protein structure classification in databases, Structural alignment methods, Protein structure prediction by amino acid sequence: use of sequence patterns, Prediction of secondary structure, Prediction of 3D structure.

REFERENCES:

1. Andreas D. Boxevanis, Bioinformatics, Wiley International.
2. David W. Mount, Bioinformatics: Sequence and Genome analysis, Cold Spring Harbour.
3. T.K.Attwood and Parry . Smith D.J, Introduction to Bio Informatics, Pearson Education Ltd, South Asia.
4. Vittal.R.Srinivas, Bioinformatics: A Modern Approach, PHI.
5. S.C.Rastogi, N.Mendiratta, P.Rastogi, Bioinformatics: Methods and Applications, PHI.

Downstream Processing

Course Outline

Downstream Processing | **DSP** | **BTL-703**
Course Title | Short Title | Course Code

Lectures	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Credits**
	03	15	40	3

Course Description:

This course is aimed to develop the basic knowledge and operations of recovery processes to undergraduate students. The background expected includes a prior knowledge of SE and TE Biotechnology courses. The goals of the course are to understand the basic principles of downstream processes and their applications in engineering trade.

Prerequisite Course(s): Unit operation and Fermentation technology.

General Objective:

- To develop the basic knowledge and skills of recovery processes, including the filtration, centrifugation, chromatographic separations and their role in Fermentation Technology.

Learning Outcomes:

After completion of the course, students will be able to:

1. Apply the mathematical and engineering terms for designing the best suitable method for biomolecule separation.
2. Apply the basic principle by studying the characteristics of biological mixtures for designing and conduct the experiments.
3. Able to recognize the need of separation technique of biomolecules and methodology involved, will helpful for lifelong learning.
4. Apply the skills and engineering strategy in the separation technique of biomolecules that is meant for societal welfare.
5. Apply the knowledge of engineering principle to living entities for societal welfare.

COURSE CONTENT

BE Biotechnology **Downstream Processing** **Semester –VII**

Teaching Scheme
Lectures -3 Hrs/week

Examination Scheme
End Semester Exams (ESE): 80 Marks.
Paper Duration: 3 Hours.
Internal Sessional Exam (ISE): 20 Marks.

Unit: I
Introduction and Separation of Particles: **No. of Lecture: 8 Hours, Marks: 16**
Role and importance of downstream processing in biotechnology, Characteristics of biological mixtures (broth), Filtration, Filter media, Theory of filtration, Types of filters (vacuum filter, plate and frame filter, leaf filter),Centrifugation, Theory of centrifugation, Types of centrifuge (tubular bowl centrifuge, basket centrifuge, ultra centrifuge), Sedimentation, Precipitation and flocculation.

Unit: II
Cell disruption methods: **No. of Lecture: 8 Hours, Marks: 16**
Introduction, Types of intracellular products and importance, Methods of cell disruption, Physico-mechanical cell disruption: liquid shear (high pressure homogenizer), Solid shear agitation and abrasives (bead mill, kinetics of bead mill), Freezing - thawing, Ultrasonication (ultrasonic vibrators), Thermal shock, Osmotic shock, Chemical treatment: alkali treatment, Detergent solubilization, Lipid solubilization, Enzymatic method.

Unit: III
Extraction and Concentration: **No. of Lecture: 8 Hours, Marks: 16**
Extraction, modes of extraction, Liquid-liquid extraction, Two phase aqueous extraction, Super critical extraction, Solvent recovery, Extraction application.
Concentration of products:
Evaporation, Types of evaporation, Membrane process, Ultrafiltration, Reverse osmosis, Dialysis, Nanofiltration, Sorption, Sorption mechanism, Modes of operation in sorption process, Adsorption.

Unit: IV
Purification of product: **No. of Lecture: 8 Hours, Marks: 16**
Fractional precipitation, Chromatography: Types of chromatography: Adsorption, Ion exchange, Gel permeation, Affinity, Molecular Exclusion, High Performance Liquid Chromatography (HPLC), Gas Liquid Chromatography (GLC), Crystallization, Drying, Types of drying (spray drying, vacuum drying, freeze drying), High performance thin layer chromatography. Electrophoresis: Theory of electrophoresis, Gel electrophoresis, Isoelectric focusing.

Unit: V
Formulation and Case studies: **No. of Lecture: 8 Hours, Marks: 16**
Introduction, Importance of formulation, Formulation of baker’s yeast, Enzymes (glucose isomerase, detergent enzymes), Formulation of pharmaceutical products, Application research, Granulation: wet granulation, Dry granulation or slugging Case studies of recovery process of penicillin, Nuclease, Citric acid, Proteins.

Reference Books:

1. Sivasankar.Separation processes in Biotechnology
2. Paul A Belter, E L Cussler, Wei-shouHu,Bio-separations- Downstream Processing for Biotechnology- Wiley Inter-science Publications, 1988.
3. P. F. Stanbury, A. Whitaker and S. J. Hall, Principles of Fermentation Technology, Aditya Books (P) Ltd, New Delhi.
4. Belter P.A. and Cussier E, Bioseparations, Wiley, 1985.

Interdisciplinary Elective
1.Biotechnology of Waste Treatment

Course Outline

Biotechnology of Waste Treatment	**BWT**	**BTL- 704**
Course Title	Short Title	Course Code

Lectures	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Credits**
	03	15	40	3

Course Description:

This course is aimed to develop the basic knowledge and operations of waste water treatment processes to undergraduate students. The goals of the course are to understand the basic principles of treatment processes and their applications in engineering trade.

Prerequisite Course(s): Bioseparation process, Microbiology and Biochemistry.
General Objective

- To develop the basic knowledge and skills of waste treatment processes, Including Nitrification, Denitrification, activated sludge process, anaerobic digestion.

Learning Outcomes:

After completion of the course, students will be able to:

1. Implement Engineering strategy for designing the models for waste treatment programmes.
2. Apply the theoretical concepts for designing the experiments for studying the metabolism of various compounds present in waste water.
3. Apply the knowledge for modeling the systems for waste water treatment which will be beneficial for environment and human kind.
4. Explain the advantages behind utilization of waste water treatment via biological way rather than chemical method.
5. Identify, formulate and solve the problems arises due to waste.

COURSE CONTENT

BE Biotechnology **Biotechnology of Waste Treatment** **Semester – VII**

Teaching Scheme
Lectures -3 Hrs/week

Examination Scheme
End Semester Exams (ESE): 80 Marks.
Paper Duration: 3 Hours.
Internal Sessional Exam (ISE):20 Marks.

Unit: I
Introduction: **No. of Lecture: 8 Hours, Marks: 16**

Introduction to waste treatment, Site surveys for waste treatment programme, Strengths of fermentation waste, Disposal of effluents, Treatment process(physical, chemical and biological), Bacterial growth and factors affecting growth kinetics, Important biological reactions: Aerobic heterotrophic reaction, Nitrification, Denitrification, Anaerobic digestion.

Unit: II
Biochemistry of Waste Treatment: **No. of Lecture: 8 Hours, Marks: 16**
Introduction, Oxygen uptake, Dissolved oxygen, Enzymes, Nitrogen metabolism, Phosphorus and sulphur, Elements and growth factors, Fate of individual chemicals, Structure activity relationships, Multisubstrate and species interactions, Biochemical indicators, Precipitation in waste treatment, Coagulation in waste treatment.

Unit: III
Waste Treatment Processes: **No. of Lecture: 8 Hours, Marks: 16**
Characteristics of activated sludge, Theory of activated sludge process, Design, Operation and control, Operation and design features of trickling filters, Rotating biological contractor, Aerated lagoons, Anaerobic digestion, Packed beds, Land farming.

Unit: IV **No. of Lecture: 8 Hours, Marks: 16**
Nitrification and Denitrification and Anaerobic Treatment:
Introduction, Forms of nitrogen, Nitrifying and denitrifying bacteria, Stoichiometry of nitrification and denitrification, Process variables in nitrification and denitrification process, Nitrification processes: Plug flow v\s complete mix, Single stage v\s two stage systems, Biofilm nitrification, Denitrification using methanol, Organic matter and thiosulfate and sulfide, Anaerobic reactor system.

Unit: V
Biological Degradation: **No. of Lecture: 8 Hours, Marks: 16**
Introduction, Determination of biological degradability, Pilot studies: PCB (polychlorinated biphenols) biodegradation, Methylethyl ketone, Aerobic biodegradation: TCE (trichloro ethane) Degradation, Polycyclic aromatic hydrocarbon degradation, Oil degradation, phenanthrene degradation.

Reference Books:

1. Bruce E Rittmann, Rurry L.Mc carty, Environmental Biotechnology:Principles and Applications, Mcgraw Hill international.
2. A.K.Chatterji, Introduction to environmental biotechnology,Eastern Economy edition.
3. Nicholas P.Cheremisinoff, Biotechnology for waste water treatment,Eastern Economy edition.
4. Murray Moo - Young, Comprehensive biotechnology, vol 4- Pergamon Press.
5. P. F. Stanbury, A. Whitaker and S. J. Hall, Principles of fermentation technology Aditya book private limited.

Interdisciplinary Elective

2. Biomedical Instrumentation

Course Outline

Biomedical Instrumentation	**BMI**	**BTL-705**
Course Title	Short Title	Course Code

Lecture	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	03	15	40	03

Course Description:
This course gives basic knowledge of the principle of operation and design of biomedical instruments.

Prerequisite Courses: Concept of biotechnology.

General Objectives:

1. The analysis of biological systems and the technological advancement for health care.
2. An engineering knowledge should be applied in an ethically responsible manner for the good of society.

Learning Outcomes:

At end of the course Student will be able to:

1. Understand principle, Working and application of biomedical instruments.
2. Understand human physiology.
3. Analyze results related to engineering and biological problems.
4. Use and design variety of software used in various biomedical instrumentations.
5. Develop ability to use the techniques, skill and modern engineering tools.
6. Work on multidisciplinary terms.
7. Explore the options for biomedical instruments in higher study.

Course Content

BE Biotechnology **Semester – VIII**

Biomedical Instrumentation

Teaching Scheme
Theory : 3 hours/ week

Examination Scheme
End Semester Examination (ESE) : 80 Marks.
Paper Duration (ESE) : 03 Hours.
Internal Sessional Examination (ISE) : 20Marks.

UNIT I **No. of Lect. – 08, Marks: 16**

Electrode-Electrolyte interface, half-cell potential, Polarization- polarisable and non-polarizable electrodes, Ag/AgCl electrodes, Electrode circuit model; motion artifact. Body Surface recording electrodes for ECG, EMG, and EEG, Internal electrodes- needle and wire electrodes, Micro electrodes- metal microelectrodes, Electrical properties of microelectrodes, Electrodes for electric stimulation of tissue.

UNIT II **No. of Lect. – 08, Marks: 16**

Cardiovascular systems, Physiology of heart, ECG lead configuration, Blood Pressure Characteristics of blood flow, Measurement of blood flow and cardiac output.

UNIT III **No. of Lect. – 08, Marks: 16**

Function of kidneys, Artificial kidney, Dialysers, Membranes for Heamo-dialysis Heamo-dialysis Machine, Portable kidney machine, Mechanics of respiration Artificial ventilation, ventilators Types, ventilator terms, classification of ventilators Modern ventilators, HF ventilators, Nebulisers and Aspirators.

UNIT IV **No. of Lect. – 08, Marks: 16**

Cardiac Pacemakers and Defibrillators: Need for pacemakers, external pacemakers, and Implantable pacemakers, recent developments, pacing system analyzer, need for defibrillators, DC defibrillators, Implantable defibrillators, and Defibrillators analyzers, measurement of blood PCO2.

UNIT V **No. of Lect. – 08, Marks: 16**

Nervous system ,Classification of Nervous system, Anatomy of Nervous system, Organisation of Brain Neuronal communication, Neuronal receptors, Sematic and Autonomic nervous system Spinal reflexes ., Neuronal firing measurements, EEG measurement.

Text Book :

1. Cromwell - Biomedical Instrumentation, Pearson / PHI
2. Khandpur - Handbook of Biomedical Instrumentation
3. Vander, Sherman, Human Physiology- The Mechanism of Body Function, TMH Ed.1981
4. Carr & Brown Introduction To Biomedical Equipment Technology

Interdisciplinary Elective.

3.Biomechanics

Course Outline

Biomechanics	**BM**	**BTL-706**
Course Title	Short Title	Course Code

Lectures	Hours per Week	No. of Weeks	Total Hours	Credits
	03	15	40	3

Course Description:

Basic Biomechanics is a first course in undergraduate biomechanics that provides background in muskuloskeletal anatomy and principles of biomechanics. The course applies and builds on the concepts of Statics and, Dynamics for human activities, and Mechanics of Materials and tissues.

Prerequisite Course(s): Basic mathematics skills (algebra, geometry), Applied mechanics and Fluid mechanics.

General Objective:

1. Biomechanics is an introductory course designed to educate kinesiology students on the basic principles of biomechanics and their applications to human movement.
2. This course will involve the analysis of efficient movement through a study of mechanical and anatomical principles and their application to human movement.

Learning Outcomes:

After completion of the course, students will be able to:

1. Identify a given bone, ligament or muscle by name, anatomic location, or function.
2. Identify relationships between structure and function in tissues and the implications/importance of these relationships.
3. Analyze the forces at a skeletal joint for various static and dynamic human activities.
4. Analyze the stresses and strains in biological tissues, given the loading conditions and material properties.
5. Identify the appropriate viscoelasticity model for the mechanical behavior of a given biological tissue.
6. Predict the overall creep and stress relaxation behavior for a basic viscoelastic material model.
7. Design orthopedic implant.
8. Work in multidisciplinary stream.
9. Explore the options for biomechnics in higher study.

COURSE CONTENT

BE Biotechnology | Biomechanics | Semester – VII

Teaching Scheme
Lectures -3 Hrs/week

Examination Scheme
End Semester Exams (ESE) : 80 Marks.
Paper Duration : 3 Hours.
Internal Sessional Exam (ISE) : 20 Marks.

Unit: I
Biomechanics of Joints
Skeletal joints, forces and stresses in human joints, Analysis of rigid bodies in equilibrium, free body diagrams, types of joint, biomechanical analysis of elbow, shoulder, spinal column, hip knee and ankle.

Unit: II
Biofluid Mechanics
Introduction, viscosity and capillary viscometer, Rheological properties of blood, laminar flow, Couette flow and Hagen-poiseuille equation and turbulent flow.

Unit: III
Hard and Soft Tissues
Hard tissues: Bone structure & composition mechanical properties of bone, cortical and cancellous bones, viscoelastic properties, Maxwell & Voight models – anisotropy.
Soft Tissues: Structure and functions of Soft Tissues: Cartilage, Tendon, Ligament, and Muscle; Material Properties: Cartilage, Tendon, Ligament, and Muscle; Modeling: Cartilage, Tendon, Ligament and Muscle.

Unit: IV
Cardiovascular Mechanics
Cardiovascular system, artificial heart valves, biological and mechanical valves development, testing of valves.

Unit: V
Biomechanics of Implants
Design of orthopedic implant, specifications for a prosthetic joint, biocompatibility, requirement of a biomaterial, characteristics of different types of biomaterials, manufacturing process of implants, fixation of implants.

References:

1. Y C Fung, Biomechanics: Mechanical Properties of Living Tissues, Springer, 2nd edition, 1993.
2. N. Ozkaya and M. Nordin, Fundamentals of Biomechanics-Equilibrium, Motion and Deformation, Springer-verlag, 2nd edition 1999
3. J. G Webster, Medical instrumentation –Application & design, John Wiley and sons Inc. 3rd ed. 2003.
4. D. J. Schneck and J. D. Bronzino, Biomechanics- Principles and Applications, CRC Press, 2nd Edition, 2000.

Elective-I

1. Food Biotechnology

Course Outline

Food Biotechnology	**FB**	**BTL-707**
Course Title	**Short Title**	**Course Code**

Lecture	**Hours per week**	**No. Of weeks**	**Total hours**	**Semester credits**
	03	15	40	03

Course Description:
This course is introduced to understand the constituents of food. This course deals with the study of microorganism present in food and the principles to control them.

Prerequisite Course(s): Microbiology, Unit operations and Biochemistry.

Objective of the Subject:
1. To understand the various constituents of the foods and their role.
2. To understand the different microorganism present and their role in causing food poison.
3. To give the knowledge to students how to preserve the food.
4. It will help in production of different food products.
5. To make brief introduction regarding the different unit operation involved in food industry.

Learning outcomes:
By completion of this course students will able to:
1. Find out the different microorganism responsible for food spoilage.
2. Different constituents of the food and their role in body.
3. Use their knowledge to preserve the food.
4. Apply their knowledge of unit operation in food industry.
5. Use their knowledge to make food product.
6. Use the techniques, skill and modern engineering tools necessary for engineering practice.
7. Apply the knowledge of engineering principles to living entities for societal welfare.
8. Work in multidisciplinary stream.
9. Explore the options for Food biotechnology in higher study.

Course content

BE Biotechnology **Food Biotechnology** **semester VII**

Teaching Scheme	**Examination scheme**	
3hrs/week	End Semester Examination (ESE)	: 80 Marks
	Paper Duration (ESE)	: 03 hours
	Internal Sessional Examination (ISE)	: 20Marks

UNIT I: Food Biotechnology **No. of Lecture: 8 Hours, Marks: 16**

Introduction to food biotechnology, Constituents of food, the sources of dietary carbohydrates and their functional property, the sources of protein and their functions, requirements of vitamins, fatty acids in food.

UNIT II: Microorganisms in Food **No. of Lecture: 8 Hours, Marks: 16**

Types of microorganism in food, Microbial examination of foods, Role and significance of micro organism in foods, Factors influencing microbial activity, Food borne diseases: Food infection, Viral infection, Food borne parasites, Food intoxication.

UNIT III: Food Spoilage and Preservation **No. of Lecture: 8 Hours, Marks: 16**

Causes of food spoilage, Spoilage of various foods and food products, Deterioration of food quality, Food preservation using high temperature, Evaporation, Drying, Low temperature and Irradiation

UNIT IV: Food Biotechnology **No. of Lecture: 8 Hours, Marks: 16**

Food fermentation, Important microbial culture in food industry, Fermentation of dairy products, Fermentation for beverage, Single cell proteins, Fermentative production of sauerkraut, Fermentation for production of vinegar and Idali.

UNIT V: Unit operation **No. of Lecture: 8 Hours, Marks: 16**

Unit operations in food industry: Size reduction, Screening, Mixing, Filtration, centrifugation, Extraction, Crystallization, Heat processing.

TEXT BOOK

1. B. Sivashankar, Food Processing and Preservation, Prentice Hall ,India.
2. Powar and Daginawala, General Microbiology (vol 2), Himalaya Publishing House.

REFERENCE BOOK

1. Murray Moo-Young, Comprehensive Biotechnology (Vol: 3), Pergamon Press, An imprint of Elsevier.
2. S.S. Purohit, Microbiology: Fundamentals and Application, Agrobios India.
3. Fraizer, Food Microbiology ,TMH publication
4. Hiller, Genetic Engineering of Food: Detection of Genetic Modifications, Willy Publication.

Elective-I

2.Plant Biotechnology

Course Outline

Plant Biotechnology	**PBT**	**BTL-708**
Course Title	**Short Title**	**Course Code**

Lectures	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Credits**
	03	15	40	3

Course Description:

This course is framed to develop the basic knowledge of plant tissue culturing methods to undergraduate students. The goals of the course are to understand the basic principles of plant tissue culturing and their applications in the field of Biotechnology.

Prerequisite Course(s): Bioprocess engineering, genetic engineering and Fermentation Technology.

General Objective :

- To develop the basic knowledge and skills of plant tissue culturing, like explants, callus, anther, ovary, etc. and making genetically modified plants for understanding their role in the field of Biotechnology.

Learning Outcomes:

After completion of the course, students will be able to:

1. Understand the bioethical issues related to plant Biotechnology.
2. Apply the advanced techniques in plant tissue culturing for making the modified varieties of plants.
3. Develop the disease and pest resistant plants.
4. Produce the value added products which are having commercial value by applying the protocols of fermentation technology.
5. Explore the options for plant biotechnology in higher study.

COURSE CONTENT

BE Biotechnology Plant Biotechnology Semester - VII

Teaching Scheme
Lectures -3 Hrs/week

Examination Scheme
End Semester Exams (ESE) : 80 Marks.
Paper Duration : 3 Hours.
Internal Sessional Exam (ISE) : 20 Marks.

Unit: I
Plant Tissue Engineering-I: **No. of Lecture: 8 Hours, Marks: 16**

Introduction to tissue engineering, Media components (micro and macro nutrients) and preparation, Media selection, Cellular totipotency, Practical application of cellular totipotency, Criteria for selection of explant, Classification of tissue culture, callus culture, cell suspension culture, Application of callus culture and cell suspension culture, single cell culture, Meristem culture.

Unit: II
Plant Tissue Engineering-II: **No. of Lecture: 8 Hours, Marks: 16**
Bioprocess consideration in using plant cell cultures, Bioreactors for suspension cultures, Bioreactors for organized tissue, Production of secondary metabolites, Anther culture, Ovary culture, Embryo culture, Protoplast culture, Synthetic seeds and preservations.

Unit: III
Plant transformation Technology: **No. of Lecture: 8 Hours, Marks: 16**
Agrobacterium mediated gene transfer; Agrobacterium based vectors, viral vectors and their application. Direct gene transfer methods; chemical methods, electroporation, microinjection, particle bombardment.

Unit: IV **No. of Lecture: 8 Hours, Marks: 16**
Plant Tissue culture, Genetic Engineering for Productivity and Performance-I:
Somatic embryogenesis, organogenesis; Protoplast isolation culture and fusion, Production of haploids, Somaclonal variations, Germplasm conservation (Cryopreservation), Herbicide resistance, Insect resistance plants, Disease resistance plants, virus resistance plants.

Unit: V **No. of Lecture: 8 Hours, Marks: 16**
Molecular farming & Industrial products, Genetic Engineering for Productivity and Performance-II and Metabolic Engineering:
Abiotic stress tolerance; Drought, temperature, salt, Metabolic engineering for plant primary metabolites and secondary metabolites, Application of Plant biotechnology for the production of quality oil, Industrial enzymes, Therapeutic Proteins, Antigens (edible vaccine) and plantibodies.

Reference Books:

1. B.D.Singh, Biotechnology: Expanding Horizons, Kalyani Publishers, New Delhi, Second Revised Edition, 2008.
2. J.Hammond,P.McGarvey and V.Yusibov (Eds.), Plant Biotechnology New Products and Applications, Springer.
3. S.S.Purohit, Biotechnology: Fundamentals and Applications, Agrobios (India), 4th Edition, 2005.
4. R.A.Dixon and Gonzales, Plant Cell Culture : A Practical Approach, IRL Press.
5. Roberta Smith, PlantTissue Culture:Techniques and Experiments. 2nded., Academic Press,2000.
6. Bhojwani, S.S.and Rajdan, Plant Tissue Culture: Theory and Practice,2004.

Elective-I

3. Animal Biotechnology
Course Outline

Animal Biotechnology	**ABT**	**BTL-709**
Course Title	Short Title	Course Code

Lectures	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Credits**
	03	15	40	3

Course Description:

This course is framed to develop the basic knowledge of animal tissue culturing methods in undergraduate students. The background expected includes a prior knowledge of BE Biotechnology courses. The goals of the course are to understand the basic principles of animal tissue culturing and their applications in the field of Biotechnology.

Prerequisite Course(s): Fermentation technology, Bioprocess engineering, Genetic Engineering and Molecular Biology.

Course objective

1. To develop the basic knowledge and skills of animal tissue culturing, production of antibodies, hormones, making of genetically modified animals.
2. Production of value added products having commercial value for understanding their role in the field of Biotechnology.

Learning Outcomes:

After completion of the course, students will be able to:

1. Describe the structure of animal genes and genomes.
2. Describe basic principles and techniques in genetic manipulation and genetic engineering.
3. Describe gene transfer technologies for animals and animal cell lines.
4. Describe techniques and problems both technical and ethical in animal cloning.
5. Explore the options for Food biotechnology in higher study.

COURSE CONTENT

BE Biotechnology **Animal Biotechnology** **Semester - VII**

Teaching Scheme
Lectures -3 Hrs/week

Examination Scheme
End Semester Exams (ESE) : 80 Marks.
Paper Duration : 3 Hours.
Internal Sessional Exam (ISE) : 20 Marks.

Unit: I **No. of Lecture: 8 Hours, Marks: 16**
Laboratory requirements for animal cell culture:
Sterile handling area, Sterilization of different materials used in animal cell culture, Aseptic concepts, Instrumentation and equipments for animal cell culture.

Culture medium: natural media, synthetic media, introduction to balanced salt solutions and simple growth medium, Brief discussion on the chemical, physical and metabolic functions of different constituents of culture medium, role of carbon dioxide, serum and supplements.

Unit: II
Types of Cell Cultures: **No. of Lecture: 8 Hours, Marks: 16**
Different types of cell cultures, Trypsinization, Cell separation, Continuous cell lines, Suspension culture, Organ culture, Development of cell lines, Characterization and maintenance of cell lines, Cryopreservation, Common cell culture contaminants.

Unit: III
Stem cell research: **No. of Lecture: 8 Hours, Marks: 16**
Current status and application in medicine, Application of animal cell culture for *in vitro* testing of drugs; Application of cell culture technology in production of human and animal viral vaccines and pharmaceutical proteins, Production of recombinant hemoglobin, blood substituent's, artificial blood.

Unit: IV **No. of Lecture: 8 Hours, Marks: 16**
Gene transfer technology in animals:
Viral and non-viral methods, Production of transgenic animals and molecular pharming, current status of production of transgenic animals, Animal cloning: Techniques, relevance and ethical issues.

Unit: V **No. of Lecture: 8 Hours, Marks: 16**
Commercial applications of cell culture:
Tissue culture as a screening system; cytotoxicity and diagnostic tests. Mass production of biologically important compounds (e.g. Vaccines), Harvesting of products, purification, and assays, Three dimensional cultures and tissue engineering.

Reference Books:

1. B.D.Singh, Biotechnology: Expanding Horizons, Kalyani Publishers, New Delhi, Second Revised Edition, 2008.
2. S.S.Purohit, Biotechnology: Fundamentals and Applications, Agrobios (India), 4th Edition, 2005.
3. Freshney, Culture of Animal Cells, 5th Edition, Wiley-Liss, 2005.
4. Ed. John R.W. Masters, Animal Cell Culture - Practical Approach, 3rd Edition, Oxford University Press, 2000.
5. Ed. Martin Clynes, Animal Cell Culture Techniques., Springer, 1998.
6. B.Hafez, E.S.E Hafez, Reproduction in Farm Animals, 7th Edition, Wiley- Blackwell, 2000.
7. Louis-Marie Houdebine, Transgenic Animals: Generation and Use, 1st Edition, CRC Press, 1997.

Elective-1
4.Environmental Biotechnology

Course Outline

Environmental Biotechnology	**EBT**	**BTL-710**
Course Title	Short Title	Course Code

Lectures	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Credits**
	03	15	40	3

Course Description:

This course is framed to develop the basic knowledge of Environmental Engineering to undergraduate students. The goals of the course are to understand the basic principles of Environmental Engineering and their applications in the field of Biotechnology.

Prerequisite Course(s): Microbiology and Bioprocess engineering.

General objective:

- To develop the basic knowledge and skills of Environmental Biotechnology, like Bioremediation, xenobiotics, Bioleaching & understanding their role in the field of Biotechnology.

Learning Outcomes:

After completion of the course, students will be able to:

1. Analyze a research problem and write clear, step-by-step instructions for conducting experiments or testing hypothesis.
2. Provide examples of current applications of biotechnology and advances in the different areas i.e. environmental, bioremediation, bioleaching and xenobiotics etc.
3. Identify the role of microorganisms in biological waste treatment.
4. Describe methods used to detect and identify microorganisms in the environment.
5. Contrast various approaches to anaerobic digestion of wastes and solve related problems.
6. Explore the options for Environmental biotechnology in higher study.

COURSE CONTENT

BE Biotechnology **Environmental Biotechnology** **Semester-VII**

Teaching Scheme
Lectures -3 Hrs/week

Examination Scheme
End Semester Exams (ESE) : 80 Marks.
Paper Duration : 3 Hours.
Internal Sessional Exam (ISE) : 20 Marks.

Unit: I **No. of Lecture: 8 Hours, Marks: 16**

Environmental Pollution & Environmental Safety Regulations:
Water, air, noise and radiation (introduction, source and effects of pollutions): Types of waste, properties, global warming, Environment Protection Act- Air, Water and Forest Conservation, Methanogenesis-Methanogenic, acetogenic and fermentative bacterial processes and conditions.

Unit: II
Microbial Biodiversity: **No. of Lecture: 8 Hours, Marks: 16**
Diversity on earth:
Extent and importance, recovery problem, Finding New diversity, biodiversity of bacteria: level of bacterial diversity, isolation strategies, Fungal biodiversity: isolation and identification, Recovering biodiversity using environmental DNA, accessing uncultured microbes, Environmental genomics: Screening environmental libraries, barriers and challenges.

Unit: III
Bioremediation: **No. of Lecture: 8 Hours, Marks: 16**
Introduction, constraints and priorities of Bioremediation, Biostimulation of Naturally occurring microbial activities, Bioaugmentation, in situ, ex situ, intrinsic & engineered bioremediation, Solid phase bioremediation -land farming, prepared beds, soil piles, Phytoremediation, Composting, Bioventing & Biosparging; Liquid phase bioremediation - suspended bioreactors, fixed biofilm reactors.

Unit: IV **No. of Lecture: 8 Hours, Marks: 16**
Hazardous Waste Management& Biological Control:
Introduction - Xenobiotic compounds, recalcitrance, hazardous wastes - biodegradation of Xenobiotics , Biological detoxification, Biological control of foliar pathogens and pests with bacterial biocontrol agents: biocontrol agents, ecology of the plant pathogen or pest, source of antagonist, Empirical approaches to select biocontrol agents

Unit: V
Treatment of Industrial Wastes: **No. of Lecture: 8 Hours, Marks: 16**
Waste water characteristics; biological waste treatment; kinetic models, unit operations, design, principle and modelling of activated sludge process. Trickling filters, fluidized reactor, up flow anaerobic sludge blanket reactor, contact process, packed bed reactor, hybrid reactors, sequential batch reactors; Bioconversions of agricultural and organic waste material into gainfully utilizable products- cellular hydrogen, food and feed stocks.

Reference Books:

1. Metcalf Eddy – Waste water Engineering – 3rd Ed., THM publications.
2. R.S. Ramalho, - Introduction to Waste Water treatment.
3. S.K.Agarwal, Environmental Biotechnology.
4. Martin Alexander, Biodegradation & Bioremediation (1999), Academic press.

LAB BIOINFORMATICS

Bioinformatics	**Bioinfo**	**BTL-711**
Course Title	Short Title	Course Code

Laboratory	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	02	**15**	**16**	**01**

Course description:
This course deals with the application of informatics tools and software to solve the problems related to biotechnology.

Prerequisite Course(s): Biochemistry, Molecular Biology and Genetic Engineering.

General Objective:

1. To develop the basic knowledge and practical skills in the field of bioinformatics.
2. To make students familiar with various tools of bioinformatics

Learning Outcomes:
At the completion of this course the students will be able to:

1. Apply practical knowledge for information retrieval.
2. Apply the basic knowledge for developing and using tools for sequence analysis of biomolecules.
3. Apply the basic knowledge for developing and using tools for structure analysis of biomolecules.
4. Explore the options for Bioinformatics in higher study.

Lab Bioinformatics

Teaching Scheme	Examination Scheme	Semester-VII
Practical - 2 Hrs/week	External Sessional Exams (ESE)/Oral (OR) : 25 Marks.	
	Internal Continuous Assessment (ICA) : 25 Marks.	

Minimum 08 experiments shall be performed from the following

1. Databases search: NCBI, EMBL
2. Basic Local Alignment Search Tool
3. Multiple sequence alignment.
4. Rasmol
5. Swiss PDB Viewer
6. Homology modelling
7. DS Visualizer
8. ArgusLab
9. Modeller
10. Chemsketch
11. Comparative docking of different HIV Protease inhibitors.
12. Pair wise alignment using Align / EMBOSS
13. Restriction Mapper.
14. Chou-Fasman Structure prediction.

Reference Books:

1. Andreas D. Baxevanis and B. F. Francis Ouellette, Bioinformatics A Practical Guide to the Analysis of Genes and Proteins by, Second Edition, a john wiley & sons, inc., publication
2. Arthur M. Lesk, Introduction to Bioinformatics , Oxford University Press Inc., New York
3. Janusz M. Bujnicki, Practical Bioinformatics, SPRINGER (SIE)
4. S. C. Rastogi, Bioinformatics Concepts, Skills and Applications by , CBS; 2 edition.

Downstream Processing Lab
LAB COURSE OUTLINE

Downstream Processing	**DSP**	**BTL-712**
Course Title	**Short Title**	**Course Code**

Practical	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	02	15	16	1

Downstream Processing Lab

Course Description:
In this laboratory, course emphasis is on the understanding of basics techniques of recovery processes. The learner can use this knowledge and apply in allied branches of Biotechnology as required.

Prerequisite Course(s): Unit Operation and Biochemistry.

General Objective:
The objective of the laboratory is to impart the fundamental knowledge of recovery processes at the research level to the students and to develop their ability to apply the analytical techniques for interpreting experimental results.

Learning Outcomes:
After successful completion of this lab student will be able to:

1. Isolate the biomolecules/bioproducts from the fermentation broths.
2. Recover the intracellular products from the microbial cells by applying the cell disruption techniques.
3. Precipitate the soluble bioproducts from the fermentation broths such as proteins and enzymes.
4. To identify the recovered product quantitatively and qualitatively by applying the analytical techniques on them.
5. Study and estimate the concentration of the recover bioproducts.

Downstream Processing Lab

Semester-VII

Teaching Scheme	**Examination Scheme**	
Practicals -2 Hrs/week	External Sessional Exams (ESE)/Oral (OR)	:25 Marks.
	Internal Continuous Assessment	:25 Marks.

Minimum eight experiments from the following

1. Cell Disruption by Ultrasonication.
2. Cell Disruption by Enzymatic Reaction.
3. Aqueous Two-phase Extraction.
4. Centrifugal Separation- Ultra Centrifugation.
5. Separation & identification of amino acids by paper chromatography.
6. Separation & identification of sugars by paper chromatography.
7. Separation & identification of lipids by thin layer chromatography.
8. Ammonium Sulphate Precipitation of biomolecules.
9. Isoelectric Precipitation.
10. Crystallisation of biomolecules.

Reference books:

1. David Plummer , An introduction to Practical Biochemistry III edition, John Wiley & Sons.
2. Keith John Walker, Principles and Techniques of Biochemistry and Molecular Biology by Cambridge University Press; 6 edition (2005).
3. By J. Jayaraman, Kunthala Jayaramanj, Laboratory Manual in Biochemistry, New Age International

Lab Elective-1
1. Food Biotechnology Lab

LAB COURSE OUTLINE

Food biotechnology	**FB**	**BTP-713**
Course Title	**Short Title**	**Course Code**

Laboratory	**Hours/week**	**No.of weeks**	**Total hours**	**Semester credits**
	02	**15**	**16**	**01**

Course Description:
This course is introduced to give practical knowledge of the food science. This course will give insight of practical techniques to produce food products as well as techniques to prevent them from microorganisms.
Prerequisite Course(s): Microbiology and Fermentation Biotechnology.

General Objective:
1. To understand fundamentals of food biotechnology technique.
2. To devise protocols to list the major food spoilage microorganisms.
3. To develop the skills to examine the food for presence of microorganism.
4. To make the learner familiarize with the productions of different food products.
5. To analyze methods used to control or destroy micro organism commonly found in food.

Learning Outcomes:
After successful completion of this lab student will be able to:
1. Isolate the microorganism in food and calculate the numbers.
2. Control the microorganism in food by using physical methods.
3. To produce various products of food biotechnology.
4. Apply their knowledge for analysis of mycotoxin.
5. Use the techniques, skill and modern engineering tools necessary for engineering practice.
6. Apply the knowledge of engineering principles to living entities for societal welfare.
7. Work in multidisciplinary stream.
8. Explore the options for Food biotechnology in higher study.

Lab Food Biotechnology

Teaching Scheme	**Examination Scheme**	**Semester-VII**
Practical - 2 Hrs/week	External Sessional Exams (ESE)/Oral (OR) : 25 Marks.	
	Internal Continuous Assessment (ICA) : 25 Marks.	

Minimum 08 experiments shall be performed from the following

1. Standard plate count.
2. Structural straining-spore straining.
3. Microbial examination of water by multiple tube fermentation test.
4. Vinegar production.
5. Wine making.
6. Microbial examination of canned foods.
7. Assay of quality of milk by methylene blue reduction test.
8. Sauerkrant fermentation.
9. Control of microbial growth by physical methods-heat.
10. Analysis of mycotoxin (Aflatoxin) in fungus contaminated food material.

REFFERENCES:

1. Frederick J. Post : Laboratory Manual for Food Microbiology and Biotechnology Edition 2,Star Publishing Company.
2. Neelima Garg: Laboratory Manual of Food Microbiology March 6, 2010.

2.Plant Biotechnology Lab
LAB COURSE OUTLINE

Plant Biotechnology	**PTB**	**BTL-714**
Course Title	**Short Title**	**Course Code**

Practical	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	02	15	16	1

Course Description:
In this laboratory, course emphasis is on the understanding of basics plant tissue culturing. The learner can use this knowledge and apply in allied branches of Biotechnology as required.

Prerequisite Course(s): Bioprocess engineering, Genetic engineering.

General Objective:
1. The objective of the laboratory is to impart the fundamental knowledge of plant tissue culturing at the research level in the students.
2. To develop their ability to apply the various techniques for developing the new varieties of plants.

Learning Outcomes:
After successful completion of this lab student will be able to:
1. Study the various techniques of explants sterilization.
2. Grow the number of plant copies using the single part of the plant.
3. Develop the new varieties of plants consisting of different characteristics.
4. Produce the genetically modified plants.
5. Produce value added plant products having commercial value at large scale level.
6. Use the techniques, skill and modern engineering tools necessary for engineering practice.
7. Apply the knowledge of engineering principles to living entities for societal welfare.
8. Work in multidisciplinary stream.
9. Explore the options for Plant Tissue Culture in higher study.

Plant Biotechnology Lab

Semester-VII

Teaching Scheme
Practicals -2 Hrs/week

Examination Scheme
External Sessional Exams (ESE)/Oral (OR):25 Marks.
Internal Continuous Assessment: 25 Marks.

Minimum eight experiments from the following

1. Preparation of Media
2. Surface sterilization
3. Callus induction
4. Organ culture
5. Protoplast isolation, culture and Cytological examination
6. Agrobacterium mediated gene transfer.
7. Artificial seed production.
8. Shake flask studies of plant cell culture.
9. regeneration of plant from callus culture
10. Anther culture.
11. Ovary culture.

Reference books:

1. C.C.Giri & Archana Giri, Plant Biotechnology: PracticalManual, IK International,2007.

Lab Elective-I
3.Animal Biotechnology Lab

LAB COURSE OUTLINE

Animal Biotechnology	**ATB**	**BTL-715**
Course Title	Short Title	Course Code

Practical	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	02	15	16	1

Course Description:
In this laboratory, course emphasis is on the understanding of basics animal tissue culturing. The learner can use this knowledge and apply in allied branches of Biotechnology as required.

Prerequisite Course(s): Microbiology, Bioprocess engineering, Fermentation technology, Genetic engineering.

General Objective:

1. The objective of the laboratory is to impart the fundamental knowledge of animal tissue culturing at the research level in the students.
2. To develop their ability to apply the various techniques for developing the modified animals.

Learning Outcomes:
After successful completion of this lab student will be able to:

1. Study the various techniques of sterilization.
2. Develop & optimize various types of Medias.
3. Study the Cell Counting and Viability.
4. Perform the Staining of Animal Cells.
5. Use the techniques, skill and modern engineering tools necessary for engineering practice.
6. Apply the knowledge of engineering principles to living entities for societal welfare.
7. Work in multidisciplinary stream.
8. Explore the options for animal biotechnology in higher study.

Animal Biotechnology Lab

Semester-VII

Teaching Scheme | **Examination Scheme**

Practicals -2 Hrs/week

External Sessional Exams (ESE)/Oral (OR):25 Marks.

Internal Continuous Assessment: 25 Marks.

Minimum eight experiments from the following

1. Sterilization Techniques.
2. Preparation of Media.
3. Preparation of Sera.
4. Primary Cell Culture.
5. Preparation of established Cell lines.
6. Cell Counting and Viability.
7. Staining of Animal Cells.
8. Preservation of Cells.
9. Culture of Virus in Chick Embryo.
10. Adaptation of Virus in Animal (in vitro) Cell Culture.

Reference books:

1. R. Pollack, Readings in Mammalian cell culture. Cold Spring Harbour Laboratory (1981). 2.
2. R. Pollack and S. Pfeiffer, Animal Cell Culture. Cold Spring Harbour Laboratory (1971).
3. R.Crowe., H. Ozer and Dr. Rifkin, Experiments with Normal and Transformed cells, Cold Spring Harbour Laboratory, (1978).
4. D. J. Merchant., R.H. Kahn and W. H. Murphy, Hand Book of cell and organ culture, Burgess Publishing Company, (1969).
5. R. Ian Freshney and R. Alan, Culture of Animal Cells, Liss. Inc. (1987).
6. Microcarrier culture: Principles and Methods, Pharmacia Fine chemicals.
7. R.E. Spier and J. B. Griffiths, Animal cell biotechnology, Vol. I and II, Academic Press (1985).

Lab Elective-I

4.Environmental Biotechnology Lab

LAB COURSE OUTLINE

Environmental Biotechnology	**EBT**	**BTL-716**
Course Title	Short Title	Course Code

Practical	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	02	15	16	1

Course Description:
In this laboratory, course emphasis is on the understanding of basics environmental engineering. The learner can use this knowledge and apply in allied branches of Biotechnology as required.

Prerequisite Course(s): Biochemistry and Microbiology.

General Objective:
1. The objective of the laboratory is to impart the fundamental knowledge of environmental engineering at the research level to the students
2. To develop their ability to apply the various techniques for developing the new technology for waste management.

Learning Outcomes:
After successful completion of this lab student will be able to:
1. Design and execute new environmental science experiments.
2. Communicate their understanding of environmental science to a lay audience.
3. Demonstrate through presentation an understanding of the global character of environmental problems and ways of solving them, including collaborative efforts spanning local to global scale.
4. Use the techniques, skill and modern engineering tools necessary for engineering practice.
5. Apply the knowledge of engineering principles to living entities for societal welfare.
6. Work in multidisciplinary stream.
7. Explore the options for environmental biotechnology in higher study.

Environmental Biotechnology Lab

Semester-VII

Teaching Scheme
Practicals -2 Hrs/week

Examination Scheme
External Sessional Exams (ESE)/Oral (OR):25 Marks.
Internal Continuous Assessment: 25 Marks.

Minimum eight experiments from the following

1. Analysis of water for colour, turbidity, solids, hardness, alkalinity, acidity, iron, sulphate, chloride, fluoride, nitrate etc.
2. Physical analysis of wastewater sample
3. Analysis of samples for DO.
4. Analysis of samples for BOD of waste water.
5. To determine the COD of waste water.
6. To determine the nitrogen contents of waste water.
7. Biological examination of water: Algae, bacteria and Protozoa
8. Bacterial water quality: Measuring quality of water by using coli form organisms (MPN method and membrane filter).
9. Biochemical activities of bacteria: hydrolysis of polysaccharides, Bacteria in waste water.
10. Determination of Biodiversity index.

Reference books:

1. Mathur: Water and Wastewater Testing.
2. Sawyer, Mc Carty & Parkin Chemistry for Environmental Engg. Standard Methods P.A, H.A New York.
3. Sirockin and Cullimore: Practical Microbiology.

PROJECT-I

Project-I	**P-I**	**BTP-717**
Course Title	Short Title	Course Code

Course Description:
The course explores the knowledge of design, experiment and analysis of data. The course develops ability to work on multidisciplinary teams, Identify, formulate, and solve engineering problems in view of economic, environmental and societal context.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**15**	**28**	**2**

Prerequisite Course(s): Knowledge of science, mathematics, computer programming and core subject of engineering.
General Objectives: The objectives of project are to develop ability to work in group. The scope of work is design and conduct experiments, as well as to analyze and interpret data within realistic constrain such as economic, environmental, social, safety and manufacturability. The project work provides plate form for planning, material procurement, preparing specification and execution of work. The project also develop to work on multidisciplinary teams, communicate effectively and Knowledge of contemporary issues.
Course Outcomes:
Upon successful completion of this course the students will be able to:

1. Apply knowledge of mathematics, science, and engineering.
2. Design and conduct experiments, as well as to analyze and interpret data.
3. Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
4. Function on multidisciplinary teams, communicate effectively and Knowledge of contemporary issues.
5. Identify, formulate, and solve engineering problems by understanding professional and ethical responsibility.
6. Understand the impact of engineering solutions in a global, economic, environmental, and societal context.
7. Recognition of the need for, and an ability to engage in life-long learning.
8. Use the techniques, skills, modern engineering tools and software necessary for engineering practice.

Project-I
(Lab Course Contents)

Semester-VII | **Examination Scheme:**
Teaching Scheme: | **Internal Continuous Assessment: 25 Marks**
Practical : 2 Hrs/Week | **End Semester Examination OR :25Marks**

- Every student of BE shall undertake the Project-I in semester VII. It is expected that the broad area of Project-I shall be finalized by the student in the beginning of the VII semester and Minor project undertaken may be of Project-I.
- Each student shall work on an approved project, a group of **05 students (maximum)** shall be allotted for the each Project-I and same group for Project-II.
- Project-I may involve some investigation work or design problem or experimental set up of some developmental work or prototype equipment or dissertation related to field of biotechnology, biochemical engineering and allied fields. The project work shall involve sufficient work so that students get acquainted with different aspects of fabrication, design or analysis. The project topics shall consist either some investigate work or design problem or experimental set up of some development work or prototype equipment or dissertation related to field of Biotechnology, Biochemical engineering and allied fields.
- The students are required to carry out one of the following projects:
    1. Processes based Project: Manufacture of Bioproduct.
    2. Equipment based Project: Detailed design and fabrication of the equipment for a given capacity.
    3. Experimental based Project: Experimental investigation of basic or applied research problem in the field of Microbiology, Immunology, Molecular biology, Bioprocess, Biochemistry, Genetic Engineering, Bioinformatics, Enzyme technology and Environmental Biotechnology.
    4. Industrial Problems: Any problem or project directly related to existing plants for modification of process or equipment or regarding pollution control and energy conservation.
- Each student group is required to maintain log book for documenting various activities of Project-I.
- The students shall submit the report to the corresponding guide, present their work in due time based on following points,
    1. Introduction.
    2. Literature survey.
    3. Experimental setup and procedure.
    4. Extent of project completed.

- Presentation can be performed with OHP slides / LCD.
- The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of Project-I. Maximum four Project-i groups shall be assigned to one teaching staff.
- **Guide lines for ICA :** Assessment of the project for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given below:

Assessment of Project-I

Name of the Project: ____

Name of the Guide: ____

SN	Exam Seat No	Name of Student	Project Selection based on literature survey	Documentation	Experimentation/ Design/ Fabrication.	Presentation	Total
			10	5	5	5	25

SEMINAR -II

Teaching Scheme:
Practical: 2 Hrs./ Week

Examination Scheme:
Internal Continuous Assessment: 25 Marks

Course Description: The course explores the knowledge of presentation and effective communication. The course develops ability to work on multidisciplinary teams, Identify, formulate, and solve engineering problems in view of economic, environmental and societal context.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Practical	**2**	**14**	**28**	**2**

Prerequisite Course(s): Knowledge of science, mathematics, computer programming and core subject of engineering.

General Objectives: The objectives of Seminar –II are to develop ability express our view, presentation and effective communication. The scope of seminar-II is study various national and international journal for design, experiments conduct, as well as to analyze and interpret data within realistic constrain such as economic, environmental, social, safety and manufacturability.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Understand literature survey for selection of seminar topics.
2. Apply knowledge of mathematics, science, and engineering for effective presentation of selected topic.
3. Function on multidisciplinary teams, communicate effectively and Knowledge of contemporary issues.
4. Identify, formulate, and solve engineering problems by understanding professional and ethical responsibility.
5. Understand the impact of engineering solutions in a global, economic, environmental, and societal context.
6. Practice the use of various resources to locate and extract information using offline & online tools, journals.
7. Practice the preparation and presentation of scientific papers and seminars in an exhaustive manner.

Seminar-II

(Course Contents)

Semester-VII **Examination Scheme:**
Teaching Scheme: **Internal Continuous Assessment: 25 Marks**
Practical : 2 Hrs/Week

1. For Seminar-II every student will individually study a topic assigned to him / her and submit a report and shall deliver a short lecture / Seminar on the topic at the end of term.
2. The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of Seminar-II. Seminar shall be related state of the art topic of his choice approved by the committee.
3. Seminar topic should not be repeated however the innovativeness of topic may be considered and registration of the same shall be done on first come first serve basis.
4. Topic of Seminar shall be registered within a two week from commencement of VII Semester and shall be approved by the committee.
5. Maximum six seminar supervision shall be allotted to each teacher.
6. student shall deliver a seminar as per scheduled and submit the seminar report (paper bound copy)in following format:
   a. Size of report shall be of minimum 25 pages.
   b. Student should preferably refer minimum five reference books / magazines/standard research papers.
   c. Format of report
      i. Introduction.
      ii. Literature survey.
      iii. Theory 1) Implementation 2) Methodology
      3) Application 4) Advantages, Disadvantages.
      iv. Future scope.
      v. Conclusion.

7. ASSESSMENT OF SEMINAR-II

Guide lines for ICA : Assessment of the Seminar-I for award of ICA marks shall be done by the guide and a departmental committee jointly, as per the guidelines given below:

Title of Seminar: ____
Name of Guide: ____

SN	Name of Student	Topic Selection	Literature survey	Report writing	Depth of understanding	Presentation	Total
		5	5	5	5	5	25

INDUSTRIAL VISIT

Industrial Visit	IV	BTP-817
Course Title	**Short Title**	**Course Code**

Course Description: The course explores the knowledge industry organization, new trends in manufacturing, maintenance and safety. The industrial visit will provide the practical visualization of theoretical study of various engineering subject.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Practical	**-**	**-**	**-**	**1**

General Objectives: The main objective behind these visits is student should get insights of industrial processes and they should get familiar with the working environment of industry. This also helps for strengthen industry institute interaction.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Understand organizational set up of an industry.
2. Understand manufacturing, material handling, maintenance, safety standard and environmental consideration in industry.
3. Function on multidisciplinary teams, communicate effectively and Knowledge of contemporary issues.
4. Identify, formulate, and solve engineering problems by understanding professional and ethical responsibility.
5. Understand the impact of engineering solutions in a global, economic, environmental, and societal context.
6. Get industrial exposure.
7. Get encouraged becoming an entrepreneur and setting up their own industrial unit.

Industrial Visit
(Course Contents)

Semester-VII **Examination Scheme:**
Teaching Scheme: **Internal Continuous Assessment: 25 Marks**

1. During B.E. First Term /During vacation after TE Second Term every student shall visit minimum industries arranged by colleges and accompanied by teachers. There shall be at least one teacher for a group of 20 students, lady teachers for girls and at least one non-teaching staff accompanied with the students.
2. If due to some reason student is unable to accompany with other students, Individual student can visit minimum three industries.
3. Students should submit written report about the visits individually at the end of B.E. First term.
4. The report should contain information about the following points:
   a. The organization - activities of organization and administrative setup technical personnel and their main duties.
   b. The project/ industry brief description with sketches and salient technical information.
   c. The work/processes observed with specification of materials, products, equipments etc. and role of engineers in that organization.
   d. Suggestions (if any) for improvement in the working of those organizations.
   e. The evaluation of the report of technical visits will be made by panel of three teachers appointed by principal based on following points:
      i. Coverage aspect: All above points should be covered.
      ii. Detailed observations: System *I* Process / Product explained with data, diagram specifications.
      iii. Quality of presentation: Report should be very objective and should consist of clear and systematic organization of topics and information.
      iv. Viva - voce: A viva -voce shall be conducted on the technical visit report by the teachers to assess the specific knowledge gained by the students for technical applications.

BE CGPA pattern syllabus

B.E. Biotechnology

Semester-VIII

Faculty of Engineering and Technology

North Maharashtra University, Jalgaon

Bioprocess Modeling and Simulation.
Course Outline

Bioprocess Modeling and Simulation	BPMS	BTL-801
Course Title	**Short Title**	**Course Code**

Lectures	Hours per Week	No. of Weeks	Total Hours	Credits
	03	15	40	3

Course Description:

This course is aimed to introduce the different aspects of modeling in bioprocess system and to familiarize the simulation of bioprocess modeling to undergraduate students.

Prerequisite Course(s): Chemical reaction engineering, Heat transfer, Microbiology, Molecular biology.

General objective:

- The course builds upon the foundation of bioprocess design principles and modeling and focuses on actual computer aided design projects.

Learning Outcomes:

After completion of the course, students will be able to:

1. Do mathematical modeling of bioprocess engineering system.
2. Do computer aided design of various equipments used in bioprocess industries.
3. Do mathematical modeling of biological system.
4. Do simulation of bioprocess equipment.
5. Learn the software for modeling and simulation.

COURSE CONTENT

BE Biotechnology   Bioprocess modeling and Simulations   Semester-VIII

Teaching Scheme
Lectures -3 Hrs/week

Examination Scheme
End Semester Exams (ESE) : 80 Marks.
Paper Duration : 3 Hours.
Internal Sessional Exam (ISE) : 20 Marks.

Unit: I

Introduction to modeling.   **No. of Lecture: 8 Hours, Marks: 16**

Introduction: Role of process dynamics and control, Laws and Languages of process control, Mathematical Modeling of Bioprocess Engineering System: Fundamentals uses of mathematical model, scope of coverage, Principles of formulation; Fundamental Laws of Modeling: continuity equation, Energy equation, Equation of motion, Transport equation, equation of state, Phase and chemical equilibrium.

Unit: II   **No. of Lecture: 8 Hours, Marks: 16**

Study of mathematical models of Biochemical Engineering Systems.

Introduction, Modeling of CSTRs (isothermal, constant hold up, variable hold up), Batch reactors, Non isothermal CSTR, Plug flow reactor.

Unit: III   **No. of Lecture: 8 Hours, Marks: 16**

Computer aided design of heat and mass transfer equipment.

Batch distillation with hold up, Ideal binary distillation column, Design of shell and tube heat exchangers, Design of rotary dryer, Design of single effect evaporator.

Unit: IV

Biological Models.   **No. of Lecture: 8 Hours, Marks: 16**

Modeling of gene regulation, Modeling of signal transduction in prokaryotes and eukaryotes, Models for inheritance, Genetic inbreeding model, Simple logistic models, Simple prey predator models, Microbial population models (growth model, product formation), Pharmaceutical models.

Unit: V

Simulation.   **No. of Lecture: 8 Hours, Marks: 16**

Introduction, Computer programming, Computational methods, Advantage and limitation of simulation techniques, Simulation of ammonia production system, Runga-Kutta method, Newton Raphson method; Simulation of Three CSTR in series, Non isothermal CSTR.

Reference Books:

1. Luyben W.L., Process Modeling Simulation and Control for Chemical Engineers., McGraw Hill, 1988.

2. Chapra S.C., R.P. Canale, .Numerical Methods for Engineers., Tata-McGraw Hill Publications.

3. Franks R.E.G., .Modeling and Simulation in Chemical Engineering., Wiely Instscience, NY

4. John Ingam, Irving J. Dunn., .Chemical Engineering Dynamic Modeling with PC simulation., VCH Publishers.

5. J.R. Leigh, Modeling and Control of Fermentation Processes, Peter Peregrinus, London, 1987.

6. J.N.Kapur, Mathematical Models in Biology and Medicine.

7. Cooney and Humphery, Comprehensive Biotechnology,Volume-2,Elsevier Publication.

8. James E. Bailey, David F. Ollis, Biochemical Engineering fundamental, Mcgraw Hill, International edition.

9. Pevzner, Computational Molecular Biology- An Algorithmic Approach, PHI, New Delhi.

10. Setubal, Introduction to Computational Molecular Biology, Cengage Learning PVT.

11. Vose, Simple Genetic Algorithms, The- Foundations and Theory, PHI, New Delhi.

Bioprocess Industries.
Course Outline

Bioprocess Industries	**BPI**	**BTL-802**
Course Title	Short Title	Course Code

Lectures	Hours per Week	No. of Weeks	Total Hours	Credits
	03	15	40	3

Course Description:

This course is aimed at introducing the fundamentals of industrial bioprocess engineering. The basics of bioreactor designing have also been incorporated in the course.

Prerequisite Course(s): Fermentation technology, Bioprocess engineering, Genetic engineering.

General Objectives:
The objective of the course is to provide the basic knowledge of bio processes and its industrial application. This course helps to familiarize various aspects of bioreactors, to understand the media requirements and working conditions for profitable run of bioprocess industries with the help of data analysis.

Learning Outcomes:

After completion of the course, students will be able to:

1. Apply knowledge of chemical and mechanical engineering for design of biological system in biotech industries.
2. To get the knowledge of properties of materials and its view in designing bioprocess equipment within the standards prescribed by regulating authority in India and world.
3. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.
4. An ability to work in an industrial or research position within the bioprocess or related fields.

COURSE CONTENT

BE Biotechnology **Bioprocess Industries** **Semester - VIII**

Teaching Scheme	**Examination Scheme**	
Lectures -3 Hrs/week	End Semester Exams (ESE)	:80 Marks.
	Paper Duration	: 3 Hours.
	Internal Sessional Exam (ISE)	:20 Marks.

Unit: I

Pilot plant units **No. of Lecture: 8 Hours, Marks: 16**

General aspects regarding purpose and function, size and location, organization personnel, programming operation, sampling reporting of results and safety costs budgeting.

Unit: II

Pilot plant operations **No. of Lecture: 8 Hours, Marks: 16**

Pilot plant designs, ducts and flow pass as age, Power per unit volume of liquid, Volumetric mass (oxygen)- transfer coefficient, mixing time concept, design example of scale-up.

Unit III

Bioreactor Operation **No. of Lecture: 8 Hours, Marks: 16**

Choosing the cultivation method, design and operation of a typical aseptic, aerobic fermentation process, alternate bioreactor configurations, Environmental requirements for animal cell cultivations, reactors for large scale production using animal cell, plant cell cultivation and bioreactor considerations in immobilized cell.

Unit IV

Biopharmaceuticals and Biotransformation: **No. of Lecture: 8 Hours, Marks: 16**

Production of penicillin, B-Lactum antibiotics, Streptomycin, Cephalosporins, Aminoglycoside, Tetracyclines, Steroid Biotransformation.

Unit V

Important products through r-DNA technology: **No. of Lecture: 8 Hours, Marks: 16**

Hepatitis B, vaccine, interferons, Insulin, somatotrophic hormone, therapeutic proteins Vaccines.Production of biodiesel and biogas, Biological production of hydrogen and biofuel cellsBiological waste treatment (utilization of mixed culture).

Reference Books:

1. Johnstone and Thring: Pilot Plant Models and Scale up Methods in Chemical Engineering. McGraw Hill Book Co.1987.
2. Aiba.S, Humphery A.E and Millis.N.F, Biochemical Engineering,Academic Press,1965.
3. Shuler, M.L. and Kargi,F. Bioprocess Engineering - Basic concepts – 2 nd ed., Prentice Hall of India Pvt. Ltd., 2005
4. Peter F. Stanbury, Stephen J. Hall & A. Whitaker, Principles of Fermentation Technology, 2 nd ed., Butterworth – Heinemann An Imprint of Elsevier India Pvt. Ltd., 2005.
5. Bailey and Ollis, “Biochemical Engineering Fundamentals”, 2 nd ed.,McGraw Hill, 1986.
6. Pauline M. Doran, “Bioprocess Engineering Calculation”, Blackwell Scientific Publications.

Elective-II
1.Genomic and Proteomics
Course Outline

Genomics and proteomics	G&P	BTL-803
Course Title	**Short Title**	**Course Code**

Lecture	Hours per week	No. Of weeks	Total hours	Semester credits
	03	15	40	03

Course Description:
This course is introduced for learning the science of genomics and proteomics to understand the entire DNA sequence of organisms in order to improve human health or advance agricultural technology and applying the techniques of molecular biology, biochemistry, and genetics to analysing the structure, function, and interactions of the proteins produced by the genes of a particular cell, tissue, or organism, with organizing the information in databases, and with applications of the data.

Prerequisite Course(s): Biochemistry, Molecular biology, Genetic engineering.

Objective of the Subject:
1. To make student understand the DNA sequence of organism.
2. To study the different techniques used for the sequencing of DNA.
3. To study the various techniques used for the protein sequencing.

Learning outcomes:
After completion of this course students will able to:
1. Sequence the DNA of various organisms.
2. Apply their knowledge in order to improve human health by studying genome sequence.
3. Understand the interactions of proteins.
4. Use modern techniques of protein sequencing such as MALDI-TOF.

Course content

BE Biotechnology Genomics and proteomics semester VIII

Teaching Scheme
Theory: 3 hours/ week

Examination Scheme
End Semester Examination(ESE): 80Marks.
Paper Duration (ESE): 03 Hours.
Internal Sessional Examination (ISE): 20 Marks.

UNITI: Introduction to Genomics **No. of Lecture: 8 Hours, Marks: 16**
New science of genomics, orientation and structure of genomes, Introduction to Structural and Functional genomics, assembling a physical map of a genome, Features of prokaryotic eukaryotic & organellar genomes, Genome sizes- C value paradox, Gene counting.

UNIT II: DNA sequencing technique **No. of Lecture: 8 Hours, Marks: 16**
Principles of DNA sequencing, Methods of preparing genomic DNA for sequencing, Early sequencing efforts, DNA sequencing: Sanger Dideoxy method, Automated DNA sequencing, Shotgun sequencing- contig assembl, Fluorescence method.

UNIT III: **Sequence of organism** **No. of Lecture: 8 Hours, Marks: 16**
Genome projects on *E.coli*., Arabidopsis and rice; Human genome project and the genetic map. Functional genomics studies with model systems such as Drosophila, Yeast, *C. elegans*.

UNIT IV: Proteomics **No. of Lecture: 8 Hours, Marks: 16**
Proteomics and Proteomes, Various tools used in proteomics, Mining proteomes, protein expression profiling, identifying protein – protein Interactions and protein complexes, mapping- protein identification, new directions in proteomics**.**

UNIT V: Techniques in Proteomics **No. of Lecture: 8 Hours, Marks: 16**
Protein level estimation – Edman protein microsequencing, Protein cleavage,2D gel Electrophoresis, Metabolic labelling, Detection of proteins on SDS gel, Pattern analysis, Mass spectrometry, Principles of MALDI-TOF, Tandem MS-MS, Peptide mass Fingerprinting.

TEXT BOOKS

1. Primrose, S.B. and Twyman, R.H., “Principles of Genome Analysis and Genomics”Blackwell Publishing Co., 2003.
2. Liebler, D.C., “Introduction to Proteomics”, Humana Press, 2002
3. Arthur M Lesk, Introduction to Genomics Oxford University Press.
4. Sabesan, Genomics & Proteomics, Ane Books.

REFERENCES

1. Pennington, S.R. and Dunn, M.J., “Proteomics”, BIOS Scientific Publishers, 2001.
2. Hunt, S.P., Livesey, R. and Livesey, F.J., “Functional Genomics: A Practical Approach” Oxford University Press, 2000.
3. Suhai S., “Genomics and Proteomics: Functional and Computational Aspects”, Springer 2000.
4. Cantor, C.R. and Smith, C.L., “Genomics: The Science and Technology Behind the Human Genome Project”, Wiley and Sons, 1999.

Elective-II

2.GOOD MANUFACTURING PRACTICES

Course Outline

Good manufacturing practices	GMP	BTL-804
Course Title	**Short Title**	**Course Code**

Lecture	Hours per week	No. Of weeks	Total hours	Semester credits
	03	15	40	03

Course Description:
This course is introduced to understand basic good manufacturing practices to maintain the product quality.

Prerequisite Course(s): Microbiology, Unit operations, Biochemistry.

Course Objective:

1. Develop the basic knowledge of GMP.
2. Develop the basic knowledge regarding good practices in production and quality control.
3. Understand the basics of Good manufacturing practices.

Learning Outcomes

After the completion of this course the students will be able to:

1. Demonstrate their understanding of the roles of Quality Assurance and Quality Control in a GMP environment.
2. Demonstrate their understanding good practices in production
3. Follow proper documentation procedures.
4. Use modern techniques, skill and modern engineering tools in GMP for better product quality.

COURSE CONTENT

BE Biotechnology Good Manufacturing Practice semester VIII

Teaching Scheme

3hrs/week

Examination scheme

End Semester Examination (ESE) :80 Marks.
Paper Duration (ESE) :03 hours.
Internal Sessional Examination (ISE) :20Marks.

Unit I:

Introduction to GMP **No. of Lecture: 8 Hours, Marks: 16**

Introduction, Quality system, Quality risk management, Good manufacturing practices for pharmaceutical products, Sanitation and hygiene, Qualification and validation, Complaints, Product recalls, Product quality review, The Indian GMP Regulations.

Unit II:

Contract production, analysis and other activities Self-inspection, quality audits and suppliers' audits and approval: **No. of Lecture: 8 Hours, Marks: 16**

The contract giver, The contract accepter, Items for self-inspection, Self-inspection team, Frequency of self-inspection, Self-inspection report, Follow-up action, Quality audit Suppliers, audits and approval.

Unit III:

Training, Personal Hygiene, Equipment & Materials **No. of Lecture: 8 Hours, Marks:16**

Introduction, Starting materials, Packaging materials, Intermediate and bulk products, Finished products Rejected, recovered, reprocessed and reworked materials, Recalled products, Returned goods, Reagents and culture media, Reference standards, Waste materials, Miscellaneous.

Unit IV:

Personnels & Good practices in production. **No.of Lecture: 8 Hours, Marks: 16**

Introduction, Key Personnels, Prevention of cross-contamination and bacterial contamination during production, Processing operations, Packaging operations.

Unit IV:

Good practices in quality control & Premises. **No. of Lecture: 8 Hours, Marks: 16**

Introduction, Ancillary areas, Storage areas, Weighing areas, Production areas, Quality control areas, Control of starting materials and intermediate, bulk and finished products Test, requirements Batch record review, Stability Studies.

Reference Books:

1. Mindy J. Allport-Settle,Good Manufacturing Practice (GMP) Guidelines: The Rules Governing Medicinal Products in the European Union, EudraLex Volume 4 Concise Reference PharmaLogica, Inc.
2. Joseph D. Nally Good Manufacturing Practices for Pharmaceuticals, Sixth Edition (Drugs and the Pharmaceutical Sciences), edited, CRC Press.
3. Mindy J. Allport-Settle, Current Good Manufacturing Practices: Pharmaceutical, Biologics, and Medical Device Regulations and Guidance Documents Concise Reference CreateSpace Independent Publishing Platform.

Elective-II
3.Pharmaceutical Biotechnology
Course Outline

Pharmaceutical Biotechnology	**PBT**	**BTL-805**
Course Title	Short Title	Course Code

Lectures	Hours per Week	No. of Weeks	Total Hours	Credits
	03	15	40	3

Course Description:

This course is aimed to develop the basic knowledge of application of Biotechnology procedures in the field of Pharmacy to undergraduate students. The course aims exposing students to various topics in biotechnology, including the pharmacist's role in biotechnology, criteria for regulatory approval for biotechnology drugs, technology in genetic engineering and its application to pharmacy.

Prerequisite Course(s): Immunology, Genetic engineering.

General objective:

1. The basic background knowledge gained in immunology and biochemistry; to enable the student to advance the skills necessary in the understanding of biotechnology derived drugs and drug therapy.

Learning Outcomes:

After completion of the course, students will be able to:

1. Evaluate different pharmaceutical parameters of current biotechnology products.
2. Determine parameters related to stability and formulation of biopharmaceutical products.
3. Discuss quality control procedures related to biopharmaceutical products.
4. Discuss novel formulation methods for better delivery of biotechnology derived drugs.
5. Discuss the delivery of biopharmaceutical products by the parenteral, oral, transdermal and nasal routes of administration.

COURSE CONTENT

BE Biotechnology **Pharmaceutical Biotechnology** **Semester – VIII**

Teaching Scheme
Lectures -3 Hrs/week

Examination Scheme
End Semester Exams (ESE) : 80 Marks.
Paper Duration : 3 Hours.
Internal Sessional Exam (ISE) : 20 Marks.

Unit: I
Introduction
Defintition of biotechnology, the different aspects of biotechnology, pharmaceutical biotechnology and its role in producing therapeutics and diagnostics and in health care.

Unit: II
Animal and plant cell culture
Brief introduction to cell culture with respect to the properties of animal and plant cells, Media requirements, Typical media used, Typical methods for setting up primary culture, Cell strains vs cell lines, Use of plant/animal cell culture for production of pharmaceuticals, Therapeutic proteins.

Unit: III
Genomics in Clinical Diagnostics
Restriction fragment length polymorphism, Gel electrophoresis techniques (PAGE, SDS-PAGE and agarose gel electrophoresis), Immunoblotting, Southern blotting, Northern blotting, Western blotting, PCR and RT PCR, Sanger dideoxy method of sequencing.

Unit: IV
Immunology
Immunity, Methods of immunization, Antigen antibody reactions, Generation of immune response, Polyvalent antibodies, Hypersensitivity responses, Preparation and characterization of immune sera, allergenic extracts, Monovalent antibodies or monoclonal antibodies, hybridoma technology, Humanization of monoclonal antibodies, Application of monoclonals in therapeutics and diagnostics RIA and ELISA diagnostic methods.

Unit: V
Vaccines
Preparation and standardization of vaccines, Discussion of different types of vaccines, different approaches for vaccine preparation and their quality control parameters, pharmacogenomics.

Reference Books:

1. Gray Walsh & B. Murphy, Biopharmaceuticals and industrial prospective., Kluwer publishers (1999).
2. Gray Walsh, Biopharmaceuticals., Wiley John & Sons, Inc. (2003).
3. Camille G. Wermuth, The practice of Medicinal chemistry., Academic Press, (2003).
4. Dann, J.A, Crommelin & Robert D., Sindelar, Pharmaceutical Biotechnology, Oct. 2002, Taylor & Francis.
5. Dubey, R.C., A Textbook of Biotechnology. 4th ed., S. Chand & Co. P Ltd, New Delhi, p. 732. ISBN 81-219-2608-4.
6. U. Satyanarayana, Biotechnology, Books and Allied (P) Ltd, Kolkata (2005)

Elective-II
4.Nanobiotechnology

Course Outline

Nanobiotechnoloy	NBT	BTL-806
Course Title	**Short Title**	**Course Code**

Lecture	Hours per week	No. Of weeks	Total hours	Semester credits
	03	15	40	03

Course Description:
This course deals with applications resulting from the combination of biotechnology and nanotechnology in the fields of medicine and environment. The goal of this course is to provide an insight into the fundamentals of nanotechnology in biological and biomedical research.

Prerequisite Course(s): Microbiology, Biochemistry, Molecular biology

General Objective:
1. To understand the essential features of nanotechnology and biology that are converging to create the new area of nanobiotecnology.
2. To recognize the structural and functional principles of Nanobiotechnology.
3. To employ bionanomaterials for analysis and sensing techniques.
4. To apprehend and explain the biomedical applications of nanotechnology.

Learning outcomes:
After completion of this course students will able to:
1. It will also guide the students to understand how nanomaterials can be used for a diversity of analytical and medicinal rationales.
2. Students will be able to synthesize and characterise the Nanomaterials.
3. Apply their knowledge of drug delivery by using Nanomaterials.
4. Access the toxicity of nanomaterial.
5. Apply knowledge in medical and agriculture field, waste treatment.

COURSE CONTENT

BE Biotechnology | **Nanobiotechnology** | **Semester- VIII**

Teaching Scheme
Theory: 3hours/week

Examination scheme
End semester examination (ESE) : 80 marks.
Paper duration : 3 hours.
Internal sessional examination (ISE) : 20 marks.

UNIT I: **No. of Lecture: 8 Hours, Marks: 16**

Introduction to nanotechnology, Nanobiotechnology definition and concept, Cellular Nanostructures: S-layers, Nanopores, Biomolecular motors, rhodopsin, Criteria for suitability of nanostructures for biological applications, Bottom-up versus top-down models.

UNIT II: **No. of Lecture: 8 Hours, Marks: 16**

Methods of preparation of nanoparticles, properties of nanomaterials; nanoparticle synthesis using microbes, Basic characterization techniques**,** Electron microscopy (SEM, TEM and STM); Atomic force microscopy; Photon correlation spectroscopy and others, Introduction to BioMEMS; Recent developments in bioMEMS.

UNIT III: **No. of Lecture: 8 Hours, Marks: 16**

Concepts and advantages of microfluidic devices, Materials and methods for the manufacture of microfluidic component, Fluidic structure,Nanostructures for drug delivery (Nanovesicles; Nanospheres; Nanocapsules, Magnetic nanoparticles; Liposomes; Dendrimers), concepts, targeting, routes of delivery and advantages.

UNIT IV: **No. of Lecture: 8 Hours, Marks: 16**

Fluorescent nanomaterials for Biosensors and Biolabelling, Quantum dots, imaging and biosensors; Nanodevices for sensor development, Antimicrobial activity and wound healing, Artificial implants, Tissue engineering, Identification of pathogenic organisms by magnetic nanoparticle-based techniques.

UNIT V: **No. of Lecture: 8 Hours, Marks: 16**

Effect of nanomaterials on human health, environment and safety, Recent progress and challenges in the risk assessment of Nanomaterials, Assessment of the toxic effects of nanoparticles based on *in-vitro* laboratory tests.

Text Books/References

1. Niemeyer C. M., Nanobiotechnology: Concepts, Applications and Perspectives, Wiley – VCH, 2006.
2. David S Goodsell, Bionanotechnology, John Wiley & Sons, 2004.
3. Debasis Bagchi, Manashi Bagchi, Hiroyoshi Moriyama, Fereidoon Shahidi
4. Buddy D. Ratner, Allan S. Hoffman , Frederick J. Schoen , Jack E. Lemons,

Elective-III

1.System Biology

Course Outline

System Biology	SB	BTL-807
Course Title	**Short Title**	**Course Code**

Lecture	Hours per week	No. Of weeks	Total hours	Semester credits
	03	15	40	03

Course description:
This course deals with basics of system biology. It also introduces various softwares involved in modelling and simulation. This course has also been dealt with various mathematical model constructions of biological pathways.

Prerequisite Course(s): Biochemistry, Molecular biology, Genetics.

Course objectives:
To introduce the students with the basics of both theoretical and practical aspects of system biology approach. This course gives a introduction Systems Biology. This course will cover the basics of mathematical modelling part of Systems Biology.

Learning objectives:
After completion of this course students will be able to:

1. Apply a network biology analysis approach to a wide range of molecular biology problems.
2. Critically assess the quality of high-throughput protein-protein interaction data.
3. Apply basics of biological networks.
4. Describe basic computational methods for biological networks based on high-throughput data.
5. Describe and apply basic algorithms.

COURSE CONTENT

BE Biotechnology System Biology Semester VIII

Teaching Scheme
Theory: 3 hours/ week

Examination Scheme
End Semester Examination(ESE): 80Marks.
Paper Duration (ESE): 03 Hours.
Internal Sessional Examination (ISE): 20 Marks.

Unit I: No. of Lecture: 8 Hours, Marks: 16

System Biology

Introduction, System Structure Identification, System Behavior Analysis, System Control, System Design, Measurement Technologies And Experimentalmethods, System Structure Identification, The Systeome Project, Impacts Of System Biology.

Unit II: No. of Lecture: 8 Hours, Marks: 16

Reverse Engineering And Data Mining From Gene Expression Data

The Dbrf Method For Inferring A Gene Network From Large-Scale Steady-State Gene Expression Data, Performance Of The Dbrf Method, Application To Yeast Gene Expression Data, The Analysis Of Cancer Associated Gene Expression Matrices, Automated Reverse Engineering Of Metabolic Pathways From Observed Data By Means Of Genetic Programming.

Unit III: No. of Lecture: 8 Hours, Marks: 16

Software for Modeling And Simulation

The ERATO Systems Biology Workbench: An Integrated Environment For Multiscale And Multi Theoretic Simulations In Systems Biology, The Systems Biology Markup Language, The Systems Biology Workbench, Automatic Model Generation For Signal Transduction With Applications To MAP-Kinase Pathways, Mapk Pathway With Scaffolds:Experimental Background, Parameter Estimation.

Unit IV: No. of Lecture: 8 Hours, Marks: 16

Cellular Simulation

Towards A Virtual Biological Laboratory, Modular Modeling Concept, Computational Cell Biology, The Stochastic Approach, Modeling Bacterial Chemotaxis, Computer Simulation Of The Cell: Human Erythrocyte Model And Its Application.

Unit V: **No. of Lecture: 8 Hours, Marks: 16**

System-Level Analysis

Constructing Mathematical Models Of Biological Signal Transduction Pathways: An Analysis Of Robustness, Robust perfect adaptation and integral feedback control In Bacterial Chemotaxis, Combination Of Biphasic Response Regulation And Positive Feedback As A General Regulatory Mechanism In Homeostasis And Signal Transduction, Regulation Of MAPK Concentration.

Reference Books:

1. Hiroaki Kitano, Foundations of Systems Biology edited; The MIT Press Cambridge
2. Uri Alon, An Introduction to Systems Biology: Design Principles of Biological Circuits, First edition; Chapman and Hall/CRC Publications.
3. Eberhard Voit, First Course in Systems Biology; Garland Science.
4. Edda KlippSystems, Biology , Wolfram Liebermeister; First edition Wiley VCH

Course Outline
Molecular Modelling and Drug Design

Molecular Modeling & Drug Design	**MMDD**	**BTL808**
Course Title	Short Title	Course Code

Course Description:

This course is framed to develop the basic knowledge modeling & drug design to undergraduate students. The background expected includes a prior knowledge of BE Biotechnology courses. The goals of the course are to understand the basic principles of drug designing and their applications in the field of Biotechnology.

Lectures	Hours per Week	No. of Weeks	Total Hours	Credits
	03	15	40	3

Course Objective
1. To understand the critical relationship among bimolecular structure, function and force field models.
2. To be able to utilize basic modeling techniques to explore biological phenomena at the molecular level.
3. To emphasize modeling drug/receptor interactions in detail by molecular mechanics, molecular dynamics simulations and homology modeling.

Course Outcome:
After completion of the course student will be able to:
1. Students are introduced to the principles and practice of Molecular modeling and modern drug discovery.
2. An awareness of rational drug design, based on understanding the three-dimensional structures and physicochemical properties of drugs and receptors will be created.
3. Understand the impact of engineering solution by drug designing in global economic and societal context.

COURSE CONTENT

Molecular Modeling and Drug Designing   Semester - VII

Teaching Scheme
Lectures -3 Hrs/week

Examination Scheme
End Semester Exams (ESE): 80 Marks.
Paper Duration: 3 Hours.
Internal Sessional Exam (ISE):20 Marks

Unit I: **No. of Lecture: 8 Hours, Marks: 16**
Introduction To Molecular Modelling:

Introduction - Useful Concepts in Molecular Modelling: Coordinate Systems. Potential Energy Surfaces, Molecular Graphics, Surfaces, Computer Hardware and Software, The Molecular Modelling Literature.

Unit II: **No. of Lecture: 8 Hours, Marks: 16**
Force Fields:
Force Fields, Bond Stretching. Angle Bending, Introduction to Non-bonded Interactions, Electrostatic Interactions, Vander Waals Interactions, Hydrogen Bonding in Molecular Mechanics, Force Field Models for the Simulation of Liquid Water.

Unit III: **No. of Lecture: 8 Hours, Marks: 16**
Energy Minimisation And Computer Simulation:
Energy Minimisation methods, Non-Derivative method, Simple Thermodynamic Properties and Phase Space, Boundaries, Analyzing the Results of a Simulation and Estimating Errors.

Unit IV: **No. of Lecture: 8 Hours, Marks: 16**
Molecular Dynamics & Monte Carlo Simulation:
Molecular Dynamics Simulation Methods, Molecular Dynamics Using Simple Models, Molecular Dynamics with Continuous Potentials, Molecular Dynamics at Constant Temperature and Pressure, Monte Carlo Simulation of Molecules, Molecular Modeling software.

Unit V: **No. of Lecture: 8 Hours, Marks: 16**
Drug Design:
Protein Structure Prediction-Comparative Modeling, Constructing and Evaluating a Comparative Model, Molecular Docking, AUTODOCK and HEX. Structure based DeNovo Ligand design, Drug Discovery –QSAR.

Reference Book:

1. A.R.Leach, “Molecular Modelling Principles and Application”, Longman, 2001.
2. J.M.Haile, “Molecular Dynamics Simulation Elementary Methods”, John Wiley and Sons,1997.
3. Satya Prakash Gupta, “QSAR and Molecular Modeling”, Springer - Anamaya Publishers, 2008.

Elective-III
3.Stem Cell Technology
Course Outline

Stem Cell Technology	**SCT**	**BTL-809**
Course Title	Short Title	Course Code

Lectures	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Credits**
	03	15	40	3

Course Description:

This course is aimed to develop the knowledge of basics of stem cell biology, pluripotency and induced pluripotency, adult, embryonic and cancer stem cells, and the barriers to regenerative medicine, including scientific, ethical, regulatory and proprietary issues to undergraduate students. The goals of the course are to understand the basic principles of modern aspects of stem cell technology and the techniques of stem cell science.

Prerequisite Course(s): Cell Biology, Immunology.

Course objective:
To develop the basic knowledge and skills of stem cell science in research projects.

Learning Outcomes:
After completion of the course, students will be able to:

1. Grow the embryonic stem cell in lab
2. Understand stem cell in regeneration of cells.
3. Perform stem cell therapies.
4. Understand the ethical issues related to stem cell technology.

COURSE CONTENT

BE Biotechnology   Stem Cell Technology   Semester – VIII

Teaching Scheme
Lectures -3 Hrs/week

Examination Scheme
End Semester Exams (ESE) : 80 Marks.
Paper Duration : 3 Hours.
Internal Sessional Exam (ISE) : 20 Marks.

Unit I
Stem cells
Introduction: Tissue organization, Stem cells, Sources, Unique properties of stem cells, classification, Embryonic stem cells, adult stem cells, similarities and differences between adult and embryonic stem cells, Functional characterization.

Unit II
Embryonic stem cells
Stem cells and their developmental potential, In vitro fertilization-culturing of embryos blastocyst-inner cell mass-isolation and growing ES cells in lab- Identification and characterization of human ES cells-Cloning and controlled differentiation of human embryonic stem cells, Applications of Embryonic stem cells – Gene knock in – Gene knock out

Unit III
Adult stem cells
Somatic stem cells, test for identification of adult stem cells, adult stem cell differentiation, different types of adult stem cells, liver stem cells, skeletal muscle stem cells, bone marrow derived stem cells, Induced pluripotent cells.

Unit IV
Cancer stem cell signaling
Introduction**:** Tumor stem cells, Breast Cancer Stem Cells: Identification - Signalingpathways: Notch signaling – Wnt signaling in stem cells and cancer cells.

Unit V
Stem cells in tissue engineering
Introduction: Biomaterials, Cell and biomaterial interactions, Haematopoietic Stem Cells, Mesenchymal stem cells, Bone tissue engineering, Cartilage tissue engineering, Cardiovascular tissue engineering, Neural tissue engineering, Therapeutic applications, Parkinson's disease, Diabetes: Pancreatic cells regeneration. Stem cell based gene therapy and benefits to human.

REFERENCES:

1. Ariff Bongso, EngHin Lee "Stem Cells: From Bench to Bedside" World Scientific Publishing Company. 2005.
2. C S Potten "Stem Cells" Elsevier,1996.
3. Daniel R. Marshak "Stem cell biology" Cold Spring Harbor Laboratory Press.
4. Robert Lanza "Essentials of Stem Cell Biology" Elevier, 2009.
5. Peter Quesenberry "Stem cell biology and Gene Therapy" Wiley, Liss,1988.

COURSE OUTLINE
Elective-III
4.Biofuel and Alcohol Technology

Biofuel and Alcohol Technology	**BAT**	**BTL-810**
Course Title	Short Title	Course Code

Lectures	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Credits**
	03	15	40	3

Course Description:

This course is aimed to develop the basic knowledge and operations of Biofuel and alcohol technology to undergraduate students. The background expected includes a prior knowledge of BE Biotechnology courses. The goals of the course are to understand the basic principles biofuels production & fermentations for production of organic solvents and Biofuel production processes and their applications in engineering trade.

Prerequisite Course(s): Bioprocess engineering, Fermentation technology, Biochemistry.

General objective:

- To develop the basic knowledge and skills in Biofuels and alcohol production.

Learning Outcomes:

After completion of the course, students will be able to:

1. Have an advanced understanding of biofuel and biomass production.
2. Critically appraise logistical issues associated with implementing large scale biofuel and biomass energy production.
3. Perform technical, economic and environmental comparisons of various energy systems.
4. Implement the various methods of fermentations processes.
5. Explain the alcohol recycling & biochemistry of alcohol.

COURSE CONTENT

BE Biotechnology **Biofuel and Alcohol Technology** **Semester - VIII**

Teaching Scheme

Lectures -3 Hrs/week

Examination Scheme

End Semester Exams (ESE): 80 Marks.
Paper Duration: 3 Hours.
Internal Sessional Exam (ISE):20 Marks.

Unit: I

Introduction to Fuel Technology: **No. of Lecture: 8 Hours, Marks: 16**

Renewable & Nonrenewable energy resources, Useful features of biofuels, Undesirable features of biofuels, Biogas technology, Biodiesel Production, Biohydrogen production.

Unit: II

Bioenergy from biomass: **No. of Lecture: 8 Hours, Marks: 16**

Biomass conversion to heat and power: thermal gasification of biomass, anaerobic digestion, Biomass conversion to biofuel: thermochemical conversion, syngas fermentation.

Unit: III

Alcohol Technology: **No. of Lecture: 8 Hours, Marks: 16**

Introduction to Alcohol Technology, Raw Material of Alcohol Industry, Storage & handling of Raw material in detail, Study of different yeast strains used in alcohol industries, Study of yeastproduction as single protein cell.

Unit: IV **No. of Lecture: 8 Hours, Marks: 16**

Alcoholic Fermentations:

Study of different alcoholic fermentation techniques, Batch fermentation, Continuous fermentation, Modem techniques of Continuous fermentation, Bio still fermentation, Encillium process Wet milling of grain for alcohol production, Grain dry milling cooking for alcohol production, Use of cellulosic feed stocks for alcohol production, Scaling in distilleries, Fusel oil separation.

Unit: V

Biochemistry & Recycling of Alcohol: **No. of Lecture: 8 Hours, Marks: 16**

Study of different recycling process, Biochemistry of alcohol production, The management of fermentation in the production of alcohol, Alcohol distillation-The fundamental, Parameters & affecting alcoholic fermentations, By product of alcoholic fermentation, Distillery quality control, Alcoholometry.

Reference Books:

1. B.D. Singh, Kalyani Publications.
2. Chmles E. ,Out lines of Chemical Technology.
3. Olaf A Hougen, Kwenneth M. Watson, and Roland A Ragatz, Chemical Process Principles – Part I, Material and Energy Balances by CBS Publishers and Distributors (1995).
4. T. P. Lyons ,Text books of alcohol tech.

Bioprocess Modeling and Simulations Lab
LAB COURSE OUTLINE

Bioprocess Modeling and Simulations	**BPMS**	**BTL-811**
Course Title	Short Title	Course Code

Practical	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Semester Cred1its**
	02	15	16	1

Course Description:
In this laboratory, course emphasis is on the understanding of use of modeling and simulation as an aid to the understanding of biochemical engineering processes and their dynamics with respect to cpp programs.

Prerequisite Course(s): Unit operation, Computer application**.**

General Objective:
The objective of the laboratory is to impart the fundamental knowledge of requirements of a bioprocess to be suited for a laboratory experiment for students, the mathematical models of the chosen process are presented in detail for batch, fed-batch, and continuous mode of operation.

Learning Outcomes:
After successful completion of this lab student will be able to:

1. Distinguish and apply the principles of modelling of bioreaction processes, model classification (structured/ unstuctured, segregated/ non-segregated, etc.)
2. Understand and apply principles of modelling in batch, fed-batch and continuous bioreactor using basic kinetic models.
3. Analyse and interpret experimental data from bioreactors, predict bioreactor operation, monitor it and control.
4. Describe the origin of non-ideal flow behaviour in real reactors and the impact of non-ideal flow effects on process performance, design and modelling.

Bioprocess Modeling and Simulations Lab

Semester-VIII

Teaching Scheme	**Examination Scheme**	
Practicals -2 Hrs/week	External Sessional Exams (ESE)/Oral (OR)	:25 Marks.
	Internal Continuous Assessment	: 25 Marks.

Minimum eight experiments from the following

1) CAD of shell and tube exchanger.

2) CAD of adsorption column.

3) CAD of single effect evaporator.

4) Computer controlled heat exchanger.

5) CAD for rotary dryer.

6) Simulation of temperature on surface catalyst.

7) Simulation of reactor design.

8) Simulation of ammonia production system.

9) Modeling and simulation of protein.

10) Drug designing.

Books:

1. By B.K. Lydersen, N.A. D'Elia & K.L. Nelsen, Bioprocess Engineering Systems, Equipment & Facilities John Wiley and Sons Inc. New York.
2. Luyben W.L. Process Modeling Simulation and Control for Chemical Engineers., McGraw Hill, 1988.
3. Chapra S.C., R.P. Canale, .Numerical Methods for Engineers., Tata-McGraw Hill Publications.

Bioprocess Industries Lab

LAB COURSE OUTLINE

Bioprocess Industries	**BPI**	**BTL-812**
Course Title	Short Title	Course Code

.

Practical	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	02	15	16	1

Course Description:
In this laboratory, course emphasis is on the understanding of basics techniques of industrial bio process. The learner can use this knowledge and apply in allied branches of Biotechnology as required.

Prerequisite Course(s): Fermentation Technology, Bioprocess Engineering.

General Objective:
The objective of the laboratory is to impart the fundamental knowledge of industrial bioprocess at the research level to the students and to develop their ability to apply the analytical techniques for interpreting experimental results.

Learning Outcomes:
After successful completion of this lab student will be able to:

1. Demonstrate a detailed knowledge of growth kinetics.
2. Study the effect of substrate and product concentration on biomass yield for bakers yeast production Interpret the significance of Biotechnology in production.
3. Demonstrate a detailed knowledge of therapeutic agents of microbial origin and their production.
4. Demonstrate knowledge of plant tissue culture systems and artificial seed production.

Bioprocess Industries Lab

Semester-VIII

Teaching Scheme **Examination Scheme**

Practicals -2 Hrs/week External Sessional Exams (ESE)/Oral (OR):25 Marks.

Internal Continuous Assessment : 25 Marks.

Minimum eight experiments from the following

1. Growth kinetics of microorganisms using shake flask method.
2. Determination of specific thermal death rate constant (Ka).
3. Determination of Volumetric oxygen transfer coefficient (K_La), effect of aeration and agitation speed.
4. Preparation of Immobilized enzymes and cells and evaluation of kinetic parameters.
5. Kinetics study of Product formation.
6. Effect of substrate and product concentration on biomass yield for bakers yeast production.
7. Studies on settling characteristics of various microbial cultures.
8. Explant preparation and their inoculation on suitable plant growth media.
9. Callus induction technique and regeneration of plant from callus culture.
10. Artificial seed production.
11. Shake flask studies of plant cell culture.

Books:

1. Richards, Introduction to Industrial Sterilization,.
2. S.S.Purohit, Biotechnology: Fundamentals and Applications, Agrobios (India), 4th Edition, 2005.
3. P.F.Stanbury, A.Whitkar and S.J.Hall, Principles of Fermentation Technology, Aditya Book House, New Delhi.

Lab Elective-II
1.Genomics and Proteomics Lab
LAB COURSE OUTLINE

Genomics and proteomics	**G&P**	**BTL-813**
Course Title	Short Title	Course Code

Laboratory	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	02	**15**	**16**	**01**

Course Description:
This course is introduced to emphasis on the insight of the DNA sequences and the protein sequences and the interaction of the proteins.
Prerequisite Course(s): Biochemistry, Molecular Biology, Genetic Engineering.

General Objective:
1) To develop skills of the techniques to sequence the DNA
2) To find the interaction of the two proteins.
3) To develop the skills of the technique to sequence protein

Learning Outcomes:
After successful completion of this course students will be able:
1) To find the sequence of the DNA.
2) To calculate the molecular mass of protein.
3) To find the interaction of the proteins.
4) Apply their knowledge to pharmaceuticals development on the basic of interaction of the proteins.

Lab Proteomics and Genomics

Teaching Scheme	**Examination Scheme**	**Semester-VIII**
Practical - 2 Hrs/week	External Sessional Exams (ESE)/Oral (OR)	: 25 Marks.
	Internal Continuous Assessment (ICA)	: 25 Marks.

Minimum 08 experiments shall be performed from the following

1) Extraction and Solubilization of Proteins for Proteomic Studies.
2) Preparation of Bacterial Samples for 2-D PAGE.
3) 2-D PAGE of High-Molecular-Mass Proteins.
4) Comparing 2-D Electrophoretic Gels Across Internet Databases.
5) Computational Prediction of Protein-Protein Interactions.
6) The Yeast Two-Hybrid System for Detecting Interacting Proteins.
7) Finding Genes in Genomic Nucleotide Sequences by Using Bioinformatics.
8) Sequence-Based Detection of Single Nucleotide Polymorphisms.
9) Mammalian Two-Hybrid Assay for Detecting Protein-Protein Interactions in Vivo.
10) Scanning for DNA Variants by Denaturant Capillary Electrophoresis.

REFFERENCE:

1) Starkey, Mike, Elaswarapu, Ramnath,Genomics Protocols,Springer, 2001, ISBN 978-1-59745-188-8
2) Walker, John M., The Proteomics Protocols Handbook,Springer, ISBN 978-1-59259-890-8,2005
3) Michael P. Starkey, Ramnath Elaswarapu, Methods in molecular Biology:Genomic protocol,Volume 175.

Lab Elective II

2. Lab Good Manufacturing Practices

LAB COURSE OUTLINE

Good Manufacturing Practices	**GMP**	**BTP-814**
Course Title	Short Title	Course Code

.

Practical	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	02	15	16	1

Course Description:
This course provides an overview of the quality system of management controls for research laboratories and organizations. To ensure the uniformity, consistency, reliability, reproducibility, quality, and integrity of the final product. This lab course is introduced to understand basic good manufacturing practice to maintain the product quality.

Prerequisite Course(s): SE Biotechnology courses.

General Objective:
The objective of the laboratory is to impart the fundamental knowledge of good manufacturing practices at the research level to the students and to develop their ability to apply and follow good practices in production.

Learning Outcomes:
After successful completion of this lab student will be able to:

1. Follow fundamental compliance requirements for current GMP.
2. Apply compliance protocols in all efforts aimed at generating regulated data for evaluation by the US FDA and regulatory agencies overseas.
3. Demonstrate their understanding good practices in production.

2. Lab Good Manufacturing Practices

Teaching Scheme	**Examination Scheme**	**Semester-VIII**
Practical - 2 Hrs/week	External Sessional Exams (ESE)/Oral (OR)	: 25 Marks.
	Internal Continuous Assessment (ICA)	: 25 Marks.

Minimum 08 experiments shall be performed from the following

1. Introduction to GMP.
2. Product quality review.
3. Starting materials for various industries.
4. Packaging materials.
5. Waste materials management.
6. Prevention of cross-contamination and bacterial contamination during production.
7. Personal hygiene.
8. Labeling.
9. Drafting the device master record.
10. Obtaining information on GMP requirements.

Reference Books:

4. M.K. Satish, Biosafety and Bioethics, I.K. International publishing house.
5. Mindy J. Allport-Settle,Good Manufacturing Practice (GMP) Guidelines: The Rules Governing Medicinal Products in the European Union, EudraLex Volume 4 Concise Reference PharmaLogica, Inc.
6. Joseph D. Nally Good Manufacturing Practices for Pharmaceuticals, Sixth Edition (Drugs and the Pharmaceutical Sciences), edited, CRC Press.
7. Mindy J. Allport-Settle, Current Good Manufacturing Practices: Pharmaceutical, Biologics, and Medical Device Regulations and Guidance Documents Concise Reference Create Space Independent Publishing Platform.

Lab Elective-II
3.Pharmaceutical Biotechnology Lab
LAB COURSE OUTLINE

Pharmaceutical Biotechnology	**PBT**	**BTP-815**
Course Title	Short Title	Course Code

Practical	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	02	15	16	1

Course Description:
In this laboratory, course emphasis is on the understanding of basics techniques of pharmaceutical processes. The learner can use this knowledge and apply in allied branches of Biopharmaceutical and Biotechnology as required.

Prerequisite Course(s): Microbiology, Bioprocess Engineering.

General Objective:
The objective of the laboratory is to impart the fundamental knowledge of pharmaceutical processes at the research level to the students and to develop their ability to apply the analytical techniques for interpreting experimental results.

Learning Outcomes:
After successful completion of this lab student will be able to:
1. Isolate the microbes by air microbiology: solid and liquid impingement methods.
2. Apple to use coliform count of water by MPN technique.
3. To identify the sterility as per IP.
4. Studies on selective media: McConkey Agar, Cetrimide Agar, Vogel Johnson, Salt mannitol agar.
5. Study various immunology and biochemical test.
6. Estimate the antimicrobial assay of antibiotic, introduction to zone of inhibition and calculation.
7. Study Immobilization of enzymes/cells by calcium alginate/gelatin/agar.
8. Capable to isolate the DNA.
9. Determination of thermal death time and thermal death point.
10. Determination of effect of Ultra-Violet exposure on growth of E coli.

Pharmaceutical Biotechnology Lab

Semester-VIII

Teaching Scheme
Practicals -4 Hrs/week

Examination Scheme
External Sessional Exams (ESE)/Oral (OR):25 Marks.
Internal Continuous Assessment: 25 Marks.

Minimum eight experiments from the following

1. Air microbiology by solid and liquid impingement methods.
2. Coliform count of water by MPN technique.
3. Test for sterility as per IP (Injection water/ nonabsorbent cotton/soluble powder/ear drops).
4. Microbial limit test on excipients as per I.P. – Hard gelatin, tragacanth, starch, lactose
5. Studies on selective media: McConkey Agar, Cetrimide Agar, Vogel Johnson, Salt mannitol agar.
6. Antibiotic sensitivity test by disc method.
7. Widals test tube agglutination method
8. Biochemical tests (Catalase, Oxidase, Urease, Nitratase, Protease, Amylase and IMVIC).
9. Antimicrobial assay of antibiotic, introduction to zone of inhibition and calculation.
10. Immobilization of enzymes/cells by calcium alginate/gelatin/agar.
11. Isolation of DNA.
12. Selection and isolation of bacteria by replica plating.
13. Determination of thermal death time and thermal death point.
14. Effect of Ultra-Violet exposure on growth of E coli.
15. Demonstration of electrophoresis either by PAGE or Agarose gel electrophoresis.

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Reference Books:

1. Kanai L. Mukherjee, Medical Laboratory Technology: A Procedure Manual for Routine Diagnostic Tests Tata McGraw Hill Publishing Company Ltd., New Delhi.

2. Desmond S. T. Nicholl, An Introduction to GENETIC ENGINEERING, 2nd Edition, Cambridge University Press.

3. Wulf Crueger & Anneliese Crueger, Panima, Biotechnology: A Textbook of Industrial Microbiology, 2nd Edition, Publishing Corporation, New Delhi/Bangalore.

Lab Elective-II
4.Nanobiotechnology Lab
LAB COURSE OUTLINE

Nanobiotechnology	**Nano tech**	**BTL-816**
Course Title	Short Title	Course Code

Laboratory	**Hours/week**	**No.of weeks**	**Total hours**	**Semester credits**
	02	**15**	**16**	**01**

Course Description:
In this course learner is emphasis production and to give an insight towards the experimental component in the manipulation of biomolecules, nanoparticles and bioconjugates.

Prerequisite Course(s): Biochemistry, Microbiology.

General Objective:
1. To comprehend the fundamentals of nano-bioconjugation techniques.
2. To devise protocols for analyte estimation electrochemically at the nanoscale.
3. To develop the skills in design and development of scaffolds.
4. To make the learner familiarize with designing and functionalizing at the Nanoscale.

Learning Outcomes:
After successful completion of this lab student will be able to:
1. Synthesiz the nanoparticles.
2. Use nanoparticle in drug delivery.
3. Will be able assess the toxicity of the nonmaterial.

Lab Nanobiotechnology

Semester-VIII

Teaching Scheme
Practical - 2 Hrs/week

Examination Scheme
External Sessional Exams (ESE)/Oral (OR): 25 Marks.
Internal Continuous Assessment (ICA): 25 Marks.

Minimum 08 experiments shall be performed from the following:

1. Biosynthesis of Nanoparticles by Microorganisms.
2. Isolation and Bioconjugation DNA structure with Nanoparticles.
3. Determination of electrical conduction of DNA-nano conjugate.
4. Functionalization of nanoparticles for drug delivery.
5. Effect of Nanoparticles on biomolecules.
6. Methods for Studying of Toxicity of Silica-based Nanomaterials to Living Cells.
7. Quantitative estimation of Biomolecule- conjugated Quantum Dots.
8. Methods for Isolating RNA Sequences Capable of Binding to or Mediating the Formation of Inorganic Materials.
9. In Vivo Testing for Gold Nanoparticle Toxicity.
10. Amino Acid Mediated Linear Assembly of Au Nanomaterials.

REFERENCES:

1. Andrew Collins, Nanotechnology Cookbook: Practical, Reliable and Jargonfree Experimental Procedures, Elsevier, 2012.
2. Challa, Nanofabrication Towards Biomedical Applications, Techniques, Tools, Applications and Impact, Wiley – VCH, 2005.

Industrial Lecture

Industrial Lecture	**IL**	**BTP-817**
Course Title	Short Title	Course Code

Course Description:

The gap between industry's needs and the academic community's aspirations appears to be considerably large. There exists a strong feeling, at least in the academic circles, that unless technology driven initiatives find a surer place in the industrial sector in this country, the academia-industry interaction is likely to remain confined to developmental activities with limited exploratory or research-based content As institutes committed primarily to creation and growth of technological knowledge, technical institutes have an important role to play in the industrial sector of the country's economy. This fact by way of encouraging mechanisms to foster interaction between the academia and industry. Typically, academic interest in the multidimensionality of a problem leads to a tendency to explore a variety of options to arrive at a solution. This industrial lecture develops ability of student for expectations of the industrialists from the fresh engineers.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	**1**	**15**	**1**	**2**

General Objectives: The domains in which interaction is possible are:

a. Placement and entrepreneurship development.
b. Industry participation in technology development involving some exploratory work.
c. Academic intervention in solving specific industry problems.
d. Laboratory utilization by industry.
e. Continuing education programme.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Understand need, requirement and expectation of industry from fresh engineers.
2. Understand importance of laboratory practices throughout carrier of engineer. Design and conduct experiments, as well as to analyze and interpret data.
3. Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
4. Function on multidisciplinary teams, communicate effectively.
5. Identify, formulate, and solve engineering problems by understanding professional and ethical responsibility.
6. Recognition of the need for, and an ability to engage in life-long learning.
7. Use the techniques, skills, modern engineering tools and software necessary for engineering practice.

PROJECT- II

Project-II	**P-II**	**BTP-818**
Course Title	Short Title	Course Code

Course Description:
The course explores the knowledge of design, experiment and analysis of data. The course develops ability to work on multidisciplinary teams, Identify, formulate, and solve engineering problems in view of economic, environmental and societal context.

	Hours per Week	**No. Of Weeks**	**Total Hours**	**Semester Credits**
Laboratory	**4**	**15**	**48**	**6**

Prerequisite Course(s): Knowledge of science, mathematics, computer programming and core subject of engineering.
General Objectives: The objectives of project are to develop ability to work in group. The scope of work is design and conduct experiments, as well as to analyze and interpret data within realistic constrain such as economic, environmental, social, safety and manufacturability. The project work provides plate form for planning, material procurement, preparing specification and execution of work. The project also develop to work on multidisciplinary teams, communicate effectively and Knowledge of contemporary issues.
Course Outcomes:
Upon successful completion of this course the students will be able to:

1. Apply knowledge of mathematics, science, and engineering.
2. Design and conduct experiments, as well as to analyze and interpret data.
3. Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
4. Function on multidisciplinary teams, communicate effectively and Knowledge of contemporary issues.
5. Identify, formulate, and solve engineering problems by understanding professional and ethical responsibility.
6. Understand the impact of engineering solutions in a global, economic, environmental, and societal context.
7. Recognition of the need for, and an ability to engage in life-long and self learning.
8. Use the techniques, skills, modern engineering tools and software necessary for engineering practice.

Project-II
(Lab Course Contents)

Semester-VIII
Teaching Scheme:
Practical : 2 Hrs/Week

Examination Scheme:
Internal Continuous Assessment: 75Marks
End Semester Examination OR :75Marks

- Every student of shall undertake the Project-II in semester VIII.
- Each student shall work on an approved project, a group of **05 students (maximum)** shall be allotted for the each Project-II as same group for Project-I.
- Project-II may involve fabrication, design or investigation of a technical problem that may take design, experimental or analytical character or combine element of these areas. The project work shall involve sufficient work so that students get acquainted with different aspects of fabrication, design or analysis, testing, their result and conclusion.
- Each student group is required to maintain log book for documenting various activities of Project-II.
- The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of Project-II. Maximum four Project-i groups shall be assigned to one teaching staff.
- **Guide lines for ICA :** Assessment of the project for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given below:

Name of the Project: ____

Name of the Guide: ____

SN	Exam Seat no	Name of Student	Literature Survey	Design/ Experimentation/ Fabrication	Result and conclusion	Project Report	Presentation	Total Marks
			10	25	20	10	10	75

Syllabus

(With effect from 2015-16)

B.E. Chemical Engineering

Semester-VII

Final Year Chemical Engineering

CGPA Pattern

Faculty of Engineering and Technology

North Maharashtra University, Jalgaon

NORTH MAHARASHTRA UNIVERSITY, JALGAON
STRUCTURE OF TEACHING & EVALUATION
B.E. (CHEMICAL ENGINEERING) W.E.F.2015-2016

SEMESTER VII

COURSE CODE	NAME OF THE COURSE	GROUP	TEACHING SCHEME				EVALUATION SCHEME					CREDITS
							THEORY		PRACTICAL		TOTAL	
			THEORY HRS/week	TUTORIAL HRS/week	PRACTICAL HRS/week	TOTAL	ISE	ESE	ICA	ESE		
CHL 701	Process Dynamics & Control	D	3	--	--	3	20	80	--	--	100	3
CHL 702	Chemical Reaction Engineering-II	D	3	--	--	3	20	80	--	--	100	3
Interdisciplinary Elective (Any One From CHL 703 & CHL 704)												
CHL 703	Energy Engineering	E	3	--	--	3	20	80	--	--	100	3
CHL 704	Industrial Hazards & Safety	E	3	--	--	3	20	80	--	--	100	3
Elective-I (Any One From CHL 705-CHL 708)												
CHL 705	Biochemical Engineering	E	3	--	--	3	20	80	--	--	100	3
CHL 706	Petrochemical Technology	E	3	--	--	3	20	80	--	--	100	3
CHL 707	Computational Fluid Dynamics	E	3	--	--	3	20	80	--	--	100	3
CHL 708	Piping Design	E	3	--	--	3	20	80	--	--	100	3
CHL 709	Transport Phenomenon	D	3	--	--	3	20	80	--	--	100	3
CHP 710	LAB Process Dynamics & Control	D	--	--	2	2	--	--	25	25(OR)	50	1
CHP 711	LAB Chemical Reaction Engineering-II	D	--	--	2	2	--	--	25	25(OR)	50	1
Lab Elective-I												
CHP 712	LAB Biochemical Engineering	E	--	--	2	2	--	--	25	25(OR)	50	1
CHP 713	LAB Petrochemical Technology	E	--	--	2	2	--	--	25	25(OR)	50	1
CHP 714	LAB Computational Fluid Dynamics	E	--	--	2	2	--	--	25	25(OR)	50	1
CHP 715	LAB Piping Design	E	--	--	2	2	--	--	25	25(OR)	50	1
CHP 716	Project-I	D	--	--	2	2	--	--	25	25(OR)	50	2
CHP 717	Seminar-II	D	--	--	2	2	--	--	25	--	25	2
CHP 718	Industrial Visit	D	--	--	--	--	--	--	25	--	25	1
	TOTAL		**15**	**--**	**10**	**25**	**100**	**400**	**150**	**100**	**750**	**23**

NORTH MAHARASHTRA UNIVERSITY, JALGAON
STRUCTURE OF TEACHING & EVALUATION
B.E. (CHEMICAL ENGINEERING) W.E.F.2015-2016

SEMESTER VIII

COURSE CODE	NAME OF THE COURSE	GROUP	TEACHING SCHEME				EVALUATION SCHEME					CREDITS
							THEORY		PRACTICAL		TOTAL	
			THEORY HRS/week	TUTORIAL HRS/week	PRACTICAL HRS/week	TOTAL	ISE	ESE	ICA	ESE		
CHL 801	Computer Aided Process Equipment Design Modeling & Simulation	D	3	--	--	3	20	80	--	--	100	3
CHL 802	Chemical Plant Design &Project Engineering	D	3	--	--	3	20	80	--	--	100	3
Elective-II (Any One From CHL 803 - CHL 806)												
CHL 803	Industrial Pollution Control	E	3	--	--	3	20	80	--	--	100	3
CHL 804	Advance Separation Techniques	E	3	--	--	3	20	80	--	--	100	3
CHL 805	Polymer Technology	E	3	--	--	3	20	80	--	--	100	3
CHL 806	Oil Technology	E	3	--	--	3	20	80	--	--	100	3
Elective-III (Any One From CHL 807-CHL 810)												
CHL 807	Mathematical Methods in Chemical Engineering	E	3	--	--	3	20	80	--	--	100	3
CHL 808	Advance Catalysis	E	3	--	--	3	20	80	--	--	100	3
CHL 809	Plant Utility	E	3	--	--	3	20	80	--	--	100	3
CHL 810	Intellectual Property Rights	E	3	--	--	3	20	80	--	--	100	3
CHP 811	LAB Computer Aided Process Equipment Design Modeling & Simulation	D	--	--	2	2	--	--	25	25	50	1
CHP 812	LAB Chemical Plant Design &Project Engineering	D	--	--	2	2	--	--	25	25(OR)	50	1
Lab Elective-II												
CHP 813	LAB Industrial Pollution Control	E	--	--	2	2	--	--	25	25(OR)	50	1
CHP 814	LAB Advance Separation Techniques	E	--	--	2	2	--	--	25	25(OR)	50	1
CHP 815	LAB Polymer Technology	E	--	--	2	2	--	--	25	25(OR)	50	1
CHP 816	LAB Oil Technology	E	--	--	2	2	--	--	25	25(OR)	50	1
CHP 817	Industrial Lecture*	C	--	--	1*	1	--	--	50	--	50	2
CHP 818	Project-II	D	--	--	4	4	--	--	75	75	150	6
	TOTAL		**12**	**--**	**11**	**23**	**80**	**320**	**200**	**150**	**750**	**23**

NOTE: * Minimum 06 lectures to be delivered by experts of the industry in alternative weeks. Next week group discussion on the lecture delivered.

Course Outline

Process Dynamics & Control	**PDC**	**CHL 701**
Course Title	Short Title	Course Code

Course Description:

This course describes fundamental aspects of dynamic processes and the engineering tasks of process operations and control. The objective of the course is to apply the principles of science and chemical engineering to design static and dynamic model of processes, design of feedback and other control structures; and advanced control strategies.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**03**	**15**	**40**	**03**

Prerequisite Course (s): Fluid Flow Operation, Process Calculations, Process Heat Transfer, Mass Transfer I & II, Instrumentation & Instrumental Analysis, Chemical Engineering Thermodynamics, Chemical Reaction Engineering-I.

General Objectives:

1. To understand the importance of process control and role of process control engineers.
2. To develop input-output model of various processes by mathematical models.
3. To study the concept of linearization.
4. To develop transfer functions and study the dynamic behavior of various systems.
5. To design a control system to meet desired needs of chemical engineering process.
6. To design and analyze block diagrams from process information.
7. To study, design and tune different controllers.
8. To study dynamic behavior of feedback control processes.
9. To understand stability analysis using frequency response techniques.
10. To study advanced control strategies by various control mechanisms.

Learning Outcomes:

By the end of this course the students will be able to understand process dynamics and various forms of mathematical models required to express them, including differential equations, transfer functions, and frequency response plots. The students will understand the main ideas behind advanced multivariable control and also will be capable to analyze, design and tune various control systems. As the subject requires understanding of basic sciences and engineering, the students will be able to function along with multidisciplinary teams and will be capable of setting and complete team projects.

BE Chemical Engineering **Semester – VII**

Process Dynamics & Control

(Course Content)

Teaching Scheme		**Examination Scheme**	
Theory	: 3 hours/ week	End Semester Examination (ESE)	: 80 Marks
Practical	: 2 hours week	Paper Duration (ESE)	: 03 Hours
		Internal Sessional Examination (ISE)	: 20 Marks
		Internal Continuous Assessment (ICA)	: 25 Marks
		End Semester Examination (ESE) (OR)	: 25 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Characteristics of Chemical Process Control, Mathematical Modeling of Chemical Processes, State Variables and State Equation for Chemical Processes. Input –Output Model, Linearization of non linear systems. First order system and their transfer functions.

UNIT-II **No. of Lect. – 08, Marks: 16**

Dynamic behavior of first order system, Pure capacity process, First order system with variable Time constant and gain, Response of first order system in series: Interacting and Non-interacting. Second order system and their transfer function.

UNIT-III **No. of Lect. – 08, Marks: 16**

Dynamic behavior of second order system: under damped and over damped and critically damped systems. Transportation lag. Higher order systems. Introduction to feedback control systems, Controllers and final control element. Block diagram of chemical reactant control systems.

UNIT-IV **No. of Lect. – 08, Marks: 16**

Dynamic behavior of feedback control processes: P, PD, PI, and PID. Design of feedback controller: Performance criteria, selection of type of controller, Tuning of feedback controller. Stability analysis by Routh criteria, Root Locus Diagram.

UNIT-V **No. of Lect. – 08, Marks: 16**

Frequency response analysis of linear processes: Bode's diagram, Nyquist plots. Design of feedback control system using frequency response technique: Bode's stability criteria, gain and phase margin. Ziegler – Nichols tuning technique. Control Systems with Multiple Loops: Feed forward, Cascade, Ratio, selective, split range, Adaptive and Inferential control. Multi Variable Control.

Textbooks:

1. George Stephanpolous, Chemical Process Control, Prentice Hall of India.
2. D.R. Coughnour, Process System Analysis and Control, McGraw-Hill.
3. R.P. Vyas, Process Control & Instrumentation (2nd edition). Central Techno publication, Nagpur.

References:

1. K. Krishnaswamy, Process Control, New age International.

Course Outline

Chemical Reaction Engineering-II	**CRE-II**	**CHL 702**
Course Title	Short Title	Course Code

Course Description:

This course describes to use appropriate terminology of chemical reaction engineering of heterogeneous nature and design. It illustrates basic scientific principles associated with the reactor design.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**03**	**15**	**40**	**03**

Prerequisite Course (s): Applied Physical chemistry, Chemical Reaction Engineering – I, Mass Transfer I & II, Process Equipment Design I & II.

General Objectives:

1. To study the fluid particle reaction non-catalytic reactions.
2. To study the determination of rate controlling step.
3. To study the fluid-fluid system (without catalyst).
4. To study the reactors for gas-liquid reactions.
5. To study the preparation and deactivation of catalyst.
6. To study the determination of surface area and Pore volume of catalyst.
7. To study the solid catalyzed reactor.
8. To study the diffusion and reaction in spherical catalyst pellets.
9. To study the design of Moving Bed Reactor, Fluidized Bed Reactor and Slurry Bed Reactor.
10. To study the design of Trickle bed reactors, Isothermal and Adiabatic fixed bed reactor.

Learning Outcomes:

At the end of the course students are able to apply basic kinetics and mass transfer principles for development of heterogeneous system rate expressions for fluid particle and fluid -fluid non catalytic reaction. The students demonstrate their ability how to prepare and use the catalyst for enhancements of reaction rate and understand its deactivation and generation. The students will become competitive to undertake the designing of solid catalyzed reaction, Fluidized bed Reactors, Slurry bed reactors, Trickle bed reactors, Isothermal and Adiabatic fixed bed reactor.

BE Chemical Engineering **Semester – VII**

Chemical Reaction Engineering-II

(Course Content)

Teaching Scheme		**Examination Scheme**	
Theory	: 3 hours/ week	End Semester Examination (ESE)	: 80 Marks
Practical	: 2 hours/week:	Paper Duration (ESE)	: 03 Hours
		Internal Sessional Examination (ISE)	: 20 Marks
		Internal Continuous Assessment (ICA)	: 25 Marks
		End Semester Examination (ESE)(OR)	: 25 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Introduction to fluid particle reaction non-catalytic reactions, unreacted core model for Spherical particle of unchanging size, Rate of reaction for shrinking spherical particles, Determination of rate controlling step , Various contacting patterns in fluid solid reactors for fluid particle non-catalytic reactions.

UNIT-II **No. of Lect. – 08, Marks: 16**

Introduction to fluid-fluid system (without catalyst), Rate equation for Instantaneous, Fast, Intermediate and slow reaction, Slurry Reaction kinetics, Rate equation for infinitely slow reaction, Film conversion parameter , Reactors for gas-liquid reactions and their comparative evaluations on the basis of holdups. Aerobic fermentation, Tower for fast and slow reaction, Mixer settler and semi-batch contacting pattern. Reactive distillation and extractive reaction.

UNIT-III **No. of Lect. – 08, Marks: 16**

Introduction, Classification, Characteristics, Preparation and Deactivation of catalyst, promoters and inhibitors, Determination of surface area and Pore volume of catalyst, Adsorption process and its classification, Types of adsorption isotherm.

UNIT-IV **No. of Lect. – 08, Marks: 16**

Introduction to solid catalyzed reactor , Rate equation for adsorption , desorption and surface reaction, Diffusion and reaction in spherical catalyst pellets , Internal effectiveness factor, Overall effectiveness factor, Estimation of diffusion and reaction limited regimes, Mass transfer and reaction in a packed bed, The determination of limiting situation from reaction data, chemical vapor deposition reactors.

UNIT-V **No. of Lect. – 08, Marks: 16**

Introduction to heterogeneous catalytic reactors.

Design, Mechanical construction and applications of: Moving bed reactors, Fluidized bed Reactors, Slurry bed reactors, Trickle bed reactors, Isothermal and Adiabatic fixed bed reactor.

Textbooks:

1. Octave Levenspiel, Chemical Reaction Engineering, John Wiley and Sons.
2. J.M. Smith, Chemical Engineering Kinetics, McGraw Hill
3. H.Scott Fogler, Elements of Chemical Reaction Engineering, Prentice Hall, New Jersey.
4. Coulson & Richardson Chemical Engineering (Vol. III), Butterworth-Heinmann (Elsevier) (Sixth Edition).
5. Coulson & Richardson Chemical Engineering (Vol. V), Butterworth-Heinmann (Elsevier) (Sixth Edition).
6. S.D. Dawande, Principles of Reaction Engineering, Denett & Co., Nagpur.

References:

1. Lanny D. Schimdt , Chemical Reaction Engineering, Oxford University Press.
2. Froment and Bischoff, Chemical Reactor Analysis and Design, Wiley Publication, New York.
3. Hiroo Tominaga and Masakazu Tamaki, Chemical Reactions and Reactor Design, Wiley and Maruzene Publications.

Course Outline

Interdisciplinary Elective

Energy Engineering	**EE**	**CHL 703**
Course Title	Short Title	Course Code

Course Description:

Energy engineering aims to give students real-world technical expertise in strategic renewable energy disciplines, as well as an in depth understanding of the issues associated with renewable energies and their development, including the short and medium-term technical, technological, geopolitical and environmental challenges.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**03**	**15**	**40**	**03**

Prerequisite Course (s): Engineering Chemistry I & II, Engineering physics I and II, Mathematics I and II, Soft Skill I and II, Elements of Electrical & Electronics Engineering, Elements of Civil Engineering & Engineering Mechanics, Elements of Civil Engineering & Engineering Mechanics, Elements of Electrical & Electronics Engineering.

General Objectives:

1. To impart introduction to energy engineering. Energy resources and forms of energy.
2. To study about Conventional Energy Sources like Coal and types of coal and byproduct, Petroleum, Natural gas and Refinery Products
3. To study about solar energy, wind energy, geothermal, tidal energy, Bio energy.
4. To impart the knowledge of Chemical Energy Sources- Fuel cell, Hydrogen, Methanol, Nuclear energy.
5. To give the knowledge of Energy conversion processes and devices, Power plants with conventional energy sources.
6. To study national energy strategies and national energy plans.

7. To study energy power management, energy planning in India.
8. To study energy audit of a company.

Learning Outcomes:

Students shall have ability to apply knowledge of mathematics, science, and engineering to various processes, as well as to analyze and interpret the data. They will be able to understand the conventional and nonconventional source of energy, National energy strategy and energy plans, energy power management, energy audit, various energy conversion processes, devices and about the power plants.

Final Year **Semester – VII**

(Interdisciplinary subject(s) offered

by Chemical Engineering Department)

Energy Engineering

(Course Content)

Teaching Scheme		**Examination Scheme**	
Theory	: 3 hours/ week	End Semester Examination (ESE)	: 80 Marks
		Paper Duration (ESE)	: 03 Hours
		Internal Sessional Examination (ISE)	: 20 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Energy engineering and energy technology: Law of conservation of Energy, Generalized equation of Energy conservation, Energy resources and forms of energy, Energy demand, Changing energy consumption trends, National energy strategies of India, Crucial Issue in India's energy planning. Energy power management and Energy planning in India. Energy Audit- Types of Energy Audits Conservation and recycling.

UNIT-II **No. of Lect. – 08, Marks: 16**

Conventional Energy Sources

Coal : Type of coal, classification of Indian coal. Important Properties of coal. Exploration, Coal Preparation, Removal of sulphur, Storage and Transportation of coal. Coal gasification, coal liquefaction.

Petroleum, Natural gas and Refinery Products: Introduction to Petroleum and Natural gas and Naphtha. Exploration of petroleum. Production of crude oil and Natural gas. Transportation of crude oil and Natural gas. Refining of crude oil and Natural gas Refinery. Liquefaction of Natural gas

UNIT-III **No. of Lect. – 08, Marks: 16**

Chemical Energy Sources:

Fuel cells: Introduction, Design and operation of a Fuel cell. Classification of fuel cells: Types of fuel cells, Advantages and disadvantages of fuel cells, Applications of fuel cells. Hydrogen: Introduction, Applications of Hydrogen, Production of Hydrogen, Storage and transportation safety and management, Hydrogen technology development in India.

UNIT-IV **No. of Lect. – 08, Marks: 16**

Nuclear Energy: Nuclear energy and application compared with coal, Fuels for Nuclear Fission Reactor. Storage and Transportation. Energy from Nuclear fission reactor. Fast breeder Reactor. Boiling water reactor. Pressurized heavy and Light Water reactor. Uranium Enrichment Process. Nuclear Waste Management.

Solar Energy: Terms and definition ,units. Application of solar heater solar energy storage, Thermal storage, battery storage. Applications of Solar energy. Wind energy: Basic Principles of wind energy conversion. Site Selection Considerations. Classification of wind energy conversion system, Wind power density, Power in wind stream, Forces on the blades of a propeller, Energy pattern factor, Definition of wind speed for Turbines.

UNIT-V **No. of Lect. – 08, Marks: 16**

Bio energy: Biomass energy resources, Biomass conversion processes, direct combustion of biomass, Thermo chemical conversion of biomass, Biochemical conversion, Ethanol from biomass, Applications, Biodiesel.

Energy conversion technologies and Electrical power plants: Power plants with conventional energy sources, Coal fired steam thermal power plants, Combined cycle power plants, Integrated coal gasification combined cycle power plants, Plant factors and reserves.

Textbooks:

1. S. Rao and Dr. B.B. Parulekar, "Energy Technology" Non Conventional, Renewable and Conventional, Khanna Publishers, New Delhi.
2. G.D. Rai "Non conventional Energy Sources", Khanna Publishers,New Delhi

References:

1 S.B. Pandya, “Conventional Energy Technology” Fuels and Chemical Energy Tata McGraw-Hill Publishing Company Ltd, New Delhi

2 S.P. Sukhatme, “Solar Energy”, Principals of thermal collection and Storage. Tata McGraw-Hill Publishing Company Ltd, New Delhi

3 Thipse, S. S. “ Alternative fuels” Jaico Publishing House; First edition , 2010

Course Outline

Interdisciplinary Elective

Industrial Hazards & Safety	**IHS**	**CHL 704**
Course Title	Short Title	Course Code

Course Description:

This course describes identification of components needed to provide a safe environment, analyze resulting safety and health issues.

	Hours per Week	**No. of Weeks**	**Total Hours**	**Semester Credits**
Lecture	**03**	**15**	**40**	**03**

Prerequisite Course (s): Chemical Plant Design and Project Engineering, Process Heat Transfer, Project Engineering Economics & Costing.

General Objectives:

1. To identify the components needed to provide a safe and healthful work environment through case studies and review of injury statistics provided in the course.
2. To analyze safety and health issues resulting from worker complaints or OSHA violations and suggest potential remedies.
3. To identify potential workplace safety and health hazards and determine how to mitigate the hazards through engineering controls, administrative controls and personal protective equipment.
4. To demonstrate research skills necessary for mastery of the topic, which will entail a presentation on a specific industry. Worker compensation claims in the industry selected by the student will be evaluated and injury prevention methods reviewed in the report.
5. To conduct basic safety inspections using strategies that they have developed though hazard identification and job hazard analysis.

6. To review the principles for developing and implementing a successful occupational health and safety program and evaluation of a work site.
7. To compare past and contemporary philosophies of safety and accident prevention as well as be able to compare injury data from previous decades.
8. To identify the moral and economic consequences associated with the major classifications and causes of accidents and the cost of workers' compensation based on the risk classes of industries.
9. To explain the causal relationship between accidents and liability including the no fault workers compensation system and the third party liability type lawsuit.
10. To identify basic fire prevention and protection programs in the workplace.
11. To identify essential elements of an occupational safety and health program and the components of international standard organizations in safety and health..
12. To describe basic components of an effective company safety and health program including management commitment, employee involvement, hazard recognition and control and training.

Learning Outcomes:

At the end of this course, the student will have ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability. They shall understand the function of hydrogen and its safety during working and energy from various power plants. Students shall understand the impact of engineering solutions in a global, economic, environmental, and societal problem during study. Students will have an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Final Year **Semester – VII**

(Interdisciplinary subject(s) offered
by Chemical Engineering Department)

Industrial Hazards & Safety

(Course Content)

Teaching Scheme		**Examination Scheme**	
Theory	: 3 hours/ week	End Semester Examination (ESE)	: 80 Marks
		Paper Duration (ESE)	: 03 Hours
		Internal Sessional Examination (ISE)	: 20 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Introduction to Industrial Safety:

History and development of safety movement, Need for safety, Safety legislation: Acts and rules, Safety standards and codes, Safety policy: safety organization and responsibilities and authorities of different levels. Accident sequence theory, Causes of accidents, Accident prevention and control techniques, Plant safety inspections, Job safety Analysis and investigation of accidents, First aid.

UNIT-II **No. of Lect. – 08, Marks: 16**

Industrial Safety Management

Management**:** Concept, definition, nature and importance, Role and functions of a manager, Elements and functions of Management.

Management Principles**:** Authority, responsibility & power of Management, Span of Control.

Delegation and decentralization of authority. General principles of Management.

Industrial Safety**:** History of Safety Movement in India and abroad. The Accident Problem, Nature & size need for safety, legal, humanitarian, economic and social considerations.

Safety Management**:** Role of management in Industrial Safety. Safety Management Principles & Practices.

UNIT-III **No. of Lect. – 08, Marks: 16**

Safety Awareness & Training:

Training for Safety: Assessment of needs. Design & development of training programmes. Training methods and strategies. Training of manager, supervisors & workers. evaluation of training programmes.

Training Programme: In-Plant training programmes. Out-of-plant training programmes. Seminars, Conferences & Workshop, Programmes for new workers. Job instructions Vs Safety instructions.

UNIT-IV **No. of Lect. – 08, Marks: 16**

Safety Promotion & Publicity:

Safety suggestion schemes. Safety competitions, Safety incentive Schemes. Audio Visual Publicity, other promotional methods.

Human behavior and safety: Human factors contributing to accidents. Individual differences. Behaviour as function of self and situation. Perception of danger and acceptance of risks. Knowledge and responsibility vis-a-vis safety performance. Role of management, Supervisors and safety department in motivation.

UNIT-V **No. of Lect. – 08, Marks: 16**

Control of Physical and Chemical Hazards:

Purpose of lighting. Advantages of good illumination. Lighting and safety. Lighting and the work. Sources and types of artificial lighting. Principles of good illumination. Recommended minimum standards of illumination. Design of lighting installation, Lighting and colour, Purpose of ventilation. Engineering Control of noise, Vibration damping, Noise isolation.

Hazardous properties of chemicals and appreciation of information provided in Material safety data sheets. Classification of dangerous materials. Safety in transportation of dangerous materials by road, rail, ships and pipelines. Safety in bulk storage of hazardous substances. Safety in handling of chemicals in the plant by pipelines.

Textbooks:

1. R.S. Gupta, Handbook of Fire Technology, National Safety Council of India.
2. Major hazard control, A Practical Manual, Inter National Labour Office, 3rd impression (1 Nov. 1988), www.amazon.in
3. Encyclopedia of occupational health and safety, Inter National Labor Office, 4th revise edition, 1 March 1990. www.amazon .in
4. R.K. Jain and Sunil S. Rao, Industrial Safety, Health and Environment Management Systems, Khanna Publishers, New Delhi (2006)Slote.L. Handbook of Occupational Safety and Health, John Willey and Sons, NewYork
5. Frank P. Lees, Loss of Prevention in Process Industries, Vol. 1 and 2, Butterwort
6. Heinemann Ltd., London (1991).

References:

1. Industrial Safety -National Safety Council of India.
2. The Factories Act with amendments 1987, Govt. of India Publications DGFASLI, Mumbai Grimaldi and Simonds, Safety Management, AITBS Publishers, New Delhi (2001).
3. Industrial Safety and Pollution Control Handbook: National Safety Council and Associate Publishers Pvt. Ltd, Hyderabad (1993).
4. Risk Assessment and Environmental Management: D. Kofi Asvite- Dualy, John Willey & Sons, West Sussex, England (1998).
5. Gilbert M. M., Pearson, "Introduction to Environmental Engineering & Science": Education, Singapore (2004).
6. R.S. Gupta," Fire Technology", National Safety Council of India.
7. Major hazard control, Inter National Labor Office.
8. Encyclopedia of occupational health and safety, Inter National Labor Office.
9. Safety, health and working condition in the transfer of technology, Inter National Office.

Elective - I

Course Outline

Biochemical Engineering	**BCE**	**CHL 705**
Course Title	Short Title	Course Code

Course Description:

The course consists of study of Biological Material & Energy Balances for bioprocesses & unit operations used in the bioprocesses. It also includes Enzyme Engineering. Immobilization of enzymes and kinetic study of the enzyme catalyzed reactions. Study of microbial kinetics, various models, different types of Bioreactors with material balances are the integral part of this course. Sterilization reactors, air sterilization, O_2 transport in bioprocesses, recovery of the fermentation products followed by instrumentation and control are also included in the course.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**03**	**15**	**40**	**03**

Prerequisite Course (s): Process Calculation, Mass Transfer – I & II, Instrumentation and Instrumental Analysis, Chemical Reaction Engineering – I.

General Objectives:

1. To study the biological materials to obtain various chemicals from them and Energy and Material balances for the bioprocesses and Unit operations involved in these processes.
2. To study Enzyme Engineering.
3. To study kinetics of microbial growth, various models and different reactor configurations for the growth of microorganisms.
4. To study sterilization of liquids and air, O_2 transport through cell and determination of oxygen transfer coefficients.
5. To study the unit operations for the recovery of fermentation products.
6. To study the application of controls and instrumentations in bioprocesses.

Learning outcomes:

The students after completing the course will be able to apply a knowledge and understanding of various biochemical processes for the recovery of many important chemicals and biochemical's. The students will utilize the principles of hygiene, will demonstrate the understanding of basic science and engineering and will use the knowledge of chemical engineering to design efficient product bioprocesses by designing bioreactors and effective downstream processing mechanism.

. **BE Chemical Engineering** **Semester – VII**

Biochemical Engineering

(Course Content)

Teaching Scheme		**Examination Scheme**	
Theory	: 3 hour/ week	End Semester Examination (ESE)	: 80 Marks
Practical	: 2 hour/ week	Paper Duration (ESE)	: 03 Hours
		Internal Sessional Examination (ISE)	: 20 Marks
		Internal Continuous Assessment (ICA)	: 25 Marks
		End Semester Examination (ESE) (OR)	: 25 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Characteristics of Biological material. Types of microorganisms; general physical properties of cells and chemical composition of cells; requirement for growth of cells and formulation of media; reproduction cycles in microorganisms; changes in composition of cells with age and with growth rate; effect of substrate limiting growth on the composition of cells; strain breeding; Maintenance of pure cultures.

Material Balances in bioprocesses, Application of material balances to bioprocesses.

Energy balances in bioprocesses, Heat of reaction for processes with biomass production. Unsteady state energy and material balances in bioprocesses.

UNIT-II **No. of Lect. – 08, Marks: 16**

Enzymes. History. Enzyme nomenclature and classification. Applications of enzymes. Enzyme substrate complex and enzyme action. Effect of Temperature and pH on enzyme activity. Kinetics of enzyme catalyzed reaction; simple enzyme kinetics with one and two substrates; Michaelis Menten kinetics. Evaluation of parameters of Michaelis Menten equation. Kinetics of reversible enzyme catalyzed reaction. Enzyme inhibition. Types of enzyme inhibition. Kinetics of competitive, uncompetitive and noncompetitive enzyme inhibition. Substrate activation and inhibition. Immobilization of enzymes and their applications.

UNIT-III **No. of Lect. – 08, Marks: 16**

Microbial Kinetics: Monod's growth kinetics. Environmental effects on growth kinetics. Balanced growth kinetics, Transient growth kinetics, Unstructured batch growth model, Growth of filamentous organisms, Product formation kinetics. Unstructured model.

Reactor Configurations: Batch growth of microorganisms, Stirred tank reactor with recycle of biomass, Continuous stirred tank fermenters in series, plug flow fermenter, fed batch fermenter, Numericals on these, multiphase reactors such as packed bed reactors, bubble column reactors, fluidized bed reactors and trickle bed reactors.

UNIT-IV **No. of Lect. – 08, Marks: 16**

Sterilization: Importance of Sterilization. Batch Sterilization of liquids, continuous sterilization of liquids, sterilization of air.

Aeration and Agitation: Mass transfer and Microbial respiration, bubble aeration and mechanical agitation, correlation between oxygen transfer coefficient and operating variables, effect of temperature, organic substances, surface active agents, mycelium and types of sparger on oxygen transfer coefficient. Measurement of oxygen transfer coefficient, Scale up.

UNIT-V **No. of Lect. – 08, Marks: 16**

Recovery of fermentation products, Disruption of cells, mechanical methods, ultrasonic vibrations, grinding and mechanical shear, shearing by pressure, induction by lysis.

Reverse Osmosis: Ultra filtration, Instrumentation and Control: Introduction, methods of measuring process variables; temperature measurement and control, pressure measurement and control, foam sensing and control, weight of fermenter and estimation of microbial biomass, dissolved oxygen measurement and control, inlet and exit gas analysis, pH measurement and control, bioprocess economics.

Textbooks:

1. James E. Bailey & David F. Ollis, Biochemical Engineering. Fundamentals; McGraw Hill Publication.
2. P.F.Stanbury, A. Whitaker & S,J.Hall, Principles of Fermentation Technology; Aditya Books Ltd; New Delhi.
3. Doran Pauline M. Bioprocess Engineering Principles, Academic Press. An Imprint of Elsevier.4. Shular Michael L. and Kargi Fikret. Bioprocess Engineering Basic Concepts, Prentice Hall of India.
4. Shular Michael and Kargi Fikret, Bioprocess Engineering Basic Concepts, Prentice Hall of India
5. Editors: J.F. Richardson, D.G. Peacock, Coulson's & Richardson's Chemical Engineering, (Vol-III) Asian Books Pvt. Ltd. New Delhi
6. J.H. Backhurst & J.H.Harker, Coulson's & Richardson's Chemical Engineering (Vol-V) Asian Books Pvt. Lt

References:

1. Shuichi Aiba, Arthur E.H. & Nancy F.M., Biochemical Engineering; University of Tokyo Press.

Elective - I

Course Outline

Petrochemical Technology	**PCT**	**CHL 706**
Course Title	Short Title	Course Code

Course Description: This course describes the various unit operations and unit processes involved in the manufacturing various petrochemicals.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**03**	**15**	**40**	**03**

Prerequisite Course (s): Chemical Engineering Processes-I & II.

General Objectives:

1. To introduce with the petroleum refinery worldwide
2. To develop knowledge of different refining processes
3. To develop knowledge of safety and pollution control in the refining industries
4. To study production of Methane and its derivatives
5. To study general characteristics, production of ethane- ethylene-Acetylene and their derivatives
6. To study Dehydrogenation of Butane
7. To study Synthesis gas and synthetic chemicals and their applications.
8. To study Petroleum Aromatics.
9. To study derivatives of benzene.
10. To study chemicals from xylene.

Learning Outcomes:

Studying this subject the students will learn about petrochemicals as well as different refining processes. This subject will guide the students about the development of petrochemical industries. This subject furnishes the conversion of petroleum feedstock to chemicals and intermediates. As the subject requires understanding of basic knowledge of petrochemicals and basic sciences the students will be able to work along with multidisciplinary teams and will be capable of handling consultancy projects related to petrochemical technology.

BE Chemical Engineering **Semester – VII**

Petrochemical Technology

(Course Content)

Teaching Scheme		**Examination Scheme**	
Theory	: 3 hour/ week	End Semester Examination (ESE)	: 80 Marks
Practical	: 2 hour/ week	Paper Duration (ESE)	: 03 Hours
		Internal Sessional Examination (ISE)	: 20 Marks
		Internal Continuous Assessment (ICA)	: 25 Marks
		End Semester Examination (ESE) (OR)	: 25 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Petrochemical Industry in India. Feed stocks for petrochemicals, separation of aromatics.

Chemicals from methane: Manufacture of methanol, formaldehyde, acetic acid, ethylene glycol, CS_2, liquid fuels from methanol, manufacture of ethanol.

UNIT-II **No. of Lect. – 08, Marks: 16**

Chemicals from ethane- ethylene-Acetylene.

Ethane: Occurrence, halides of ethane, Nitroethane and oxidation of ethane. Ethylene production, production of ethylene derivatives like vinyl acetate monomer, ethylene oxide, ethylene diamine, ethanol and acetaldehyde.

Chemicals from acetylene: acrylic acid, vinyl chloride, vinyl acetate and Acetonitrile.

UNIT-III **No. of Lect. – 08, Marks: 16**

Chemicals from C3, C4 and higher carbon atoms:

Products from propane. Dehydrogenation of propane and higher paraffin’s.

Chemicals from propylene: Isopropyl alcohol, acetone, propylene glycol, acrylic acid and ester, Phenol.

Dehydrogenation of butanes. Production of Iso and n- butanol. Production of methyl –tert-butyl ether [MTBE], Adipic acid. Derivatives from hydrocarbons higher than butane.

UNIT-IV **No. of Lect. – 08, Marks: 16**

Synthesis gas and chemicals:

Synthesis gas. Steam reforming of hydrocarbons. Production of synthesis gas. Chemicals from synthesis gas. Oxo synthesis, vinyl acetate, acetic acid.

Fischor- Tropsch synthesis: catalysts and the products.

LPG: sources, properties grades of LPG. Supply of LPG to consumers, the storage and use of LPG.

UNIT-V **No. of Lect. – 08, Marks: 16**

Petroleum aromatics: Production of BTX. Benzene derivatives like Aniline, phenol, alkylation of benzene.

Products from toluene: Chlorotoluenes, O- Cresols, Dinitrotoluenes, Benzaldehyde, caprolactum, Terephthalic acid.

Textbooks:

1. Bhaskararao B.K. “A Text on Petrochemicals”, Khanna Publishers, New Delhi
2. Sarkar G.N. “Advanced Petrochemicals” Khanna Publishers, New Delhi

References:

1. Maiti Sukumar [editor],”Introduction to Petrochemicals”, Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi

Course Outline

Elective-I

Computational Fluid Dynamics	**CFD**	**CHL707**
Course Title	Short Title	Course Code

Course Description:

The incorporation of CFD (Computational Fluid Dynamics) as a possible solution to modern day fluid mechanic problems has become part of the daily lives of many engineers along with the companies they work for. Usually, the main objective is to quantitatively estimate forces produced by flows around a specific structural component or to optimize the design of an individual part responding to forces originating from fluid dynamics.

These skills imply a high degree of multidisciplinary competence in order to accurately define and resolve specific problems. A profound knowledge is needed in different key areas such as CAD to properly discretize the problem, fluid mechanics to properly understand the governing phenomena behind the problem, numerical methods to understand how these fluid dynamic problems are numerically solved and finally, experimental techniques in fluid mechanics to understand the underlying errors in reference values used for validation.

	Hours per Week	**No. of Weeks**	**Total Hours**	**Semester Credits**
Lecture	**03**	**15**	**40**	**03**

Prerequisite Course (s): Fluid Flow Operation, Process Calculations, Mechanical Operation, Mass Transfer-I, Mass Transfer-II, Process Heat Transfer

General Objectives:

1. To understand the philosophy of computational fluid dynamics and conservation principles.
2. To understand classification of flows & characteristics of simple turbulent flows, free turbulent flows.

3. To study different models such as turbulence models, mixing length model, the k-e model and their algebraic stress equations.
4. To study Grid Generation.
5. To understand discretization of ordinary and partial differential equations.
6. To study approximation of first, second and mixed derivatives & its implementation on boundary conditions.
7. To study applications of discretisation in solving engineering problems.
8. To understand heat transfer in a complex tubes and channels.
9. To study type of flow processes.

Learning Outcomes:

On completion of this course the student is expected to apply the differential equations governing fluid flow, heat transfer and mass transport to formulate strategies for the solution of engineering problems, to use basic methods for solving these equations numerically using a computer.

BE Chemical Engineering **Semester – VII**

Computational Fluid Dynamics

(Course Content)

Teaching Scheme		**Examination Scheme**	
Theory	: 3 hour/ week	End Semester Examination (ESE)	: 80 Marks
Practical	: 2 hour/ week	Paper Duration (ESE)	: 03 Hours
		Internal Sessional Examination (ISE)	: 20 Marks
		Internal Continuous Assessment (ICA)	: 25 Marks
		End Semester Examination (ESE)(OR)	: 25 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Philosophy of computational fluid dynamics, conservation principles of mass, energy, and momentum, simplified flow models such as incompressible, potential and creeping flows, classification of flows. Effect of turbulence on time-averaged Navier-Stokes equations, Characteristics of simple turbulent flows, Free turbulent flows.

UNIT-II **No. of Lect. – 08, Marks: 16**

Turbulence models, Mixing length model, The k-e model, Algebraic stress equation models. Grid Generation: Structured and unstructured grids, choice of grid, general transformation of equations, some modern developments in grid generation in solving the engineering problems. Finite Difference Method.

UNIT-III **No. of Lect. – 08, Marks: 16**

Discretization of ordinary and partial differential equations, approximation of first, second and mixed derivatives, implementation of boundary conditions, discretization errors, applications to the engineering problems.

UNIT-IV **No. of Lect. – 08, Marks: 16**

Discretisation methods, approximations of surface integrals and volume integrals, interpolation and differentiation practices, implementation of boundary conditions, applications to the engineering problems. One-dimensional unsteady heat conduction.

UNIT-V **No. of Lect. – 08, Marks: 16**

Flow in a sudden pipe contraction / expansion, flow and heat transfer in a complex tubes and channels, reactive flow, multiphase flow, and turbulent flow processes.

Textbook :

1. Anderson Jr J. D., "Computational Fluid Dynamics: The Basics with Applications", McGraw Hill. 1995.
2. Muralidhar K. and Sundararajan T. "Computational Fluid Flow and Heat Transfer", Narosa Publishing House, 2003.
3. H. K. Versteeg and W. Malalasekera, "An introduction to computational fluid dynamics: the finite volume method", Longman scientific & technical publishers, 2007.
4. Ranade V. V, "Computation Flow Modeling for Chemical Reactor Engineering", Academic Press. 2002.

References:

1. Ferziger J. H. and Peric M., "Computational Methods for Fluid Dynamics", 3ed. Springer, 2002.

Elective - I

Course Outline

Piping Design	**PDSN**	**CHL 708**
Course Title	Short Title	Course Code

Course Description:

Piping design course is structured to raise the level of expertise in piping engineering and to improve the competitiveness in the present scenario of industries. This course provides various know how of piping system designs, development skills and knowledge of current trends of plant layout.

	Hours per Week	**No. of Weeks**	**Total Hours**	**Semester Credits**
Lecture	**03**	**15**	**40**	**03**

Prerequisite Course (s): Chemical Engineering Materials, Fluid Flow Operation, Process Calculations, Mechanical Operation, Process Heat Transfer, Mass Transfer I & II, Process Equipment Design I & II.

General Objectives:

1. To study the role of piping engineer.
2. To study the scope of piping engineering.
3. To study the criteria for selection of pipe joints.
4. To study the frictional losses and Pressure drops calculation for Newtonian & Non-Newtonian fluids.
5. To study the types of valves.
6. To study the constructional features.
7. To study the pipe rack spacing and drawing.
8. To study the piping systems for plant utilities.
9. To study the how to use various symbols like piping, line, valve and equipment in piping drawing.

10. To study the PFD, P&ID and utility flow diagram.

Learning Outcomes:

The students after completing the course will be able to apply a knowledge and understanding of the role of chemical engineer as piping engineer, the scope, selection of the various pipe joint, calculations involved like frictional losses and pressure drops, various valves to be used and their construction features, piping supports for utilities pipeline. Students are able to draw drawings like PFD, P&ID and Utility flow diagram.

BE Chemical Engineering **Semester – VII**

Piping Design

(Course Content)

Teaching Scheme		**Examination Scheme**	
Theory	: 3 hour/ week	End Semester Examination (ESE)	: 80 Marks
Practical	: 2 hour/ week	Paper Duration (ESE)	: 03 Hours
		Internal Sessional Examination (ISE)	: 20 Marks
		Internal Continuous Assessment (ICA)	: 25 Marks
		End Semester Examination (ESE) (OR)	: 25 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Role of piping engineer, Scope of piping engineering, Responsibilities of piping engineer, Inputs received by piping engineers and output given by them, Interactions of piping engineers with other disciplines such as process engineering, instrumentation engineering etc.

UNIT-II **No. of Lect. – 08, Marks: 16**

Pipes and pipe fittings – standards and specification, steel pipes, steel pipe fittings, cast iron pipes, cast iron fittings, joining of cast iron pipes, tubes of other materials, design of flanges and flange joints.

UNIT-III **No. of Lect. – 08, Marks: 16**

Types of Valves, Control Valves, Safety Valves, Constructional features, Criteria for selection, Piping components, Safety valves and other pressure relieving devices, Constructional features, Selection criteria.

UNIT-IV **No. of Lect. – 08, Marks: 16**

Pipe Rack Spacing, Drawing pipe in the rack, Pipe insulation shoes, Pipe guides, Pipe Flexibility, Pipe Supports, Field supports, Dummy supports, Hanger rods, Spring hangers, Pick-up pipe supports, Plant utilities, Control valve manifolds, Utility stations, Sewer and underground piping system**.**

UNIT-V **No. of Lect. – 08, Marks: 16**

Introduction to PFD, P&ID, Utility flow diagrams, Piping symbols, Line symbols, Valve symbols, Equipment Symbols, Plant layout.

Textbooks:

1. Design of Piping system, M.W. Kellogg Co. 1976 (2ndEdition).
2. G. K. Sahu, Handbook of Piping Design.
3. Sam Kannapan, P.E. Pipe Stress Analysis , Willey-Interscience Publications.
4. Roy A. Parisher, Robert A. Rhea ,Pipe Drafting and Design, Gulf Professional Publishing,3rd Edition.
5. Thakore,Bhatt,Introduction to Process Engineering and Design,Tata McGraw-Hill Education, 2007
6. D. J. Deutsch, Process piping systems, Chemical Engineering Magazine. McGraw Hill.

References Books:

1. M. L. Nayyar, P.E , Piping Handbook, 6 th edition, McGraw-Hill, Inc
2. Johan J McKetta,Piping Design Handbook , CRC Press, 1992.

Course Outline

Transport Phenomenon	**TP**	**CHL 709**
Course Title	Short Title	Course Code

Course Description:

The main aim is to give a balanced overview of the field of transport phenomena, discussing the fundamental theories of the subject, and illustrating how to use them to solve transport problems and elaborate conceptual and mathematical models, from conservation principles.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**03**	**15**	**40**	**03**

Prerequisite Course (s):--Fluid Flow Operation, Mass Transfer –I, Process Heat Transfer, Mass Transfer-II

General Objective:

1. To develop an ability to apply knowledge of mathematics, interdisciplinary science, and engineering in the field of transport processes.
2. To study equilibrium and non equilibrium processes.
3. To study role of intermolecular forces.
4. To study fundamental laws of conservation and apply to understand behavior of transport processes.
5. To study Newtonian and Non Newtonian behavior of fluids.
6. To formulate momentum, energy and mass balances in chemical processes.
7. To determine momentum, heat, mass flux distribution in rectangular, cylindrical and spherical co-ordinates.
8. To develop equation of motion using equation of continuity.
9. To develop equation of energy.
10. To study simultaneous momentum, heat and mass transport.

Learning Outcomes:

Students will be able to apply engineering principles and analyze problems dealing with transport phenomena. Students will be able to apply mathematics, science, and engineering principles to analyze transport phenomena problems. This course provides a fundamental basis for applying and physically interpreting the transport mechanism. The student will be capable of understanding various transport operations and collective effect of momentum, heat and mass transfer.

BE Chemical Engineering **Semester – VII**

Transport Phenomenon

(Course Content)

Teaching Scheme		**Examination Scheme**	
Theory:	3 hours/ week	End Semester Examination (ESE)	: 80 Marks
		Paper Duration (ESE)	: 03 Hours
		Internal Sessional Examination (ISE)	: 20 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Introduction. Transport phenomenon and Unit Operation. Equilibrium and Rate Processes. Fundamental variables. The role of Intermolecular forces. Simple Balance: Material and Energy.

Molecular transport Mechanism:

The Analogy. The Case of Heat Transfer. The Case of Mass Transfer. The Case of Momentum Transfer. The Analogues forms. Heat, Mass, Momentum Diffusivities. Thermal Conductivity. Diffusion Coefficient. Viscosity.

UNIT-II **No. of Lect. – 08, Marks: 16**

Viscosity and Mechanism of Momentum Transport. Velocity Distribution in Laminar Flow.

UNIT-III **No. of Lect. – 08, Marks: 16**

Thermal Conductivity and The Mechanism of Energy Transport. Temperature Distribution in Solids and in laminar Flow.

UNIT-IV **No. of Lect. – 08, Marks: 16**

Diffusivity and Mechanism of mass Transport. Concentration Distribution in Solids and in Laminar Flow.

UNIT-V **No. of Lect. – 08, Marks: 16**

The Equation of Change for Isothermal System. The Equation of Change for Non-Isothermal System.

Textbooks:

1. R.B. Bird; W.E. Stewart; E.N. Lightfoot, Transport Phenomenon, John Wiley & Sons1994;Singapore
2. R.S. Brodsky & H.C. Hershey, Transport Phenomenon ,McGraw-Hill{International edition}

References:

1. C.O. Bennett & J.E. Myers; Momentum, Heat & Mass Transfer; McGraw-Hill, 1982.
2. James R. Welly, Charles E. Wicks & Robert E. Wilson; Fundamentals of Momentum, Heat& Mass Transfer {3rd edition}. John Wiley & Sons; Singapore.

Course Outline

Lab Process Dynamics & Control	**Lab PDC**	**CHP 710**
Course Title	Short Title	Course Code

Course Description:

This course illustrates practical aspect of process control and its application to chemical engineering. It describes various systems used in process control.

	Hours per Week	**No. of Weeks**	**Total Hours**	**Semester Credits**
Laboratory	**02**	**15**	**16**	**01**

Prerequisite Course (s): Fluid Flow Operation, Process Calculations, Process Heat Transfer, Mass Transfer I & II, Instrumentation & Instrumental Analysis, Chemical Engineering Thermodynamics, Chemical Reaction Engineering-I .

General Objectives:

1. To develop the students' skills in applying differential equations for describing steady and transient heat transfer problems.
2. To develop students' skills in applying mechanical design approaches for thermal engineering components and heat transfer systems.
3. To provide the students with fundamental theoretical concepts and practical analysis skills associated with convective heat transfer including external and internal heat transfer configurations.
4. To provide the students with fundamental theoretical concepts and practical analysis skills associated with radiation heat transfer.

Learning Outcomes:

Students completing this laboratory course are able to apply the knowledge of control theory for understanding the various processes, carried out in the Chemical Engineering Industry. The students demonstrate their ability of understanding the process control and its application by virtue of experimentation.

Course Content:

(Any eight experiments/assignments from the following)

List of Experiments/Assignments:

1. Dynamic behavior of Mercury Thermometer.
2. Dynamic behavior of Single Tank system.
3. Dynamic behavior of C.S.T.R.
4. Dynamic behavior of two tank non-interacting system.
5. Dynamic behavior of two tank interacting system.
6. Dynamic behavior of Mercury Manometer Second order system.
7. Dynamic behavior of Final Control Element.
8. Study of Controllers.
9. Study of closed loop control system.
10. Study of flow, temperature and pressure control systems.

References for Practicals:

Designed Standard College Laboratory Manual and Instruction Manuals of the Laboratory Equipment Suppliers.

Course Outline

Lab Chemical Reaction Engineering-II	**Lab CRE-II**	**CHP 711**
Course Title	Short Title	Course Code

Course Description:

The intent of this course is to help to understand concepts in chemical reaction engineering. This course describes experimental techniques for determining rate for heterogeneous chemical reactions, the mechanisms and theories of heterogeneous chemical reactions.

	Hours per Week	**No. of Weeks**	**Total Hours**	**Semester Credits**
Laboratory	**02**	**15**	**16**	**01**

Prerequisite Course (s): Lab Applied Physical Chemistry, Lab. Mass Transfer I and II.

General Objectives:

1. To introduce and enhance the rate of non catalytic heterogeneous chemical reactions.
2. To study improvement in purity of ethanol using various reactive and extractive distillation.
3. To study absorption and adsorption processes for heterogeneous systems.

Learning Outcomes:

At the end of course students will able to understand how to enhance rate of non catalytic chemical reactions and how to use reactive and extractive distillation for improvement of purity of ethanol. The students learn how to use absorption and adsorption processes for heterogeneous systems.

Course Content:

(Any eight experiments/assignments from the following)

List of Experiments/Assignments:

1. To study the reaction of solid liquid system for an instantaneous reaction for benzoic acid NaOH and calculate the enhancement factor.
2. To study the isothermal decomposition of ethyl alcohol in tubular reactor packed with activated alumina catalyst.
3. To improve the % purity of commercially used ethanol using reactive distillation.
4. To improve the % purity of commercially used ethanol using extractive distillation.
5. To carry out the catalytic reaction to convert the nitrobenzene to aniline in presence of iron filling / HCl catalyst in the reactor.
6. To study the reaction of liquid-liquid system for butyl acetate - NaOH and to calculate the enhancement factor.
7. Absorption – to study the reaction of liquid gas system for NaOH – CO2 to determine rate of absorption.
8. Adsorption – to study the adsorption of Acetic Acid on charcoal.
9. Preparation of Butyl Acetate by Reactive Esterification.

References for Practicals:

Designed Standard College Laboratory Manual and Instruction Manuals of the Laboratory Equipment Suppliers.

Elective - I

Course Outline

Lab Biochemical Engineering	**Lab BCE**	**CHP 712**
Course Title	Short Title	Course Code

Course Description:

The course develops ability among the students to apply the principles of Chemical Engineering to Bioprocesses. They will learn to apply principles of process calculation, mechanical operations, mass transfer and Chemical reaction engineering to biochemical process and shall develop an ability to design bioreactors.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**15**	**16**	**01**

Prerequisite Course (s): Process calculation, Mechanical operations, Mass Transfer-I & II and Chemical Reaction Engineering –I.

General Objectives:

1. To apply material balances & energy balances to bioprocesses/unit operations involved in bioprocesses.
2. To study & calculate the rate of reactions, size of reactors, selection of reactors etc.
3. To determine the oxygen transfer coefficient.
4. To study instrumentation & process controls for bioprocesses.

Learning Outcomes:

1. Students will be able to apply material and energy balances to biochemical processes.
2. They will be able to select the proper bioreactor and calculate size of reactor.
3. They will be able to apply various instrumentation and control.
4. They will get acquainted with sterilization processes for liquids and air.

Course Content:

(Continuous Assessment will be based on the following assignment)

List of Assignments:

1. Material balances in Bioprocesses.
2. Energy balances in Bioprocesses.
3. Unsteady state Energy and Material Balances.
4. Bioreactors and numericals based on them.
5. Bioreactors in series and Bioreactors with recycle.
6. O_2 transfer coefficient and determination of K_La.
7. Sterilization of liquids and air.
8. Instrumentation and control in Bioprocesses.

References for Practicals:

1. Doran Pauline M. "Bioprocess Engineering Principles", Academic Press, an Imprint of Elsevier.
2. Editors: J. F. Richardson, D. G. Peacock, "Coulson's & Richardson's Chemical Engineering, Vol-III", Asian Books Pvt. Ltd. New Delhi
3. J.H. Backhurst&J.H.Harker, "Coulson's & Richardson's Chemical Engineering, Vol-V Asian Books Pvt. Ltd.
4. P.F.Stanbury, A.Whitaker&S,J.Hall, "Principles of Fermentation Technology", Aditya Book Ltd., New Delhi.

Elective - I

Course Outline

Lab Petrochemical Technology	**Lab PCT**	**CHP 713**
Course Title	Short Title	Course Code

Course Description:

This course describes how to determine the various physical and chemical properties of various petrochemicals.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**15**	**16**	**01**

Prerequisite Course (s): Applied organic chemistry, Applied physical chemistry, Mass transfer-I Mass transfer-II, Chemical Engineering processes-I, Chemical Engineering processes-II.

General Objectives:

1. To study various physical/chemical properties of petrochemicals
2. To study & analyze petrochemicals.
3. Application of physical & chemical data in various processes.

Learning Outcomes:

The students after completing the course will be able to determine the various physical and chemical properties of petrochemicals. The students will be able to design various unit operations for petrochemicals during experimental data.

<u>Course Content:</u>

(Any eight experiments/assignments from the following)

List of Experiments/Assignments:

1. Determination of Sulphur content of oil
2. Determination of Aromatic content of petrochemical
3. Determination of Refractive index of petrochemicals
4. Determination of Moisture content of petrochemical
5. Determination of Carbon residue of petrochemical
6. Determination of Cloud and pour point of petrol/diesel
7. Determination of Smoke point of fuel
8. Determination of Sediment content of crude oil / fuel oils
9. To study the water separability of petroleum products:
10. To study the Oxidation stability of gasoline /ATF

References for Practicals:

Designed Standard College Laboratory Manual and Instruction Manuals of the Laboratory Equipment Suppliers.

Elective - I

Course Outline

Lab Computational Fluid Dynamics	**Lab CFD**	**CHP 714**
Course Title	Short Title	Course Code

Course Description:

The incorporation of CFD (Computational Fluid Dynamics) as a possible solution to modern day fluid mechanics problems has become part of the daily life of many engineers along with the companies they work for. Major automobile manufacturers have incorporated CFD's in their design cycles. Usually, the main objective is to quantitatively estimate forces produced by flows around a specific structural component or to optimize the design of an individual part responding to forces originating from fluid dynamics.

	Hours per Week	**No. of Weeks**	**Total Hours**	**Semester Credits**
Laboratory	**02**	**15**	**16**	**01**

Prerequisite Course (s): Fluid Flow Operation, Process Calculations, Mechanical Operation, Mass Transfer-I, Mass Transfer-II, Process Heat Transfer.

General Objectives:

1. To impart design skills, both in analysis and synthesis.
2. To define driving potential for mass transfer as concentration gradient, and verify for various mass transfer operations.
3. To understand and develop process replica of experiments performed.

Learning Outcomes:

Students are able to understand the theoretical principles and practical considerations for design of flow processes, mass transfer and heat transfer and also the engineering approaches to deriving the design equations for complex transfer operations. The students are able to design and predict the major process parameters in flow processes. The students can use and analyze experimental data to derive the kinetic and process parameters with simple computing techniques. The students are able to develop an understanding for the major theories, approaches and methodologies used in CFD; The students will be able to build up the skills in the actual implementation of CFD methods (e.g. boundary conditions, turbulence modeling etc.) in using commercial CFD codes. The students will gain experience in the application of CFD analysis to real engineering designs.

Course Content:

(Any eight Experiments /assignments from the following)

List of Experiments/assignments:

1. Problems on Gauss-Siedel/Jacobi/TDMA.
2. Numerical simulation of quasi one dimentional nozzle flow.
3. Analysis of boundary layer over a flat plate. (Blasius equation)
4. Transient Conduction equation in 2 dimensions.
5. Convection-Diffusion Equation in 2 dimensions.
6. Analysis of internal flow.
7. Analysis of external flow: Aerofoil or similar shape.
8. Validation of natural convection in a square cavity.
9. CFD analysis of heat transfer in pin fin.
10. Study of different mesh generation schemes.

References for Practicals :

Designed Standard College Laboratory Manual and Instruction Manuals of the Laboratory Equipment Suppliers.

Elective - I

Course Outline

Lab Piping Design	**Lab PDSN**	**CHP 715**
Course Title	Short Title	Course Code

Course Description:

The laboratory course intended to develop ability amongst the student to understand need and importance of piping design and to evaluate actual piping system required for the process industries. The ability of students to translate piping design into the drawing of process flow diagrams, piping and instrumentation diagrams and utility flow diagrams using various drawing of pipe fittings, pipe joints, piping symbols, line symbols, valve symbols, equipment symbols and pressure relieving devices. It helps to understanding, critically evaluating, interpreting, and drawings the piping system based on economically feasible.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**15**	**16**	**01**

Prerequisite Course (s): Chemical Engineering Materials, Fluid Flow Operation, Process Calculations, Mechanical Operation, Process Heat Transfer, Mass Transfer I & II, Process Equipment Design I & II.

General Objectives:

1. To study how to draw and use pipe fittings.
2. To study how to draw and use pipe joints.
3. To study how to draw and use piping symbols.
4. To study how to draw and use line symbols.
5. To study how to draw and used valve symbols.
6. To study how to draw and use equipment symbols.
7. To study how to draw and use pressure relieving devices.

8. To study how to use given information to draw the Process flow diagram, Piping and instrumentation diagram and Utility flow diagram.

Learning Outcomes:

The students after completing the course will be able to coordinate, analyze and interpret data, and work in groups. It will develop an ability to apply classroom concepts in how to draw the piping system drawings along with importance of concepts of accuracy and precision. The students will develop an ability to communicate through the drawing transparently into a standard formats like process flow diagrams, piping and instrumentation diagrams and utility flow diagrams.The students will demonstrate interpersonal skills required to lead and will recognize the importance of life-long learning.

<u>Course Content:</u>

(Any five drawing sheets of half imperial size based on the following)

List of Drawings:

1. Pipe Fittings
2. Pipe Joints
3. Piping Symbols
4. Line Symbols
5. Valve Symbols
6. Equipment Symbols
7. Pressure Relieving Devices
8. Process Flow Diagram
9. Piping and Instrumentation Diagram
10. Utility Flow Diagrams

References for Practicals:

Textbooks:

1. M.W. Kellogg Co. Design of Piping system 1976
2. G. K. Sahu, Handbook of Piping Design
3. Sam Kannapan, P.E. Pipe Stress Analysis, Willey-Inter science Publications.
4. Roy A. Parisher, Robert A. Rhea, Pipe Drafting and Design, Gulf Professional Publishing,3rd Edition
5. Thakore/Bhatt, Introduction to Process Engineering and Design ,Tata McGraw-Hill Education, 2007
6. D. J. Deutsch, Process piping systems, , Chemical Engineering Magazine, McGraw Hill.

References Books:

1. M.L. Nayyar, P.E., Piping Handbook, 6^{th} edition, McGraw-Hill, Inc
2. Johan J McKetta, Piping Design Handbook, CRC Press, 1992.

Course Outline

Project-I	**PROJ-I**	**CHP 716**
Course Title	Short Title	Course Code

Course Description:

The course intends to develop the abilities among students of providing research, industrial solutions and work in multidisciplinary subjects. The objective of the course is to apply the concepts of Chemical Engineering for providing green and clean technology.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**15**	**16**	**02**

Prerequisite Course (s): LAB Chemical Process, LAB Data Analysis &Interpretation, Industrial training /EDP / Special Study, LAB Entrepreneurship, Minor Project.

General Objectives:

1. To identify, formulate, design and provide the solution to various chemical engineering problems.
2. To demonstrate the ability to perform the task with multidisciplinary teams.
3. To demonstrate the computational skills using various scientific techniques.

Learning Outcomes:

At the end of course students will be able to provide analytical, experimental solutions to meet the global challenges and will exhibit their ability to present an explanatory report. The course will reveal the abilities of the students to provide helpful keys for industrial and social safety and environmental issues and also will demonstrate the understanding of professional and ethical responsibilities.

Project-I

(Course Content)

Teaching Scheme		**Examination Scheme**	
Practical	: 2 hours/ week	Internal Continuous Assessment (ICA)	: 25 Marks
		End Semester Examination (ESE) (OR)	: 25 Marks

Course Content:

- Every student shall undertake the Project-I in semester VII. It is expected that the broad area of Project-I shall be finalized by the student in the beginning of the VII semester and Minor project undertaken in VI semester may be a part of Project -I.
- Each student shall work on an approved project, a group of **05 students (maximum)** shall be allotted for the each Project-I and same group for Project-II.
- Project-I may involve some investigation of fabrication, design or investigation of a technical problem that may take design, experimental or analytical character or combine element of these areas. The project work shall involve sufficient work so that students get acquainted with different aspects of fabrication, design or analysis.
- Each group of students is required to maintain separate log book for documenting various activities of Project-I.
- The three member committee appointed by Head of the department shall be constituted for finalizing the topics of Project-I. Maximum four Project groups shall be assigned to one teaching staff.

Guidelines for Internal Continuous Assessment (ICA):

Assessment of the project for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given below.

Assessment Sheet for Project-I

Name of the Project: ____

Name of the Guide: ____

SN	**Exam Seat No**	**Name of Student**	**Project Selection Based on Literature Survey**	**Documentation**	**Design /Experimentation /Fabrication etc.**	**Presentation**	**Total Marks**
			10	05	05	05	25

Course Outline

Seminar-II	**SMNR-II**	**CHP 717**
Course Title	Short Title	Course Code

Course Description:

The course intends develop ability among the students to explore recent changes, development in the technologies, unified approach and improvement in the technical ability. The course aims to encourage students for communicating the technological developments formally and informally.

	Hours per Week	**No. of Weeks**	**Total Hours**	**Semester Credits**
Laboratory	**02**	**15**	**16**	**02**

Prerequisite Course (s): Industrial Training/EDP/Special Study, Minor Project, Seminar-I.

General Objectives:

1. To develop technical and communication skills.
2. To build up the ability, to present the ideas by logical, lucid notional endorsement.
3. To develop an ability for understanding of professional and ethical responsibilities.

Learning Outcomes:

Students completing this course will demonstrate their ability to work by exploring the avenues of Chemical Engineering. It will bring on the knowledge of latest and future trends and developments in the field of Chemical Engineering and Allied Engineering branches. The students will be able to create and develop new ideas and commitment to reveal self education, social values through lifelong learning.

BE Chemical Engineering **Semester – VII**

Seminar- II

(Course Content)

Teaching Scheme
Practical: 2 hours/ week

Examination Scheme
Internal Continuous Assessment (ICA): 25 Marks

Course Content:

1	For Seminar-II every student will individually study a topic assigned to him / her and submit a report and shall deliver a Seminar on the topic during the semester - VII
2	The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of Seminar-II. Seminar shall be related to present scenario of any challenges , innovations to meet the global standards of his choice approved by the committee
3	Seminar topic should not be repeated and registration of the same shall be done on first come first serve basis
4	Topic of Seminar shall be registered within a two weeks from commencement of Semester - VII and shall be approved by the committee
5	Maximum six seminar supervision shall be allotted to each teacher
6	At the end of semester, student should submit the seminar report (paper bound copy) in following format: a. Size of report shall be of minimum 25 pages. b. Student should preferably refer minimum five reference books / magazines/standard research papers. c. Format of Report i. Introduction ii. Literature survey iii. Theory 1) Implementation 2) Methodology 3) Application 4) Advantages, Disadvantages

	iv. Future scope v. Conclusion

Guidelines for Internal Continuous Assessment (ICA):

ICA shall be based on evaluation of student performance by a seminar presented by the student. Every student shall be required to present a seminar in presence of Panel of teachers constituted by the Head of Department in consultation with the Principal.

Assessment Sheet for Seminar-II

Title of Seminar: ____

Name of Guide: ____

SN	Exam Seat No	Name of Student	Topic Selection	Literature survey	Report writing	Depth of understanding	Presentation	Total
			5	**5**	**5**	**5**	**5**	**25**

Course Outline

Industrial Visit	**IV**	**CHP 718**
Course Title	Short Title	Course Code

Course Description:

The course aims to provide general overview, trends and developments happening in the field of Chemical Engineering and Allied Industries. It aims to understand the Chemical Engineering Principles executed for economic and societal development. The visit aims to make them friendly about the industrial culture and managerial responsibilities.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	--	--	--	2

Prerequisite Course (s): Chemical Engineering Processes-I, Chemical Engineering Processes-II, Industrial Economics & Management, Process Engineering Economics & Costing, Process Equipment Design-I & II

General Objectives:

1. To develop a desire for gaining, up-to-date knowledge about the Industrial development.
2. To identify the industrial problems and provide various Chemical Engineering Solutions.
3. To build up skilled, devoted engineers for societal growth.

Learning Outcomes:

At the end of this course, students will be aware of current and future trends of Chemical Industries. The students will be able to gain new knowledge, skills and various industrial procedures adopted for product development. It will help them to understand the challenges faced by the Industries and need of today's Chemical Engineering Industry.

<u>Course Content:</u>

Industrial Visit

- Student shall undergo industrial visit (3 industries) for a minimum period of one day during summer vacations between sixth semester and seventh semester.
- The industries in which industrial visit is taken should be a medium or large scale industry
- The paper bound report on training must be submitted by the student in the beginning of eighth semester along with a certificate from the company where the student took training.
- Every student should write the report separately.
- Institute / Department/T&P Cell have to assist the students for finding Industries for the visit.
- Students must take prior permission from Department before joining for Industrial visit.

OR

EDP (Entrepreneurship Development Program)

- Student has to participate in Entrepreneurship Development Program for a minimum period of One week during summer vacations between seventh semester and eighth semester.
- Every student must submit the paper bound report based on the program in the beginning of eighth semester along with a certificate (Course / Program completion) from the program organizers.
- Every student should write the report separately.
- Institute / Department may arrange Entrepreneurship Development Program at their campus.
- Students must take prior permission from Department before attending any Entrepreneurship Development Program.

OR

Special Study

- Student has to submit name of three topics of his interest to the department.
- Special study in a group shall not be allowed.
- The three-member committee appointed by Head of Department shall allot one topic out of the three topics submitted by the student.
- Every student must submit the paper bound report based on special study at the end of seventh semester.

- Department should allot guide to all such students, for monitoring their progress and guide them for literature survey / report writing etc.
- Evaluation of special study shall be done based on presentation made by student, followed by brief question answer session.

Assessment shall be based on the active participation of the students in the Industrial Training / EDP / Special study and based on knowledge / skill acquired by the student. The three-member committee appointed by Head of Department in consultation with the Principal shall assess the reports and award marks based on following:

(a) Report	10 marks.
(b) Presentation	10 marks.
(c) Viva-voce at the time of presentation	05 marks.

Total: 25 marks.

Syllabus

(With effect from 2015-16)

B.E. Chemical Engineering

Semester-VIII

Final Year Chemical Engineering

CGPA Pattern

Faculty of Engineering and Technology

North Maharashtra University, Jalgaon

Course Outline

Computer Aided Process Equipment Design Modeling & Simulation	**CAPEDMS**	**CHL 801**
Course Title	Short Title	Course Code

Course Description:

This course describes how to use appropriate terminology of process equipment design. It illustrates the application of scientific principles associated with process equipment design.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**03**	**15**	**40**	**03**

Prerequisite Course (s): Process Equipment Design-I & II, Process Heat Transfer, Mass Transfer-I & II.

General Objective:

1. To study the Shell and tube heat exchanger and batch reactor.
2. To study the Single Effect Evaporator and Distillation Column.
3. To study the absorption column and rotary dryer.
4. To study the lumped parameter model. Modeling difficulties in CSTR.
5. To study the modeling of constant hold up three CSTR in series.
6. To study introduce the chemical engineering simulation, and steps of simulation Process.
7. To study the Simulation of CSTR with second order irreversible exothermic reaction using Runga-Kutta Method.
8. To study the Modeling for Catalyst Decay in a CSTR.

Learning Outcomes:

At the end of the course students will be able to display the ability of using Chemical Engineering concepts in designing and providing computer aided solutions to various unit operations and unit processes. The students will demonstrate the computational skills using engineering softwares and also the ability to perform the task with multidisciplinary teams.

BE Chemical Engineering **Semester – VIII**

Computer Aided Process Equipment Design Modeling & Simulation

(Course Content)

Teaching Scheme		**Examination Scheme**	
Theory	: 3 hours/ week	End Semester Examination (ESE)	: 80 Marks
Practical	: 2 hours /week	Paper Duration (ESE)	: 03 Hours
		Internal Sessional Examination (ISE)	: 20 Marks
		Internal Continuous Assessment (ICA)	: 25 Marks
		End Semester Examination (ESE)	: 25 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Computer Aided Design:

Shell and Tube Heat Exchanger. Basic Theory, Types of heat exchanger its major characteristics and application. The rating and sizing method and various steps of design of heat exchanger. Flow sheet of optimal design of heat exchanger. Kern Methods of shell and tube side Design. Total pressure drop Delta P_T, shell side pressure drop, Baffles and Tube arrangement, standard coding and its layout, Fluids in a shell and tube Heat exchanger. Double pipe heat exchanger. LMTD and correction factor and writing of C ++Program.

Batch Reactor -Isothermal and non-isothermal Heating and Cooling medium.

UNIT-II **No. of Lect. – 08, Marks: 16**

Computer Aided Design:

Single Effect Evaporator. (SEE) Boiling point rise and duhring Rule, hydrostatic head effect, Use of vacuum in evaporator system. Types of evaporator- single effect evaporator. Assumption of evaporator. Numerical based on single effect evaporator with C++ programs, difference of SEE and Multiple effect evaporator MEE).

Distillation Column: Steps of distillation column , material and energy balance, dew point and bubble point, MESH equation, Ideal binary distillation column, multicomponent non ideal distillation column, batch distillation with hold up, Relative volatility, Smoker equation and MacCabe- Thiele diagram, q-line equations and numerical on C++ program.

UNIT-III **No. of Lect. – 08, Marks: 16**

Computer Aided Design:

Absorption Column: Introduction, steps of designing absorption column. Types of packing, Rate of absorption, Height of column based on liquid film conditions, pressure drop and flooding co relation. Numerical based on C++ program

Rotary Dryer: Classification types of rotary dryers, rates of drying, Material Balance and Energy Balance of continuous rotary dryer. Numerical based on C++ program.

UNIT-IV **No. of Lect. – 08, Marks: 16**

Introduction to Lumped Parameter Model.

Modeling of An Activated Sludge Process as a continuous Operation by Recycling Biological Sludge. Modeling Difficulties in C.S.T.R. (Isothermal and Non Isothermal). Modeling of Constant Hold up Three CSTR's in Series. Modeling of minimizing the yield of intermediate product. (Optimal residence time). Modeling for Evaluation of the Adiabatic Equilibrium Temperature. Modeling for Catalyst Decay in a Fluidized Bed Modeled as a CSTR.

Modeling for Evaluation of Conversion with Catalyst Decay in Batch Reactor.

UNIT-V **No. of Lect. – 08, Marks: 16**

Introduction of the Chemical Engineering Simulation. Simulation Language. When to Use Simulation? Steps of Simulation Process. Chemical Engineering Application of Simulation Techniques. Advantage and Limitation of Simulation Technique. Simulation of Ammonia Production System. Simulation of Catalyst Temperature by Newton-Raphson Method. Simulation of CSTR By Euler's Method. Simulation of CSTR with Second Order Irreversible Exothermic Reaction Using Runga-Kutta Method.

Textbooks:

1. W. L. Luyben , Process Modeling Simulation and Control for Chemical Engineers; McGraw Hill 1988.
2. B.C. Bhattacharya & C. M. Narayan, Computer Aided Design of Chemical Process Equipment: 1st Edition, 1992, NCBA, Calcutta.

References:

1. S.D. Dawande, Process Equipment Design (Vol. I & II), Denett & Co., Nagpur.
2. J.H. Perry, Chemical Engineer's Hand Book, McGrawhill, New Delhi.
3. Lloyed E. Brownell, Edwin H. Young, Process Equipment Design, John Wiley & Sons.

Course Outline

Chemical Plant Design and Project Engineering	**CPDPE**	**CHL 802**
Course Title	Short Title	Course Code

Course Description:

This course describes to use appropriate terminology of chemical plant design and project engineering for possible commercialization of chemical plant. It illustrates role of chemical engineer in chemical plant design aspects with the project engineering.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**03**	**15**	**40**	**03**

Prerequisite Course (s): Applied Physical chemistry, Process Calculation, Process Heat Transfer, Chemical Reaction Engineering – I & II, Mass Transfer I & II, Process Equipment Design I & II.

General Objectives:

1. To study the role of Chemical Engineer in Chemical Plant Design.
2. To study the Development of the project.
3. To study the Process Design: Choice of process continuous Vs. Batch processing.
4. To study the Reactors for gas-liquid reactions.
5. To study the Preparation and Deactivation of catalyst.
6. To study the Determination of surface area and Pore volume of catalyst.
7. To study the solid catalyzed reactor.
8. To study the Diffusion and reaction in spherical catalyst pellets.
9. To study the design of Moving Bed Reactor, Fluidized Bed Reactor and Slurry Bed Reactor.
10. To study the design of Trickle bed reactors, Isothermal and Adiabatic fixed bed reactor.

Learning Outcomes:

At the end of the course students will understand the role of chemical engineer in chemical plant design. The students will apply their basic knowledge of mathematics, sciences and engineering to develop process design of chemical plant with appropriate plant layout and location by reducing the cost of piping and adopting the tool of management for planning, scheduling and controlling like PERT and CPM network analysis with overall safety for the sustainable plant design.

Chemical Plant Design and Project Engineering

(Course Content)

Teaching Scheme		**Examination Scheme**	
Theory	: 3 hours/ week	End Semester Examination (ESE)	: 80 Marks
Practical	: 2 hours/ week	Paper Duration (ESE)	: 03 Hours
		Internal Sessional Examination (ISE)	: 20 Marks
		Internal Continuous Assessment (ICA)	: 25 Marks
		End Semester Examination (ESE) (OR)	: 25 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Introduction to Chemical Engineering Plant Design and Project Engineering. The role of Chemical Engineer in Chemical Plant Design. Chemical Engineering Design, need for Plant Design, Process Design.

Development of the project: Evaluation of a process, process research, research evaluation, process development, preliminary engineering studies, pilot plant, semi-commercial plant, commercial plant and commercial plant design factors.

Technical factors, economic factor, safety considerations, legal phases, sources of information.

UNIT-II **No. of Lect. – 08, Marks: 16**

Process Design: Choice of process continuous Vs. Batch processing.

Process Equipments and Materials: Selection of Materials, Plan for Selection of Materials.

Selection of Process Equipments, Equipment selection procedures, standard versus special equipment.

Scale up method, types of flow sheet, development of process flow sheet from process information.

UNIT-III **No. of Lect. – 08, Marks: 16**

Plant Layout : Introduction, planning-layout, factors in planning-layout, methods of layout planning, area concept, two dimensional layouts, scale models, principles of plant layout, safety, utilities & material handling equipments , railroads and roads, etc. Plant layout for Benzene Hexachloride process.

Locating the Chemical Plant: Introduction, summary of factors in plant location. Economic location, plant location factors, raw material supply, market and transportation, power and fuel, water supply, temperature, plant measures for conservation of water, legal restriction, federal pollution act, climate, labour, community and site characteristics and waste disposal.

UNIT-IV **No. of Lect. – 08, Marks: 16**

Site preparations and Structures: Introduction, Site Preparation, Surface Evaluation, Foundation and Shape of Foundation, Machinery and Equipment Foundations, Supports, Outdoor Plants, Selection Building types, Building design principles, Flooring , walls, Roof, safety and higher protection conditioning , heating and ventilation. Cost Consideration for Plant Sites and Structures

New Development in Management techniques (PERT & CPM).

UNIT-V **No. of Lect. – 08, Marks: 16**

Process Auxiliaries : Introduction, Piping, Explanation of CODES, Selection of Piping, Pipe strength, Wall thickness, Nominal Pipe Size (NPS), Criteria for Selection of Materials, Pipe sizing by ID, Choosing the final pipe size, Process steam piping, piping layout, piping insulation.

methods of providing flexibility for piping.

Textbooks:

1. F.C. Vilbrandt and C.E. Dryden, “Chemical Engineering Plant Design”, McGraw Hill, New Delhi.
2. Peter M. S. and K.D. Timmerhaus, “Plant Design and Economics for Chemical Engineers”, McGraw Hill.
3. Modes J. and Philips, Rheinhold, Project Engineering with CPM and PERT, Van Nostrand Reinhold Co., 1970

References:

1. Perry’s Chemical Engineer’s handbook, McGraw-Hill: New York, 2008

Elective-II

Course Outline

Industrial Pollution and Control	**IP&C**	**CHL 803**
Course Title	Short Title	Course Code

Course Description:

This course describes Industrial Pollution and its control by various methods such as physical, chemical and biological. It also includes information regarding Water (Prevention and Control of Pollution) Act, 1997, Air (Prevention and control of Pollution) Act, 1981.The design of water and air pollution control equipment is included in this course.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**03**	**15**	**40**	**03**

Prerequisite Course (s): Applied Physical Chemistry, Mechanical Operation, Applied Organic Chemistry and Environmental Science.

General Objective:

1. To study types of Pollution &Pollution control aspects.
2. To study Water (Prevention and Control of Pollution) Act,1997, Air (Prevention and control of
3. Pollution) Act, 1981.
4. To study Waste Water Treatment Processes.
5. To learn about removal of mercury& measurement of Mercury.
6. To study the removal of nitrogen by Physico-chemical processes and Biological methods
7. To study the treatment of Phenolic Effluents.
8. To learn about pollution control in fertilizer industry, petroleum and petrochemical units
9. To study the treatment of distillery waste.

Learning Outcomes:

Students will be able to understand the processes, pollution prevention and waste management techniques which is used in industry. Students will be able to know the types of processes that take place in industry and review the types of emissions that can occur. Students will understand the general activities and processes used in industries, the ways in which wastes are produced, pollution control and waste minimization techniques.

BE Chemical Engineering **Semester – VIII**

Industrial Pollution and Control

(Course Content)

Teaching Scheme		**Examination Scheme**	
Theory	: 3 hours/ week	End Semester Examination (ESE)	: 80 Marks
Practical	: 2 hours/ week	Paper Duration (ESE)	: 03 Hours
		Internal Sessional Examination (ISE)	: 20 Marks
		Internal Continuous Assessment (ICA)	: 25 Marks
		End Semester Examination (ESE) (OR)	: 25 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Types of Pollution. Introduction: Pollution control aspects. Environmental Legislation: Water (Prevention and Control of Pollution) Act,1997, Air (Prevention and control of Pollution) Act, 1981. Industrial Waste Water Analysis. Industrial Gaseous Effluent Analysis.

UNIT-II **No. of Lect. – 08, Marks: 16**

Introduction to removal of BOD, Biological oxidation units: Activated Sludge Process; Trickling Biological Filters; Waste Stabilisation Ponds. Anaerobic Treatment. Numerical Examples based on removal of BOD. Removal of Chromium. Introduction to removal of Chromium. Control Methods, Reduction precipitation, Ion Exchange, Reverse Osmosis, Lime coagulation and adsorption

UNIT-III **No. of Lect. – 08, Marks: 16**

Removal of Mercury: Introduction of removal of mercury, Measurement of Mercury, Ventron mercury removal process. Removal of ammonia/urea: Introduction to removal of ammonia/urea, Methods for removal of nitrogen, Physico-chemical processes, Biological methods

UNIT-IV **No. of Lect. – 08, Marks: 16**

Treatment of Phenolic Effluents: Introduction to Treatments of Phenolic Effluents, Sources of phenols. Treatments/Removal Methods: Steam Gas Stripping. Adsorption/Ion Exchange; Extraction of phenols using Phenosolvants, Biological Methods of Treatment. Removal of particulate matter: Introduction to removal of particulate matter, Gravity settling chamber, solid traps, cyclone separators, fibre filters, fabric filters, liquid scrubbers and ESP. Numerical Examples based on settling chamber, cyclone separators, fiber filter and ESP.

UNIT-V **No. of Lect. – 08, Marks: 16**

Pollution control in process industries: Introduction to pollution control, Pollution control aspects of fertilizer industry: Introduction to pollution control in fertilizer industry. Removal of carbon in ammonia plant effluents by scrubbing with liquids using vacuum filtration, Removal of oil in ammonia plant effluents, Removal of hydrogen sulphide in ammonia plant effluents. Pollution control in petroleum and petrochemical units: Introduction Refinery Liquid based treatment methods: Oxidation pond treatment, disposal of sludges. Treatment of liquid effluents from petrochemical industries.

Textbooks:

1. S. P. Mahajan, Pollution control in process industries, Tata McGraw-Hill Publication.
2. M. N. Rao&A K. Datta, Waste Water Treatment: IBH Pub., Delhi.

References:

1. M. Narayana Rao and A.K.Datta,Waste water treatment ,Oxford and IHB publ. New Delhi.
2. Swamy AVN, Industrial Pollution Control and Engineering., Galgotia publications, 2005. Hyderabad.

Elective-II

Course Outline

Advanced Separation Techniques	**AST**	**CHL 804**
Course Title	Short Title	Course Code

Course Description:

The objective of the course is to give a thorough understanding of the strategies employed for developing safe separation methods for the chemical analysis. The intention behind the course is to transmit the essential knowledge for critically evaluating the performance of an analytical procedure during chemical separations.

	Hours per Week	**No. of Weeks**	**Total Hours**	**Semester Credits**
Lecture	**03**	**15**	**40**	**03**

Prerequisite Course (s): Mass Transfer I & II, Mechanical Operations.

General Objective:

1. To introduce basics of separation techniques.
2. To learn Mechanism of Separation.
3. To learn Selection of separation processes.
4. To learn Azeotropic Distillation.
5. To learn Extractive Distillation.
6. To learn concept in super critical fluid extraction.
7. To learn Phase equilibria characteristics.
8. To study enhanced distillation & reactive distillation techniques.
9. To study membrane separation processes.
10. To study Biochemical separation processes.

Learning Outcomes:

At the end of the course students will gain a fundamental understanding of the theoretical basis of analytical separation process in terms of equilibrium and thermodynamic driving forces, and other physical chemical aspects of separations. Students will also gain practical knowledge of experimental methods and analytical instrumentation for carrying out analytical separations using gas and liquid chromatography. Students will also understand and will be able to apply distillation, extraction, and solid phase extraction for sample cleanup prior to chromatographic methods. Students will be able to select and apply appropriate separation methods to the analysis of real world problems. Students will learn meaningful interpretation of data from analytical separation method and they will understand approaches for the validation of analytical methods based on separations.

BE Chemical Engineering **Semester – VIII**

Advanced Separation Techniques

(Course Content)

Teaching Scheme		**Examination Scheme**	
Theory	: 3 hours/ week	End Semester Examination (ESE)	: 80 Marks
Practical	: 2 hours/ week	Paper Duration (ESE)	: 03 Hours
		Internal Sessional Examination (ISE)	: 20 Marks
		Internal Continuous Assessment (ICA)	: 25 Marks
		End Semester Examination (ESE) (OR)	: 25 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Separation Processes: Industrial Chemical Processes, Mechanism of Separation.

Separation by phase addition or creation. Separation by barrier. Separation by solid agent. Separation by external field or gradient. Component Recoveries and product purities. Separation power. Selection of feasible separation processes.

Crystallization from the melt: Introduction.

Progressive freezing: component Separation by progressive freezing, Pertient variables in progressive freezing. Applications.

UNIT-II **No. of Lect. – 08, Marks: 16**

Enhanced distillation: Introduction. Azeotropism.

Azeotropic distillation: Introduction, exploitation of homogeneous azeotropes, exploitation of pressure sensitivity, exploitation of boundary curvature, Exploitation of azeotropy and liquid Extractive distillation: Introduction, solvent effect in extractive distillation, extractive distillation, design and optimization, solvent screening and selection extractive distillation by salt effects.

Reactive distillation: Introduction, simulation, modeling and design feasibility, Mechanical design and implementation issues, process applications.

UNIT-III **No. of Lect. – 08, Marks: 16**

Supercritical fluid separation processes: Introduction. Physical properties of pure supercritical fluids; thermodynamic properties and transport properties. Process concept in super critical fluid extraction. Phase equilibria: Liquid- Fluid equilibria, Solid- Fluid equilibria, Polymer- Fluid equilibria and the Glass Transition, Cosolvents and surfactants, phase equilibria models.

UNIT-IV **No. of Lect. – 08, Marks: 16**

Ultra filtration: Process description, UF membranes, membrane characterization, process limitations, process configurations, Energy requirements, Design and economics.

Microfiltrations: process description, Examples, MF membranes, membrane characterization, process limitations, Equipments configurations, process Applications and Economics.

Gas- Separations membranes: Process descriptions, examples, Basic principles of operations, selectivity and permeability, Gas- Separation membranes, membrane system design features, energy requirements and economics.

UNIT-V **No. of Lect. – 08, Marks: 16**

Biochemical separation processes: Introduction.

Initial product harvest and concentration: centrifugation, Filtration, Selection of cell separation

Unit operation, Cell disruption, protein refolding.

Initial purification: Precipitation, Extraction, Adsorption, Membrane processes.

Final Purification and product formulation.: Chromatography, Lyophilization and drying.

Integration of fermentation and downstream processing operations.

Textbook:

1. Richardson and Coulson, Chemical Engineering, Vol. II, Butterworth-Heinmann (Elsevier) (Fifth Edition).

References:

1. Perry Robert H. and Green Don W. Perry’s chemical Engineers Handbook 7th edition. McGraw Hill Publication, New York.
2. Seader J. D. and Henley Ernest J, Separation Process Principles. John Wiley and Sons, Inc, New York.
3. Ladisch Michael R., Bioseparations Engineering, Principles, Practice and Economics, Wiley Interscience, John Wiley and Sons, Inc. Publications New York.
4. Long Robert B. Separation Process in Waste Minimization .Marcel Dekker, Inc, New York.

Elective-II

Course Outline

Polymer Technology	**PT**	**CHL 805**
Course Title	Short Title	Course Code

Course Description:

The main objective of this course is to equip students with scientific knowledge and technical skills that are in line with current advancements in the field of polymer and related industries.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**03**	**15**	**40**	**03**

Prerequisite Course (s): Applied organic chemistry

General Objective:

1. To introduce basics of polymer science & technology.
2. To study the importance of molecular weight & its determination.
3. To study the glass transition temperature & its relation with molecular weight of polymers.
4. To study the different thermal analysis techniques & mechanical properties of polymers.
5. To study the different polymer processing techniques.
6. To study the manufacturing techniques of industrially important polymers.

Learning Outcomes:

At the end of the course Students will understand the significance of molecular weight and thermal analysis in polymer processing & technology, fundamental aspects of polymer science and engineering both from an academic and an industry point of view and able to identify the different polymer processing techniques useful for manufacturing finished desired plastic articles. The students will also learn how to translate the scientific knowledge into development of products.

BE Chemical Engineering **Semester – VIII**

Polymer Technology

(Course Content)

Teaching Scheme		**Examination Scheme**	
Theory	: 3 hours/ week	End Semester Examination (ESE)	: 80 Marks
Practical	: 2 hours/ week	Paper Duration (ESE)	: 03 Hours
		Internal Sessional Examination (ISE)	: 20 Marks
		Internal Continuous Assessment (ICA)	: 25 Marks
		End Semester Examination (ESE) (OR)	: 25 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Introduction to polymers and their classification, functionality, oligomer, polymer , repeating units, Types of polymerization. Addition Polymerization, Condensation Polymerization. Mechanism of polymerization. Bulk, solution, suspension and emulsion polymerization techniques. Co-polymerization.

UNIT-II **No. of Lect. – 08, Marks: 16**

Molecular weight & degree of polymerization, Significance of molecular weight of polymers, Average molecular weight and molecular weight distribution in polymers, measurements of number, average by Cryoscopy; Ebulliometry, Membrane osmometry, Vapor pressure osmometry and End group analysis. Measurement of viscosity, average molecular weight by viscometry.

UNIT-III **No. of Lect. – 08, Marks: 16**

Glass transition temperature, Factors influencing glass transition temperature, Glass transition temperature & molecular weight, Glass transition temperatures & plasticizers. Thermal analysis of polymer by differential scattering calorimeter; TGA, TMA and HDT. Mechanical properties like tensile strength, Young's Modulus, hardness, etc.

UNIT-IV **No. of Lect. – 08, Marks: 16**

Polymer processing& techniques, Compounding, Calendaring, Die casting, Rotational casting, Film casting, Injection moulding, Blow moulding, Extrusion moulding, Thermoforming, Foaming.

UNIT-V **No. of Lect. – 08, Marks: 16**

Properties, applications and manufacturing techniques of Polyethylene, Polypropylene, PVC, Phenol formaldehyde, Urea formaldehyde, Epoxy polymers, Styrene-Butadiene rubber (SBR), Nylon-6, 6 , Viscose Rayon.

Textbook:

1. V. R. Gowarikar, N. V. Vishwanathan, JaydevSreedhar, Polymer Science; New Age International (P) Limited, New Delhi.

References:

1. B. K. Sharma, Polymer Science, Goel Publishing House; Meerut
2. Malcolm P. Stevens, Polymer chemistry, Oxford university press
3. Fried W. Billmeyar, Text book of polymer science, John Willey and Sons
4. M. Gopalarao, Dryden’s Outlines of Chemical Technology; 3rd edn; East West Press.

Elective-II

Course Outline

Oil Technology | **OIT** | **CHL 806**

Course Title | Short Title | Course Code

Oil Technology	**OIT**	**CHL 806**
Course Title	Short Title	Course Code

Course Description:

The purpose of this course is to expose students to the oils and fats methods used in industries and research. This course prepares the student to take up such challenges in his profession and understand important principles and present economic principles and their applications in the field of Chemical Engineering and Technology

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**03**	**15**	**40**	**03**

Prerequisite Course (s): Fluid Flow Operation, Mass Transfer –I, Process Heat Transfer, Mass Transfer-II, Chemical Reaction Engineering –I & II.

General Objective:

1. To introduce concepts of importance of oils, fats and waxes.
2. To study scales of production various oils and its plant capacity.
3. To study presence of adulteration in other vegetable oils
4. To study factors affecting solvent extraction plant and VOR
5. To study methods of vegetable oil refining
6. To study the bi products from refining.
7. To study various analysis of oils, soaps and detergents.
8. To estimate optimum time and utility for production
9. To study the safety during processes.

Learning Outcomes:

At the end of the course students will be able to understand the various factors responsible for establishing a chemical industry such as SEP, VOR, Soap & detergent industries. The students will be capable of applying their process engineering knowledge by allocating resources to obtain maximum productivity.. The students will exhibit their ability to identify, formulate, and solve engineering problems during productions.

BE Chemical Engineering **Semester – VIII**

Oil Technology

(Course Content)

Teaching Scheme		**Examination Scheme**	
Theory	: 3 hours/ week	End Semester Examination (ESE)	: 80 Marks
Practical	: 2 hours/ week	Paper Duration (ESE)	: 03 Hours
		Internal Sessional Examination (ISE)	: 20 Marks
		Internal Continuous Assessment (ICA)	: 25 Marks
		End Semester Examination (ESE) (OR)	: 25 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

What are oils, Fats and Waxes?. Fatty acid composition and classification of oil and fats, sources, types, nomenclature, structures ,Non-glycerides, constituents and their importance, toxic constituents and detoxification. Physical and Chemical characteristics of Groundnut oil, Cottonseed, sunflower, soybean oil, linseed oil, rice bran oil. Utilization of Fats and oil in soap and oleo chemical Industries.

UNIT-II **No. of Lect. – 08, Marks: 16**

Chemical reactions of fats and fatty acids like dehydration, sulphation & sulphonation, esterification, interesterification, hydrolysis and hydrogenation, Isomerisation and polymerization, Nutritional significance of oils and fats. Waxes, Oxidation, Autoxidation, Rancidity, Antioxidants, etc.

UNIT-III **No. of Lect. – 08, Marks: 16**

Elementary analysis of oils ,fats and waxes, Physical and Chemical analysis of oils and fats, thiocyanogen value, acetyl and hydroxyl values, peroxide value, Reichert Meissel, Polenske and Kirschner values etc. Thin layer, column and Gas liquid chromatography; BIS. standards for oils and oil cakes, detection of adulteration in oils and fats.

UNIT-IV **No. of Lect. – 08, Marks: 16**

Manufacture of soaps and detergents. Liquid Detergents, Industrial applications of surfactants. Manufacture and analysis of butter, Margarine, vanaspati and other fat blends, Analysis of soaps and detergents, BIS standards for soaps and detergents, Classification of surfactants, Raw materials for soaps and detergents,

UNIT-V **No. of Lect. – 08, Marks: 16**

Mechanical and solvent extractions of oils, Degumming, Refining, Bleaching, Deodorization of oil and fats, hydrogenation and Vanaspati, cooking and salad oils, Confectionary fats, Animal Fats, Oleo chemicals : Production and Separation of fatty acids, Glycerol –recovery and uses, Bio- diesel, Types of Varnish, Alkyd resins, etc.

Textbooks:

1. Bailey's A. E, Industrial oils and Fats ,Edition 6, Vol. I, II and III, Edited by Feireidoom Shahidi (2005).
2. Break and Bhatia, Handbook of Industrial Oil and Fat Products, CBS Publishers and Distributors, New Delhi. Vol 1 to 4.
3. NIIR BOARD, Hand book on Soaps, Detergents and acid Slurry, 2nd Edition , Publisher- Asia Pacific Business Press Inc., Delhi.
4. NIIR BOARD, Hand book on Herbal Products, 2 vols. Publisher- Asia Pacific Business Press Inc., Delhi.
5. NIIR BOARD, Essential oil Hand book, Publisher- Asia Pacific Business Press Inc., Delhi.
6. Fryer Perecival Technical Hand book of oils, fats and waxes, Vols 2, published by, Cambridge University Press.

References:

1. Technical Hand book of oils, fats and waxes, Vols 2, published by, Cambridge university, Press.
2. Devidson , Synthetic Detergent and Analysis , Published by John Wiley.I

Elective-III

Course Outline

Mathematical Methods in Chemical Engineering	**MMC**	**CHL 807**
Course Title	Short Title	Course Code

Course Description:

The Course consists of mathematical methods used in Chemical Engineering. It includes various methods for Root Finding, Solution of Simultaneous Linear Equation also it includes Solution of L.P.P. by Analytical Method and Graphical Method. Students will also learn about Chemical engineering optimization.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**03**	**15**	**40**	**03**

Prerequisite Course (S): Engineering Mathematics- I, II, III, Process Equipment Design-I & II.

General Objectives:

1. To introduce basic methods, to solve mathematical problems.
2. To learn how to develop numerical methods and estimate numerical errors.
3. To choose the most appropriate numerical method for its solution based on characteristics of the problem.
4. Identify and classify the numerical problem to be solved.
5. Analyze the accuracy of the numerical solution and identify alternate strategies and methods to achieve greater accuracy when it is needed.
6. To develop an ability to identify chemical engineering problems.
7. Formulate a chemical engineering problem as a mathematical model, and select an appropriate solution method.

8. Formulate and solve process design problems, based on economic analysis and using mathematical models of chemical processes.
9. Optimum design of chemical processing equipment and plants.
10. Allocation of resources or services among several activities to maximize the benefit.

Learning Outcomes:

By the end of the course the students will reveal an ability to apply knowledge of mathematics, science, and engineering to design , analyze and interpret data which is used for designing a system, component, or process to meet desired needs within economic constraints. Students exhibit their ability to identify, formulate, and solve engineering problems using Root finding methods, higher-order Root finding Methods such as Newton’s method, Newton-Raphson's method. Using Interpolation & Extrapolation students will apply the knowledge of mathematical technique to solve industrial problems. The students will demonstrate the ability of formulating and solving the LPP and will provide optimum equipment design.

BE Chemical Engineering **Semester – VIII**

Mathematical Methods in Chemical Engineering

(Course Content)

Teaching Scheme		**Examination Scheme**	
Theory:	3 hours/ week	End Semester Examination (ESE)	: 80 Marks
		Paper Duration (ESE)	: 03 Hours
		Internal Sessional Examination (ISE)	: 20 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Root Finding Methods : Bisection Method, Regula-falsi Method, Newton-Raphson Method, Direct Integration Method, Muller's Method.

Solution Of Simultaneous Linear Equation: Gauss Elimination Method, Matrix Inversion Method, Gauss Jordan Method, Jacobi's Iteration Method, Gauss Seidal Method.

UNIT-II **No. of Lect. – 08, Marks: 16**

Interpolation & Extrapolation: Newtons-Gregory Forward Interpolation Formula, Newtons-Gregory Backward Interpolation Formula, Stirling's Formula, Central Difference Interpolation Formula, Choice of an Interpolation Formula.

Linear Programming (L.P.): Introduction to L.P., Formulation of L.P. Problems (L.P.P)/L.P. Models.

UNIT-III **No. of Lect. – 08, Marks: 16**

Solution of L.P.P. by Analytical Method (containing two variables), Solution of L.P .P. By Graphical Method. Solution of L.P.P. with application of simplex technique.

Chemical Engineering Optimization-I : The Optimum Diameter To height ratio for Large Oil Storage Vessel for Cost Minimization, Optimization of dimensions of an open rectangular Tank.

UNIT-IV **No. of Lect. – 08, Marks: 16**

Chemical engineering optimization-II: Optimization of diameter and length of heat exchanger, Optimization of outlet temperature for counter-current arrangement in heat exchanger, Optimum thickness of insulation, Optimum (economical) pumping temperature for pumping of oil, Optimization of dimension of rotary dryer, Optimum dimensions and optimum outlet temperature of air preheater.

UNIT-V **No. of Lect. – 08, Marks: 16**

Chemical engineering optimization-III: Optimization of kinetics of consecutive reactions.
Optimum residence time for maximum yield in ideal isothermal batch reactor, optimization in refinery blending operation, optimization to get maximum yield with respect to reactor volume, optimization of dimensions of straight rectangular Fin, Optimum proportions of a pressure vessel, optimum size of pressure vessels.

Textbooks:

1. T.F. Edgar and B.M. Himellblau, Optimization of Chemical Processes, International Edition. McGraw Hill, 1989.
2. P.K. Gupta and D.S. Hira, Operation research 1st edition reprint, S. Chand & Company NewDelhi.1997.
3. B.S. Grewal Numerical Methods In Engg. & Science, Khanna Publications; Delhi.
4. G.K.Roy, Solved Problems In Chemical Engg, Khanna Publications, New Delhi.
5. S.D. Dawande, Process Equipment Design (Vol. I & II), Denett & Co., Nagpur.
6. B.C. Bhattacharya, Introduction to Chemical Equipment Design (Mechanical Aspects), CBS Publisher and Distributors, New Delhi.

References:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publisher,New Delhi
2. S. Pushpavanam, Mathematical Methods in Chemical Engineering, PHI Learning Pvt. Ltd.
3. S.S. Sastry, Introduction To methods Of Numerical Analysis, Prentice Hall.
4. Jenson V.G., Jeffreys G.V., Mathematical Methods in Chemical Engineering, Elsevier Publications.

Elective-III

Course Outline

Advance Catalysis	**AC**	**CHL 808**
Course Title	Short Title	Course Code

Course Description:

This course describes to use appropriate terminology of application of advance catalysis for possible commercialization of chemical processes. It illustrate show a chemical engineer is able to use his know how in development of chemical processes using advance catalysis.

	Hours per Week	**No. of Weeks**	**Total Hours**	**Semester Credits**
Lecture	**03**	**15**	**40**	**03**

Prerequisite Course (s): Applied Physical Chemistry, Mechanical Operation, Chemical Engineering Thermodynamics, Chemical Reaction Engineering – I & II, Mass Transfer I & II, Process Equipment Design I & II.

General Objectives:

1. To study the Homogeneous and Heterogeneous Catalysis.
2. To study the Catalyst Components and Catalyst treatment.
3. To study the Introduction, Definition, Advantages and Application of Supported Catalysts.
4. To study the Design and Development of Supported Catalysts.
5. To study the Regeneration of Catalysis: Fluid Catalytic Cracking Unit.
6. To study the Regeneration Processes.
7. To study the Catalysis in Petroleum Industries.
8. To study the Catalysis in Petrochemical Industries.
9. To study the Introduction, Importance and Types of biocatalysts.
10. To study the Classification of Microbial Cell and Methods and Techniques of immobilization.

Learning Outcomes:

Through this course, Students will be capable to study heterogeneous catalysis, kinetics of elementary steps, overall reactions, and evaluation of kinetic parameters with the tools, skills and knowledge and will be able to apply advanced reactive systems analysis. Students will be able to do the technical and economic evaluation of chemical processes and operations. The course will develop the ability of students to apply the theory of catalysis to various chemical industries.

BE Chemical Engineering **Semester – VIII**

Advance Catalysis

(Course Content)

Teaching Scheme		**Examination Scheme**	
Theory:	3 hours/ week	End Semester Examination (ESE)	: 80 Marks
		Paper Duration (ESE)	: 03 Hours
		Internal Sessional Examination(ISE)	: 20 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Catalysis: Introduction, History.

Homogeneous Catalysis: Introduction, Characterization of solution Processes, Examples of solution catalysis: Acid – base catalysis, Organometallic Catalysis.

Heterogeneous Catalysis: Introduction, Characterization of Surface Processes, Properties of Solid Catalysts, Influence of Mass Transport on Catalyst Performance.

Catalyst Components: Catalytically active species, Supports, Binders, Promoters.

UNIT-II **No. of Lect. – 08, Marks: 16**

Supported Catalysts: Introduction, Definition of Supported Catalysts. Advantages of Supported Catalysts: Separability, Cost, Catalyst activity, Catalyst Selectivity.

Support Materials for the Catalyst, Composition, Size and Shape, Surface Area., Porosity and Pore size. Attrition Loss, Density, Cost and quality.

Design and Development of Supported Catalysts: Preparation and Manufacture, Catalyst Preparation Methods, Catalysts from Physical Mixtures, Impregnated Catalysts, Ion exchange Catalysts. Testing and evaluation of Supported Catalysts, Application of Supported Catalysts.

UNIT-III **No. of Lect. – 08, Marks: 16**

Regeneration of Catalysts:

Fluid Catalytic Cracking Unit: Process Description, Heat Balance, Coke formation, Coke burning, CO Combustion, Environmental aspects. Regenerator Operating Parameters. Influence of Regenerator design on Catalyst Fluidization, Equipment/Unit Operation in Cracking Units.

Noble and Base Metal Catalysis: Noble Metal Catalysis, Deactivation, Regeneration,Regeneration Processes such as continuous Catalyst Regeneration, Fixed Bed Semi Regenerative Process, Cyclic or swing, Reactor for regeneration. Base Metal Catalysis: Process and Catalyst Description.

UNIT-IV **No. of Lect. – 08, Marks: 16**

Catalysis in Petroleum and Petrochemical Industries:

Applications of zeolites in Petrochemical Refining. Improving quality of Petroleum fuels throughCatalysis. O-xylene isomerization over Nickel containing SAPO-5 molecular sieves.Pd-sulfonatedPolysiloxane catalyst for etherification of FCC light gasoline. Oxidation of Ethylbenzene catalyzed by Soluble Cobalt (III) complexes. Comparative evaluation of various catalysts used for removal of NOx from air streams.

UNIT-V **No. of Lect. – 08, Marks: 16**

Biocatalysts: Introduction and importance of biocatalysts. Type of biocatalysts.

Enzymes: Definition, Sources of Enzymes, production of Enzymes. Formation of enzyme substrate complex.Applications.

Simple enzyme kinetics.Derivation of Michaelis Menten equation. Evaluation of parameters of Michaelis Menten equation. Effect of Temperature and pH on enzyme Kinetics.

Microbial Cell: Classification of cells. Requirement for the growth of cells and growth Media.

Textbooks:

1. Bhattacharya KG and Talukdar A K, Catalysis in Petroleum and Petrochemical Industries. Narosa Publishing House, New Delhi.
2. Richardson J.F. and Peacock D.G. Richardson and Coulson's, Chemical Engineering, Volume-III, Asian Books Pvt. Ltd., New Delhi.
3. James E. Bailey and David F. Ollis, Biochemical Engineering Fundamentals; McGraw Hill Publication.

References:

1. Kirk Othmer, Encyclopedia of Chemical Technology, 4th edition, Volume-V. John Wiley and sons New York.

Elective-III

Course Outline

Plant Utility	**PU**	**CHL 809**
Course Title	Short Title	Course Code

Course Description:

This course covers the requirement of different utilities for the process plant, along with its generation and its effective utilization. Main utilities required for processes are water, steam, air and refrigeration. Steam and non- steam heating media are important for conversion of raw material to products in reactors and to elevate the temperature in the chemical processes. Refrigeration is important to maintain the temperature in the process plant. Compressed air, process air is used in processes & in instrument air is used in pneumatic devices & controls.

	Hours per Week	**No. of Weeks**	**Total Hours**	**Semester Credits**
Lecture	**03**	**15**	**40**	**03**

Prerequisite Course (s): Fluid Flow Operation, Applied Inorganic Chemistry, Process Calculations, Mechanical Operation, Applied Physical chemistry, Chemical Engineering Thermodynamics.

General Objectives:

1. To study Steam generation and its application in chemical process plants.
2. To study types of compressors and vacuum pumps & method of vacuum development
3. To understand characteristics of refrigeration system& production of liquid N_2 and O_2.
4. To understand basic calculations involved in steam generation and refrigeration
5. To study cryogenics used in chemical process plant
6. To understand insulation for meeting the process equipment requirement
7. To study Properties, use, Sources and methods of generation of inert gases

Learning Outcomes:

After successful completion of course the student will be able to understand and identify different utilities required for chemical plants and criteria for selecting the equipments. Students demonstrate the ability to perform the task by identifying, formulating, designing and providing the various chemical engineering utilities.

BE Chemical Engineering **Semester–VIII**

Plant Utility

(Course Content)

Teaching Scheme		**Examination Scheme**	
Theory:	3 hours/ week	End Semester Examination (ESE)	: 80 Marks
		Paper Duration (ESE)	: 03 Hours
		Internal Sessional Examination (ISE)	: 20 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Steam: Steam generation and its application in chemical process plants, Design of efficient steam heating systems, Steam economy, condensate utilization, steam traps, Selection and application, waste heat utilization.

UNIT-II **No. of Lect. – 08, Marks: 16**

Compressors And Vacuum Pumps: Types of compressors and vacuum pumps, Methods of vacuum development and their limitations , Materials handling under vacuum, piping systems , Lubrication in compressors and pumps.

UNIT-III **No. of Lect. – 08, Marks: 16**

Refrigeration Systems: Refrigeration system and their characteristics, cryogenics, the characteristics and production of liquid N_2 and O_2. Load calculation, humidification and de-humidification equipments. Drying and cooling tower.

UNIT-IV **No. of Lect. – 08, Marks: 16**

Insulation: Importance of insulation for meeting for the process equipment .Fitting and valves Insulation for high, intermediate, low temperatures .Determination of optimum insulation thickness.

UNIT-V **No. of Lect. – 08, Marks: 16**

Inert Gases: Properties of inert gases & their use , Sources and methods of generation . Comparison of nitro generation routes .Operational, maintenance and safety aspects.

Textbooks:

1. Jack Broughton, Process utility systems, Institution of Chemical Engineers U.K.
2. Reid, Prausnitz Poling; The properties of gases & liquids, IVth ed. McGraw Hill international edition.
3. S.C. Arora& S. Domkumdwar; A course in refrigeration and air conditioning; Dhanpat Rai & Co. (P)Ltd.
4. Stoccker, W.F., Refrigeration and Air Conditioning, Mc-Graw Hill, 1983.
5. Jorgenson, R., Fan Engineering, Buffalo Rorge Co., 1983.

References:

1. Lyle, O., Efficient Use of Steam, HMSO, 1974.

Elective-III

Course Outline

Intellectual Property Rights	**IPR**	**CHL 810**
Course Title	Short Title	Course Code

Course Description:

This course is introduced for learning the basic fundamentals of Intellectual property rights and Entrepreneurship to undergraduate students. The goals of the course are to understand the basic knowledge of intellectual property rights, trademarks, chemical safety & chemical ethics and entrepreneurship.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	15	40	03

Prerequisite Course (s): 12^{th} Std. Science and SE and TE Chemical Engineering Courses.

General Objectives:

The objective of the course is to provide the basic knowledge of IPR and Entrepreneurship, Intellectual property, trademarks, chemical safety and entrepreneurship

Learning Outcomes:

After successful completion of this course the students will be able to choose which type of IPR they should apply for. The course will help to understand various ethical issues regarding the field and Aspects of Studying Intellectual Property Rights students will able to adopt environment friendly approach industrially. Student will able to understand the basics of marketing management. A commitment to reveal self education, social values by providing the services to society through lifelong learning.

BE Chemical Engineering **Semester–VIII**

Intellectual Property Rights

(Course Content)

Teaching Scheme		**Examination Scheme**	
Theory:	3 hours/ week	End Semester Examination (ESE)	: 80 Marks
		Paper Duration (ESE)	: 03 Hours
		Internal Sessional Examination(ISE)	: 20 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Overview of Intellectual Property: Introduction and the need for intellectual property right (IPR), IPR in India – Genesis and Development, IPR in abroad, some important examples of IPR. Patents: Macro economic impact of the patent system, Patent and kind of inventions protected by a patent, Patent document, How to protect your inventions? Granting of patent, Rights of a patent, How extensive is patent protection? Why protect inventions by patents?

UNIT-II **No. of Lect. – 08, Marks: 16**

Searching a patent, Drafting of a patent, Filing of a patent, The different layers of the international patent system (national, regional and international options), Utility models, Differences between a utility model and a patent? Trade secrets and know - how agreements.

Copyright- What is copyright? What is covered by copyright? How long does copyright last? Why protect copyright?

Related Rights **-** What are related rights? Distinction between related rights and copyright? Rights covered by copyright?

UNIT-III **No. of Lect. – 08, Marks: 16**

Trademarks: What is a trademark? Rights of trademark? What kind of signs can be used as trademarks? Types of trademark, Function does a trademark perform, How is a trademark protected?
How is a trademark registered? How long is a registered trademark protected for? How extensive is trademark protection? What are well-known marks and how are they protected? Domain name and how does it relate to trademarks?

Geographical Indications: What is a geographical indication? How is a geographical indication protected? Why protect geographical indications?

UNIT-IV **No. of Lect. – 08, Marks: 16**

Industrial Designs: What is an industrial design? How can industrial designs be protected? What kind of protection is provided by industrial designs? How long does the protection last? Why protect industrial designs?

New Plant Varieties: Why protect new varieties of plants? How can new plants be protected? What protection does the breeder get? How long do the breeder's rights last? How extensive is plant variety protection?

Unfair Competition: What is unfair competition? Relationship between unfair competition and intellectual property laws?

Enforcement of Intellectual Property Rights: Infringement of intellectual property rights. Enforcement Measures

UNIT-V **No. of Lect. – 08, Marks: 16**

Intellectual Property: Overview of Biotechnology and Intellectual Property, Biotechnology Research and Intellectual Property Rights Management, Licensing and Enforcing Intellectual Property, Commercializing Biotechnology Invention, Case studies of Biotechnology, Case studies of patents in other areas

Textbooks:

1. T. M Murray and M.J. Mehlman, Encyclopedia of Ethical, Legal and Policy issues in Biotechnology, John Wiley & Sons 2000.

References:

1. P.N. Cheremisinoff, R.P. Ouellette and R.M. Bartholomew, Biotechnology Applications and Research, Technomic Publishing Co., Inc. USA, 1985.
2. D. Balasubramaniam, C.F.A. Bryce, K. Dharmalingam, J. Green and K. Jayaraman, Concepts in Biotechnology, University Press (Orient Longman Ltd.), 2002.

3. Bourgagaize, Jewell and Buiser, Biotechnology: Demystifying the Concepts, Wesley Longman, USA, 2000.
4. Ajit Parulekar and Sarita D' Souza, Indian Patents Law – Legal & Business Implications; Macmillan India ltd, 2006.
5. B.L.Wadehra; Law Relating to Patents, Trade Marks, Copyright, Designs & Geographical Indications; Universal law Publishing Pvt. Ltd., India 2000.
6. P. Narayanan; Law of Copyright and Industrial Designs; Eastern law House, Delhi, 2010.

Course Outline

Lab Computer Aided Process Equipment Design Modeling & Simulation	**Lab CAPEDMS**	**CHP 811**
Course Title	Short Title	Course Code

Course Description:

This course describes how to use appropriate terminology of process equipment design. It illustrates the application of scientific principles associated with process equipment design. The intent of this course is to help to understand concepts in modeling of process equipment design.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**15**	**16**	**01**

Prerequisite Course (s): Process Equipment Design-I, Process Heat Transfer, Mass Transfer-I, Chemical Reaction Engineering-I & II.

General Objective:

1. To study the Shell and tube heat exchanger and batch reactor.
2. To study the Single Effect Evaporator and Distillation Column.
3. To study the absorption column and rotary dryer.
4. To study the lumped parameter model. modeling difficulties in CSTR.
5. To study the modeling of constant hold up three CSTR in series.
6. To study introduce the chemical engineering simulation, and steps of simulation Process.
7. To study the Simulation of CSTR with second order irreversible exothermic reaction using Runga-KuttaMethod.
8. To study the Modeling for Catalyst Decay in a CSTR.

Learning Outcomes:

At the end of the course students will be able to display and demonstrate the ability of using Chemical Engineering concepts in designing and providing computer aided solutions to various unit operations and unit processes with the help of C/C++. The students will demonstrate the computational skills using engineering software's and also the ability to perform the task with multidisciplinary teams.

Course Content:

List of Practical Experiments:

1. Computer aided design of shell & tube heat exchanger.
2. Computer aided design of single effect evaporator.
3. Computer aided design of rotary dryer.
4. Simulation of ammonia production system.
5. Simulation of catalyst temperature by Newton Raphson method.
6. Simulation of Reactor Design.
7. Computer control heat exchanger.
8. Computer Aided Design of absorber.

References:

1. W. L. Luyben , Process Modeling Simulation and Control for Chemical Engineers; 1988 McGraw Hill.
2. B.C. Bhattacharya & C. M. Narayan, Computer Aided Design of Chemical Process Equipment : 1st Edition, 1992, NCBA, Calcutta.

Note: Students can use only C And / Or C++ Programming Language for the Above Syllabus.

Lab Chemical Plant Design and Project Engineering	Lab CPDPE	CHP 812
Course Title	Short Title	Course Code

Course Description:

This course illustrates practical aspect of chemical plant design and project engineering and its application to start the commercial plant. It helps the students to understand various processes used in industries. It illustrates role of chemical engineer in chemical plant design aspects with the project engineering.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**15**	**16**	**01**

Prerequisite Course (s): Applied Physical chemistry, Process Calculation, Process Heat Transfer, Chemical Reaction Engineering – I & II, Mass Transfer I & II, Process Equipment Design I & II, Process Engineering Economics & Costing, Industrial Economics & Management

General Objectives:

1. To accustom the students' skills with the development of the project
2. To develop skills in students for the process design.
3. To provide the students with fundamental theoretical concepts and practical analysis skills associated with plant layout and piping.
4. To provide the students with fundamental theoretical concepts and practical analysis skills associated with network analysis using PERT and CPM method for planning, scheduling and controlling chemical projects.

Learning Outcomes:

At the end of the course students will understand the role of chemical engineer in chemical plant design. The students will apply their basic knowledge of mathematics, sciences and engineering to develop process design of chemical plant and also display the research by designing, conducting, interpreting and analyzing experimental data for preparing reports with appropriate plant layout and location by reducing the cost of piping and adopting the tool of management for planning, scheduling and controlling like PERT and CPM network analysis with overall safety for the sustainable plant design.

<u>Course Content:</u>

(Any five Drawing sheets of half imperial size /Assignments/Experiments based on above syllabus)

List of drawing sheets:

1. Process flow diagram of Manufacturing of Benzene Hexa Chloride (BHC)
2. Process flow diagram of Manufacturing of Nitric Acid
3. Plant Layout for Manufacturing of Benzene Hexa Chloride (BHC)
4. Plant Layout for Manufacturing of Nitric Acid
5. Piping diagram for Manufacturing of Nitric Acid
6. Piping diagram for Manufacturing of Benzene Hexa Chloride (BHC)
7. Network Analysis Numerical : PERT & CPM

References:

1. F.C. Vilbrandt and C.E. Dryden, Chemical Engineering Plant Design McGraw Hill, New Delhi.
2. Peter M. S. and K.D. Timmerhaus, Plant Design and Economics for Chemical Engineers. McGraw Hill.
3. Modes J. and Philips, Rheinhold, Project Engineering with CPM and PERT, Van Nostrand Reinhold Co., 1970
4. Perry's Chemical Engineer's handbook, McGraw Hill : New York, 2008

Elective-II

Course Outline

Lab Industrial Pollution Control	**Lab IPC**	**CHP 813**
Course Title	Short Title	Course Code

Course Description:

This course illustrates practical aspect of Industrial Pollution Control in chemical plant and its need in industries. It helps the students to understand various processes used in treatment of waste in industries.

	Hours per Week	**No. of Weeks**	**Total Hours**	**Semester Credits**
Laboratory	**02**	**15**	**16**	**01**

Prerequisite Course (s): Applied Physical chemistry, Biochemical Engineering, Process Calculation, Process Heat Transfer, Chemical Reaction Engineering – I & II, Mass Transfer I & II, Process Equipment Design I & II.

General Objectives:

1. To study types of Pollution &Pollution control aspects.
2. To study Water (Prevention and Control of Pollution) Act, 1997, Air (Prevention and control of Pollution) Act, 1981.
3. To study Waste Water Treatment Processes.
4. To learn about removal of mercury& measurement of Mercury.
5. To study the removal of nitrogen by Physico-chemical processes and Biological methods.
6. To study the treatment of Phenolic Effluents.
7. To learn about pollution control in fertilizer industry, petroleum and petrochemical units.
8. To study the treatment of distillery waste.

Learning Outcomes:

Students will be able to understand the processes, pollution prevention and waste management techniques which is used in industry. Students will be able to know the types of processes that take place in industry and review the types of emissions that can occur. Students will understand the general activities and processes used in industries, the ways in which wastes are produced pollution control and waste minimization techniques.

<u>Course Content:</u>

(Any Eight Experiments/Assignments from the following)

<u>List of Experiments:</u>

1. Determination of dissolved oxygen.
2. Determination of BOD.
3. Determination of phenol.
4. Determination of COD.
5. Determination of metal (any one) in waste water.
6. Determination of chloride ion in given water.
7. Determination of turbidity in given sample.
8. Measurement of particulate matter in air.
9. Measurement of gaseous pollutant (any one) in air.
10. Measurement of various types of residues or solids in the given sample.

References:

1. S. P. Mahajan, Pollution control in process industries, Tata McGraw-Hill Publication
2. M. N. Rao & A K. Datta, Waste Water Treatment: IBH Pub., Delhi

Elective-II

Course Outline

Lab Advanced Separation Techniques	**Lab AST**	**CHP 814**
Course Title	Short Title	Course Code

Course Description: This course intended to fulfill the need for comprehensive laboratory course in Advanced Separation Techniques.

	Hours per Week	**No. of Weeks**	**Total Hours**	**Semester Credits**
Laboratory	**02**	**15**	**16**	**01**

Prerequisite Course (s): Lab Mass Transfer-I & II

General Objectives:

1. To introduce planning, safety concepts and experimental techniques for pollution free chemical separations.
2. To provide students with an understanding of the relationship between separation technology principles and performance of actual experimental laboratory operations.
3. To inculcate critical thinking abilities in students for separation of chemicals

Learning Outcomes:

Students completing this course will able to apply the principles of separation techniques studied during theory course in the laboratories for pollution free chemical separations. They will also identify the particular technique suitable for separation, from their theoretical knowledge.

Course Content:

(Any eight experiments/assignments from the above theory syllabus)

References for Practicals:

Standard laboratory manual for practices.

Elective-II

Course Outline

Lab Polymer Technology	**Lab PT**	**CHP 815**
Course Title	Short Title	Course Code

Course Description: This course intended to fulfill the need for comprehensive laboratory course in polymer technology.

	Hours per Week	**No. of Weeks**	**Total Hours**	**Semester Credits**
Laboratory	**02**	**15**	**16**	**01**

Prerequisite Course (s): Lab Applied organic chemistry.

General Objectives:

1. To train the students for analysis of polymers & plastic materials with due care and precautions.
2. To develop the students' skills in applying practical knowledge for the laboratory scale synthesis of polymers.

Learning Outcomes:

Students completing this laboratory course will able to apply the knowledge of quantitative analysis which is required during characterization of polymer samples. Through laboratory synthesis of polymers they will also understand the various polymer manufacturing processes carried out in the polymerization industries.

<u>Course Content:</u>

(Any eight Experiments/Assignments from the following)

List of Experiments:

1. Determination of molecular weight of a polymer by viscosity measurements, (Any Two).
2. Preparation of phenol formaldehyde resin.
3. Preparation of urea formaldehyde resin.
4. Preparation of Nylon 6:6.
5. Determination of the Saponification value of given plastic material.
6. Determination of the Acid value of given plastic material, (Any Two).
7. Determination of the Hydroxyl value of given plastic.
8. Determination of the Carbonyl value of given plastic.

References for Practicals:

S.K.Bhasin, Sudha Rani, Laboratory manual on Engineering Chemistry: Dhanpat Rai Publishing Compony, New Delhi

Elective-II

Course Outline

Lab Oil Technology	**Lab OIT**	**CHP 816**
Course Title	Short Title	Course Code

Course Description:

The intent of this course is to help to understand concepts in chemical reaction engineering. This course describes experimental techniques for determining rate laws for chemical reactions, the mechanisms and theories of chemical reactions.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**15**	**16**	**01**

Prerequisite Course (S): Fluid Flow Operation, Mass Transfer –I, Process Heat Transfer, Mass Transfer-II, Chemical Reaction Engineering –I & II

General Objectives:

1. To study the analysis of raw materials and final products.
2. To study various products from oil and fatty acids
3. To study ideal batch reaction some oleo chemicals.

Learning Outcomes:

Students will demonstrate the concepts of chemical reaction engineering using knowledge of basic process engineering and technology. The students will be able to design various reactions during experimental data.

Course Content:

(Any eight experiments from the following)

List of Experiments:

1. Determination of free fatty acids.
2. Determination of Iodine Value.
3. Determination of Saponification Value.
4. Determination of Unsaponifiable Matter.
5. Determination of Peroxide Value.
6. Preparation of detergent powder and its analysis.
7. Determination of Total Fatty matter of soap.
8. Determination of glycerol.
9. Preparation of Varnish.
10. Determination of Reichert Meissel Value.

References for Practical:

1. British Indian standard Books. Analysis of oils fats and waxes.
2. NIIR BOARD, Hand book on Soaps, Detergents and acid Slurry, 2nd Edition , Publisher- Asia Pacific Business Press Inc., Delhi.

Course Outline

Industrial Lecture	**IL**	**CHP 817**
Course Title	Short Title	Course Code

Course Description:

The course inculcates into the students the knowledge about technologies development in industrial sector. The course also develops the management and administration skills in the students and also helps to know the expectations of the industrialists from the fresh engineers.

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	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	**1**	**15**	**1**	**2**

Course Objectives:

1. To increase Industry-Institute Interaction.
2. To make aware the students about the developments and challenges in the Industry.
3. To encourage the participation of students for development of technology .

Course Outcomes:

At the end of course the students will understand the need, requirement and expectation of industry from fresh engineers and in turn will learn about the skills required by the industry. The students will be in a position to manage the various activities in the industry related to production, quality control, purchase, marketing, research, human resource, taxation, administration etc.

They will be able to identify, formulate, and solve engineering problems by understanding professional and ethical responsibility. They will develop the ability to understand the environmental issues for green and clean technologies. They will also gain the knowledge for contribution in economic development by improving the productivity of the industrial processes.

Industrial Lecture

(Course Contents)

Semester-VIII **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 50Marks**

Lecture: 1 Hrs/Week

1. There is a need to create avenues for a close academia and industry interaction through all the phases of technology development, starting from concept to commercialization.
2. Minimum 6 lectures to be delivered by experts from the industry in alternate weeks. Next week group discussion on the lecture delivered.
3. Student should submit assignment in hard copy on the topic of industry lecture. The number of assignment should be equal to number of industry lecture.

Guide lines for ICA: Assessment of the Industrial Lecture for award of ICA marks shall be done jointly departmental committee as per attendance in industrial lecture and overall performance in semester**.**

PROJECT – II

Project-II	**PROJ-II**	**CHP 818**
Course Title	Short Title	Course Code

Course Description:

The course explores the knowledge of designing, experimentation and analysis of data. The course intends to present a complete explanation for technical & societal problems by applying the chemical engineering knowledge. The course develops an ability to provide feasible technological solutions to meet economical & societal issues.

Laboratory	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
	4	15	48	6

Prerequisite Course (s): Knowledge of science, mathematics, computer programming and core subject of engineering.

Course Objectives:

1. To develop ability to work in group
2. To develop feasible engineering solutions .
3. To abridge a gap between academia and society

Course Outcomes:

At the end of the course students will be able to develop the ideas and knowledge related to contemporary issues. They will illustrate to provide a complete mechanism for stable industrial and research solution**.** The students will reveal their commitment for making world better to live.

Project-II
(Lab Course Contents)

Semester-VIII **Examination Scheme:**

Teaching Scheme: Internal Continuous Assessment (ICA) : 75Marks

Practical: 2 Hrs/Week End Semester Examination OR (ESE) : 75Marks

- Every student of shall undertake the Project-II in semester VIII.
- Each student shall work on an approved project, a group of **05 students (maximum)** shall be allotted for the each Project-II as same group for Project-I.
- Project-II may involve fabrication, design or investigation of a technical problem that may take design, experimental or analytical character or combine element of these areas. The project work shall involve sufficient work so that students get acquainted with different aspects of fabrication, design or analysis, testing, their result and conclusion.
- Each student group is required to maintain log book for documenting various activities of Project-II.
- The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of Project-II. Maximum four Project-II groups shall be assigned to one teaching staff.

Guide lines for ICA: Assessment of the project for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given below.

Assessment Sheet for Project-II

Name of the Project: ____

Name of the Guide: ____

SN	Exam Seat No	Name of Student	Literature Survey	Design /Experimentation /Fabrication etc.	Result and conclusion	Project Report	Presentation	Total Marks
			10	25	20	10	10	75

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Fourth Year Engineering

(Civil Engineering)

Faculty of Engineering and Technology

Course Outline

Term-VII

w.e.f. A.Y. 2015-16

BE (Civil) : Semester - VII

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Water Resources Engineering I	D	3	---	---	3	20	80	---	---	100	3
Estimating and Costing	D	3	---	---	3	20	80	---	---	100	3
Interdisciplinary Elective	E	3	---	---	3	20	80	---	---	100	3
Elective - I	E	3	---	---	3	20	80	---	---	100	3
Geotechnical Engineering II	D	3	--	---	3	20	80	---	---	100	3
Estimating and Costing lab	D	---	---	2	2	---	---	25	25	50	1
Geotechnical Engineering II lab	D	---	---	2	2	---	---	25	25	50	1
LAB# Elective I lab	E	---	---	2	2	---	---	25	25	50	1
Project – I	D	---	---	2	2	---	---	25	25	50	2
Seminar - II	D	---	---	2	2	---	---	25	---	25	2
Industrial Visit	D	---	---	---	---	---	---	25	---	25	1
Total		15	---	10	25	100	400	150	100	750	23

ISE: Internal Sessional Examination ESE: End Semester Examination ICA: Internal Continuous Assessment

#Lab for Elective-I

Inter Disciplinary Elective

1. Finite Element Methods
2. Geographical Information systems

Elective I

1. Numerical Methods in Civil Engineering
2. Sustainable Building Technology
3. Watershed Management
4. Open Channel & Conduit Flow

* Note 1: For branches like Chemical Engineering and Biotech Engg, two laboratory hours can be merged to form a four hour slot. Note 2: Out of 3 practical ESE heads, all the three heads are orals. Note 3 : Interdisciplinary Elective shall be offered by the department to the students of other department. Students from one department cannot register for Interdisciplinary Elective of the same department.

* . Note 4: At least 15 students should register for offering any elective.

Water Resources Engineering-I

Short Title: WRE-I

Course Description:

The course is focused on developing the skills of students for identification and assessment of available natural and artificial water resources. It deals with the study of Hydrology and water requirement of crops related to Civil Engineering. The part of the subject is focused on irrigation engineering and development of water resources.

	Hours/Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	13	39	3
Tutorial	--	--	--	

General Objectives:

- To know the hydrologic cycle and analyze different components of the cycle such as precipitation, evaporation, transpiration and infiltration.
- To introduce the students with various methods of discharge measurements in streams; and also the analysis and estimation of runoff and flood using hydrographs.
- To introduce the students with ground water hydrology and hydraulics of wells and also water logging and drainage.
- To know reservoir planning and reservoir sedimentation.
- To explain various systems and methods of irrigation and water requirements of crops.

Learning Outcomes:

Upon successful completion of this course the student will be able to:

- Demonstrate the hydrologic cycle and its applications.
- Discuss precipitation, its measurement and analysis.
- Identify other phases of the hydrologic cycle such as evaporation, transpiration and infiltration and their measurement and applications.
- Explain various methods of measurement of stage and discharge in streams.
- Assess flood hydrograph, unit hydrograph, S-curve and their applications.
- Discuss movement of ground water and its occurrence in aquifers.
- Demonstrate hydraulics of wells under steady flow in confined and unconfined aquifers.
- Analyse run off process and estimate annual yield of streams.
- Explain water logging and its control also drainage of water logged lands by subsurface pipes drains.
- Discuss planning and investigations for locating and creating a reservoir and also its benefit cost ratio.
- Identify sedimentation of reservoir and its control and asses life of reservoir.
- Identify various methods of irrigation and soil water and plant relationship.
- Asses water requirements of crops, Duty, Delta and Irrigation efficiencies and canal capacities.

Course Content

Teaching Scheme:
Lectures: 3 Hours/week

Examination Scheme:
End Semester Examination(ESE): 80 Marks
Paper Duration(ESE): 3 Hours
Internal Sessional Examination(ISE): 20 Marks

Unit-I **(8 Hours, 16 marks)**

Hydrology and Water resources development, Hydrologic cycle, applications of hydrology and hydrological cycle.

Precipitation: Different forms, types, measurement of precipitation: different types of rain gauges - non-automatic and automatic, presentation of data: mass curve and hyetograph, methods to find out the areal average depth of precipitation, annual average precipitation and its variation, optimum number of rain gauge stations, estimation of missing data.

Disposal of Precipitation: Elementary concepts of evaporation, evapo-transpiration and infiltration, factors affecting and methods for determination of these three processes, infiltration indices.

Unit-II **(8 Hours, 16 marks)**

Introduction to stream gauging and introduction to methods of discharge and stage measurement in streams.

Runoff: Runoff process, yield, factors affecting Runoff, estimation of runoff volume.

Floods: Estimation of peak flow, rational method and introduction to other methods, introduction to design floods for various hydraulic structures.

Hydrographs: Definition, components, factors affecting the shape, base flow separation,

Flood hydrograph, Unit hydrograph – definition, assumptions, applications, derivations and limitations, S-hydrograph.

Unit-III **(8 Hours, 16 marks)**

Ground water hydrology: Occurrences and distribution of ground water, specific yield of aquifers, movement of ground water, Darcy's law, permeability, safe yield of basins, hydraulics of wells under steady flow in confined and unconfined aquifers, well loss, specific capacity of well, well irrigation: introduction to tube wells and open wells.

Water logging and drainage: Causes, preventive and curative measures of water logging, design and spacing of the tile – drains.

Unit-IV **(7 Hours, 16 marks)**

Reservoir Planning: Types of developments: Storage and diversion works, single and multi-purposes reservoirs, introduction to various investigations for locating a reservoir, mass curve and estimation of required storage, economics of reservoir planning, Benefit – cost ratio.

Reservoir Sedimentation: Process of erosion, introduction to suspended and bed loads, critical tractive force, trap efficiency and life of reservoir, factors affecting silting and control of reservoir sedimentation.

Unit-V **(8 Hours, 16 marks)**

Introduction to irrigation: Necessity, benefits, Ill effect, irrigation systems and methods and their classifications.

Soil-water-plant relationships: Classification of soil water, saturation capacity, Field capacity, determination of field capacity, quality of irrigation water.

Water requirement of crops: Limiting soil moisture condition, depth of irrigation water and frequency, principal Indian crops and their seasons, base period, duty of water and delta, factors affecting & methods of improving the duty of water, intensity of irrigation, paleo irrigation, kor depth and kor period, outlet factor, capacity factor, time factor, crop ratio, overlap allowance, calculations of canal capacities, application of water, warabandi, National Water Policy.

Recommended Books:

1. Subramanya K, “Engineering Hydrology”, Third Edition, 2008, Tata McGraw-Hill Publishing Company Limited, New Delhi.
2. Modi P.N. 2012. “Irrigation, Water Resources and Water Power Engineering, Eight edition. Standard Book House, Delhi.
3. Garg S.K. 1998. Irrigation Engineering And Hydraulic Structures” ,Khanna Publishers, Delhi.
4. Punmia B.C., Pande B.B., .Lal, “Dams II: Irrigation and Water Power Engineering”. 1999. Laxmi Publications Pvt. Ltd., New Delhi.
5. Varshney R.S., Gupta S.C., Gupta R.L.. “Theory and Design of Irrigation Structures, Volume I and II”, 1979 Fourth edition. New Chand & Bros., Roorki.
6. Mutreja, “Applied Hydrology”, Tata McGraw Hill Company, New Delhi
7. Bharat Singh , “Irrigation Engineering”.
8. Sharma R.K., “A Text Book of Hydrology & Water Resources”, Dhanpat Rai and Sons.
9. K.B.Khushlani “ Irrigation Engineering”.
10. Justin, Hinds , “Irrigation Engineering and Practice”
11. Raghunath H.M., “Hydrology”, New Age Publications, New Delhi.
12. Raghunath H.M., “Ground Water”, New Age Publications, New Delhi.
13. P.Jayaram Reddi, “A Text Book of Hydrology”, Laxmi Publications, New Delhi

Estimating and Costing

Short Title: E & C
Course Description:

This course introduces the students about concept of Estimations of quantities of work. The topic on approximate estimate is useful for calculating approximate cost of structures which is further useful for the making budget provisions in the planned works. The information on detailed estimate based on measurements and the rate of completed item of work is useful in finding comparatively accurate costs of each item of work and total cost of the structure. The rate analysis of an item of work shall help in finding out the rate per unit on the basis of material cost, labour cost, contractors profit and other probable miscellaneous expenditure required for the completed item of the work for actual execution of the works as per lead and lift. Thus the subject shall strongly help to build professionalism among the learner by providing the knowledge and estimating skills at the project sites along with the use of software's / programmes of estimating which makes learner a perfect professional civil engineer.

	Hours/Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	13	39	3
Tutorial	--	--	--	

General Objectives:

- To enable the students with working out quantities of various items involved in the construction of structures.
- Student will also be able to work out the rate analysis.

Learning Outcomes: At the end of this course, the graduate

- Attains a level of proficiency to prepare approximate as well as detailed estimate of any civil engineering project.
- Is likely to understand the bar bending schedule and other schedules related to the process of estimating.
- Is competent enough to calculate the amount of material, labours and machinery required to execute any civil engineering item.
- Attains a skill to write a specification of any civil engineering item.
- Is well proficient to compute the rate of any civil engineering item.
- Is expected to understand the terminologies associated with valuation.
- Is well trained for deciding the unit of payment of any item of civil engineering.

Course Content

Teaching Scheme:
Lectures: 3Hours/week
Practicals: 2 Hours/week

Examination Scheme:
End Semester Examination(ESE): 80 Marks
Paper Duration(ESE): 4 Hours
Internal Sessional Examination(ISE): 20 Marks

Unit-I **(8 hours, 16 marks)**

Approximate Estimate: Definition and Necessity, General Principles, Methods of Preparing Approximate Estimates for Buildings, Roads, Bridges, Water Supply Scheme, Drainage Scheme, and Retaining Wall.
Detailed Estimate: Types of Detailed Estimate, Purpose, Data Required for Preparing Detailed Estimate, Factors to be considered during Preparing Detailed Estimate, Methods of Taking out Quantities, Abstracting, Units of Measurement.
Building Cost: Building Cost, Provisional Sum, Centage Charges, Work Charged Establishment, Administrative Approval, Budget Provision, Technical Sanction, Different Methods of Execution of Minor Works in PWD, Like Piece Work, check List, Day Work, Daily Labour. Introduction to registration as contractor in the PWD.

Unit-II **(7 hours, 16 marks)**

Detailed Estimate: PWD Method and Center Line Method of Taking out Quantities, Using IS 1200 Rules, Estimate of Load Bearing Residential Building (1 BHK Only).

Unit-III **(8 hours, 16 marks)**

Detailed estimate: Reinforcement Quantities of RCC Elements like Slab, Beam, Column, Isolated Column Footing, Stair Case and Preparation of Bar Bending Schedule.

Unit-IV **(8 hours, 16 marks)**

Specification: Definition & Purpose, Types of Standard Specification, Red Book, Legal Aspect, Drafting Detailed Specification with Reference to Material, Quality, Workmanship, Method of Execution, Mode of Measurement and Payment for Major Items Like (Excavation, Stone/ Brick Masonry, Plastering, Ceramic Tile Flooring, R.C.C. Work Only)
Analysis Of Rates: Factors Affecting Cost of an Item of Work, Material, Sundries, Labour, Lead and Lift, Tools and Plant, Overhead and Profit. Task Work Definition and Factors affecting Task Work, Analysis of Rates of Items Mentioned in the Specification Above.

Unit-V **(8 hours, 16 marks)**

Valuation: Definition and Purpose, Price, Cost and Value, Types of Value, Factors Affecting Value of Property, Concept of Free Hold, Lease Hold Property, Years Purchase And Outgoings, Legal Aspects of Valuation, Methods of Valuation, Land and Building Method, Rental Method, Belting Method of Valuation of Land. Standard Rent and Standard Rent Fixation, Depreciation, Various Methods of Depreciation, Sinking Fund, and Book Value. (No Numericals Should Be Asked)

Recommended Books:

1. B. N. Dutta, “Estimating and costing in civil engineering theory and Practice” , S. Dutta & company, Lucknow.
2. M. Chakraborty, “Estimating, Costing Specifications & valuation in civil Engineering”, published by M. Chakraborti , Calcutta.
3. Rangawala, “Estimating and Costing”, Charotar Publishing House, Anand.
4. B. S. Patil, “Civil Engineering Contracts & Estimates”, Orient Longman Ltd, Mumbai.
5. G. S. Biradi, “Estimating and Costing”, Dhanpat Rai & Sons.

Finite Element Methods

Inter-Disciplinary Elective

Short Title: FEM

Course Description:

Finite element analysis is now widely used for solving complex static and dynamic problems encountered in engineering and the sciences. The course introduces theoretical basics and practical application of the finite element method. It is designed to solve practical problems related to solid mechanics, machines and structures. It describes the general assumptions, and discusses the implementation of finite element procedures for linear and nonlinear analyses. Reliable and effective finite element procedures are discussed with their applications to the solution of general problems in solid, structural mechanics. The governing continuum mechanics equations, conservation laws, virtual work, and variational principles are used to establish effective finite element discretizations and the stability, accuracy, and convergence are discussed.

	Hours/Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	13	39	3
Tutorial	--	--	--	

General Objective:

- Conceptual understanding of the mathematics, numerical analysis, statistics which underpin the engineering discipline.
- Provide background solid mechanics required for the FEA contents.
- Provide an understanding of fundamental knowledge and technique of FEM.
- Application of established engineering methods to complex engineering problem solving.

Learning Outcomes:

Knowledge and understanding:

Having successfully completed the module, students will be able to demonstrate knowledge and understanding of:

- Variational principles in statics and dynamics of structure
- Fundamental concepts and method of FEA
- Direct stiffness, Rayleigh-Ritz methods and FEA.
- FEA formulation in solid mechanics.
- Fundamental isoparametric elements.

Intellectual skills:

Having successfully completed the module, students will be able to:

- Formulate finite element matrices .
- Analyse and build FEA model for various engineering problems.
- Identify information requirements and sources for design and evaluation.
- Synthesize information and ideas for use in the evaluation process.

Course Content

Teaching Scheme:
Lectures: 3Hours/week

Examination Scheme:
End Semester Examination(ESE): 80 Marks
Paper Duration(ESE): 3 Hours
Internal Sessional Examination(ISE): 20 Marks

Unit-I **(08 Hours 16 marks)**

Concept of finite element, Classification of element for discrete and continuum structure, characteristics of an element, Displacement function, General approach for formulation of the problem, degree of freedom, assembly rules and boundary conditions, Gradient and Divergence theorems.

Matrix algebra, Concept of local and global, Coordinates, Rules of transformation of stiffness matrix from local to global axes, various methods of approximation. Approximation errors in F.E.M., Various measures of errors, Accuracy of solution, Advantages and disadvantages of F.E.M.

Unit-II **(08 Hours 16 marks)**

Discretization of the Domain into elements, shape function, Pascal triangle, selection for the order of polynomial, convergence requirement, inter element compatibility conforming and non-conforming element, concept of band width.

Principal of minimum potential energy, Rayleigh-Ritz method, the method of weight residuals, Saints-Venant principal, Application of above methods to a field problems.

Unit-III **(08 Hours 16 marks)**

One dimensional second order and fourth order equations, Lumped and work equivalent load, theory of work equivalent load, Shape function for one dimensional analysis, Derivation of element equations.

Analysis of one dimensional structure (beam, column etc.) by F.E.M. with different loading and boundary conditions.

Unit-IV **(07 Hours 16 marks)**

Finite element method for two dimensional problems, second order equation involving scalar valued function, two dimensional finite elements and interpolation function.

Direct method for determination of stiffness matrix for plane truss, continuous beams and plane frame elements, solution for displacement unknowns and analysis.

Unit-V **(08 Hours 16 marks)**

Triangular and Rectangular elements for plane stress/strain conditions, effect of element aspect ratio, finite representation of infinite mass.

Formulation of stiffness matrix for slabs using triangular or rectangular elements with different boundary conditions. Introduction of Isoparametric1D and 2D elements, shape function and natural co-ordinate system, quadrilateral isoparametric elements for plane stress /strain conditions.

Recommended Books:

1. O. C. Zinekiewice & R. L. Tayor , “The Finite Element method”.
2. J. N. Reddy, “An Introduction to the Finite Element method”
3. C.S. Desai and J.F. Abel ,“Introduction to the finite element method”
4. V. K. ManikaSelvam, ,“Rudiments of finite element method” . DhanpatRai
5. V. K. ManikaSelvam, “Finite Element Primer”, DhanpatRai

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Geographical Information System

Inter-Disciplinary Elective

Short Title: GIS

Course Description

This course offers an introduction to the concepts, principles, and theories behind Geographic Information Systems (GIS), with emphasis on the nature of geographic information. This course is designed to enable student to evaluate, to apply and to analyze software's related to GIS .mainly to highlight the relevant basic knowledge of GIS modeling , spatial data analysis vector data and raster data processing. Students acquainted with related knowledge can be able to apply in design, and modelling. Apply a knowledge of GIS to be a system of hardware, software, data, people, organizations, and institutional arrangements for collecting, storing, analyzing, and disseminating information about areas of the earth.

	Hours/Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	13	39	3
Tutorial	--	--	--	

General Objectives:

1. Understand the purposes of GIS and the kinds of problems to which GIS is applied.
2. Understand the fundamental types of GIS data, data conversion, including raster and vector data.
3. To become Proficient with a commercially available GIS software package.
4. Use GIS operators to perform a number of kinds of analyses.
5. Aware of geographic information that is available on the World Wide Web.
6. Understand the limitations of geographic information systems and geographic data in general.
7. Explain the components and functionality of a GIS and the differences between GIS and other information systems;
8. Design and complete a GIS project from start to finish (data capture, data storage and management, analysis, and presentation);

Learning Outcomes:

1. After successful completion of this course, a graduate is in position to identify and predict the aerial imageries with the help of GIS software.
2. The graduate can design the model.
3. The graduate is likely to predict the importance of GIS
4. The graduate is capable of planning and design 2D, 3D.
5. The graduate is likely to interpret geological, topographical prevailing under area of consideration.

Course Content

Teaching Scheme:
Lectures: 3Hours/week

Examination Scheme:
End Semester Examination(ESE): 80 Marks
Paper Duration(ESE): 3 Hours
Internal Sessional Examination(ISE): 20 Marks

Unit-I **(07 Hours 16 marks)**

Introduction to GIS

Definition, concepts, Information System, components of GIS, History, elements of GIS, objectives of GIS, hardware and software requirements of GIS, Geospatial data architecture, Operations, Geographic co-ordinate system, Map Projections, Input data for GIS, display, types of output products, GIS categories, Level and scale of Measurement, importance of data quality.

Unit-II **(08 Hours 16 marks)**

Vector Data and Processing

GIS data types, data Representation, Data Sources, typical GIS data sets, Data Acquisition, vector data model, relationship between classes, data structure, data verification and editing spatial data models and errors- GIS databases, attributes data input and management.

Unit-III **(08 Hours 16 marks)**

Raster Data and Processing

Elements of data model, cell, value, data structure, cell by cell encoding, run length encoding, Quad tree, Header files, format, Types of raster data, data compression, Linking and integration of vector data.

Unit-IV **(08 Hours 16 marks)**

Data Conversion and Editing

Data format conversion, Medium conversion, Spatial interpolation, measurement and analysis methods, Data accuracy and standards, Attribute data input and Management- Relational mode- Data manipulation- classification techniques, Digital Elevation Model: Need of DEM, Various structures of DEM: line, TIN, grid.

Unit-V **(08 Hours 16 marks)**

Meta Data and GIS Modelling

Meta data- data standard - OGC - open source GIS - GIS modelling, basic elements, classification, model processing, integration, Binary models, Index model, Regression models, Linear Regression model, Logistic Regression model, Process model.

Reference Books:

1. C P LO Albert K. W. Yeung, "Concept and Techniques of Geographic information System", Prentice Hall India
2. M Anji Reddy, "Textbook of Remote Sensing and Geographical Information systems", BS Publications,
3. Kang tsung Chang. "Introduction to Geographical Information System", Tata McGraw Hill, 7th edition, (2010)
4. Burrogh P.A., "Principles of Geograpical Information System for Land Resources Assessment", Oxford Publications
5. A.M. Chandra and S.K. Ghosh. "Remote Sensing and Geographical Information System".
6. Longley, Paul A., Michael F. Goodchild, David J. Maguire, David W. Rhind ,"Geographic Information Systems and Science", Second Edition 2005, , John Wiley & Sons, New York.
7. Satheesh Gopi, R. Sathikumar, N. Madhu, "Advanced Surveying (Total Station, GIS and Remote Sensing)", First Edition 2007:

Numerical Methods in Civil Engineering

Elective-I

Short Title: NMCE

Course Description:

The numerical methods course involves solving engineering problems from all fields of engineering. Course will cover the fundamental topics in numerical methods such as numerical integration, differentiation and numerical linear algebra, solution of nonlinear algebraic systems and solution of ordinary and partial differential equations, curve fitting, interpolation. The student will be familiar in using numerical tools to solve problems in their own field of interest.

	Hours/Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	13	39	3
Tutorial	--	--	--	

General Objectives:

To introduces students to the mostly used numerical methods in the different engineering fields . The aim is to study and apply various numerical methods such as Gaussian Elimination Method ,Gauss Jordon Method, Method of Bisection, Method of false position, Newton Raphson Method, Method of Simple Iteration, Method of Least Square, Newton Interpolation, Lagrange Interpolation, Euler's Method, Modified Euler's Method, Runge Kutta Method and develop program for the same.

Learning Outcomes:

After successful completion of the course, Students will be able to

- Solve an algebraic or transcendental equation using an appropriate numerical method
- Approximate a function using an appropriate numerical method
- Solve a differential equation using an appropriate numerical method
- Evaluate a derivative at a value using an appropriate numerical method
- Solve a linear system of equations using an appropriate numerical method
- Perform an error analysis for a given numerical method
- Calculate a definite integral using an appropriate numerical method
- Code a numerical method in a modern computer language.

Course Content

Teaching Scheme:
Lectures: 3Hours/week
Practicals: 2 Hours/week

Examination Scheme:
End Semester Examination(ESE): 80 Marks
Paper Duration(ESE): 3 Hours
Internal Sessional Examination(ISE): 20 Marks

Unit-I **(8 Hours 16 marks)**

Introduction: Mathematical Modelling and Engineering Problem Solving, Algorithm Design, Flowchart, Errors in Numerical Computation.

Solution of Linear algebraic Equation: Gauss Elimination method, Gauss Seidel method, Gauss Jordan method, Partial Pivoting method and its conditions for convergence.

Unit-II **(8 Hours16 marks)**

Solution of Non Linear Algebraic and Transcendental Equations: Bisection, False position, Newton Raphson Method, Generalized Newton Raphson Method.

Linear Programming Problem: Introduction, Requirements, Assumptions, Applications, Limitations, General Mathematical Model, Formulations, Introduction to Artificial Variables, Simplex Algorithm for Maximization & Minimization Cases.

Unit-III **(7 Hours 16 marks)**

Curve Fittings: Linear Regression, Polynomial Regression, Multiple Linear Regression, General Linear Least Squares, and Engineering Applications of Curve fitting.

Interpolation: Newton's divided difference interpolating polynomials, Non-linear regression, Lagrange Interpolating polynomials, Coefficient of interpolating polynomials.

Unit-IV **(8 Hours 16 marks)**

Numerical Differentiation: High accuracy differentiation formula, First order differentiation Equations, Second order differentiation Equations, Derivatives of Equally Spaced Data.

Numerical Integration: Trapezoidal rule, Simpson's one third and $3/8^{th}$ rule, Gaussian Quadrature 2 point Formula.

Unit-V **(8 Hours 16 marks)**

Numerical methods for Solution of ordinary differential equation: Taylor's series method, Euler's method, Modified Euler's method, Runge Kutta method, Predictor Corrector Method.

Numerical methods for Solution of Partial Differential Equation: Introduction to initial value and boundary value problem, Finite difference methods for the solution of one dimensional wave equation two dimensional (parabolic and elliptic) and higher order PDE.

Recommended Books:

1. Steven C Chapra & Raymond P. Canale, “Numerical Methods for Engineers”, Tata Mc-Graw Hill Company Limited, New Delhi, 2002
2. Schilling & Harries, “Applied Numerical Methods for Engineers”, THOMSON, Brooks/Cole, Newyork, 2000
3. S. Rajasekaran, “Numerical Methods in Science & Engineering”, A.H.Wheeler & Company Private Limited, 2000
4. Sharma J.K., “Operation Research”, MACMILLAN India Limited, 2003
5. Jain, Iyenger & Jain, “Numerical Methods”, New Age Publishing Company, New Delhi, 2004
6. Sastry S.S., “Introductory Methods of Numerical Analysis”, Prentice Hall (India) Limited, New Delhi, 2000
7. Kanti Swaroop & P.K.Gupta, “Operation Research”, Sultan Chand & Sons, New Delhi, 1998
8. S.S.Rao, “Optimization Theory and Application”, Wiley Eastern Limited, 1999

Sustainable Building Technology

Elective-I

Short Title: SBT

Course Description:

This course deals with concepts of Sustainable Building Technology such as Sustainable development, Green Building, Assessment and the LEED rating system etc. It also elaborates design of a sustainable building for Lighting, Ventilation and Energy conservation for building envelope. It includes use of local building materials, their characteristics and effects on properties of concrete. It enables students to learn Cost Effective Techniques for Walling Roofing and other units. It also covers Water Management, Recycling, , Lightening protection, Fire protection, Thermal insulation, Air conditioning , Noise pollution-sources and control measures.

<table>
<tr><th></th><th>Hours/Week</th><th>No. of Weeks</th><th>Total Hours</th><th>Semester Credits</th></tr>
<tr><td>Lecture</td><td>03</td><td>13</td><td>39</td><td rowspan="2">3</td></tr>
<tr><td>Tutorial</td><td>--</td><td>--</td><td>--</td></tr>
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General Objectives:

- To describe concepts required for sustainable building design and and building practices.
- To focus Environmental issues related to building materials and construction.
- To emphasise importance of water management systems

Learning outcomes:

- Upon completion of this course, the candidate will be able to:
- Identify the key components of the LEED® Rating System
- Describe key green building concepts
- Know design principles and techniques for sustainable buildings
- Use Sustainable Building Materials and assess their impact
- Know various water management systems.

COURSE CONTENT

Teaching Scheme:	**Examination Scheme:**
Lectures: 3Hours/week	End Semester Examination(ESE): 80 Marks
Practicals: 2 Hours/week	Paper Duration(ESE): 3 Hours
	Internal Sessional Examination(ISE): 20 Marks

Unit-I **(8 Hours, 16 Marks)**

Concept of Green Building: Sustainable Development concept, Buildings and climate, Important considerations for the design of a sustainable buildings. Green Building Assessment, Current version of the LEED rating system.

Unit-II **(7 Hours, 16 Marks)**

Energy and Buildings: The design of a sustainable building, Lighting - day lighting; Ventilation - natural ventilation; Indoor air quality; Passive and Active systems for energy production and conservation, Elements of successful design of a building envelope.

Unit-III **(8 Hours, 16 Marks)**

Sustainable Building Materials: Environmental issues related to building materials, Local Building Materials from

a) Agricultural waste: Rice husk, Coconut wastage, Banana leaves.

b) Industrial waste: Red mud, Blast furnaces slag, Fly Ash.

Their Physical Characteristics and effects on properties of concrete

Unit-IV **(8 Hours, 16Marks)**

Cost Effective Techniques for Sustainable Building: Stabilized Mud blocks, Stone masonry blocks, Solid and Hollow concrete blocks, Selection of building blocks. Ferro-Concrete, Properties and Uses, Practical aspects.

Alternative sustainable Roofing Systems: Concepts in Roofing alternatives, Filler slab roofs, Composite Slab panel roofs, hollow block roofs, Masonry Domes.

Unit-V **(8 Hours, 16 Marks)**

Environmental Techniques: Waste water Management**,** Rain water harvesting and conservation, Recycling, waste water treatment processes, external drainage system in building.

Lightening in building, Fire protection of building, Thermal environment inside the building, systems of air conditioning

Noise pollution: Sources and control measures Noise pollution-sources and control measures

Reference Books:

1. K.S.Jagadish, B.V.V.Reddy ,“Alternative Building Materials and Technologies”, New Age International Publishers
2. “Sustainable building design Manual” by Energy research institute delhi.
3. Gevorkian ,”Green Buildings” Mc Graw hill.
4. “Fibre reinforced Cement Composites”, P. N. Balaguru and S.P. Shah, McGraw Hill,
5. The engineering guide to LEED- new construction-sustainable constuction for engineers haselbach.
6. Fibre cements and Fibre Concretes”, D. J.Hannant, John Wiley and Sons.
7. Properties of Concrete”, A.M.Neville, ELBS, Longman.
8. Miller G. T Jr; Living in the environment; Cengage Publisher.
9. Cunningham W; Principles of Environmental Science: TMH
10. Harris CE, Prichard MS, Rabins MJ, Engineering Ethics; Cengage Pub.
11. Martin; Ethics in Engineering; TMH.
12. RanaSVS;Essentials of ecology and environment; PHI Pub.
13. Gerard Kiely, Environmental Engineering; TMH
14. Khan BH; Non Conventional energy resources; TMH Pub.

Watershed Management

Elective-I

Short Title: WSM

Course Description:

This course is designed to enable student to assess, apply and analyze the relevant geological, ground water, irrigation principles. In this course , the topics on Morphology , ground water, irrigation, pollution, issues in irrigation, appraisals, rain water harvesting, urban water shed management are mainly to highlight for the relevant basic knowledge . Students acquainted with related knowledge can be able to apply in design, and economics of watershed projects.

	Hours/Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	13	39	3
Tutorial	--	--	--	

Prerequisite courses: Engineering Geology, Irrigation Engineering.

General Objective:

The basic objective of the course is to make students aware about importance of conservation of water and its management and know the methods, design, issues, appraisals used for watershed management. Students should also be aware about geology and groundwater.

Learning Outcomes:

After successful completion of this course, a graduate is in position

1.To identify and predict the watershed area and its characteristics.

2.Evaluate the factors with respect to groundwater, rain water.

3.To predict the importance of watershed management.

4. Plan and design the watershed management programme.

5. To interpret Geological, Topographical and Metrological conditions prevailing under area of consideration.

Course Content

Teaching Scheme:

Lectures: 3Hours/week

Practicals: 2 Hours/week

Examination Scheme:

End Semester Examination(ESE): 80 Marks

Paper Duration(ESE): 3 Hours

Internal Sessional Examination(ISE): 20 Marks

Unit-I **(8 Hours 16 Marks)**

Concept of Watershed. Significance of watershed based development. Watershed characteristics geomorphology and hydrology. Drainage basin, network and channel morphology.

Unit-II **(8 Hours 16 Marks)**

Watershed Hydrology – Hydrologic cycle, water balance, climate and precipitation, soil and infiltration, interception and evapotranspiration, groundwater, streamflow and runoff, water quality, aquatic ecosystems [eutrophication, habitat disturbance].

Unit-III **(7 Hours 16 Marks)**

Watershed Resource Appraisal-Physical, Hydrological and Land use/cover, Land Capability Classification, Watershed Management and Planning and objectives.

Unit-IV **(8 Hours 16 Marks)**

Issues in water resources – Point source pollution, agricultural and urban non-point source pollution, erosion, water scarcity, flooding, and drinking water protection, soil and water conservation measures, watershed Program, Benefit Cost Analysis.

Unit-V **(8 Hours 16 Marks)**

Urban Watershed Management – Wet weather flow, , Green Roof, Rain water harvesting from urban structures, Urban watershed management ,goals & strategies, Sustainability & UWSM, urban storm water pollution and sediment management.

Recommended Books:

1. Murthy, J.V.S. (1994), "Watershed Management in India", Wiley Eastern Ltd., New Delhi.
2. Paranjape, S. and Others. (1998), "Watershed – based Development", Bharat Gyan Vigyan Samithi, New Delhi.
3. Mutreja, K.N. (1990) ,"Applied Hydrology", Tata McGraw-Hill Pub.Co. Ltd. New Delhi.
4. Sinha R.J. (2000), "Water Planning and Management", Yash Publishing House, Bikaner.
5. C.J. Hoan , "Hydrology & small Watersheds".
6. D.M. Michal, "Hydrology" .

Open Channel and Conduit Flow

Elective-I

Short Title: OCCF

Course Description:

The subject deals with the applications of Fluid mechanics to the flow problems under atmospheric and imposed pressure i.e. flow through open channels and conduit flow. This subject is extended to study of Fluid Mechanics in general and its applications to open channel and conduit flows in particular.

	Hours/Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	13	39	3
Tutorial	--	--	--	

Course Prerequisites: Knowledge of fluid kinematics and dynamics, concepts of uniform and critical flow in open channels, concepts of pipe flow systems.

General Objectives:

- To learn uniform and critical flow in trapezoidal and circular channels and transitions in rectangular channel and their applications.
- To study Gradually Varied Flow in open channel, its computation and applications.
- To analyze Rapidly Varied Flow, Unsteady Flow and hydraulic jump & surge in open channel and their applications.
- Introduction to pipe network & design of pipes including rising main and gravity main.
- To understand unsteady flow in pipes including water hammer and design of surge tank.

Course Outcomes: Upon successful completion of this course the student will be able to,

1. Evaluate normal and critical depth in trapezoidal and circular channel.
2. Analyze transitions in rectangular channel with a hump and change in width.
3. Demonstrate Gradually Varied Flow (GVF) and different forms of differential equation of GVF.
4. Analyze different types of GVF profiles and their characteristics.
5. Compute GVF profiles in trapezoidal channel by different methods.
6. Explain Rapidly Varied Flow (RVF) due to hydraulic jump and various flumes.
7. Assess and compute hydraulic jump in open channels.
8. Discuss unsteady flow in open channel and evaluate surges in rectangular channel.
9. Analyze three reservoir problem and pipe network.
10. Discuss practical methods of design of rising and gravity mains.
11. Evaluate economical diameter of rising main.
12. Identify unsteady flow in pipes and analyze establishment of flow and water hammer phenomenon.
13. Explain surge tanks and design of simple cylindrical surge tank.

Course Outline

Teaching Scheme:
Lectures: 3Hours/week
Practicals: 2 Hours/week

Examination Scheme:
End Semester Examination(ESE): 80 Marks
Paper Duration(ESE): 3 Hours
Internal Sessional Examination(ISE): 20 Marks

Unit-I **(8 Hours, 16 Marks)**

Revision of concepts of open channel flow, velocity and pressure distributions, equations of continuity, energy and momentum, uniform and critical flow in trapezoidal and circular channels, calculation of normal and critical depths in trapezoidal and circular channels, the first and second hydraulic exponents (M and N). (No derivations of equations for M and N).

Unit-II **(9 Hours, 16 Marks)**

Transitions: – Rectangular channel with a hump and with a change in width.

Gradually varied flow:-Types of non uniform flow, Gradually Varied Flow theory for rectangular and trapezoidal prismatic channels, differential equation of GVF and its alternate forms, different types of GVF profiles and their characteristics and examples of their occurrence, control sections.

Computation of GVF profiles by Direct step method, only mention of other methods.

Unit-III **(7 Hours, 16 Marks)**

Rapidly Varied Flow: - Introduction, comparison of GVF and RVF, RVF due to hydraulic jump in horizontal, frictionless, rectangular channel, specific force, conjugate depths and energy loss in hydraulic jump, classification and uses, field examples of occurrence of hydraulic jump with GVF profiles and their analysis.

Unsteady flow in open channel: - Surges and waves in open rectangular channels – simple cases of positive surges neglecting friction.

Unit-IV **(07 Hours, 16 Marks)**

1) Pipe flow: - Three reservoir problem, pipe network. Practical design methods of rising mains and gravity mains using nomograms/ charts, economical diameter of rising main.

Unit-V **(8 Lectures, 16 Marks)**

Unsteady flow in conduits: - Mention of types of unsteady flows, establishment of flow, water hammer, celerity of pressure wave thought rigid and elastic pipes (no derivation of the equations), sudden and gradual and partial opening and closing of valves, details of pressure cycles (no derivation of the equation for water hammer pressure rise).

Surge tanks: - Necessity, location, function, types, analysis of simple cylindrical surge tank considering frictional effects.

Recommended Books:

1. Dr. K. Subramanya, “Flow in Open Channels”, Tata McGraw-Hill Education Pvt., Ltd., New Delhi, 3rd Edition-2012.
2. Streeter V.L. & Wylie E.B., “Fluid Mechanics”, Tata McGraw-Hill Education Pvt., Ltd., New Delhi, 6th reprint - 2012.
3. Dr. A. K. Jain, “Fluid Mechanics, Khanna Publishers”, Delhi, Edition – 2011.
4. Dr. P.N.Modi , “Dr. S.M. Seth, Hydraulic and Fluid Mechanics”, Standard Publications, Delhi, Edition – 2011.
5. Dr. K. Subramanya, “FM & HM-Problems & Solutions”, Tata McGraw-Hill Education Pvt. Ltd. New Delhi, 6th reprint-2013.
6. Dandekar M. M. and K.N. Sharma, “Water power Engineering”, Vikas Publishing House Privet Limited, Delhi.
7. Chow Ven Tee, “Open Channel Hydraulics”, Tata McGraw Hill Publishing Company Limited, New Delhi.

Geotechnical Engineering-II

Short Title: GTE-II

Course description:

In this course students are guided to apply the theory learnt in Geotechnical Engineering-I to the practical applications. They are introduced to the topics of bearing capacity of shallow foundations, deep foundations, etc. They are required to determine the relevant parameters necessary for prediction of bearing capacity, foundation design, design of pile foundations etc

	Hours/Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	13	39	3
Tutorial	--	--	--	

General Objectives:

1. To describe the methods of soil investigation.
2. Estimation of bearing capacity of shallow foundations by various theories.
3. Understand the need for pile foundations and determine their load carrying capacity.
4. To illustrate Deep foundations and machine foundations

Learning Outcomes: Upon successful completion of the course the student will be able to,

1. Decide type of soil investigation methods needed before commencement of the construction.
2. Estimate bearing capacity of soil.
3. Predict soil behaviour under the application of loads and come up with appropriate solutions to foundation design queries.

Course Content

Teaching Scheme:
Lectures: 3Hours/week
Practicals: 2 Hours/week

Examination Scheme:
End Semester Examination(ESE): 80 Marks
Paper Duration(ESE): 3 Hours
Internal Sessional Examination(ISE): 20 Marks

UNIT-I **(10 Hours 16 marks)**

Soil Exploration, Sampling and Testing: Subsurface Exploration Trial Pits, Shafts and Boring, Geophysical Tests, Wash Boring, Representative and Undisturbed Samples, Bore Hole Sampling, Laboratory Evaluation of Foundation Parameters, Field Testing, Penetration Tests, Plate Load Test in Detail with Reference to IS:1888 and Its Applications and Estimation of Settlements, Bore Hole Tests.

Bearing Capacity: Definitions of Ultimate Bearing Capacity, Gross, Net and Safe Pressures, Allowable Bearing Pressure, Load Settlement Curve, Terzaghi's Bearing Capacity Analysis, Bearing Capacity Equations for Square and Circular Footings, Factors Influencing Bearing Capacity, Performance of Footings in Different Soils, Vesic's Chart, Local and Ganeral Shear, Effects of Water Table and Depth, Bearing Capacity of Layered Soils.

UNIT-II **(7 Hours 16 marks)**

Elastic settlement: Elastic Settlement, Elastic Stresses and Strains, Contact Pressure, Pressure Bulb, Empirical Relation for Settlement of Bases, Total and Differential Settlement, Tolerable Settlement, I.S. Criteria, Effect of Lowering Water Table.

UNIT-III **(7 Hours 16 marks)**

Shallow Foundations: Spread Footings, Minimum Depth, Plain and RCC Footings, Allowable Soil Pressure, Use of SPT Blow Count, I.S. Charts, Wall Footings, Column Footings, Combined Footings, Raft Foundations, Floating Foundations, Grillage Foundations. (Only Derivations, No Numerical)

UNIT-IV **(8 Hours 16 marks)**

Pile Foundation: Introduction to Pile Foundation, Necessity of Pile Foundation, Classification of Piles, Construction Methods of Bored Piles, Concrete Bored Piles, Driven Cast in-Situ Piles, Pile Capacity Based on Static Analysis, Piles in Sand, Piles in Clay, Dynamic Methods and Their Limitations, In-Situ Penetration Tests and Pile Load Test as per IS:2911 Specifications, Negative Skin Friction, Pile Groups, Ultimate Load Capacity of Groups, Settlement of Pile Groups in Sand and in Clays as Per IS: 2911 and Critical Depth Method.

UNIT-V **(7 Hours 16 marks)**

Piers and Caissions: Hand Excavated and Drilled Piers, Method of Installation, Use of Drilling Mud, Caissions and Foundation Walls, Open, Box and Pneumatic Caissons, Sinking Method, Sand Island Method, Caisson Disease, Capacity and Settlement of Piers and Caissons, Well Foundation. Sheet Piles and Cofferdams, Temporary Supports and Braced Sheeting for Excavations, Pressure Distribution Cofferdams and Cellular, Cantilever and Anchored Sheet Piles.

Machine Foundation: Mechanical Vibrations, Single Degree Freedom Systems, Free and Forced Vibrations, Damped Systems, Natural Frequency, Resonance Magnification, Vibration Parameters , Vibration Test, Dynamic Modules ,Coefficient of Elastic Uniform Compression, Block Foundation Design Balken Method, Isolation And Control of Vibration Screen Barriers.(No Numerical and Derivations.)

Recommended Books:

1. Punmia B. C. “Soil mechanics and foundation engineering ” ,Laxmi Publications Pvt. Ltd., New Delhi, Latest edition.
2. Kasmalkar B. J. “Geotechnical Engineering”, Pune Vidyarthi Griha Prakashana, Sadashiv Peth Pune-30, Latest edition.
3. V.N.S.Murthy “Soil mechanics and foundation engineering”,Vol.1, Saikrupa Technical Consultants, Bangalore, Latest edition.
4. J.E.Bowles, “Foundation analysis and design”, McGraw Hill International ed. New York.
5. Wayne C. Teng, “Foundation Design” Prentice Hall of India, New Delhi.
6. K.R. Arora, “Soil Mechanics and Foundation Engineering” Standard Publishers Distributors.
7. Shashi K. Gulhati and Manoj Datta, “Geotechnical Engineering” Tata McGraw Hill Publication, Latest edition.
8. T.W. Lambe, “Soil Testing for Engineers”, John Wiley Publication.
9. Gopal Ranjan, Rao, “ Basic and Applied Soil Mechanics”, New age publication.

Estimating and Costing Lab

ICA (Term Work): 25 Marks

ESE (Oral): 25 Marks

Course Description:

This course introduces the students about concept of Estimations of Quantities of work, Cost estimation of work using DSR, Approximate cost of work to be executed, specifications of work.

	Hours/Week	No. of Weeks	Total Hours	Semester Credits
Lab hours	02	13	26	1

General Objectives:

In this laboratory work students will be introduced to Mode of measurements of items, DSR, determination of various quantities of executed work, Preparation of approximate estimates, rate analysis of items, bar bending scheduling in RCC structures. Use of software for preparation of Estimate.

Learning outcomes:

Upon successful completion of course the student will be able to

1. Understand units and modes of measurements of various items of work.
2. Know the method of preparation of approximate estimates of various civil engineering works.
3. Apply knowledge of preparation of check list of items of construction, rate analysis for preparation of detailed estimate of various civil engineering works.
4. Make use of DSR for Estimation, IS 1200 for measurement & can aware the methods of estimation in government organization.
5. Understand the preparation of bill of quantities by taking measurements of completed item of work and rate of the item.
6. Use computer software's to prepare estimate of works.

Lab course content:

All given Practical's are compulsory

1) Units of Measurements of Various Items of Civil Engineering Works / Study of DSR, Study and Use of Check List of PWD for Estimating of Various Building Works.
2) Approximate Estimate of
   i) Residential Building. ii) Public Building.
   iii) Elevated Service Reservoir. iv) Road and Bridges.
3) Prepare Check List of Items, Detailed Estimate of A Single Storey (Up To 2 BHK) Load Bearing Structure by Using Current DSR.

4) Prepare Check List of Items, Detailed Estimate of A Framed Residential Double Storey Structure by Using Current DSR and Estimate of Detailed Quantities of Steel Reinforcement and Prepare Bar Bending Schedule.
5) Detailed Estimate of Any Two of Following
   i) Compound Wall. ii) Septic Tank. iii) Earth Work in Road / Cannel.
6) Rate Analysis of Any Three Items.
7) Site Visit (Attached Estimate and Photographs) / Study Standard Estimate of PWD or Any Civil Organization

Note: Any One of the above Lab Course Content Should be Done Using any Estimating And Costing Software/ Prepare Excel Spread Sheet.

Guidelines for ICA:

ICA shall be based on continuous evaluation of student's performance throughout the semester and term work prepared by the students in the form of file.

Guidelines for ESE:

ESE shall be based on term work prepared by students & Evaluation will be based on performance during oral examination.

Recommended Books:

1. B. N. Dutta, "Estimating and costing in civil engineering theory and Practice" , S. Dutta & company, Lucknow.
2. M. Chakraborty, "Estimating, Costing Specifications & valuation in civil Engineering", published by M. Chakraborti , Calcutta.
3. Rangawala, "Estimating and Costing", Charotar Publishing House, Anand.
4. B. S. Patil, "Civil Engineering Contracts & Estimates", Orient Longman Ltd, Mumbai.
5. G. S. Biradi, "Estimating and Costing", Dhanpat Rai & Sons.

Geotechnical Engineering-II

ICA (Term Work): 25 Marks

ESE (Oral): 25 Marks

Course Description:

This course deals with learning of the practical applications through assignment work such as field investigations, bearing capacity of shallow foundations, pile foundations, etc. They are required to determine the relevant parameters necessary for applications such as prediction of bearing capacity, foundation design, design of pile foundations etc.

	Hours/Week	No. of Weeks	Total Hours	Semester Credits
Lab hours	02	13	26	1

General Objectives:

- To apply the methods for soil investigation for field conditions.
- To estimate bearing capacity of shallow foundations by various theories.
- To assess the bearing capacity of pile foundation.

Course Outcome:

After successful completion of the course the student will be able to,

- Implement the design philosophies in foundation design.
- Prepare soil investigation reports.
- Design foundation for different conditions of bearing capacity and other design parameters.
- Design pile foundations.

Lab Course Content:

A) Laboratory work should consist of assignments based any five of the following;

1. Preparation of Soil investigation report based on given data.
2. Problems on Plate Load Test, Standard Penetration Test and corrections.
3. Problems on bearing capacity calculations for different conditions.
4. Problems on Settlement analysis.
5. Problems on Design of pile foundations.
6. Design considerations of caissons and well foundation.
7. Design of under reamed pile.

B) Demonstration of any one of following tests;

1. Plate load test.
2. Standard penetration test.
3. Swelling pressure test.

Guidelines for ICA:

ICA shall be based on continuous evaluation of students performance throughout the semester and term work prepared by the students in the form of Journal.

Guidelines for ESE:

ESE shall be based on term work prepared by students & Evaluation will be based on performance during oral examination.

Recommended Books:

1. Punmia B. C. “Soil mechanics and foundation engineering ”,Laxmi Publications Pvt. Ltd., New Delhi, Latest edition.
2. Kasmalkar B. J. “Geotechnical Engineering”, Pune Vidyarthi Griha Prakashana, Sadashiv Peth Pune-30, Latest edition.
3. V.N.S.Murthy, “Soil mechanics and foundation engineering”,Vol.1, Saikrupa Technical Consultants, Bangalore, Latest edition.
4. J.E.Bowles, “Foundation analysis and design”, McGraw Hill International ed. New York.
5. Wayne C. Teng, “Foundation Design” Prentice Hall of India, New Delhi
6. K.R. Arora, “Soil Mechanics and Foundation Engineering” Standard Publishers Distributors.
7. Shashi K. Gulhati and Manoj Datta, “Geotechnical Engineering” Tata McGraw Hill Publication, Latest edition.
8. T.W. Lambe, “Soil Testing for Engineers”, John Wiley Publication.
9. Gopal Ranjan, Rao, “ Basic and Applied Soil Mechanics”, New age publication.

Numerical Methods in Civil Engineering Lab

Elective I

ICA (Term Work): 25 Marks

ESE (Oral): 25 Marks

Course Description:

In this Laboratory course emphasis is given to apply the knowledge of these methods to solve practical problems and develop numerical skills required in Civil Engineering .

	Hours/Week	No. of Weeks	Total Hours	Semester Credits
Lab hours	02	13	26	1

General Objectives:

The emphasis will be on understanding the concepts of the numerical methods and on applying these concepts for solving various problems.

To discuss and solve problems on methods covered in syllabus and develop programs for the same.

Course Outcomes:

After successful completion of the course, Students will be able to

- Solve problems of various numerical methods and develop the programmes for the same.
- Solve algebraic or transcendental equation
- Solve linear systems of equations
- Approximate a function using an appropriate numerical method
- Solve a differential equation using an appropriate numerical method
- Evaluate a derivative at a value using an appropriate numerical method.
- Calculate a definite integral using an appropriate numerical method

Lab Course Content:-

A) Computer Programs Based on Following Numerical Methods – (any five)

1. Gaussian Elimination Method
2. Gauss Jordon Method
3. Method of Bisection
4. Method of false position
5. Newton Raphson Method
6. Method of Simple Iteration
7. Method of Least Square

8. Newton Interpolation
9. Lagrange Interpolation
10. Euler's Method
11. Modified Euler's Method
12. Runge Kutta Method

B) Numerical Assignment Based on Following Numerical Methods – (Minimum three)

1. LPP – Simplex Method
2. Curve Fitting
3. Boundary Value Problem
4. Simpson's One third
5. Simpson's 3/8 rule
6. Lagrange Formula
7. Gaussian Quadrature

Guidelines for ICA:

ICA shall be based on continuous evaluation of students performance throughout the semester and term work prepared by the students in the form of journal.

Guidelines for ESE:

ESE shall be based on term work prepared by students & Evaluation will be based on performance during oral examination.

References Books:

1.Steven C Chapra & Raymond P. Canale, "Numerical Methods for Engineers", Tata Mc-Graw Hill Company Limited, New Delhi, 2002
2. Schilling & Harries, "Applied Numerical Methods for Engineers", THOMSON, Brooks/Cole, Newyork, 2000
3. S. Rajasekaran, "Numerical Methods in Science & Engineering", A.H.Wheeler & Company Private Limited, 2000
4. Sharma J.K., "Operation Research", MACMILLAN India Limited, 2003
5. Jain, Iyenger & Jain, "Numerical Methods", New Age Publishing Company, New Delhi, 2004
6. Sastry S.S., "Introductory Methods of Numerical Analysis", Prentice Hall (India) Limited, New Delhi, 2000
7. Kanti Swaroop & P.K.Gupta, "Operation Research", Sultan Chand & Sons, New Delhi, 1998
8. S.S.Rao, "Optimization Theory and Application", Wiley Eastern Limited, 1999

Sustainable Building Technology

Elective I

ICA (Term Work): 25 Marks

ESE (Oral): 25 Marks

Course Description:-

This course deals with getting knowledge of different concepts of Sustainable Building Technology through assignment work in lab on topics such as Green Building Assessment and the LEED rating system Lighting, Ventilation and Energy conservation. use of local building materials, Cost Effective Techniques for Sustainable and Water Management, ,

	Hours /weeks	Nos. of weeks	Total Hours	Semester Credit
Lab hours	2	13	26	1

General Objectives:

- Describe sustainable building design principles and building practices.
- To be familiar with various techniques used in sustainable buildings and building materials
- To focus on water management

Learning outcomes:

- Upon completion of this course, the candidate will be able to:
- Identify the key components of the LEED® Rating System
- Describe key green building concepts
- Know design principles and techniques for sustainable buildings
- Use Sustainable Building Materials and assess their impact
- Know various water management systems.

Lab Course Content:
It shall consist of Assignments based on theory course work of each unit.

Labwork includes Any six assignements from the list given below

1. Important considerations for the design of a sustainable buildings. Green Building Assessment, Current version of the LEED rating system.
2. The design of a sustainable building, Lighting Ventilation - natural ventilation; Indoor air quality; Passive and Active systems for energy production
3. Sustainable Building Materials from Agricultural waste**:** Rice husk, Coconut wastage, Banana leaves.

4. Sustainable Building Materials from Industrial waste**:** Red mud, Blast furnaces slag, Fly Ash.
5. Cost Effective Techniques for Sustainable Building: Stabilized Mud blocks, Stone masonry blocks, Solid and Hollow concrete blocks,
6. Cost Effective Techniques for Sustainable Building Ferro-Concrete, Properties and Uses, Practical aspects.
7. Alternative Roofing Systems**:** Concepts in Roofing alternatives, Filler slab roofs, Composite Slab panel roofs, hollow block roofs, Masonry Domes.
8. Waste water Management, Recycling, waste water treatment processes
9. Rain water harvesting and conservation
10. Lightening in building, Fire protection of building, Thermal environment inside the building, systems of air conditioning
11. Noise pollution: Sources and control measures Noise pollution-sources and control measures

Guidelines for ICA:

ICA shall be based on continuous
evaluation of student's performance throughout the semester.

Guidelines for ESE:

In ESE the student may be asked to answer questions based on ICA. Evaluation will be base d on Performance in oral examination.

Reference Books:

1. K.S.Jagadish, B.V.V.Reddy ,"Alternative Building Materials and Technologies", New Age International Publishers
2. "Sustainable building design Manual" by Energy research institute delhi.
3. Gevorkian ,"Green Buildings" Mc Graw hill.
4. "Fibre reinforced Cement Composites", P. N. Balaguru and S.P. Shah, McGraw Hill,
5. The engineering guide to LEED- new construction-sustainable constuction for engineers haselbach.
6. Fibre cements and Fibre Concretes", D. J.Hannant, John Wiley and Sons.
7. Properties of Concrete", A.M.Neville, ELBS, Longman.
8. Miller G. T Jr; Living in the environment; Cengage Publisher.
9. Cunningham W; Principles of Environmental Science: TMH
10. Harris CE, Prichard MS, Rabins MJ, Engineering Ethics; Cengage Pub.
11. Martin; Ethics in Engineering; TMH.
12. RanaSVS;Essentials of ecology and environment; PHI Pub.
13. Gerard Kiely, Environmental Engineering; TMH
14. Khan BH; Non Conventional energy resources; TMH Pub.

Watershed Management

Elective-I

ICA (Term Work): 25 Marks

ESE (Oral): 25 Marks

Course Description:

In this laboratory course emphasis is given on gaining the practical oriented knowledge related to watershed management and their applications in the field.

Prerequisite courses: Engineering Geology, Groundwater, Irrigation.

	Hours /weeks	Nos. of weeks	Total Hours	Semester Credit
Lab hours	2	13	26	1

General Objective:

In this laboratory work student will solve the problems on rain gauges, groundwater contouring.

Learning Outcomes:

- Upon successful completion of this course the student will be able to :
- Calculate optimum no. of rain gauge stations
- Prepare details of ground water contouring.
- Calculate drainage density and drainage pattern, drainage frequency.
- Estimate benefit cost analysis
- To demarcate watershed area..

Lab Course Content

Following experiments/ assignments are to be performed .Term works shall consist of journal giving details of the experiments/ assignments performed.

[Minimum six practical / Assignments shall be performed]

1. Mapping and demarcation of watershed.
2. Areal Precipitation – Thiessen Polygon, Isohyetal method. Analysis and interpretation of rainfall data.
3. Water balance estimation.
4. Estimation of Runoff and stream flow. Flow duration curve, return period. Analysis and interpretation of stream flow data.
5. Groundwater contouring and interpretation regarding movement and flow direction.

6. Land capability classification.
7. Soil loss estimation.
8. Visit to a Watershed and submission of report.

Guide lines for ICA

ICA shall be based on continuous evaluation of student performance throughout semester and practical /assignments submitted by the student in the form of journal.

Guide lines for ESE

ESE will be based on laboratory journal submitted by the student. In ESE the student may asked to answer questions based on the experiments/ assignments.

Evaluation will be based on performance in oral examination.

Recommended Books:

1.Murthy, J.V.S. (1994), "Watershed Management in India", Wiley Eastern Ltd., New Delhi.
2.Paranjape, S. and Others. (1998), "Watershed – based Development", Bharat Gyan Vigyan Samithi, New Delhi.
3.Mutreja, K.N. (1990) ,"Applied Hydrology", Tata McGraw-Hill Pub.Co. Ltd. New Delhi.
4.Sinha R.J. (2000), "Water Planning and Management", Yash Publishing House, Bikaner.
5.C.J. Hoan , "Hydrology & small Watersheds".
6. D.M. Michal, "Hydrology" .

Open Channel and Conduit Flow

(Elective-I)

ICA (Term Work): 25 Marks

ESE (Oral): 25 Marks

Course Description:

The lab work deals with the applications of Fluid mechanics such as flow through open channels and conduit flow.

	Hours /weeks	Nos. of weeks	Total Hours	Semester Credit
Lab hours	2	13	26	1

General Objectives:

- To learn uniform and critical flow in trapezoidal and circular channels and transitions in rectangular channel and their applications.
- To study Gradually Varied Flow in open channel and its computations.
- To analyze hydraulic jump & surge in open channel.
- Introduction to pipe network & design of pipes including rising main and gravity main.
- To understand unsteady flow in pipes including water hammer and design of surge tank.

Course Outcomes:

Upon successful completion of this course the student will be able to,

- Evaluate normal and critical depth in trapezoidal and circular channel.
- Analyze transitions in rectangular channel with a hump and change in width.
- Compute GVF profiles in trapezoidal channel by direct step method.
- Assess and compute hydraulic jump in open channels.
- Discuss unsteady flow in open channel and evaluate surges in rectangular channel.
- Discuss practical methods of design of rising and gravity mains.
- Evaluate economical diameter of rising main.
- Identify unsteady flow in pipes and analyze establishment of flow and water hammer phenomenon.
- Explain surge tanks and design of simple cylindrical surge tank.

Lab Course Content

Following assignments are to be performed. Term works shall consist of journal giving details of the assignments performed. (Any Six)

1. Calculation of normal and critical depths in trapezoidal / circular channel using graphs/ tables.

2. Example on transition in horizontal, rectangular channel.

3. Computation of G.V.F. profile in trapezoidal channel by Direct step method.

4. Calculation of hydraulic jump in horizontal, rectangular channel.

5. Calculation of surges in horizontal, rectangular channel.

6. Design of gravity/rising main (Dead end system in case of gravity mains).

7. Calculation of water hammer pressures.

8. Design of simple cylindrical surge tank.

Guide lines for ICA

ICA shall be based on continuous evaluation of student performance throughout semester and practical /assignments submitted by the student in the form of journal.

Guide lines for ESE

ESE will be based on laboratory journal submitted by the student. In ESE the student may asked to answer questions based on the experiments/ assignments.

Evaluation will be based on performance in oral examination.

Recommended Books:

1. Dr. K. Subramanya, "Flow in Open Channels", Tata McGraw-Hill Education Pvt., Ltd., New Delhi, 3rd Edition-2012.
2. Streeter V.L. & Wylie E.B., "Fluid Mechanics", Tata McGraw-Hill Education Pvt., Ltd., New Delhi, 6th reprint - 2012.
3. Dr. A. K. Jain, "Fluid Mechanics, Khanna Publishers", Delhi, Edition – 2011.
4. Dr. P.N.Modi , "Dr. S.M. Seth, Hydraulic and Fluid Mechanics", Standard Publications, Delhi, Edition – 2011.
5. Dr. K. Subramanya, "FM & HM-Problems & Solutions", Tata McGraw-Hill Education Pvt. Ltd. New Delhi, 6th reprint-2013.
6. Dandekar M. M. and K.N. Sharma, "Water power Engineering", Vikas Publishing House Privet Limited, Delhi.
7. Chow Ven Tee, "Open Channel Hydraulics", Tata McGraw Hill Publishing Company Limited, New Delhi.

Project-I

Project-I **P-I**
Course Title Short Title Course
Code
Course Description:
The course explores the knowledge of design, experiment and analysis of data. The course develops ability to work on multidisciplinary teams, Identify, formulate, and solve engineering problems in view of economic, environmental and societal context.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	15	30	2

COURSE CONTENT

Project-I
Semester-VII

Lab:2 Hrs/week **Examination**
Scheme

Total Semester Credits:
02
Internal Continuous Assessment (ICA): 25
Marks
End Semester Examination(ESE)-Oral:25
Marks

Total:50Marks

1. It is expected that the broad area of Project-I shall be finalized by the student in the beginning of the VII semester / extension of Minor project undertaken may be Project-I.
2. A group of Minimum 3 and Maximum 5 students shall be allotted for Project-I and same project group for Project-II.
3. Exhaustive survey of literature based on a clear definition of the scope and focus of the topic should be carried out by the students. The **Synopsis/Abstract** on the selected topic, after detail literature survey should be submitted to the Project coordinator appointed by Head of the department.
4. Project-I may involve literature survey, problem identification, work methodology preparing specification and material procurement, collection of data , conduction of experiments and analysis. The project work shall involve

sufficient work so that students get acquainted with different aspects of fabrication, design or analysis.

5. Approximately more than 50% work should be completed by the end of VII semester.
6. Each student group is required to maintain log book for documenting various activities of Project-I and submit group project report in the form of thermal bound at the end of semester –VII. Submit the progress report in following format:
   a. *Title*
   b. *Abstract*
   c. *Introduction*
   d. *Problem identification and project objectives*
   e. *Literature survey*
   f. *Case study/Analysis/Design Methodology*
   g. *Work to be completed (Progress status)*
   h. *Expected result and conclusion*
   i. *References.*

7. Evaluation Committee comprising of the Guide, Project Coordinator and Expert appointed by the Head of the department will award the marks based on the work completed by the end of semester and the presentation based on the project work.

Guide lines for ICA : The Internal Continuous Assessment shall be based on the active participation of the students in the Project work and knowledge / skill acquired. Assessment of the project-I for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given in **Table-A.**

Guide lines for ESE: The End Semester Examination for Project shall consist of demonstration if any, presentation and oral examinations based on the project report**.**

Assessment of Project-I

Name of the Project: ______________________________

Name of the Guide: ______________________________

Table-A

SN	Name of Student	Problem Identification and project objectives	Literature Survey	Project Methodology/ Design/PCB/ hardware/ simulation/ programming	Progress Status	Present ation	Total
		5	5	5	5	5	25

Seminar-II

COURSE CONTENT

Seminar-II **S-II**
Course Title Short Title Course
Code

Course Description: The course explores the knowledge of presentation and effective communication. The course develops ability to work on multidisciplinary teams, Identify, formulate, and solve engineering problems in view of economic, environmental and societal context.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	15	30	2

COURSE CONTENT

Seminar-II
Semester-VII

Examination
Scheme
Practical : 2 Hrs/Week **Total Semester Credits: 02**
Internal Continuous Assessment (ICA): 25
Marks

1. Each Student shall select a topic for seminar which is not covered in curriculum. Seminar topic should not be repeated and registration of the same shall be done on first come first serve basis.
2. Topic of Seminar shall be registered within a three weeks from commencement of VII Semester and shall be approved by the committee.
3. The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of Seminar-II. Seminar shall be related state of the art topic of his choice approved by the committee.
4. Each student should deliver a seminar in scheduled period (Specified in time table or time framed by department) and submit the seminar report (paper bound copy/Thermal bound)in following format:
    a. *Title*
    b. *Abstract*

c. *Introduction*
d. *Literature survey*
e. *Concept*
f. *Functional and Technical Details*
g. *Applications*
h. Comparison with similar topics / methods
i. *Future scope*
j. *References*

ASSESSMENT OF SEMINAR-II

Guide lines for ICA: ICA shall be based on topic selection , presentation and Seminar-II report submitted by the student in the form of thermal bound. Assessment of the Seminar-II for award of ICA marks shall be done jointly by the guide and a departmental committee, as per the guidelines given in **Table- B**

Name of Guide: ________________________________

Table-B

SN	Name of Student	Seminar Topic	Topic Selection	Literature survey	Report writing	Depth of under-standing	Presentation	Total
			5	**5**	**5**	**5**	**5**	**25**

Industrial Visit

Industrial Visit **IV**
Course Title Short Title Course
Code

Course Description: The course explores the knowledge industry organization, new trends in manufacturing, maintenance and safety. The industrial visit provide the practical visualization of theoretical study of various engineering subject.

COURSE CONTENT

Semester-VII **Examination**
Scheme
Total Semester Credits:
01
Internal Continuous Assessment (ICA): 25
Marks

1. Industry visits to minimum two industries shall be carried out by each student preferably or college shall arrange the industrial visit during the vacation period otherwise during the regular VII semester.
2. The student should obtain appropriate certificates of visit from the concerned organizations just after the visits.
3. Every Student should submit Industrial Visit report individually at the end of Semester-VII(First Term of Final Year)
4. The report(Thermal Bound) should contain information about the following points:
   a. *The organization - activities of organization and administrative setup technical personnel and their main duties.*
   b. *The project / industry brief description with sketches and salient technical information.*
   c. *The work / processes observed with specification of materials, products, equipments etc. and role of engineers in that organization.*
   d. *Suggestions (if any) for improvement in the working of those organizations.*
5. The evaluation of the report of technical visits will be made by panel of three teachers appointed by Head of the department based on following points:

Guide lines for ICA : ICA shall be based on knowledge gain by student and Industrial Visit Report submitted by the student in the form of Thermal bound. Assessment of the Industrial Visit for award of ICA marks shall be done jointly by industrial visit coordinators departmental committee based on viva -voce as per the guidelines given in **Table- C**

Table-C

SN	Name of Student	Name of Industry	Report writing	Depth of Under-standing	Total
			15	**10**	**25**

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Fourth Year Engineering

(Civil Engineering)

Faculty of Engineering and Technology

Course Outline

Term-VIII

w.e.f. A.Y. 2015-16

BE (Civil) : Semester – VIII

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Water Resources Engineering II	D	3	---	---	3	2	80	---	--	100	3
Environmental Engineering II	D	3	---	---	3	2	80	---	--	100	3
Elective - II	E	3	---	---	3	2	80	---	--	100	3
Elective - III	E	3	---	---	3	2	80	---	--	100	3
Water Resources Engineering II lab	D	--	---	2	2	---	---	2	2	50	1
Environmental Engineering II lab	D	--	---	2	2	---	---	2	25(PR)	50	1
LAB# Elective II lab	E	--	---	2	2	---	---	2	2	50	1
Industrial Lecture*	C	--	---	1*	1	---	---	5	--	50	2
Project - II	D	--	---	4	4	---	---	7	7	150	6
Total		12	---	11	23	80	320	200	150	750	23

ISE: Internal Sessional Examination ESE: End Semester Examination ICA: Internal Continuous Assessment

#Lab for Elective-II

* Minimum 6 lectures to be delivered by experts from the industry in alternate weeks. Next week group discussion on the lecture delivered.

Elective II
1. Advanced Structural Design
2. Earthquake Engineering
3. Systems Approach in Civil Engineering
4. Construction Safety & Disaster Management

Elective III
1. Water Power Engineering
2. Industrial Pollution & Control
3. Architecture & Town Planning
4. Retrofitting of Structures

Note 1: For branches like Chemical Engineering and Biotech Engineering, two laboratory hours can be merged to form a four hour slot. Note 2: Out of 3 practical ESE heads, at least 1 head should be practical. Note 3: Interdisciplinary Elective shall be offered by the department to the students of other department. Students from one department can not register for Interdisciplinary Elective of the same department. Note 4: At least 15 students should register for offering any elective.

Water Resources Engineering –II

Short Title: WRE-II
Course Description

In this course students are introduced with the topics such as basics of Gravity dams & Earth dams along with study of Spillways & Diversion Head works and irrigation canals.

	Hours/Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	13	39	3
Tutorial	--	--	--	

Course Objectives:

1. To introduce the students with the dams including gravity and earth dam, modes of failures and stability analysis of these dams.
2. To introduce the students with the diversion head-works and explain stability analysis of weirs on permeable foundations.
3. To explain the different spillways and design principles of ogee spillway. Also to provide students with details of energy dissipation below spillway.
4. To know unlined irrigation canals and their design principles.

Course Outcomes: Upon successful completion of this course the student will be able to

1. Identify types of dams and their selection and also selection of site for dam.
2. Demonstrate diversion head works and its components.
3. Discuss causes of failures of weirs on permeable foundation and their remedies.
4. Analyze stability of weirs on permeable foundation using Khosla's theory.
5. Explain gravity dam and its cross section; compute the forces on gravity dam.
6. Compute various stresses developed in gravity dam.
7. Discuss causes of failures of gravity dam and analyze its stability.
8. Assess and compare elementary and practical profiles of a gravity dam.
9. Identify different spillways along with their suitabilities.
10. Explain design principles of Ogee spillway.
11. State different methods of energy dissipation below spillway.
12. Discuss various types of spillway gates.
13. Demonstrate earth dams and its components.
14. Discuss causes of failures of earth dams.
15. Explain control of seepage and drainage in earth dams.
16. Analyze stability of slopes of earth dams.
17. Discuss irrigation canals, its types and alignment.
18. Design cross section of unlined alluvial irrigation canal using Kennedy's and Lacey's theories using I. S. Code.
19. Discuss design procedure for L-section of irrigation canal as per I. S. Code.

Course Outline

Teaching Scheme:
Lectures: 3Hours/week
Practicals: 2 Hours/week

Examination Scheme:
End Semester Examination(ESE): 80 Marks
Paper Duration(ESE): 3 Hours
Internal Sessional Examination(ISE): 20 Marks

UNIT I **(08 Hours, 16 marks)**

Dams: - Introduction and scope of the subject, types of dams, reservoir storage zones, selection of site for dam, choice of a dam, economical height of dam.

Diversion head works :- Introduction, selection of site, types of weirs and barrages, layout of diversion headwork and its components and functions, causes of failures of weirs on permeable foundations and remedies, Hydraulic design of weir with respect to subsurface flow, safety against piping and uplift, Bligh‘s, Lane’ s and Khosla’s theories.

UNIT II **(09 Hours, 16 marks)**

Gravity dams: - Introduction, cross section, forces acting on dam, load combinations as specified by IS 6512-1984, stresses in dam (normal, principal and shear stresses), modes of failures, stability analysis and design of gravity dam, elementary and practical profile, low and high dam, materials of construction, control of cracking, galleries, Joints and keys.

UNIT III **(07 Hours, 16 marks)**

Earth dams :- Introduction, types, elements of earth dam, basic design considerations, causes of failures, piping and its prevention, control of seepage, drainage in earth dams, phreatic line – its uses and characteristics, equation, procedure of construction phreatic line for various cases, stability of upstream and downstream slopes of earth dam under various situations, introduction to rock-fill dam.

UNIT IV **(08 Hours, 16 marks)**

Introduction to arch dams, types and their suitability, optimum central angle for constant angle arch dam.

Spillways: - Introduction, spillway capacity, different types of spillways and their suitabilities, design principles of Ogee spillway, working of siphon spillway.

Energy dissipation below spillway, types of hydraulic jump, jump height curves and tail water rating curves, various types of energy dissipators: Indian Standard stilling basins and buckets.

Gates: - Uses, types of spillway crest gates.

UNIT V **(07 Hours, 16 marks)**

Canal irrigation: - Types of irrigation canals, canal alignment.

Design of cross section of stable unlined channels in alluvial soil by Kennedy’s and Lacey’s theories according to IS 7112 – 1973, merits and demerits of Kennedy’s and Lacey’s theories, Garret’s diagram.

Design procedure for L – section of an irrigation canal, balancing depth, losses in canals, schedule of area statistics and channel dimensions.

Imp. Note:- Following charts should be provided to students of B.E. (civil) during theory paper.

i) Dr. A.N. Khosla’s curves for design of weir on permeable foundation.

ii) Garret’s diagram for design of unlined alluvial canals.

Reference books:-

1. Modi P.N. “ Irrigation, Water Resources and Water Power Engineering”, Eight edition. Standard Book House, Delhi2012.
2. Garg S.K, “ Irrigation Engineering And Hydraulic Structures”. Khanna Publishers ,1998, Delhi.
3. Punmia B.C., Pande B.B., .Lal, “ Dams II: Irrigation and Water Power Engineering”. Laxmi Publications Pvt. Ltd., New Delhi1999..
4. Varshney R.S., Gupta S.C., Gupta R.L. “ Theory and Design of Irrigation Structures, Volume I and II”, Fourth edition. New Chand & Bros., Roork1979. i.
5. Bharat Singh “ Irrigation Engineering”.
6. Sharma R.K., “A Text Book of Hydrology & Water Resources”, Dhanpat Rai and Sons.
7. K.B.Khushlani “ Irrigation Engineering “.
8. Justin, Hinds “Irrigation Engineering and Practice “

Environmental Engineering II

Short Title: EE-II
Course description:

The course is designed to make aware the student about environmental hygiene and sanitation with specific reference to domestic wastewater and municipal solid waste. It also introduces the student with air pollution control technology. The course describes water pollution scenario, its causes, and sources. The course also describes parameters of water pollution, wastewater sampling methods, methods of examination of wastewater in laboratory and the consequences of wastewater in environment. The course includes the domestic wastewater management strategies including its removal from houses, transportation and treatment by physico-chemical and biological methods. The course covers conventional as well as advanced methods of wastewater treatment. It also covers the municipal solid waste generation rates, its methods of sampling, its bad effects, methods of transportation and final disposal. The elements of air pollution control technology are also included in the syllabus.

	Hours/Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	13	39	3
Tutorial	--	--	--	

General objectives: the principal objective of the course is to train a civil engineering student in domestic and municipal sanitation. Its objective is to appraise the student about importance of municipal wastewater and solid waste management. It also enables the student to use technological tools to treat, reuse or dispose-off safely the municipal liquid and solid waste. The course also introduces the student with basics of air pollution control technology.

Learning outcomes: The major expected outcomes of the curse are listed as follows:

1. The student will learn about the sources and causes of water pollution.
2. The student will learn about the mechanism of water pollution.
3. The student will learn about the parameters of water pollution.
4. The student will learn the methods of wastewater sampling, and examination.
5. The student will learn the design and maintenance of house plumbing and sewerage facilities.
6. The student will learn the design and maintenance of physic-chemical and biological methods of wastewater treatment.
7. The student will learn the importance of municipal solid waste management.
8. The student will learn the technology of municipal solid waste management.
9. The student will learn the basics of air pollution.

Course Outline

Teaching Scheme:
Lectures: 3Hours/week
Practicals: 2 Hours/week

Examination Scheme:
End Semester Examination(ESE): 80 Marks
Paper Duration(ESE): 3 Hours
Internal Sessional Examination(ISE): 20 Marks

Unit I **(8 Hours, 16 Marks)**

Sampling of sewage-Grab sampling, composite sampling, domestic and industrial sewage sampling plans, sample preservation.

Microbial decomposition of organic matter, role of enzymes, acclimatization, classification of microorganisms, aerobic and anaerobic cycles.

Characteristics of sewage- parameters of characterization, dissolved oxygen and its significance, biochemical oxygen demand, first stage BOD satisfaction and nitrification process chemical oxygen demand, total solids, different types of solids in water, biodegradability, factors affecting biodegradability, MLSS and F/m ratio.

Reactor flow regime-Batch reactor, continuous flow reactor, plug flow reactor, completely mixed flow reactor, kinetics of microbial degradation in batch reactor.

Disposal of sewage- Pollution effects due to disposal of sewage on land, river, lake and sea. Oxygen sag curve, river re-aeration.

Unit II **(7 Hours, 16 Marks)**

Collection of sewage-House plumbing- elements, design.

Sewage pumping- difficulties in pumping, types of pumps used, their maintenance.

Conveyance of sewage- Quantity of domestic and storm sewage-assessment, sewer-terminologies, non-silting non-scouring velocity, coefficient of roughness, Manning’s formulation, Chezy’s formulation, design of circular sewer-combined and seperate, ogee shaped sewer material, sewer appurtenances, forces acting on sewers, laying of sewer, maintenance of sewer.

Unit III **(8 Hours, 16 Marks)**

Conventional sewage treatment processes- unit operations and processes, grit chamber, skimming tanks, primary sedimentation of sewage, coagulation of sewage, theory of biological treatment, suspended and attached growth system, aerobic and anaerobic treatment systems.

Activated sludge process-theory and detailed design, trickling filters- theory and detailed design, modifications in ASP, theory and design of aerated lagoons, anaerobic lagoons, rotating biological disk, anaerobic filters, UASB, fluidized bed reactor.

Unit IV **(8 Hours, 16 Marks)**

Oxidation pond- theory and design using BOD loading parameter, elevation and temperature correction, constructional features, no detailed design.

Sewage disposal in unsewered areas- septic tanks- theory and design. Low cost toilets for rural areas-theory and design.

Nitrogen removal- theory and technology. Non-biodegradable organics- sources, bad effects, present status, removal methods- introduction only, photo-catalysis-theory, reactor configurations, process variables, present day applications.

Sludge generation rates, sludge handling sludge disposal methods-introduction, sludge drying beds.

Anaerobic digestion-theory and design of digester

Unit V **(8 Hours, 16 Marks)**

Sources of solid waste. Municipal SW- bad effect, generation rates, effect of socio-economics on rate of generation, global and Indian scenario, storage- sizing of dust bin, IS specifications, multi-bin collection systems, collection, removal methods, transportation-assessment of vehicle requirement, concept of route optimization (no mathematical treatment), methods of disposal- land filling, composting, incineration, vermin-composting, hog feeding, sea disposal. Description of methods of disposal and their relative merits. Importance of Hygiene and sanitation, application to public places like colleges, parks, cinema halls, auditoriums, hospitals, offices etc.

Definition of air pollution, elements of air pollution, global air pollution scenario- global warming and its

implications, energy-environment-economics correlation, effects on human being, animals, plants and property. Introduction to Intergovernmental panel on climatic changes. No mathematical treatment.

Reference books:-

1. E W Steel and Terence J McGhee , " Water Supply and Sewerage", International Student Edition.
2. G S Birdie, "Water supply and sanitary engineering", Dhanpat Rai publishing
3. B C Punmia, Ashok Jain and Arun Kr Jain, "Wastewater engineering", Firewall Media publication.
4. M N Rao and S K S Rao, "Air pollution", TMH publications.
5. S K Garg, "Sewage Disposal and Air Pollution Engineering", Khanna Publishers, New Delhi.
6. Pevy, Rowe & Tchobanoglous, "Environmental Engineering", McGraw Hill International, New Delhi.

Advanced Structural Design

Elective-II

Short title- ASD
Course Description:-

This course deals with the design aspects of a few special structures with a view to simulation of realistic behaviour as closely as possible. The categories of structures which are going to be dealt with in this course are study of ductile detailing for reinforced concrete frame buildings, design of rectangular combined footing, flat slabs, cantilever retaining wall, water tanks, post tension girders etc.

	Hours/Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	13	39	3
Tutorial	--	--	--	

General objective:-

After successful completion of the course student will able to

1. Familiar with the principles of reinforced concrete and prestressed design.
2. Calculate the loads on structural components as per IS-code provisions.
3. Prepare, read and interpret structural drawings.
4. Understand codal methods to design and analyze heavy structures such as retaining wall, water tank, prestressed concrete girders etc.
5. Analyze, design and prepare detail drawings for flat slab, retaining wall, water tank and pre-stressed concrete girders.

Learning outcomes:-

Upon successful completion of this course the student will be able to

1. Design RCC structures such as retaining wall, combined footing, water tank, flat slab.
2. Understand principles of pre-stressing and design of post tension girder.
3. Incorporate IS-code provisions in design of structure.
4. Prepare detail drawings for the designed members of structure.

Course Outline

Teaching Scheme:
Lectures: 3Hours/week
Practicals: 2 Hours/week

Examination Scheme:
End Semester Examination(ESE): 80 Marks
Paper Duration(ESE): 4 Hours
Internal Sessional Examination(ISE): 20 Marks

UNIT I **(9 Hours, 20 marks)**

R.C. Structures

- Ductile detailing of RC members as per Is 13920.
- Design of rectangular combined footing.
- Design of interior panel of flat slabs.

UNIT II **(10 Hours, 20 marks)**

- Design of cantilever retaining wall.
- Design of circular water tanks resting on ground based on following conditions
  i. Flexible joint between walls and the base.
  ii. IS code method.

UNIT III **(10 Hours, 20 marks)**

Prestressed concrete structures

- Introduction:- Basic concept, materials, prestressing systems, stages of loading,stresses in tendons.
- Losses in pre-stresses :- Nature of losses, loss due to elastic shortening of concrete, shrinkage, creep, anchorage slip, successive pre-stressing of straight cables, relaxation of stress in steel friction in a curved cable anchorage.

UNIT IV **(10 Hours, 20 marks)**

- Transfer of pre-stress in pre-tensioned members, transmission length, end zone reinforcements. Anchorage Zone stresses in post –tensioned members – Guyan's method.
- Limit state design of pre-stressed concrete member's philosophy of design, various criteria for limit. States, design loads, strength and serviceability.
- Design of post tensioned flexural members – Rectangular and flanged sections, cable profile, Design of shear reinforcement, bond partial pre-stressing limit state method.

Reference Books:-

1. N. Krishnaraju, "Prestressed Concrete"

2. T. Y. Lin, “Design of prestressed concrete structure”.
3. S.R. Karve & V. L. Shah, “Limit State Analysis & Design of Reinforced Concrete”, Structures PublicatinsR.C.C. Structures.
4. Punmia, Jain & Jain, “Comprehensive R.C.C. Design”, Laxmi Publications.
5. S. K. Duggal, “Earthquake Resistant Design of Structures”, Oxford University Press.
6. N. C. Sinha & S. K. Roy, “Fundamentals of Reinforced Concrete”
7. S. Unnikrishna Pillai, Devdas Menon, “ Reinforced Concrete Design”, Tata McGraw-Hill Publication.
8. S. Ramamrutham, “Design of Reinforced Concrete Design”, Dhanpat Rai Publishing Company.
9. B. C. Punmia, “Reinforced Concrete Structures”, Laxmi Publication.

Reference IS Codes:-

10. IS 456-2000 Plain and Reinforced Concrete - Code of Practice.
11. IS 1343 (1980): Code of Practice for Pre-stressed Concrete.
12. IS 13920 (1993): Ductile detailing of reinforced concrete structures subjected to seismic forces.

Earthquake Engineering

Elective-II

Short Title: EQE

Course Description:

The course allows structural engineers to consolidate their knowledge on the effect of earthquake ground motions on civil engineering structures. The course will cover the analysis and the design of structures that are located in active seismic zones. The course will also introduce the use of supplemental damping and seismic isolation systems to raise the seismic performance of buildings and bridges

	Hours/Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	13	39	3

General objective:-

1. To know basic earthquake mechanisms, tectonics, types of ground motion, and propagation of ground motion.
2. To interpret earthquake ground motion data.
3. Seismic design of RC structure as per IS 1893:2002, IS13920 and 4326
4. Determine the base shear by equivalent static analysis method

Course outcomes:

The student will demonstrate the ability to:

1. Understand basic earthquake mechanisms, tectonics, types of ground motion, and propagation of ground motion.
2. Understand and interpret earthquake ground motion data.
3. Understand qualitative and quantitative representations of earthquake magnitude.

a. Determine the base shear by equivalent static analysis method based on the type of structural system, irregularity, location and occupancy.

Course Outline

Teaching Scheme:
Lectures: 3Hours/week
Practicals: 2 Hours/week

Examination Scheme:
End Semester Examination(ESE): 80 Marks
Paper Duration(ESE): 3 Hours
Internal Sessional Examination(ISE): 20 Marks

Unit I **(07Hrs, 16 Marks)**

Influence of geology on earthquake, causes of earthquake and their characteristics, Earthquake parameters, magnitudes, intensity, scales, seismic zoning of India, seismic coefficients for different zones, Natural disasters, mitigation and social aspects.

Unit II **(08 Hrs, 16 Marks)**

Theory of vibrations:

Vibrations - definition, causes, classifications. Single Degree of Freedom systems (SDOF) - free, forced, damped, un-damped vibrations. Introduction to Multi-degrees of Freedom systems (MDOF) - derivations of related equations and solutions to two degree and three degree of freedom systems.

Unit III **(08 Hrs, 16 Marks)**

Seismic design of RC structure as per IS 1893 and 4326, Seismic coefficient method. Basic requirement, estimation of story shear, effect of unsymmetrical geometry and masses, mass center and stiffness center, estimation of story shear and tensional moments for unsymmetrical buildings. IS code provision to response spectrum, Modal analysis for RCC frame, Design of multistoried building, concept of ductile detailing, IS 13920 provisions for RC frame.

Unit IV **(08 Hrs, 16 Marks)**

Type of forces generated due to earthquake, effects on different types of foundation, design of RCC isolated footing for earthquake loading, liquefaction, causes and its remedial measure.

Unit V **(08 Hrs, 16 Marks)**

Introduction of different control systems, Passive control: base isolation and active control: bracing system

Reference books:-

1. Duggal , “ Earthquake resistance design of structure”’ Oxford University Press.
2 . David J. Downik , “ Earthquake Resistant Design”, Jon Wiley and Sons Publication
3. Earthquake Tips NICEE, IIT, Kanpur

4. Jaikrishna and Chandarsekaran, “ Elements of Earthquake Engineering” .

5. Kramer S. L , “ Geotechnical Earthquake Engineering.”, Prentice Hall India Publication

6. Relevant Latest Revisions of IS codes.

7. Anil K. Chopra, "Dynamics of Structures: Theory and Applications to Earthquake Engineering", Pearson Education, 3'd Edition, 2007.

8. D.J. Dowrick, "Earthquake Resistant Design for Engineers", Wiley.

9. Vinod Hosur, "Earthquake Resistant Design of Building Structures", Wiley, 2013

System Approach in Civil Engineering

Elective-II

Short Title: SAC

Course Description:

Systems engineering deals with work-processes, optimization methods, and management tools in projects. Systems engineering ensures that all likely aspects of a project or system are considered, and integrated into a whole.

Aim is to develop capability in solving various civil engineering management Problems related to infrastructural projects. They should be able to analyze and come to appropriate solution.

	Hours/Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	13	39	3
Tutorial	--	--	--	

General Objective:

1. To Learn different types of optimisation techniques
2. To learn Linear and non linear Programming
3. To study dynamic Programming

Learning outcomes:-

At the end of course student will have following abilities,

1. Explain the basic concept of study of system approach in civil engineering.
2. Develop a mathematical model for a given problem to optimize it.
3. Decide for optimization and utilization of resources & apply system approach in civil engineering and in industrial operations.
4. Solve the real life problems which arise in industries like transportation , assignment , decision making,
5. Do Job sequencing using operation techniques.
6. Optimize the solution for different practical problems with available constraints.
7. Gain basic knowledge for engineering analysis software.

Course Outline

Teaching Scheme:
Lectures: 3Hours/week
Practicals: 2 Hours/week

Examination Scheme:
End Semester Examination(ESE): 80 Marks
Paper Duration(ESE): 3 Hours
Internal Sessional Examination(ISE): 20 Marks

UNIT I **(9 Hours, 16 marks)**

Introduction, System concepts, use of system approach , Optimization techniques and their applications in civil engineering , methods of analysis, mathematical representation, Various models, objective function, constraints.

Linear programming: Formulation of Linear optimization models for Civil engineering applications. The simplex method, special cases in simplex method, Method of Big M, duality, sensitivity analysis.

UNIT II **(7 Hours, 16 marks)**

Linear programming:

Distribution models: transportation and assignment problems and their Solutions

UNIT III **(8 Hours, 16 marks)**

Dynamic programming:

Dynamic programming , principle of optimality, recursive equation. Stochastic method, Queing theory simulation, sequencing, capitalization, annuity benefit cost.

UNIT IV **(8 Hours, 16 marks)**

Non linear programming:

Single variable unconstrained optimization – Local and global optima, unimodal function, Sequential search techniques.

Multivariable problems (unconstrained) Gradient techniques, steepest techniques, Newton's method.

Multivariable optimization with equality constraints- Lagrange’s multiplier techniques.

UNIT V **(7 Hours, 16 marks)**

Games theory , Replacement model

Reference books:-

1. S.S. Rao, “ Engg. Optimization Theory and Practice”, John Wiley and Sons
2. Thomas K Jewell,” A systems approach to civil engineering planning and design”,Harper and row.
3. Samual Labi ,” Introduction to civil engineering systems”, Wiley
4. Hamdy A. Taha, “System approach in civil engineering”, Prantice Hall.
5. Harvey M. “ Principle of system approach in civil engineering”
6. Shrivastava,Shenoy and Sharma,” Quantitative techniques for managerial
7. Decisions”,Wiley Eastern
8. Paul J. Ossenbruggen, “An Approach to Teaching Civil Engineering System”
9. N.D. Vohra “Quantitative Techniques in Management” , Mc Graw Hill \
10. Hira , Gupta ,”Operation Research “, S. Chand

Construction Safety & Disaster Management

Elective –II

Short Title: CS&DM
Course Description:

The subject deals with the principles of safety management in the construction industry which will enable the student to become familiar with modern and conventional techniques for construction safety. This subject also deals with the principles of disaster management

	Hours/Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	13	39	3
Tutorial	--	--	--	

General objective:

The general objective of course is to understand safety concepts in construction industry and analyze activities involved in using safety methods with respect to cost, engineering economics etc. Also it aims to explain different disaster management techniques used and public awareness related to disaster mitigation.

Learning outcomes:

Upon successful completion of these course the student will be able to :

1. Identify the construction safety management system.
2. Learn the measures to be taken for safety during construction.
3. Identify various types of disasters.
4. Learn the disaster management techniques and its analysis.
5. Learn effective implementation of safety management and public awareness regarding disaster management

Course Outline

Teaching Scheme:
Lectures: 3Hours/week
Practicals: 2 Hours/week

Examination Scheme:
End Semester Examination(ESE): 80 Marks
Paper Duration(ESE): 3 Hours
Internal Sessional Examination(ISE): 20 Marks

Unit – I **(08 hours 16 marks)**

Construction Safety Management – Role of various parties, duties and responsibilities of top management, site managers, supervisors etc. role of safety officers, responsibilities of general employees, safety committee, safety training, incentives and monitoring. Writing safety manuals, preparing safety checklists and inspection reports.

Unit – II **(08 hours 16 marks)**

Safety in construction operations – Safety in construction operations accidents on various construction sites such as buildings, dams, tunnels, bridges, roads, etc. First aid on site ,Prevention of accidents, Safety measures while using construction equipment e.g. vehicles, cranes, hoist and lifts etc. Safety of scaffolding and working platforms. Safety while using electrical appliances & Explosives.

Unit – III **(08 hours 16 marks)**

Natural Disasters & Manmade disasters

Natural Disasters : Natures and extent of disasters, natural calamities such as earthquake, floods, coasts hazards, landslides etc.

Manmade disasters: such as chemical and industrial hazards, nuclear hazards, fire hazards etc.

Unit – IV **(08 hours 16 marks)**

Disaster Management – Financing relief expenditure, legal aspects, rescue operations. Casualty management, risk management. Emergency Management Programme: Administrative setup and organization. Hazard analysis, training of personnel, information management, emergency facilities and equipment necessary.

Unit – V **(07 hours 16 marks)**

Public awareness & Management- creation, preparation and execution of the emergency management programme, role of safety officers ,awareness committee,

Reference Books:

1. Construction Safety Manual - Published by National Safety Commission of India.
2. Safety Management in Construction Industry – A manual for project manager (NICMAR Mumbai)
3. *Davies* V.S.Thomasin ,“K, Thomas Construction Safety Handbook” ,Telford, London.
4. Bureau of Indian Standards , “ IS for safety in Construction”.
5. Girimaldi and Simonds ,“ Safety management”,AITBS, New Delhi
6. Seetharaman ,“ Construction Engineering and Management”

7. K Nagarajan , “ Project Management”, New Age International Ltd.
8. Rajdeep Dasgupta, “ Disaster management & rehabilitation”, mittal Publication.
9. Dr. Kadambaui Sharma,Dr. Avinash Chiranjeev, “ Disaster management in India” Jnanda prakashan(P&D) New Delhi

Water Power Engineering

Elective –III

Short Title: WPE

	Hours/Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	13	39	3
Tutorial	--	--	--	

Course Description:

Hydropower engineering tries to tap vast amount of energy available in the flowing water on the earth's surface and convert it into electricity. The goal of this course is to become prepared for study and design of conventional and alternative power-generation plants

General objective:

To learn about:

1. Potential of hydropower that may be generated from a stream
2. Types of hydropower generation plants
3. layouts of hydropower plants
4. Analysis and preliminary design of the major systems of power plants.

Learning outcomes:

Upon successful completion of these course the student will be able to :

1. Know basics of hydropower plants and its types
2. Estimate water power potential
3. Understand layouts of hydropower plants
4. Be acquainted with various components of power plant and their working

Course Content

Teaching Scheme:
Lectures: 3Hours/week

Examination Scheme:
End Semester Examination(ESE): 80 Marks
Paper Duration(ESE): 3 Hours
Internal Sessional Examination(ISE): 20 Marks

Unit –I **(8 Lectures, 16 Marks)**

General:– Conventional and non- conventional sources of energy, status of electrical power in the World and India, advantages and disadvantages of hydro-electric power over other conventional sources, place of hydropower in the power system, transmission voltage.

Estimation of water power potential: – Mass curve, flow duration curve, firm power and secondary power, power duration curve and available power.

Power plant economics :– Types, connected load, maximum demand, load factor, load curve, base and peak load, plant capacity factor, plant use factor, diversity factor, load sharing between base load and peak load power stations, cost of electrical energy, energy rates (Tariff).

Unit- II **(8 Lectures, 16 Marks)**

Hydro electric power plants: – Classifications, run-of-river plant, valley dam plant, diversion canal plant, high head diversion plant – General arrangements & layouts of these four power plants, storage and pondage, pondage factor.

Pumped storage power plants: – Essential requirements, necessity, advantages and disadvantages, classification of pumped storage power plants, relative merits of two-unit and three-unit arrangements, problems in operation, layout, efficiency of Pumped storage power plants.

Unit- III **(8 Lectures, 16 Marks)**

Tidal Power Plants: - Principles of power generation - components of power plant – Single and two basin systems – Turbines for tidal power - Estimation of energy – Maximum and minimum power ranges

Power house:- Surface Power Stations – Structure, Dimensions, Lighting & Ventilation, Variations in design Underground Power Station – Location, Types of Layout, Components, Advantages

Intake structures:- Functions, types, losses in intakes, air entrainment and inlet aeration, cavitation.

Unit- IV **(8 Lectures, 16 Marks)**

Penstock & accessories: – Classification, design criteria, economical diameter, anchor blocks, conduit valves, bends & manifolds.

Water hammer phenomenon in penstocks, celerity of pressure wave in rigid and elastic pipes, sudden and gradual and partial opening and closing of valves, details of pressure cycles (no derivation of the equations for celerity of pressure wave and water hammer pressure).

Surge Tanks: - Necessity, locations, functions, types, analysis of simple cylindrical surge tank considering frictional effects.

Unit- V **(7 Lectures, 16 Marks)**

Non conventional energy -

Biomass energy: - Bio fuel classification, energy farming, direct combustion for heat, anaerobic digestion for biogas, different digesters, applications of Biogas.

Solar energy: - Availability, solar radiation data and measurement, elementary concepts of solar energy applications, solar air and water heaters, solar chimney, crop driers, water desalination.

Wind energy: – Introduction, characteristics, variation with height and time, potential of wind power, location of wind power station and space requirement, Introduction to horizontal axis wind turbine (HAWT) and vertical axis wind turbine (VAWT), applications of wind energy.

Reference Books:-

1. Dandekar M. M. and K.N. Sharma, Water power Engineering, Vikas Publishing House Privet Limited, Delhi.
2. Sharma R K & T.K.Sharma, A text Book of Water Power Engineering.
3. John Twidell and Tony Weir, E & F.N.Spon, Renewable Energy Resources.
4. Sukhatme S. P., Solar Energy, Principles of thermal collection and storage, TMH
5. Kreith & Kreider, Solar Heating and Cooling.
6. Tony Burton, David Sharpe, Nick Jenkins and Ervin Bossanyi, Wind Energy Handbook.
7. Dr. K. Subramanya, FM & HM-Problems & Solutions, Tata McGraw-Hill Education Pvt. Ltd. New Delhi, 6th reprint-2013.
8. Sawhney, Non conventional resources of energy, PHI Learning Pvt., Limited, Delhi.
9. Dr. A. K. Jain, Fluid Mechanics, Khanna Publishers, Delhi, Edition – 2011.
10. David A. Rivkin, Marc Randall and Lanrel Silk, Wind Power Generation and Distribution.
11. Khan B. H., Non conventional energy resources, Tata McGraw-Hill, IInd edition, 2009.

Industrial Pollution & Control

Elective-II

Short Title: IPC

Course Description:

The industries generate variety of liquid, solid and gaseous waste. The present course describes the major industries in India and at global level that are responsible for pollution. It also covers the methods of sample collection for liquid and gaseous waste from industry. The course covers the general wastewater treatment technology used for major industries and IS specification in this regard. The course describes the air pollution dispersion analysis and modeling considering meteorological parameters. It also includes the design of stack for air pollution control.

	Hours/Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	13	39	3
Tutorial	--	--	--	

General objectives

The main objective of the course is to enable a student to carry out an industrial wastewater, solid waste and air pollution survey, to propose environmental management technology and plan for water pollution control, air pollution control and land pollution control. It aim to appraise a student about prevailing environmental legislation and functioning of statutory bodies. It aims to enable a student to design, operate and maintain industrial pollution control facilities and may also represent the agencies in case of legislative operations.

Learning outcomes

The main learning outcomes of the course are listed as follows:

1. The student will learn the industrial wastewater, air pollution and solid waste sampling and survey. He/she will be able to monitor hem.
2. The student will have knowledge of prevailing legislation of pollution control.
3. The student will be aware of the method of functioning of pollution control boards.
4. The student will be aware of IS specifications for design of wastewater treatment facilities for major industries.
5. The student will be aware of the disposal standards prescribed by legislative agencies for wastewater.
6. The student will be aware of the disposal standards prescribed for solid waste by legislative agencies.
7. The student will be aware of the ambient and exhaust air standards prescribed by legislative agencies.
8. The student will be able to give a complete environmental management plan for the industry and will be able to do auditing also.

Course Outline

Teaching Scheme:
Lectures: 3Hours/week

Examination Scheme:
End Semester Examination(ESE): 80 Marks
Paper Duration(ESE): 3 Hours
Internal Sessional Examination(ISE): 20 Marks

Unit I **(7Hours,16 Marks)**

Major industries responsible for water pollution across globe and in India, water uses in major industries, industrial wastewater survey, sampling procedures, characteristics of major industries like dairy, sugar, pulp and paper, dye, metal plating, textile, petroleum, refineries, slaughterhouse, tannery, distillery etc. as per IS codes.

Unit II **(8 Hours,16 Marks)**

Treatment prescribed by IS codes for major industries like dairy, sugar, pulp and paper, dye, metal plating, textile, petroleum, refineries, slaughter house, tannery, distillery etc. Flow and quality variation and its impact on treatment, importance of flow equalization, segregation of waste streams- specific applications.

Unit III **(8 Hours,16 Marks)**

Concept of reduce, recover, reuse and recycle in industries. Housekeeping and its importance. Optimization of industrial processes keeping in view the wastewater generation and treatment, integrated approach for industrial water and wastewater management, concept of CETP, industrial ecology, water quality index and its application in industrial wastewater management.

Environmental legislations in India, salient features of water pollution prevention act and air pollution control act, and Environmental protection act. Constitution of pollution control boards and their functioning.

Unit IV **(8 Hours,16 Marks)**

Nutrient deficiency in wastewaters, addition of nutrients, Acclimatization of biomass, biological treatment using acclimatized biomass, applications and limitations in industrial biological wastewater treatment, treatment of metal plating waste, treatment of acidic and alkaline waste, application of advance wastewater treatment technology- reverse osmosis (theory, application and design), adsorption- (theory, application and design including kinetic modeling), low cost sorbents.

Unit V **(8 Hours,16 Marks)**

Meteorological parameters affecting air pollution dispersion, Gaussian dispersion equations (no derivations), estimation of air pollution dispersion, design of stack for air pollution control, plume rise. Types of scrubbers and their applications in industries, (no mathematical treatment on scrubber design).

Industrial solid waste sampling plan, characterization, disposal of waste from thermal power plant. Disposal of solid organic industrial waste. Disposal of toxic and hazardous waste-theory only.

Reference books:-

1. Joseph D Edwards, "Industrial wastewater treatment: a guide book" , CRC Press publications.
2. Industrial wastewater management, treatment and disposal, by Water Environment Federation (WEF), Tata McGraw Hill Publications.
3. M N Rao and H V N Rao, "Air pollution", Tata McGraw Hill Publications.
4. www.cpcb.nic.in
5. www.mpcb.gov.in
6. www.moef.nic.in/legis/**water**/wat1.html
7. www.cpcb.nic.in/upload/NewItems/(1)%20**Wateract1974**%20.doc
8. www.moef.nic.in/legis/**air**/**air**1.html
9. envfor.nic.in/legis/env/env1.html

Architecture and Town Planning

Elective-III

Short Title: AR&TP

Course Description:-

This course introduces the student about various concepts and principles of architecture, town planning and landscaping. It also prepares the students for implementing sustainable development principles in urban planning

	Hours/Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	13	39	3
Tutorial	--	--	--	

General objective:-

1. To train the students about concepts in Architecture and town planning
2. To make the students aware about Town planning legislations and municipal acts

Learning outcomes:-

After successfully completion of the course student will be

1. Able to gain knowledge of urban and regional planning
2. Familiar with the principles of architecture ,town planning and landscaping
3. aware with the need of planning for development
4. Able to develop basic skills in planning surveys, analysis, generating alternative strategies and evaluation of options and preparation of plans.
5. Implement concept in development of planned townships.
6. Use concepts of energy efficient building design.

COURSE OUTLINE

Teaching Scheme:
Lectures: 3Hours/week

Examination Scheme:
End Semester Examination(ESE): 80 Marks
Paper Duration(ESE): 3 Hours
Internal Sessional Examination(ISE): 20 Marks

UNIT I **(8 Hours, 16 marks)**

Architecture: Definition**:** Role of “urban planner and architect” in planning and designing. Principles of architecture, Architectural composition and elements of design.

Landscaping: Environmental art and design for urban landscape, objectives, principles, elements, material, soft landscaping, hard landscaping, and garden styles: modern and historical, water body conservation and creation.

UNIT II **(8 Hours, 16 marks)**

Town planning- Objectives, principles, stages in town development, growth of towns and theories of developments (ribbon, sector zone, concentric, multiple zone etc)

Study of new towns – Study of planned towns like new Mumbai, Gandhinagar.(infrastructure, disaster management etc)

Neighbourhood- planning and role in urban development, town planning schemes, garden city & three magnet theory, green belts.

UNIT III **(9 Hours, 16 marks)**

Concept of master plan: Structure plan, detailed town planning scheme and action plan. Estimating future needs , planning standards for different land use allocation for commerce, industries, public amenities, open areas etc, planning standards for density distributions , density zones ,planning standards for traffic network ,standard of roads , Plan implementation.

Town planning legislations and municipal acts planning of control development schemes ,urban financing , land acquisition ,slum clearance schemes ,pollution control aspects.

UNIT IV **(7 Hours, 16 marks)**

Levels in planning- regional/city/ neighbour hood.

City development plan:-Scope & purpose, Surveys- demographic, housing, land use, ws & sanitation, etc.

Traffic; transport- urban road objectives, classification, traffic management.

Legislative mechanism for dp: mrtp, planning agencies for various levels of planning. Their organisation and purpose (CIDCO-MHADA-MIDC).

UNIT V **(7 Hours, 16 marks)**

Environmental Studies in Building Science:

Components of Ecosystem; ecological principles concerning environment; climate

Responsive design; Energy efficient building design; thermal comfort; solar architecture;

Acoustics – Concepts of Acoustic, noise pollution & its control.

Reference Books:-

1. G.K .Hiraskar , “Town planning”,Dhanpatrai Publication 2002
2. S. Rangwala, “Town planning”, Charotar Publishing House Pvt. Ltd.,2009
3. G Muthu,Shobha,Mohan, “Principles of Architecture “2006
4. MRTP act 1966
5. UDPFI guidelines, ministry of urban affairs and employment, Govt. & India.
6. koenigsbeger, “Manual of tropical housing and building”, Universities Press (India)
7. Sustainable Building - Design Manual: Sustainable Building Design Practices, 2009 by TERI
8. Shah, Kale, Patki, “Building Drawing”, Tata McGraw-Hill Education, 5th edition
9. Gevorkian, “Green Buildings”, Mc Graw hill.
10. Haselbach, “The engineering guide to LEED”, new construction-sustainable construction for engineers, The McGraw-Hill, 2008.
11. Satish Chandra Agarwala , “Architecture & Town Planning”, Dhanpat Rai & Co (P) Ltd.
12. Prakash Apte, “The building of Gandhinagar”, Power publishers.
13. Annapurna Shaw, “The making of new Mumbai”, Orient Blackswan, 2004
14. http://www.cidco.maharashtra.gov.in/NM_Developmentplan.aspx

Retrofitting of Structures

Elective-III

Short Title: RS

Course Description:-

This course focuses on the rehabilitation of the structure as per need. The repairing strategies include special concrete mortar and different types of concrete or some more contemporary methods as per the assessment or inspection of the structure. The most viable issue these days of retrofitting of structure is discussed with different techniques as per there requirement.

	Hours/Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	13	39	3
Tutorial	--	--	--	

General objective:-

1. To recognize need for repair and rehabilitation.

2. To Know modern Civil Engineering techniques of repair.

3. To Have better understanding of different materials used.

4. Proper selection and specification for material

Learning outcomes:

After successfully completion of the course student will able to

1. Assess the role of civil engineer while inspecting the damaged or deteriorated structures.
2. Familiar with the different material and techniques used for repair.
3. Discuss some of the upcoming techniques like foamed concrete, mortar and dry pack, vacuum concrete, Gunite and Shotcrete, Epoxy injection, Mortar repair for cracks.
4. Know the need of retrofitting as per the situation
5. Able to apply the right retrofitting technique as per discussion on the different situations.
6. Able to apply the knowledge on the retrofitting with the composite material.

Unit 1 **(7 Hours, 16 Marks)**

Causes for distress in structure:

Philosophy & definition, causes of failure, failure in ancient time & recent times. Deficiency in design drag, material production, maintenance etc. Failure related problems; Man made and natural failure or damage. Diagnosis of failure; change in appearance on an exposure, chemical deterioration, Mechanical deterioration. Cracking in buildings. Failure of flat roofs, balconies, trenches, dams, piles abutments piers, silos, chimney, cooling towers, R.C.C. frames, Failure information & Analysis. Format of investigation. Shear, Torsion compression failure, Erection difficulty, failure in tanks silos, space frame, precast assemblies prestressed concrete structure, formwork failure, case studies.

Unit 2 **(8 Hours, 16 Marks)**

Materials and techniques for repair:

Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, Ferro cement, Fibre reinforced concrete. Rust eliminators and polymers coating for rebars during repair, foamed concrete, mortar and dry pack, vacuum concrete, Gunite and Shotcrete, Epoxy injection, Mortar repair for cracks, shoring and underpinning. Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coating and cathodic protection. Ultra-high performance fibre reinforced concrete (UHPFRC), Fiber reinforced composites, Carbon fibre reinforced polymer (CFRP), Fibre wrapping (Carbon, Aramide, Glass)

Unit 3 **(7 Hours, 16 Marks)**

Maintenance & repair of structures:

Need for maintenance and repairs Inspection of Structures for repairs and maintenance methods for repairs, Material and methodology for repairs, Cost of repair & maintenance, Repair to foundation columns, piles, floor, roof and walls

Unit 4 **(7 Hours, 16 Marks)**

Structural strengthening:

Strengthening and retrofitting of columns, beams, walls, footings and slabs, piers of concrete structures by jacketing, external post-tensioning, replacing or adding reinforcement, plate bonding, and textile reinforced concrete.

Unit 5 **(7Hours, 16 Marks)**

Preventive measures for durability of structures:

Proper selection and specification for material, The use of modern techniques for construction, Proper design, Better workmanship.

Reference Books:

1. Denison Campbell, “Concrete Structures, Materials, Maintenance and Repair”, Allen and Harold Roper Longman Scientific and Technical UK, 1991.
2. R.T.Allen and S.C.Edwards , “Repair of Concrete structures”, Blakie and Sons, UK, 1987
3. M. Alexander, H. D. Beushausen, F. Dehn& P. Moyo,”Concrete Repair, Rehabilitation and Retrofitting”, Taylor & Francis Publication.
4. Ted Kay "Assessment and Renovation of Concrete Structures" ed., John Wiley & Sons, Inc. New York., 1992.
5. Rakshit K. S. "Construction Maintenance & Repair of Highway Bridges", 1994.
6. Champion S., “Failure & Repair of Concrete Structures” Wiley Publishers, 1961.
7. Grass F K, Clarke J L & Armer GST., “Structural Assessment”, Butter Worths Publisher, 1987.
8. Raiker R N, “Learning from failures”.

Water resources Engineering-II Lab

ICA (Term Work): 25 Marks

ESE (Oral): 25 Marks

Course Description:

The Lab work is focused on developing the skills of students in the areas such as analysis of Dams and its components ,design principles and causes of failures of dams

	Hours/Week	No. of Weeks	Total Hours	Semester Credits
Lab hours	02	13	26	1

Course Objectives:

1. To learn modes of failures and stability analysis of gravity and earth dam
2. To describe diversion head-works and explain stability analysis of weirs on permeable foundations.
3. To explain the different spillways, Design principles of ogee spillway. details of energy dissipation below spillway.
4. To illustrate unlined irrigation canals and their design principles.

Course Outcomes:

Upon successful completion of this course the student will be able to

1. Describe types of dams , their selection and also selection of site for dam.
2. Know causes of failures of water retaining structures.
3. Compute various stresses developed in gravity dam.
4. Demonstrate earth dams and its components.
5. Explain control of seepage and drainage in earth dams.
6. Analyze stability of slopes of earth dams.

Lab course content:-

Minimum five out of following assignments should be performed:-

1. Development of flood hydrograph from unit hydrograph and complex storm.
2. Determination of reservoir capacity from mass inflow and mass demand curve.
3. Stability analysis of a gravity dam considering all major forces.
4. Stability analysis of slope of earth dam.
5. Design of Ogee spillway with energy dissipator.

6. Analysis of weir on permeable foundation by using Khosla's charts.

7. Design of unlined canal in alluvium by using Garret's diagram /Lacey's equations (at least three sections along the alignment including calculation of design discharge from command area and kor depth and kor period) and plotting L-section; also preparing schedule of area statistics and channel dimensions.

8. Detailed report along with drawings, based on visit to any dam; including proof of the visit.

9. Benefit - cost analysis of a water resources engineering project.

Guidelines for ICA:

ICA shall be based on continuous evaluation of students performance throughout the semester and term work prepared by the students in the form of journal.

Guidelines for ESE:

ESE shall be based on term work prepared by students & Evaluation will be based on performance during oral examination

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Reference books:-

1. Modi P.N. 2012. Irrigation, Water Resources and Water Power Engineering, Eight edition. Standard Book House, Delhi.
2. Garg S.K. 1998. Irrigation Engineering And Hydraulic Structures. Khanna Publishers, Delhi.
3. Punmia B.C., Pande B.B., .Lal, 1999. Dams II: Irrigation and Water Power Engineering". Laxmi Publications Pvt. Ltd., New Delhi.
4. Varshney R.S., Gupta S.C., Gupta R.L. 1979. Theory and Design of Irrigation Structures, Volume I and II", Fourth edition. New Chand & Bros., Roorki.
5. Bharat Singh - Irrigation Engineering.
6. Sharma R.K., "A Text Book of Hydrology & Water Resources", Dhanpat Rai and Sons.
7. K.B.Khushlani - Irrigation Engineering.
8. Justin, Hinds - Irrigation Engineering and Practice.

Environmental Engineering II Lab

ICA (Term Work): 25 Marks

ESE (Practical exam): 25 Marks

Course description:

The course includes the general parameters that are used to characterize wastewater. The standard methods of examination of these parameters is included in the syllabus. The syllabus also provides an opportunity to the student to have a practical exposure through site visit.

	Hours/Week	No. of Weeks	Total Hours	Semester Credits
Lab hours	02	13	26	1

General objectives:

The main objective of the course is to train a student in wastewater characterization using standard methods of examination in laboratory. It also aims to give an exposure to the student about practical design, maintenance, functioning an trouble shooting of wastewater treatment plant and municipal solid waste management site through site visit.

Learning outcomes:

1. The student will learn the methods of physical, chemical and biological characterization of wastewater.
2. The student will have an exposure to actual design, maintenance and functioning of wastewater treatment plant through site visit.
3. The student will practice design of units of sewage treatment plant and have a regressive study of the theory syllabus through assignments.

Lab experiments:

Student should do minimum 8 experiments out of the list mentioned below

1. Determination of dissolved oxygen.
2. Determination of BOD.
3. Determination of COD.
4. Determination of different types of solids
5. Determination of SVI.
6. Determination of chlorides.
7. Determination of chromium or any heavy metal.
8. Determination of water conductivity.
9. Determination of oil and grease.
10. Determination of Kjeldahl nitrogen.

Assignments:

Students must do minimum two assignments from each unit of the theory syllabus.

Guidelines for ICA:

ICA shall be based on continuous evaluation of students performance throughout the semester and term work prepared by the students in the form of journal.

Guidelines for ESE:

ESE shall be based on term work prepared by students & Evaluation will be based on performance during practical examination

Site visit:

Students should visit a wastewater treatment site and a solid waste management site.

Reference Books:

Standard methods for examination of waters and wastewaters, APHA Publication.

Advanced Structural Design Lab

Elective-II

ICA (Term Work): 25 Marks

ESE (Practical exam): 25 Marks

Course Description:-

In this Laboratory course emphasis is given on assignments of detailing, design of rectangular combined footing, flat slabs, cantilever retaining wall, water tanks, post tension girders etc. Also students will be exposed to the advanced structural design software's.

	Hours/Week	No. of Weeks	Total Hours	Semester Credits
Lab hours	02	13	26	1

General objectives:

The lab work deals with

1. Design RCC structures such as retaining wall, combined footing, water tank, flat slab.
2. Design of post tension girder.
3. Understanding of IS-code provisions in design of structure.
4. Preparation of detail drawings for the designed members of structure.

Learning outcomes:

Upon successful completion of this course the student will be able to

1. Design RCC structures such as retaining wall, combined footing, water tank, flat slab.
2. Design of post tension girder.
3. Understand IS-code provisions in design of structure.
4. Prepare detail drawings for the designed members of structure.

Lab Course Content

It shall be based on above syllabus and will consist of

i) At least three numbers of imperial size sheets based on pre-stressed & R.C. structures.

ii) Demonstration of computer software's for design of structures.

iii) Report on site visit to at least one structure based on above syllabus

Guidelines for ICA:

ICA shall be based on continuous evaluation of students performance throughout the semester and term work prepared by the students in the form of journal.

Guidelines for ESE:

In ESE the student may be asked to answer questions based on ICA. Evaluation will be based on Performance in oral examination.

Reference Books:-

1. N. Krishnaraju, “Prestressed Concrete”
2. T. Y. Lin, “Design of prestressed concrete structure”.
3. S.R. Karve & V. L. Shah, “Limit State Analysis & Design of Reinforced Concrete”, Structures PublicatinsR.C.C. Structures.
4. Punmia, Jain & Jain, “Comprehensive R.C.C. Design”, Laxmi Publications.
5. S. K. Duggal, “Earthquake Resistant Design of Structures”, Oxford University Press.
6. N. C. Sinha & S. K. Roy, “Fundamentals of Reinforced Concrete”
7. S. Unnikrishna Pillai, Devdas Menon, “ Reinforced Concrete Design”, Tata McGraw-Hill Publication.
8. S. Ramamrutham, “Design of Reinforced Concrete Design”, Dhanpat Rai Publishing Company.
9. B. C. Punmia, “Reinforced Concrete Structures”, Laxmi Publication.

Reference IS Codes:-

10. IS 456-2000 Plain and Reinforced Concrete - Code of Practice.
11. IS 1343 (1980): Code of Practice for Pre-stressed Concrete.
12. IS 13920 (1993): Ductile detailing of reinforced concrete structures subjected to seismic forces.

Earthquake Engineering Lab

Elective-II

ICA (Term Work): 25 Marks

ESE (oral exam): 25 Marks

Course Description:-

In this Laboratory course emphasis is given assignments based on detailing and Seismic design of RC structure as per IS 1893 and 4326. Also Students will be exposed to computer aided analysis using available software

	Hours/Week	No. of Weeks	Total Hours	Semester Credits
Lab hours	02	13	26	1

General objectives:

1. Recognize basic earthquake mechanisms, tectonics, ground motion, and propagation of ground motion.
2. Interpret earthquake ground motion data.
3. Seismic design of RC structure as per IS 1893:2002, IS13920 and 4326
4. Determine the base shear by equivalent static analysis method

Learning outcome:

The student will demonstrate the ability to:

1. Design of RC structures considering effect of seismic forces
2. Computer aided analysis using available software

Lab Course Content:-

It shall consist of

1. At least one assignment from each of four units
2. Problems based on the above syllabus shall be submitted as term work
3. Exposure to computer aided analysis using available software be considered.
4. Evaluation of Lateral Loads on Multi-storeyed Building as per IS 1893 -2002
5. Ductile detailing of flexural and compression members as per IS13920

Guidelines for ICA:

ICA shall be based on continuous evaluation of students performance throughout the semester.

Guidelines for ESE:

In ESE the student may be asked to answer questions based on ICA. Evaluation will be based on performance in oral examination.

Reference Books

11. Duggal , “ Earthquake resistance design of structure”’ Oxford University Press.

2 . David J. Downik , “ Earthquake Resistant Design”, Jon Wiley and Sons Publication

3. Earthquake Tips NICEE, IIT, Kanpur

4. Jaikrishna and Chandarsekaran, “ Elements of Earthquake Engineering” .

5. Kramer S. L , “ Geotechnical Earthquake Engineering.”, Prentice Hall India Publication

6. Relevant Latest Revisions of IS codes.

7. Anil K. Chopra, "Dynamics of Structures: Theory and Applications to Earthquake Engineering", Pearson Education, 3'd Edition, 2007.

8. D.J. Dowrick, "Earthquake Resistant Design for Engineers", Wiley.

9. Vinod Hosur, "Earthquake Resistant Design of Building Structures", Wiley, 2013

System Approach in Civil Engineering

Elective-II

ICA (Term Work): 25 Marks

ESE (oral exam): 25 Marks

Course Description:-

The Lab work aims to develop capability in solving various civil engineering Problems related to infrastructural projects by formulating problems. They should be able to analyze and come to appropriate solution.

	Hours/Week	No. of Weeks	Total Hours	Semester Credits
Lab hours	02	13	26	1

General objective:

The objective of course is to understand and analyze various activities related civil engineering projects and Select appropriate solution from various alternatives

Learning outcomes:-

After successfully completion of the course student will able to

1.Anlyse and understand various activities related civil engineering projects

2. Analyse the problem and identify alternative solutions.

3. Select from the alternatives and develop the most viable solution

4. Evaluate the effectiveness and worth of the solution.

Lab Course Content:-

It will consist of assignments and problem solving on following

1. System concepts
2. Optimisation techniques
3. Linear programming
4. Non-linear programming
5. Constrained/unconstrained optimisation
6. Dynamic programming

Guidelines for ICA:

ICA shall be based on continuous evaluation of students performance throughout the semester and term work prepared by the students in the form of journal.

Guidelines for ESE:
In ESE the student may be asked to answer questions based on ICA. Evaluation will be based on performance in oral examination.

REFERENCE BOOKS:-

1. S.S. Rao, " Engg. Optimization Theory and Practice", John Wiley and Sons
2. Thomas K Jewell," A systems approach to civil engineering planning and design",Harper and row.
3. Samual Labi ," Introduction to civil engineering systems", Wiley
4. Hamdy A. Taha, "System approach in civil engineering", Prantice Hall.
5. Harvey M. " Principle of system approach in civil engineering"
6. Shrivastava,Shenoy and Sharma," Quantitative techniques for managerial
7. Decisions",Wiley Eastern
8. Paul J. Ossenbruggen, "An Approach to Teaching Civil Engineering System"
9. N.D. Vohra "Quantitative Techniques in Management" , Mc Graw Hill
10. Hira , Gupta ,"Operation Research ", S. Chand

Construction Safety & Disaster Management

Elective-II

ICA (Term Work): 25 Marks

ESE (oral): 25 Marks

Course Description:

The lab work is based on assignments on safety management in the construction industry, modern and conventional techniques for construction safety and disaster management in the construction industry.

	Hours/Week	No. of Weeks	Total Hours	Semester Credits
Lab hours	02	13	26	1

General objective:

The objective of course is to understand various safety requirements in construction and analyze activities involved using safety methods with respect to cost, engineering economics etc It includes different disaster management

Learning outcomes:

Upon successful completion of these course the student will be able to :

1. Know construction safety management system.
2. Learn the measures to be taken for safety during construction.
3. Identify various types of disasters.
4. Learn the disaster management techniques and its analysis.
5. Implement safety management and public awareness regarding disaster management

Lab Course Content:-

Two Assignment on each unit based on syllabus

Guidelines for ICA:

ICA shall be based on continuous evaluation of students performance throughout the semester and term work prepared by the students in the form of journal.

Guidelines for ESE:

In ESE the student may be asked to answer questions based on ICA. Evaluation will be based on performance in oral examination.

Recommended Books:-

1. Construction Safety Manual - Published by National Safety Commission of India.
2. Safety Management in Construction Industry – A manual for project manager (NICMAR Mumbai)
3. *Davies* V.S.Thomasin ,“K, Thomas Construction Safety Handbook” ,Telford, London.
4. Bureau of Indian Standards , “ IS for safety in Construction”.
5. Girimaldi and Simonds ,“ Safety management”,AITBS, New Delhi
6. Seetharaman ,“ Construction Engineering and Management”
7. K Nagarajan , “ Project Management”, New Age International Ltd.
8. Rajdeep Dasgupta, “ Disaster management & rehabilitation”, mittal Publication.
9. Dr. Kadambaui Sharma,Dr. Avinash Chiranjeev, “ Disaster management in India” Jnanda prakashan(P&D) New Delhi

Industrial Lecture

COURSE CONTENT

Industrial Lecture **IL**
Course Title Short Title Course
Code

Course Description:
The gap between industry's needs and the academic community's aspirations appears to be considerably large. There exists a strong feeling, at least in the academic circles, that unless technology driven initiatives find a surer place in the industrial sector in this country, the academia-industry interaction is likely to remain confined to developmental activities with limited exploratory or research-based content As institutes committed primarily to creation and growth of technological knowledge, technical institutes have an important role to play in the industrial sector of the country's economy. This fact by way of encouraging mechanisms to foster interaction between the academia and industry. Typically, academic interest in the multidimensionality of a problem leads to a tendency to explore a variety of options to arrive at a solution. This industrial lecture develops ability of student for expectations of the industrialists from the fresh engineers.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	**1**	**15**	**14**	**2**

COURSE CONTENT

Semester-VIII **Examination Scheme**

Total Semester Credits: 02

Internal Continuous Assessment (ICA): 50 Marks

1. There is a need to create avenues for a close academia and industry interaction through all the phases of technology development, starting from conceptualization down to commercialization.
2. List of renowned persons from industry shall be prepared by the committee appointed by Head of the department. After approval from the Principal, Minimum five Industrial lectures in alternate week shall be arranged, which shall be delivered by the experts/Officials from Industries/Govt. organizations/ Private Sectors/Public Sectors / R&D Labs covering the various aspects.

3. Topics of Industrial Lectures shall be Technical in nature and should not be the specific contents from the curriculum.
4. Students shall submit the report based on minimum five lectures giving summary of the lecture delivered.
5. The summary should contain brief resume of the expert, brief information of his organization and brief summary of the lecture in bullet point form.

Guide lines for ICA : Assessment of the Industrial Lecture for award of ICA marks shall be done jointly by departmental committee as per attendance in industrial lecture, report submitted by student and overall performance in semester as per the guidelines given in **Table- D**

Table-D

SN	Name of Student	Attendance (05 Marks per Lecture)	Dept of Understanding (03 Marks per Lecture)	Report Writing	Total
		25	15	10	50

Project-II

Project-II **P-II**
Course Title Short Title Course
Code

Course Description:
The course explores the knowledge of design, experiment and analysis of data. The course develops ability to work on multidisciplinary teams, Identify, formulate, and solve engineering problems in view of economic, environmental and societal context.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	4	**15**	**60**	**6**

COURSE CONTENT

Semester-VIII **Examination**
Scheme
Total Semester Credits:
06
Internal Continuous Assessment (ICA): 75
Marks
End Semester Examination (ISE):75
Marks

Total:150Marks

1. Project-I work decided in VII semester shall be continued as Project-II
2. Students should complete implementation of ideas given in synopsis/Abstract, so that project work should be completed before end of semester.
3. Project-II may involve fabrication, design , experimentation , data analysis within realistic constraints such as economic, environmental, social, ethical, health and safety, manufacturability, and sustainability. The stage also includes testing , possible results and report writing
4. Each students project group is required to maintain log book for documenting various activities of Project-II and submit group project report at the end of Semester-VIII in the form of Hard bound.
   a. *Title*
   b. *Abstract*
   c. *Introduction*
   d. *Problem identification and project objectives*

e. Literature survey
f. Case study/Analysis/Design Methodology
g. Project design and implementation details
h. Result and conclusion
i. Future scope
j. references.

Guide lines for ICA : ICA shall be based on continuous evaluation of students performance throughout semester in project-II and report submitted by the students project group in the form Hard bound. Assessment of the project-II for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given in **Table-D.**

Guide lines for ESE:-
In ESE the student may be asked for demonstration and questions on Project. Evaluation will be based on answers given by students in oral examination.

Assessment of Project-II

Name of the Project: ______________________________

Name of the Guide: ______________________________

Table-D

		Assessment by Guide (50 Marks)				Assessment by Committee (25 Marks)		
SN	**Name of Student**	**Attendance , Participa-tion and team work**	**Material procurement / assembling/ Designing/Pr ogramming**	**Case study/ Execution**	**Project Report**	**Dept of Understan-ding**	**Presentatio n**	**Total**
Marks		**10**	**15**	**15**	**10**	**10**	**15**	**75**

NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Final Year Engineering

(Computer)

Faculty of Engineering and Technology

COURSE OUTLINE

Semester – VII

W.E.F. 2015– 2016

Annexure - I

BE Semester - VII

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Advanced Unix Programming*	D	3	---	---	3	20	80	---	---	100	3
Artificial Intelligence & Expert System	D	3	---	---	3	20	80	---	---	100	3
Interdisciplinary Elective*	E	3	---	---	3	20	80	---	---	100	3
Elective - I	E	3	---	---	3	20	80	---	---	100	3
Embedded System*	D	3	--	---	3	20	80	---	---	100	3
Advanced Unix Programming Lab*	D	---	---	2	2	---	---	25	25**(PR)**	50	1
Embedded System Lab*	D	---	---	2	2	---	---	25	25**(OR)**	50	1
Elective – I Lab #	E	---	---	2	2	---	---	25	25**(OR)**	50	1
Project – I*	D	---	---	2	2	---	---	25	25**(OR)**	50	2
Seminar – II*	D	---	---	2	2	---	---	25	---	25	2
Industrial Visit*	D	---	---	---	---	---	---	25	---	25	1
Total		**15**	**---**	**10**	**25**	**100**	**400**	**150**	**100**	**750**	**23**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA: Internal Continuous Assessment**

#Lab for Elective-I

Inter Disciplinary Elective
1 Software Engineering & Project Management
2 Enterprise Resource Planning and SAP

Elective I
1 Advanced Computer Architecture
2 Android Programming*
3 Human Computer Interaction*
4 Advanced Computer Network

*** Common Subjects with BE I.T.**

BE Semester – VIII

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Compiler Design	D	3	---	---	3	20	80	---	---	100	3
Data Warehousing & Mining*	D	3	---	---	3	20	80	---	---	100	3
Elective - II	E	3	---	---	3	20	80	---	---	100	3
Elective - III	E	3	---	---	3	20	80	---	---	100	3
Compiler Design Lab	D	---	---	2	2	---	---	25	25**(PR)**	50	1
Data Warehousing & Mining Lab*	D	---	---	2	2	---	---	25	25**(OR)**	50	1
Elective - II Lab#	E	---	---	2	2	---	---	25	25**(OR)**	50	1
Industrial Lecture$	C	---	---	1*	1	---	---	50	---	50	2
Project – II*	D	---	---	4	4	---	---	75	75 **(OR)**	150	6
Total		**12**	**---**	**11**	**23**	**80**	**320**	**200**	**150**	**750**	**23**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA: Internal Continuous Assessment**

#Lab for Elective-II

$ Minimum 6 lectures to be conducted by experts from the industry in alternate weeks. Next week group discussion on the lecture conducted.

Elective II

1 Software Metrics & Quality Assurance*
2 Distributed System*
3 Cryptography & Network Security*
4 Neural Network & Fuzzy Logic*

Elective III

1 Mobile Computing*
2 Bio-Informatics*
3 Real Time System
4 iPhone Programming*

*** Common Subjects with BE I.T**

Advanced UNIX Programming

COURSE OUTLINE

Course Title	Short Title	Course Code
Advanced UNIX Programming	**AUP**	

Course Description:

The principle objective of this course is to teach students

a. How UNIX is designed and structured.
b. How to write programs on and for Unix Platforms.
c. How to work efficiently within Unix Environment.
d. Command level view of Unix OS.
e. The important parts of the Unix Operating system's application programming interface.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	3	**14**	**42**	**3**

Prerequisite Course(s): Basic Knowledge of operating system (Unix/Linux) and C Programming.

COURSE CONTENT

Advanced UNIX Programming **Semester-VII**

Teaching Scheme **Examination Scheme**

Lecture: 3 Hours/Week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. **(8 Hrs, 16 Marks)**

a. **Unix System Overview**- Introduction, UNIX Architecture, Logging In, Files and Directories, Input and Output
b. Programs and Processes, Error Handling, User Identification, Signals
c. Time Values, System Calls and Library Functions
d. **File I/O**- Introduction, File Descriptors, open Function, creat Function, close Function, lseek Function, read Function, write Function
e. File Sharing, Atomic Operations- Appending to a file, Creating a file
f. dup and dup2 Functions, sync, fsync, and fdatasync functions, fcntl function

2. **(8 Hrs, 16 Marks)**

- **a.** **Files and Directories**- Introduction, stat, fstat, and lstat Functions, File Types, File Access Permissions, access Function, umask Function
- **b.** chmod and fchmod Functions, Sticky Bit, File Size, File Truncation, File Systems,link,unlink,remove and rename function
- **c.** Symbolic Links, symlink and readlink Functions, File Times, mkdir and rmdir Functions, chdir, fchdir, and getcwd Functions
- **d.** **System Data Files and Information** – Introduction, Password File-getpwuid, getpwnam, getpwent, setpwent, endpwent, Shadow Passwords- getspnam, getspent, setspent, endspent
- **e.** Group File- getgrgid, getgrnam, getgrent, setgrent, endgrent, Login Accounting, System Identification- uname, gethostname
- **f.** Time and Date Routines- time, gettimeofday, gmtime, localtime, mktime, asctime,ctime, strftime

3. **(8 Hrs, 16 Marks)**

- **a.** **Process Environment-** Introduction, main Function, Process Termination- Exit Functions, atexit Function
- **b.** Command-Line Arguments, Environment List, Memory Layout of a C Program, Memory Allocation- malloc , calloc, realloc, free
- **c.** Environment Variables
- **d.** **Process Control –** Introduction, Process Identifiers- getpid, getppid, getuid, geteuid, getgid, getegid
- **e.** fork Function- file sharing, vfork Function, wait and waitpid Functions
- **f.** Race Conditions, exec Functions- execl, execv, execle, execve, execlp, execvp, Process Accounting

4. **(8 Hrs, 16 Marks)**

- **a.** **Signals –** Introduction, Signal Concepts, signal Function, Unreliable Signals
- **b.** Interrupted System call ,Reliable-Signal Terminology and Semantics, kill and raise Functions, alarm and pause Functions
- **c.** Signal Sets- sigemptyset, sigfillset, sigaddset, sigdelset, sigismember, sleep Function
- **d.** **Threads –** Introduction, Thread Concepts, Thread Identification- pthread_equal, pthread_self, Thread Creation- pthread_create, Thread Termination- pthread_exit,pthread_join,pthread_cancel, pthread_cleanup_push, pthread_cleanup_pop, pthread_detach
- **e.** Thread Synchronization-pthread_mutex_init, pthread_mutex_destroy, pthread_mutex_lock, pthread_mutex_trylock, pthread_mutex_unlock
- **f.** **Daemon Processes –** Introduction, Daemon Characteristics, Coding Rules, Error Logging

5. **(8 Hrs, 16 Marks)**

- **a.** **Interprocess Communication –** Introduction, Pipes, FIFOs- mkfifo, XSI IPC, identifires and keys, ftok
- **b.** Message Queues- msgget, msgctl, msgsnd, msgrcv, Semaphores- semget, semctl, semop, Shared Memory-shmget, shmctl, shmat, shmdt
- **c.** **Network IPC-** Socket Descriptors- socket, shutdown
- **d.** Associating Addresses with sockets- bind
- **e.** Connection Establishment- connect, listen, accept
- **f.** Data Transfer- send, recv

Text Book:

1. W. Richard Stevens and Stephen A. Rago, Advanced Programming in the UNIX Environment, 2/E, Pearson Education

Reference Book:

1. W. Richard Stevens, Unix Network Programming – Interprocess Communications, Volume 2, 2/E, Pearson Education

Artificial Intelligence & Expert System

COURSE OUTLINE

Course Title	Short Title	Course Code
Artificial Intelligence & Expert System	**AIES**	

Course Description: The objective of this course is to introduce the students to the fundamentals of Artificial Intelligence and Expert Systems and enable them to apply these concepts for solving real world problems.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	**14**	**42**	**03**

Prerequisite Course(s): Basic knowledge of finite automata.

COURSE CONTENT

Artificial Intelligence & Expert System **Semester-VII**

Teaching Scheme **Examination Scheme**

Lecture: 3 Hours/Week **End Semester Examination (ESE) : 80 Marks**
Paper Duration (ESE): 03 Hours
Internal Sessional Exam (ISE): 20 Marks

1. **Introduction to Artificial Intelligence** **(08Hrs, 16 Marks)**
    a. Definitions of AI, History, AI representation
    b. Turing test
    c. AI Problem and Techniques: Problem as State Space Search, Problem Characteristics
    d. Production System: Production Rules ,Water Jug Problem
    e. Heuristic Search Techniques: BFS, DFS, A*, AO*, Mean Ends Analysis

2. **Knowledge Engineering** **(08Hrs, 16 Marks)**
    a. Knowledge Representation Issues
    b. Knowledge Representation using Predicate Logic
    c. Knowledge Representation using Rules
    d. Weak and Strong Filler Structures for Knowledge : Semantic net, Frames, Script, Conceptual dependency

3. **Game Playing and Planning** **(08Hrs, 16 Marks)**
    a. Minimax Search with Additional Refinements
    b. Overview of Planning
    c. Goal Stack Planning : Block World, STRIPS
    d. Nonlinear, Hierarchical and other Planning Techniques
    e. Perception and Action

4. Understanding , NLP and Learning (08Hrs, 16 Marks)

a. Understanding as a Constraint satisfaction: Waltz's algorithm, Constraint determination, Trihedral and Non trihedral figures labeling
b. Natural Language Processing steps
c. Learning techniques
d. Neural Network Learning :Biological neuron, Artificial neuron, Architecture of Neural Network and Learning

5. Expert Systems (08Hrs, 16 Marks)

a. Architecture of Expert System
b. Utilization and functionality
c. Knowledge Representation and Utilization in Expert System
d. Two Case Studies of Expert System
e. Expert System Shell
f. Applications of Expert System

Text Books:

1. Elaine Rich, Kevin Knight and Shiva Shankar B. Nair, "Artificial Intelligence", 3rd Edition TMH

Reference Books:

1. B. Yegnanarayana, "Artificial Neural Network", PHI
2. S. Rajasekaran and G. A. Vijayalakshmi, "Neural Networks, Fuzzy Logic, and Genetic Algorithms" PHI
3. Timothy J Ross, "Fuzzy Logic with Engineering Application", TMH
4. Dan W. Patterson, "Introduction to Artificial Intelligence and Expert System", PHI

Software Engineering & Project Management

(Inter Disciplinary Elective)

COURSE OUTLINE

Course Title	Short Title	Course Code
Software Engineering & Project Management	**SEPM**	

Course Description: The objective of this course is to introduce students from other engineering streams to get the knowledge of Software Development Life Cycle, application of analysis, design, testing principles and project planning & management concepts to develop quality software economically.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Software Engineering

COURSE CONTENT

Software Engineering & Project Management **Semester-VII**

Teaching Scheme **Examination Scheme**

Lecture: 3 Hours/Week

End Semester Examination (ESE): 80 Marks
Paper Duration (ESE): 03 Hours
Internal Sessional Exam (ISE): 20 Marks

1. Introduction to Software Engineering **(08Hrs, 16 Marks)**

a. Nature of Software
b. Software Process
c. Software Engineering Practice
d. Software Myths
e. Generic Process model
f. Process Assessment and Improvement
g. Perspective Process Models
h. Specialized Process Models
i. Personal and Team Process Models

2. Introduction to Project Management **(08Hrs, 16 Marks)**

a. What is project
b. The triple constraint
c. What is project management , Stakeholders, Project Management Knowledge Area , Project Management tools and techniques
d. Role of a Project Manager , Project Manager's job description, Suggested Skills for Project Manager , Importance of people and leadership skills
e. Project Management
f. Organizational Structure
g. Project Life Cycle and Phases
h. Nature of IT projects
i. Characteristics of IT project Team members
j. Trends affecting IT Project Management, Globalization , Outsourcing ,

Virtual Teams

3. Project Integration & Scope Management (08Hrs, 16 Marks)

a. Project Selection
b. Developing Project Charter
c. Developing Project Management Plan
d. Collecting Requirements
e. Creating Work Breakdown Structure
f. Controlling Scope

4. Project Time & Cost Management (08Hrs, 16 Marks)

a. Defining and Sequencing Project Activities and Dependencies
b. Developing Schedule, Gantt Chart, Critical Path Method , Incorporating Project Uncertainty - PERT , Critical Chain Method
c. Resource loading and Resource Leveling
d. Schedule Controlling
e. Estimating Techniques
f. Earned Value Management
g. Project Quality Management
h. Planning Quality
i. Performing Quality Assurance
j. Quality Control, Tools and Techniques

5. Project Resource & Communication Management (08Hrs, 16 Marks)

a. Development of Human Resource Plan
b. Project Organizational Chart and Responsibility Assignment
c. Multi project Scheduling and Resource Allocation
d. Identifying Stakeholders
e. Planning Communication

Text Books:

1. Pressman Roger S., "Software Engineering: A Practitioners Approach", 7th Edition, Tata McGraw Hill.
2. Joseph Phillips, PMP Project Management Professional Study Guide, Third Edition McGraw Hill.

Reference Books:

1. Samuel Mantel, Jack Meredith, Scott Shafer, Margaret M. Sutton, With M.R. Gopalan,"Project Management Core Text Book", Wiley India Edition.
2. K.K. Chitkara, UddeshKohli, "Project Management Handbook", Tata McGraw-Hill Education Pvt. Ltd., 2006

Enterprise Resource Planning and SAP

(Inter Disciplinary Elective)

COURSE OUTLINE

Course Title	Short Title	Course Code
Enterprise Resource Planning and SAP	**ERP & SAP**	

Course Description: This course is aimed at introducing foundation understanding of enterprise systems and how these systems fit into today's business operations. Enterprise Systems are now essential infrastructure to both large corporate entities, as well as to small-to-medium organization, as they remove the need to have a large number of separate individual computer-based applications.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Industrial Management

COURSE CONTENT

Enterprise Resource Planning and SAP **Semester-VII**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. **ERP Introduction** **(08 Hours, 16 marks)**
   - a Enterprise – An Overview: Introduction, Business Function and Business Processes, Integrated management Information, Role of enterprising ERP system, Business Modeling, Integrated data model
   - b Introduction to ERP: Introduction, Common ERP Myths, A Brief History of ERP, The Advantages of ERP, Roadmap for the successful ERP Implementation

2. **ERP Risk, Benefits and Related Technologies** **(08 Hours, 16 marks)**
   - a Risks and Benefits of ERP: The quantifiable benefits from ERP system, The Intangible Benefits of ERP, Risks of ERP, Risks factor of ERP implementation, Benefits of ERP
   - b ERP and Related Technologies: Introduction, BPR, Data warehousing, Data Mining, OLAP, PLM, SCM, CRM, GIS, Internet and Extranet

3. **ERP Functional Modules and Implementation** **(08 Hours, 16 marks)**
   - a ERP Functional Modules: Introduction, Functional Modules of ERP software, Supply chain and customer relationship application
   - b ERP Implementation Life Cycle: Introduction, Objective of ERP Implementation, Different phases of ERP Implementations

4. **ERP Consultants, Vendor & Employees, eBusiness and Future Direction** **(08 Hours, 16 marks)**
   - a Consultants, Vendors and Employees: Introduction, In-house implementation-Pros and Cons, Vendors, Consultants, Employee and Employee resistance, Reason for employee resistance, Dealing with employee resistance
   - b ERP and eBusiness: Introduction, ERP and eBusiness, eBusiness-supply chain integration, The eBusiness process model, Components of the eBusiness supply chain, ERP/eBusiness integration, ERP internet and WWW
   - c Future Direction and Trends in ERP: Introduction, New market new channel and faster implementation methodologies

5. **SAP Introduction and Architecture of Web Application Server** **(08 Hours, 16 marks)**
   - a SAP Introduction: SAP Transformation into a Global Business, SAP for industries, SAP R/3 Releases and Fundamentals, SAP Enterprise Core Application Overview, SAP Services Overview
   - b The Architecture of the SAP Web Application Server: The SAP Web Application Server, Basic Architectural Concepts, Services Work Process Types, Building the Client/Server SAP web AS System

Text Books:

1. Alexis Leon, " Enterprise Resource Planning", Second Edition, Tata Mcgraw Hill
2. Jose A. Hernandez, Jim Keogh, Franklin Foster Mertinez, " SAP R/3 Handbook", Third Edition, Tata McGraw Hill

Reference Books:

1. V.K. Garg, N .K. Venkita Krishnan, "ERP Ware: ERP Implementation Framework" , PHI.
2. Annetta Clewwto and Dane Franklin, "Guide to Planning ERP Application", McGRaw-Hill, 1997.
3. George Anderson, Danielle Larocca, "Teach yourself SAP in 24 hours", Pearson Education.

Advanced Computer Architecture (Elective I)

COURSE OUTLINE

Course Title	Short Title	Course Code
Advanced Computer Architecture	**ACA**	

Course Description:

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Computer Architecture
Computer Organization

COURSE CONTENT

Advanced Computer Architecture **Semester-VII**

Teaching Scheme **Examination Scheme**

Lecture: 3 Hours/Week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. **Introduction to Parallel Processing** **(08Hrs, 16 Marks)**
   a. Evolution of parallel processors with future trends & applications
   b. Parallelism in uniprocessor system
   c. Parallel computer structure
   d. Architectural classification schemes
   e. System Attributes to Performance
   f. Program and Network Properties

2. **Memory Hierarchy and Processor** **(08Hrs, 16 Marks)**
   a. Hierarchical Memory Technology
   b. Back Plan Bus System
   c. Shared Memory Organization
   d. Advance Processor Technology
   e. RISC and CISC Scalar Processor
   f. Superscalar and Vector Processors

3. **Pipelining Processors and its Super Scalars Technique**
   (08Hrs, 16 Marks)
   a. Principles of Linear Pipelining
   b. Linear and Non-linear pipelining processors
   c. General Pipelining & Reservation Table

d. SIMD Array Processors
e. Parallel Algorithm for array processor
f. Associative array Processing

4. Multiprocessors Architecture (08Hrs, 16 Marks)

a. Loosely and Tightly coupled multiprocessor
b. Processor characteristics for multiprocessing
c. Parallel algorithm for multiprocessors
d. Synchronized and Asynchronous parallel algorithm
e. Vector processing

5. Principles of Multithreading (08Hrs, 16 Marks)

a. Principles of Multithreading
b. Parallel Programming modules
c. Parallel Languages
d. Data Flow Computer Architecture
e. Data driven computing and languages

Text/Reference Books:

1. Kai Hwang, “Advance Computer Architecture, Parallelism, Scalability, Programmability”, Mc-GrawHill Publication
2. Kai Hwang and Faye A Briggs, “Computer Architecture and Parallel Processing”

Android Programming (Elective I)

COURSE OUTLINE

Course Title	Short Title	Course Code
Android Programming	**AP**	

Course Description: This course provides the students the platform to learn and understand the Android technology and encourage them to design, develop and deploy Android applications.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	3	**14**	**42**	**3**

Prerequisite Course(s): Basics knowledge of object oriented concepts.

COURSE CONTENT

Android Programming **Semester-VII**

Teaching Scheme **Examination Scheme**

Lecture: 3 Hours/Week **End Semester Examination (ESE) : 80 Marks**
Paper Duration (ESE): 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. **Introduction to Mobile Operating Systems and Mobile Application Development** **(08 Hrs. 16 Marks)**
   a. **Introduction to Mobile OS:** Palm OS, Windows CE, Embedded Linux, J2ME (Introduction), Symbian (Introduction)
   b. **Overview of Android:** Devices running android, Why Develop for Android, Features of Android, Architecture of Android, Libraries.
   c. **Setup Android Development Environment:**
   Android development Framework- - Android-SDK Eclipse, Emulators – What is an Emulator / Android AVD? , Creating & setting up custom Android emulator, Android Project Framework

2. **Android Activities, UI Design and Database** **(08 Hrs. 16 Marks)**
   a. Understanding Intent**,** Activity, Activity Lifecycle and Manifest, Form widgets, Text Fields
   b. **Layouts:** Relative Layout, Table Layout, Frame Layout, Linear Layout, Nested layouts
   c. **UI design:** Time and Date, Images and media, Composite, Alert Dialogs & Toast, Popup

d. **Menu:** Option menu, Context menu, Sub menu
e. **Database:** Introducing SQLite, SQLite Open Helper, SQLite Database, Cursor
f. **Content providers:**defining and using content providers, example-Sharing database among twodifferent applications using content providers, Reading and updating Contacts, Reading bookmarks

3. **Preferences, Intents and Notifications** **(08 Hrs. 16 Marks)**
   a. **Preferences:**Shared Preferences, Preferences from xml
   b. **Intents:** Explicit Intents, Implicit intents
   c. **Notifications:** Broadcast Receivers, Services (Working in background) and notifications, Alarms

4. **Telephony, SMS and Location Based Services** **(08 Hrs. 16 Marks)**
   a. **Telephony:** Accessing phone and Network Properties and Status, Monitoring Changes in Phone State, Phone Activity and data Connection
   b. **SMS:** Sending SMS and MMS from your Application, sending SMS Manually, Listening for incoming SMS
   c. **Location based Services:** Using Location Based Services, Working with Google Maps, Geocoder

5. **Accessing Android Hardware** **(08 Hrs. 16 Marks)**
   a. **Networking:** An overview of networking, checking the network status, communicating with a server socket, Working with HTTP, Web Services
   b. **Bluetooth:** Controlling local Bluetooth device, Discovering and bonding with Bluetooth devices, Managing Bluetooth connections, communicating with Bluetooth
   c. **Audio and Video:** Playing Audio and Video, Recording Audio and Video, Using Camera and Taking Picture

Text/Reference Books:

1. Reto Meier, "Professional Android™ Application Development", Wrox Publications.
2. Lauren Dercy and Shande Conder, "Sams teach yourself Android application development" , Sams publishing
3. Hello Android, Introducing Google's Mobile Development Platform, Ed Burnette, Pragmatic Programmers, ISBN: 978-1-93435-617-3

Human Computer Interaction (Elective –I)

COURSE OUTLINE

Course Title	Short Title	Course Code
Human Computer Interaction (Elective-I)	**HCI**	

Course Description:

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	3	14	42	3

Prerequisite Course(s): Software Engineering

COURSE CONTENT

Human Computer Interaction **Semester-VII**

Teaching Scheme **Examination Scheme**

Lecture: 3 Hours/Week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Introduction (08Hrs, 16 Marks)

a. Importance of user interface
b. Importance of good design
c. GUI-Benefits of good UI
d. Concept of Direct Manipulation
e. Graphical systems :Advantage and disadvantage
f. Characteristics of GUI
g. The web user Interface
h. Characteristics of Web UI

2. Design Process (08Hrs, 16 Marks)

a. The Human interaction with computer
b. Important human characteristics in design
c. Human consideration in design
d. Human Interaction Speeds
e. Understand the Principles of Good Screen Design

3. Models in HCI (08Hrs, 16 Marks)

a. Cognitive models
b. Goals and task hierarchies
c. Design focus, GOMS
d. Linguistics models
e. Physical and device models
f. Cognitive Architectures

4. Interaction styles **(08Hrs, 16 Marks)**

a. Menus
b. Windows
c. Device based controls
d. Screen based controls

5. Communication **(08Hrs, 16 Marks)**

a. text messages
b. feedback and guidance
c. Graphics
d. Icons and images
e. colours

Text Books:

1. Alan Dix, J. E. Finlay, G. D. Abowd, R. Beale "Human Computer Interaction", Prentice Hall.
2. Wilbert O. Galitz, "The Essential Guide to User Interface Design", Wiley publication.

Reference Books:

1. Ben Shneidermann "Designing the user interface ", Pearson Education Asia.
2. Donald A. Norman, "The design of everyday things", Basic books.
3. Rogers Sharp Preece, "Interaction Design:Beyond Human Computer Interaction",Wiley.
4. Guy A. Boy "The Handbook of Human Machine Interaction", Ashgate publishing Ltd.
5. Alan Cooper, Robert Reimann, David Cronin, "About Face3: Essentials of Interaction design", Wiley publication.
6. Jeff Johnson, "Designing with the mind in mind", Morgan Kaufmann Publication.

Advanced Computer Network (Elective I)

COURSE OUTLINE

Course Title	Short Title	Course Code
Advanced Computer Network	**ACN**	

Course Description:
This course is aimed at introducing the advanced of Computer Networking to undergraduate students. The objective of the course is to understand the basics and knowledge about the Wireless Computer Network concepts and its Security, Ad Hoc wireless network and Sensor Network with its routing protocols.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	3	**15**	**45**	**3**

Prerequisite Course(s): Undergraduate introductory class to networking required.

COURSE CONTENT

Advanced Computer Network **Semester-VII**

Teaching Scheme **Examination Scheme**

Lecture: 3 Hours/Week
End Semester Examination (ESE) :80 Marks
Paper Duration (ESE): 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Wireless Networking, Overview of 802.11 Networks, 802.11 MAC Fundamentals. (08Hrs, 16 Marks)

a Introduction to wireless Networking: Why Wireless? What makes Wireless Network different? A Network by Any other name.

b Overview of 802.11 Networks: IEEE 802 Network Technology Family tree, 802.11 Nomenclature and design, 802.11 Network Operation, Mobility Support.

c 802.11 MAC Fundamentals: Challenges for the MAC,MAC Access Modes and Timing, Contention-Based Access Using the DCF, Fragmentation and Reassembly, Frame Format, Encapsulation of Higher-Layer Protocols Within 802.11,Contention-Based Data Service, Frame Processing and Bridging

2. 802.11 Framing in Detail and Management Operations. (08Hrs, 16 Marks)

a 802.11 Framing in Detail: Data Frames, Control Frames, Management Frames, Frame Transmission and Association and Authentication States

- b Management Operations: Management Architecture, Scanning, Authentication, Pre-authentication, Association, Power Conservation, Timer Synchronization, Spectrum Management

3. Contention-Free Service with the PCF,Wired Equivalent Privacy, User Authentication with 802.1X (08Hrs, 16 Marks)

- a Contention-Free Service with the PCF: Contention-Free Access Using the PCF, Detailed PCF Framing, Power Management and the PCF
- b Wired Equivalent Privacy (WEP): Cryptographic Background to WEP, WEP Cryptographic Operations, Problems with WEP, Dynamic WEP
- c User Authentication with 802.1X: The Extensible Authentication Protocol, EAP Methods, 802.1X: Network Port, Authentication, 802.1X on Wireless LANs

4. 802.11i, Ad Hoc Wireless Networks, Routing Protocols for Ad Hoc Wireless Networks

(08Hrs, 16 Marks)

- a 802.11i: Robust Security Networks, TKIP, and CCMP: The Temporal Key Integrity Protocol (TKIP), Counter Mode with CBC-MAC (CCMP), Robust Security Network (RSN) Operations
- b Ad Hoc Wireless Networks: Introduction, Issues in Ad Hoc Wireless Networks, Ad Hoc Wireless Internet.
- c Routing Protocols for Ad Hoc Wireless Networks: Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classifications of Routing Protocols

5 Routing Protocols for Ad Hoc Wireless Networks, Wireless Sensor Networks

(08Hrs, 16 Marks)

- a Routing Protocols for Ad Hoc Wireless Networks: Table-Driven Routing Protocols, On Demand Routing Protocols, Hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms, Power-Aware Routing Protocols
- b Wireless Sensor Networks: Introduction, Sensor Networks Architecture, Data Dissemination, Data Gathering, MAC Protocols for Sensor Networks, Location Discovery, Quality of a Sensor Network.

Text Books:

1. Matthew Gast, 802.11 Wireless Networks: The Definitive Guide, Second Edition, O'Reilly
2. C.Siva Ram Murthy, B.S. Manoj, Ad Hoc Wireless Networks: Architectures and Protocols, Pearson

Embedded System

COURSE OUTLINE

Course Title	Short Title	Course Code
Embedded System	**ES**	

Course Description: The objective of this course is to introduce students the knowledge of Embedded System, Architecture of embedded system, programming, and process of embedded system development, interfaces, real time OS concept and creation of target image.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**03**	**14**	**42**	**03**

Prerequisite Course(s): Knowledge of Microprocessor/Microcontroller and Operating System

COURSE CONTENT

Embedded System **Semester-VII**

Teaching Scheme **Examination Scheme**

Lecture: 3 Hours/Week

Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. **Introduction to Embedded System** **(08Hrs, 16 Marks)**
   a. What is Embedded System?
   b. Application areas
   c. Categories of the Embedded System
   d. Overview of Embedded System architecture
   e. Specialties of Embedded System
   f. Recent trends in Embedded System
   g. Hardware architecture-CPU, Memory, Clock Circuitry, WDT, Chip Select, Communication Interfaces.
   h. Communication Protocols-I^2C, SPI & CAN

2. **Process of Embedded System Development** **(08Hrs, 16 Marks)**
   a. The development process
   b. Requirement engineering
   c. Design
   d. Implementation
   e. Integration and Testing
   f. Packaging
   g. Configuration Management
   h. Managing Embedded System development projects

3. ARM System Architecture **(08Hrs, 16 Marks)**

a. RISC design philosophy, ARM design philosophy
b. Embedded system hardware, Embedded system software
c. Registers, Current program status register
d. Pipeline, Exception, Interrupts Vector table
e. Core Extensions
g. Architecture revision
h. ARM Processor families

4. Real Time Operating System **(08Hrs, 16 Marks)**

a. Architecture of kernel
b. Tasks & Task Scheduler
c. Interrupt Service Routines, Semaphores, Mutex, Mailbox, Message queues
d. Pipes, Event Register, Timers, Signals, Memory management
e. Priority Inversion Problem
f. RTOS services in contrast with traditional OS.
g. Introduction to uCOSII RTOS, Salient Features of uCOSII, Study of kernel structure of uCOSII
h. Synchronization in uCOSII, Inter-task communication in uCOSII, Porting of RTOS.

5. Embedded Linux **(08Hrs, 16 Marks)**

a. Introduction to the Linux kernel,
b. Configuring and booting the kernel
c. The root file system
d. Root file directories, /bin, /lib etc.,
e. Linux file systems,
f. Types of file system: Disk, RAM, Flash and Network
g. Some debug techniques- Syslog and Strace, GDB
h. TCP/IP Networking- Network configuration

Text Books:

1. Dr. K.V.K.K. Prasad, "Embedded /Real-Time System: Concepts, Design & Programming", Dreamtech, Edition 2010.
2. Andrew. N. Sloss, DomnicSymes, Chris Wright, "ARM System Developer's Guide", Elsevier, edition 2004.

Reference Books:

1. KarimYaghmour , "Building Embedded Linux Systems**"**, 2003 O'Reilly & Associates,
2. Rajkamal, "Embedded Sytems ", TMH.
3. David Simon, "Embedded systems software primer", Pearson
4. Steve Furber, "ARM System-on-Chip Architecture", Pearson
5. Iyer, Gupta, "Embedded real systems Programming", TMH

Advanced UNIX Programming Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Advanced UNIX Programming Lab	**AUP Lab**	

Course Description:

This laboratory provides students with a comprehensive study of Unix commands. The practical's make students able for designing program for process creation, atexit function, file management and status information and various interprocess communications because of these students able to write efficient, maintainable, and portable code.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**14**	**28**	**1**

Prerequisite Course(s): Fundamental knowledge of C.

LAB COURSE CONTENT

(Note: Minimum FOUR Experiments each from group A and B)

Group A

1. Write a program for File Management (any 7 option)
2. Write a program for Simulation of various commands(any7 option)
3. Write a program to display user and system information
4. Write a program to display file status flags on specified descriptor
5. Write any program using atexit function
6. Write a program for process creation using fork and vfork function

Group B

1. Write a program for Inter Process Communication using pipe
2. Write a program for catching of Signals
3. Write a program for Daemon process
4. Write a program for multithreading
5. Write a program for client server communication using socket
6. Write a program for Inter Process Communication using Message Queue

Guidelines for ICA:
Students must submit ICA in the form of journal. Each experiment should be well documented. Faculty in charge will assess the experiments continuously and will

assign grade or mark for each experiment on date of completion, declared for each experiments.

Guidelines for ESE:
In the ESE, the students may be asked to perform the practical assignment with minor modification. Questions will be asked during the practical examination to judge the understanding of the student. It is expected that student knows theoretical aspect of the problem.

Text Book:

1. W. Richard Stevens and Stephen A. Rago, Advanced Programming in the UNIX Environment, 2/E, Pearson Education

Reference Book:

1. W. Richard Stevens, Unix Network Programming - Interprocess Communications, Volume 2, 2/E, Pearson Education

Note:-

- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Embedded System Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Embedded System Lab	**ES Lab**	

Course Description:

	Hours/Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**14**	**28**	**1**

LAB COURSE CONTENT

(Note: Minimum FOUR Experiments each from group A and B)

Group A

1. Writing basic C-programs for I/O operations.
2. Program to interface LCD.
3. Program to demonstrate I2C Protocol.
4. Program to demonstrate CAN Protocol.
5. Program to interface Keyboard and display key pressed on LCD.
6. Program to interface stepper motor.
7. Program to interface Graphics LCD.

Group B

1. Program to interface Touch Panel.
2. Program to implement AT commands and interface of GSM modem.
3. Interfacing 4 x 4 matrix keyboards and 16 x 2 character LCD display to microcontroller /Microprocessor and writing a program using RTOS for displaying a pressed key.
4. Writing a scheduler / working with using RTOS for 4 tasks with priority. The tasks may be keyboard LCD, LED etc. and porting it on microcontroller/ microprocessor.
5. Implement a semaphore for any given task switching using RTOS on microcontroller board.
6. Create two tasks, which will print some characters on the serial port, Start the scheduler and observe the behavior.
7. Program for exploration of (Process creation, Thread creation) using Embedded Real Time Linux.

Guidelines for ICA:

Students must submit ICA in the form of journal. Each experiment should be well documented. Faculty in charge will assess the experiments continuously and will assign grade or mark for each experiment on date of completion, declared for each experiments.

Guidelines for ESE:

In the ESE, the students may be asked to perform the practical assignment with minor modification. Questions will be asked during the practical examination to judge the understanding of the student. It is expected that student knows theoretical aspect of the problem.

Text Books:

1. Dr. K.V.K.K. Prasad, “Embedded /Real-Time System: Concepts, Design & Programming”, Dreamtech, Edition 2010.
2. Andrew. N. Sloss, DomnicSymes, Chris Wright, “ARM System Developer’s Guide”, Elsevier, edition 2004.

Reference Books:

1. KarimYaghmour , “Building Embedded Linux Systems**”,** 2003 O'Reilly & Associates,
2. Rajkamal, “Embedded Sytems “, TMH.
3. David Simon, “Embedded systems software primer”, Pearson
4. Steve Furber, “ARM System-on-Chip Architecture”, Pearson
5. Iyer,Gupta, “Embedded real systems Programming“, TMH

Note:-

- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Advanced Computer Architecture Lab (Elective I Lab)

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Advanced Computer Architecture Lab	**ACA Lab**	

Course Description:

Laboratory	Hours/Week	No. of Weeks	Total Hours	Semester Credits
	02	**14**	**28**	**01**

Prerequisite Course(s): Computer Architecture, Computer Organization

LAB COURSE CONTENT

(Note: Minimum **FOUR** Experiments each from below list)

1. Study of CRAY-1 System Architecture
2. Implement instruction pipeline
3. Implementation of matrix multiplication using threading.
4. Implementation of hyper quick sort algorithm.
5. Study of PARAM Supercomputer.
6. Study of data flow computer.

Reference Books:

1. Kai Hwang, "Advance Computer Architecture, Parallelism, Scalability, Programmability", Mc-Graw Hill Publication.
2. Kai Hwang and Faye A Briggs, "Computer Architecture and Parallel Processing"

Guidelines for ICA:
Students must submit ICA in the form of journal. Each experiment should be well documented. Faculty in charge will assess the experiments continuously and will assign grade or mark for each experiment on date of completion, declared for each experiments.

Guidelines for ESE:
In the ESE, the students may be asked to perform the practical assignment with minor modification. Questions will be asked during the practical examination to judge the understanding of the student. It is expected that student knows theoretical aspect of the problem.

Note:-
- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Android Programming Lab (Elective I Lab)

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Android Programming Lab	**AP Lab**	

Course Description: This course provides the students the platform to learn and understand the Android technology and encourage them to design, develop and deploy Android applications.

Laboratory	Hours/Week	No. of Weeks	Total Hours	Semester Credits
	02	14	28	01

Prerequisite Course(s) : Basic knowledge of object oriented concepts.

LAB COURSE CONTENT

Term Work:

Any **SIX** lab assignments should be framed by concern staff member based on above syllabus. The Practical should be carried out using JDK 6.0 or above, Android SDK and Eclipse.

These tools are available for free download at

1. www.developer.android.com
2. www.eclipse.org
3. www.sun.com

1. Program to show use of UI elements
2. Program to show demo of layouts
3. Program to create Menus and Dialog box.
4. Program to show how to use intents (implicit and explicit)
5. Program to work with database (create, insert ,delete ,update ,select operations)
6. Program to show how to use notifications
7. Program to make call, send and receive SMS.
8. Program to work with Google maps.
9. Program to play Audio and video files
10. Program to send and receive file using Bluetooth
11. Program to show how to use Networking and web-services in Android

Guidelines for ICA:

Students must submit ICA in the form of journal. Each experiment should be well documented. Faculty in charge will assess the experiments continuously and will assign grade or mark for each experiment on date of completion, declared for each experiments.

Guidelines for ESE:

In the ESE, the students may be asked to perform the practical assignment with minor modification. Questions will be asked during the practical examination to judge the understanding of the student. It is expected that student knows theoretical aspect of the problem.

Text Books/Reference Books:

1. Reto Meier, “Professional Android™ Application Development”, Wrox Publications
2. Lauren Dercy and Shande Conder, “Sams teach yourself Android application development”, Sams publishing
3. Hello Android, Introducing Google’s Mobile Development Platform, Ed Burnette,
   Pragmatic Programmers, ISBN: 978-1-93435-617-3

Note:-

- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Human Computer Interaction Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Human Computer Interaction Lab	**HCI Lab**	

Course Description:

Laboratory	**Hours/Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	2	**14**	**28**	**1**

Prerequisite Course(s): Web Technology lab

LAB COURSE CONTENT

(Note: Minimum FOUR Experiments each from group A and B)

Group A

1. Know your client –
   Children (3-4 years of age): An application to teach Alphabets , shapes.
2. Learn HCI design principles –Identify 3 different websites catering to one specific goal ze.g. Goal – on-line shopping and 3 different websites – ebay, amazon, flipkart, zovi, myntra) and perform a competitive analysis on them to understand how each one caters to the goal, the interactions and flow of the payment system and prepare a report on the same.
3. Learn the importance of menus and navigation – website redesign: News websites like CNN are always cluttered with information
4. Menu designing: Choose a unique domain, design a menu and show how it can be accommodated on an interface.
5. Icon designing: Choose a unique domain, design a few icons and show how it can be accommodated on an interface.
5. Understand the need of colors and animation – web site for an artist: A celebrity in some form of art like music, dance, painting, martial arts, etc (not actors). This site will be used to display his works and should portray his character.
7. Any other new relevant topics covering the above syllabus

Group B

1. Online shopping website
2. E -learning web site
3. Video/ Audio on demand web site
4. Travel reservation system
5. ATM Interface
6. Online trading on stock market
7. University web site
8. Placement agency

(**Note**: A project with a team of minimum 2 and maximum 3 students. The purpose of the project is focused on User interaction and NOT on the implementation of the entire project. Explain technology in interface Design; explain the user interface design process; coloring guidelines; Speech Recognition and speech generation; Types of windows; Components of UI, such as Text Boxes, List Boxes, Messages, Icons, Multimedia; Mental models; Importance of the mental models in UI design.)

Guidelines for ICA:
Students must submit ICA in the form of journal. Each experiment should be well documented. Faculty in charge will assess the experiments continuously and will assign grade or mark for each experiment on date of completion, declared for each experiments.

Guidelines for ESE:
In the ESE, the students may be asked to perform the practical assignment with minor modification. Questions will be asked during the practical examination to judge the understanding of the student. It is expected that student knows theoretical aspect of the problem.

Text Books:

1. Alan Dix, J. E. Finlay, G. D. Abowd, R. Beale “Human Computer Interaction”, Prentice Hall.
2. Wilbert O. Galitz, “The Essential Guide to User Interface Design”, Wiley publication.

Reference Books:

1. Ben Shneidermann “Designing the user interface “, Pearson Education Asia.
2. Donald A. Norman, “The design of everyday things”, Basic books.
3. Rogers Sharp Preece, “Interaction Design:Beyond Human Computer Interaction”,Wiley.
4. Guy A. Boy “The Handbook of Human Machine Interaction”, Ashgate publishing Ltd.
5. Alan Cooper, Robert Reimann, David Cronin, “About Face3: Essentials of Interaction design”, Wiley publication.
6. Jeff Johnson, “Designing with the mind in mind”, Morgan Kaufmann Publication.

Note:-

- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Advanced Computer Network Lab (Elective I Lab)

LAB COURSE OUTLINE

Course Title	Short Title Course Code
Advanced Computer Network Lab	**ACN Lab**

Course Description:
This laboratory provides students with a comprehensive study of the Advanced Computer Networking and protocols. Classroom lectures stress the strengths of Computer Networks, which provide students with the means of writing efficient, maintainable, and portable code and simulating protocols and networks.

Laboratory	Hours/Week	No. of Weeks	Total Hours	Semester Credits
	2	14	28	1

Prerequisite Course(s): Fundamental knowledge of computer network and wireless networking protocols.

LAB COURSE CONTENT

1. Setting up wireless network with and without infrastructure support.
2. Configuring Access Point with bridging mode (Point to Point and Point to Multi Point).
3. Configuring Routing between wired and wireless Networks.
4. Configuring Security in wireless network with and without infrastructure support.
5. At least 3 lab assignments based on above syllabus using any network simulator such as NS2, OPNET, OMNET, NetSim, NS3 etc.

Guidelines for ICA:
Students must submit ICA in the form of journal. Each experiment should be well documented. Faculty in charge will assess the experiments continuously and will assign grade or mark for each experiment on date of completion, declared for each experiments.

Guidelines for ESE:
In the ESE, the students may be asked to perform the practical assignment with minor modification. Questions will be asked during the practical examination to judge the understanding of the student. It is expected that student knows theoretical aspect of the problem.

Text Books:

1. Matthew Gast, 802.11 Wireless Networks: The Definitive Guide, Second Edition, O'Reilly
2. C.Siva Ram Murthy, B.S. Manoj, Ad Hoc Wireless Networks: Architectures and Protocols, Pearson

Note:-

- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Project-I

Project-I | **P-I** |
Course Title | Short Title | Course Code

Course Description:
The course explores the knowledge of design, experiment and analysis of data. The course develops ability to work on multidisciplinary teams, Identify, formulate, and solve engineering problems in view of economic, environmental and societal context.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**14**	**28**	**2**

COURSE CONTENT

Project-I **Semester-VII**

Lab:2 Hrs/week **Examination Scheme**

Total Semester Credits: 02
Internal Continuous Assessment (ICA): 25 Marks
End Semester Examination (ESE)-Oral:25 Marks
Total: 50Marks

1. It is expected that the broad area of Project-I shall be finalized by the student in the beginning of the VII semester / extension of Minor project undertaken may be Project-I.
2. A group of Minimum 3 and Maximum 5 students shall be allotted for Project-I and same project group for Project-II.
3. Exhaustive survey of literature based on a clear definition of the scope and focus of the topic should be carried out by the students. The **Synopsis/Abstract** on the selected topic, after detail literature survey should be submitted to the Project coordinator appointed by Head of the department.
4. Project-I may involve literature survey, problem identification, work methodology preparing specification and material procurement, collection of data , conduction of experiments and analysis. The project work shall involve sufficient work so that students get acquainted with different aspects of fabrication, design or analysis.
5. Approximately more than 50% work should be completed by the end of VII semester.
6. Each student group is required to maintain log book for documenting various activities of Project-I and submit group project report in the form of thermal bound at the end of semester –VII. Submit the progress report in following format:

1. *Title*
2. *Abstract*
3. *Introduction*
4. *Problem identification and project objectives*
5. *Literature survey*
6. *Analysis*
7. *Design Methodology*
8. *Expected result and conclusion*
9. *References.*

7. Evaluation Committee comprising of the Guide, Project Coordinator and Expert appointed by the Head of the department will award the marks based on the work completed by the end of semester and the presentation based on the project work.

Guide lines for ICA: The Internal Continuous Assessment shall be based on the active participation of the students in the Project work and knowledge / skill acquired. Assessment of the project-I for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given in **Table-A.**

Guide lines for ESE: The End Semester Examination for Project shall consist of demonstration if any, presentation and oral examinations based on the project report**.**

Assessment of Project-I (ICA)

Title of the Project: ______________________________

Name of the Guide: ______________________________

Table-A

SN	Name of Student	Problem Identification and project objectives	Literature Survey	Project Methodology/ Design/PCB/ hardware/ simulation/ programming	Progress Status	Present ation	Tota l
		5	5	5	5	5	25

Seminar-II
COURSE CONTENT

Seminar-II **S-II**
Course Title Short Title Course
Code

Course Description: The course explores the knowledge of presentation and effective communication. The course develops ability to work on multidisciplinary teams, Identify, formulate, and solve engineering problems in view of economic, environmental and societal context.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	**14**	**28**	**2**

COURSE CONTENT

Seminar-II **Semester-VII**

Examination Scheme
Practical : 2 Hrs/Week **Total Semester Credits: 02**
Internal Continuous Assessment (ICA): 25 Marks

1. Each Student shall select a topic for seminar which is not covered in curriculum. Seminar topic should not be repeated and registration of the same shall be done on first come first serve basis.
2. Topic of Seminar shall be registered within a three weeks from commencement of VII Semester and shall be approved by the committee.
3. The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of Seminar-II. Seminar shall be related state of the art topic of his choice approved by the committee.
4. Each student should deliver a seminar in scheduled period (Specified in time table or time framed by department) and submit the seminar report (paper bound copy/Thermal bound)in following format:
    1. *Title*
    2. *Abstract*
    3. *Introduction*
    4. *Literature survey*
    5. *Concept*
    6. *Functional and Technical Details*
    7. *Applications*
    8. Comparison with similar topics / methods
    9. *Future scope*
    10. *References*

ASSESSMENT OF SEMINAR-II

Guide lines for ICA: ICA shall be based on topic selection, presentation and Seminar-II report submitted by the student in the form of thermal bound. Assessment of the Seminar-II for award of ICA marks shall be done jointly by the guide and a departmental committee, as per the guidelines given in **Table- B**

Name of Guide: ______________________________________

Table-B

SN	Name of Student	Seminar Topic	Topic Selection	Literature survey	Report writing	Depth of under-standing	Presentation	Total
			5	5	5	5	5	25

Industrial Visit

Industrial Visit	**IV**	Course Title
Short Title	Course Code	

Course Description: The course explores the knowledge industry organization, new trends in manufacturing, maintenance and safety. The industrial visit provides the practical visualization of theoretical study of various engineering subject.

COURSE CONTENT

Semester-VII **Examination Scheme**

Total Semester Credits: 01

Internal Continuous Assessment (ICA): 25 Marks

1. Industry visits to minimum two industries shall be carried out by each student preferably or college shall arrange the industrial visit during the vacation period otherwise during the regular VII semester.
2. The student should obtain appropriate certificates of visit from the concerned organizations just after the visits.
3. Every Student should submit Industrial Visit report individually at the end of Semester-VII(First Term of Final Year)
4. The report(Thermal Bound) should contain information about the following points:
   a. *The organization - activities of organization and administrative setup technical personnel and their main duties.*
   b. *The project / industry brief description with sketches and salient technical information.*
   c. *The work / processes observed with specification of materials, products, equipments etc. and role of engineers in that organization.*
   d. *Suggestions (if any) for improvement in the working of those organizations.*
5. The evaluation of the report of technical visits will be made by panel of three teachers appointed by Head of the department based on following points:

Guide lines for ICA: ICA shall be based on knowledge gain by student and Industrial Visit Report submitted by the student in the form of Thermal bound. Assessment of the Industrial Visit for award of ICA marks shall be done jointly by industrial visit coordinators departmental committee based on viva -voce as per the guidelines given in **Table- C**

Table-C

SN	Name of Student	Name of Industry	Report writing	Depth of Under-standing	Total
			15	**10**	**25**

NORTH MAHARASHTRA UNIVERSITY,
JALGAON (M.S.)

Final Year Engineering
(Computer)
Faculty of Engineering and Technology

COURSE OUTLINE

Semester – VIII

W.E.F. 2015– 2016

Compiler Design

COURSE OUTLINE

Course Title	Short Title	Course Code
Compiler Design	**CD**	

Course Description:

This course is aimed at introducing the fundamentals of Compiler Design to undergraduate students. The objective is to learn the major phases of compilers such as lexical analysis, syntax analysis, intermediate code generation and code generation, understand the role and necessity of runtime environment and apply this knowledge for implementing the programs for various phases and system softwares using engineering tools.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	3	14	42	3

Prerequisite Course(s): Fundamentals of System Programming, Formal Language & Automata Theory

COURSE CONTENT

Compiler Design **Semester- VIII**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE): 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Introduction: **(08 Hrs, 16 Marks)**

a. Language Processors
b. The Structure if a Compiler
c. Application of Compiler Technology

Lexical Analysis:

d. The Role of Lexical Analyzer
e. Specification of Tokens
f. Recognition of Tokens
g. Lexical Analyzer Generator LEX

2. Syntax Analysis: **(08 Hrs, 16 Marks)**

a. Role of the Parser
b. Representative Grammar
c. Syntax Error Handling
d. Error-recovery Strategies

e. Context Free Grammars: Definition, Notational Conventions
f. Derivations
g. Parse Trees and Derivations
h. Ambiguity
i. Eliminating Ambiguity
j. Elimination of Left Recursion
k. Elimination of Left Factoring

3. Parsing Methods **(08 Hrs, 16 Marks)**

a. Top Down Parsing: Recursive-Descent Parsing, FIRST and FOLLOW, LL(1) grammar
b. Nonrecursive Predictive Parsing
c. Construction of Nonrecursive Predictive Parsing Table
d. Error Recovery in Predictive Parsing
e. Bottom-up Parsing: Shift-Reduce Parsing, Conflicts during Shift-Reduce Parsing
f. Introduction to LR Parsing, L-R Parsing Algorithm, Viable Prefixes
g. Simple LR Parser (SLR), Construction of Simple LR Parsing Table
h. Canonical LR(1), Construction of LR(1) Parsing Table
i. Look Ahead LR (LALR), Construction of LALR Parsing Table
j. Parser Generator - Yacc

4. Syntax-Directed Translation: **(08 Hrs, 16 Marks)**

a. Syntax-Directed Definitions
b. Dependency Graphs
c. S-attributed Definitions
d. L-attributed Definitions
e. Application of Syntax Directed Translation
f. Syntax Directed Translation Schemes

Intermediate Code Generation:

g. Variants of Syntax Trees
h. Three Address Code
i. Control Flow
j. Backpatching

5. Runtime Environment: **(08 Hrs, 16 Marks)**

a. Storage Organization
b. Activation Trees
c. Activation Records
d. Calling Sequence
e. Heap Management
f. Introduction to Garbage Collection

Code Generation:

g. Issues in Code Generator
h. The Target Language
i. Basic Blocks and Flow Graphs
j. Optimization of Basic Blocks
k. A simple Code Generator
l. Peephole Optimization

Text Books -

1. Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D Ullman- “Compilers- Principles, Techniques and Tools”, 2nd edition, Pearson, 2014.

Reference Books -

1. K. Cooper, L, Torczon, "Engineering a Compiler", Morgan Kaufinann Publishers, ISBN 81-8147-369-8.
2. K. Louden, "Compiler Construction: Principles and Practice", Cengage Learning, ISBN 978-81-315-0132-0
3. J. R. Levine, T. Mason, D. Brown, "Lex&Yacc", O'Reilly, 2000, ISBN 81-7366 –061-X.
4. S. Chattopadhyay, "Compiler Design", Prentice-Hall of India, 2005, ISBN 81- 203-2725-X.

Data Warehousing & Mining

COURSE OUTLINE

Course Title	Short Title	Course Code
Data Warehousing & Mining	**DWM**	

Course Description: The objective of this course is to introduce the students to Learn and practice data modeling using the multidimensional database schemas and developing data warehouse to extract knowledgeable information for decision support system.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Knowledge of Database Management System

COURSE CONTENT

Data Warehousing & Mining **Semester-VIII**

Teaching Scheme **Examination Scheme**

Lecture: 3 Hours/Week

End Semester Examination (ESE): 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. **Introduction to Data Warehousing** **(08Hrs, 16 Marks)**
   a. What is a Data Warehouse?
   b. A Multidimensional data model
   c. Data Warehouse Architecture
   d. From Data Warehousing to Data Mining
   e. Why preprocess data?
   f. Data Cleaning
   g. Data Integration and Transformation
   h. Data Reduction
   i. Data discretization and concept hierarchy generation

2. **Introduction to Data Mining** **(08Hrs, 16 Marks)**
   a. What is Data Mining?
   b. Data Mining Functionalities: What kinds of Patterns can be Mined?
   c. Classification of Data Mining Systems
   d. Data Mining Task Primitives
   e. Integration of Data Mining system with a Data Warehouse System
   f. Major issues in Data Mining
   g. Data Mining statics: Guidelines for successful Data Mining
   h. Applications and Trends in Data Mining

3. **Mining Frequent Patterns** **(08Hrs, 16 Marks)**
   a. Mining frequent pattern
   b. Associations: Basic concepts
   c. Market basket analysis
   d. Apriori Algorithm
   e. Association rules from frequent item sets
   f. Mining multilevel association rules
   g. Constraint based association mining
   h. Association mining to correlation analysis

4. **Classification and Prediction** **(08Hrs, 16 Marks)**
   a. Introduction to Classification and Prediction
   b. Classification by Decision tree Induction
   c. Bayesian classification
   d. Rule based classification
   e. Classification by Back propagation
   f. Other classification methods
   g. Prediction: Linear Regression
   h. Non-linear regression

5. **Cluster Analysis** **(08Hrs, 16 Marks)**
   a. What is Cluster Analysis and Outliers
   b. Types of data in cluster analysis
   c. Categorization of clustering methods
   d. Classical Partitioning methods: k-Means and k-Medoids
   e. Hierarchical Methods: Agglomerative and divisive
   f. Density Based Methods: DBSCAN
   g. Grid Based Methods: STING
   h. Outlier analysis

Text Books -

1. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Second Edition, Morgan Kaufmann.

Reference Books -

1. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction To Data Mining",Person Education, 2007.
2. G. K. Gupta, "Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006.
3. Alex Berson and Stephen J. Smith, "Data Warehousing, Data Mining & OLAP", Tata McGraw – Hill Edition, Tenth Reprint 2007.

Software Metrics and Quality Assurance (Elective II)

COURSE OUTLINE

Course Title	Short Title	Course Code
Software Metrics and Quality Assurance	**SMQA**	

Course Description:

This course introduces the students about the concepts software measurement and metrics. It includes scope of software metrics, internal product attributes, and external product attributes Software quality and quality assurance techniques. This course also describes about cost estimation, documentation and testing tools, etc.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	**03**	**14**	**42**	**03**

Prerequisite Course(s): Software Engineering.

COURSE CONTENT

Software Metrics and Quality Assurance **Semester-VIII**

Teaching Scheme **Examination Scheme**

Lecture: 3 Hours/Week

End Semester Examination (ESE): 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Introduction to Software Measurement: **(08Hrs, 16 Marks)**

a. Measurement in everyday life
b. Measurement in Software Engineering
c. The scope of software metrics
d. The representational theory of measurement
e. Measurement and Models
f. Measurement scales and scales types
g. Meaningfulness in measurement
h. Classifying software measures & Determining what to measure

2. Measuring internal product attributes: **(08Hrs, 16 Marks)**

a. Measuring internal product attributes: Size
b. Aspects of software size, Length & Reuse
c. Functionality & Complexity
d. Measuring internal product attributes: Structure
e. Types of Structural measures - Control Flow Structures
f. Modularity and Information Flow attributes & Data structures

g. Difficulties with general "complexity" measures

3. Measuring external product attributes: (08Hrs, 16 Marks)

a. Software Quality - Modelling Software Quality & Measuring aspects of Quality
b. Software Reliability:
c. Basics of Reliability Theory
d. The Software Reliability Problem
e. Parametric Reliability Growth Models
f. Predictive Accuracy
g. The importance of the operational environment

4. Cost estimation & Documentation: (08Hrs, 16 Marks)

a. Making Process Predictions - Good Estimates
b. Cost estimation-Problems and approaches
c. Models of Effort and cost
d. Software Documentation

5. Quality Assurance Techniques: (08Hrs, 16 Marks)

a. Quality Assurance Techniques- Testing Principles, Goals, Testing Life Cycle, Phases of Testing Manual Testing- Test case design criteria.
b. Automated Testing Introduction of Testing Tools- J-Meter, Win Runner, QTP, Selenium etc.
c. ISO-9000 Model
d. SEI's CMM Model
e. Comparison of the ISO-9000 model with SEI's CMM model

Text Books:

1. Flanton, Pfleeger, "Software Metrics- A Rigorous and Practical Approach" Thompson Learning.
2. Mordechai Ben-menachem/Garry S.Marliss, "Software Quality", Thompson Learning.
3. Software Testing, Second Edition By: Ron Patton,Pearson Education ISBN -13: 978-0-672-32798-8.

Reference Books:

1. Roger S. Pressman, "Software Engineering- A Practitioner's Approach", TMH.
2. Swapna Kishore and Rajesh Naik, "ISO 9001:2000 for Software Organizations", TMH.

Distributed System (Elective II)

COURSE OUTLINE

Course Title	Short Title	Course Code
Distributed Systems	**DS**	

Course Description:

This course introduces students to the principles, design and implementation of distributed systems. The lectures focus primarily on the principles and design of distributed systems and cover processes, communication, naming, synchronization, security, access control and security management.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	**3**	**14**	**42**	**3**

Prerequisite Course(s): Operating Systems, Computer Networks.

COURSE CONTENT

Distributed System **Semester-VIII**

Teaching Scheme **Examination Scheme**

Lecture: 3 Hours/Week

End Semester Examination (ESE): 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1 Introduction to Distributed Systems and Architectures

(08Hrs, 16 Marks)

a. Introduction: Definition of a Distributed system.
b. Goals: Making Resources Accessible, Distribution Transparency, Openness, Scalability, Pitfalls.
c. Types of Distributed System: Distributed Computing Systems, Distributed Information Systems, Distributed Pervasive Systems.
d. Architectural Styles: Layered architectures, Object-based architectures, Data-centered architectures, Event-based architectures.
e. System Architectures: Centralized Architectures, Decentralized Architectures, Hybrid Architectures.

2 Processes

(08Hrs, 16 Marks)

a. Threads: Introduction to Threads, Threads in Distributed Systems.
b. Virtualization: The Role of Virtualization in Distributed Systems, Architectures of Virtual Machines.
c. Clients: Networked User Interfaces, Client-Side Software for Distribution Transparency.
d. Servers: General Design Issues, Server Clusters, Managing Server Clusters.
e. Code Migration: Approaches to Code Migration , Migration and Local Resources , Migration in Heterogeneous Systems.

3 Communication

(08Hrs, 16 Marks)

a. Fundamentals: Layered Protocols , Types of Communication.
b. Remote Procedure Call: Basic RPC Operation, Parameter Passing , Asynchronous RPC.
c. Message-Oriented Communication: Message-Oriented Transient Communication, Message-Oriented Persistent Communication.
d. Stream-Oriented Communication: Support for Continuous Media, Streams and Quality of Service, Stream Synchronization.

4 Synchronization and Election

(08Hrs, 16 Marks)

a. Clock Synchronization: Physical Clocks, Global Positioning System, Clock Synchronization Algorithms.
b. Logical Clocks: Lamport's Logical Clocks, Vector Clocks.
c. Mutual Exclusion: A Centralized Algorithm, A Decentralized Algorithm, A Distributed Algorithm, A Token Ring Algorithm.
d. Global State: Needs, Properties and Various Global States
e. Election Algorithm: Bully and Ring Algorithm.

5 Security, Access Control and Security Management

(08Hrs, 16 Marks)

a. Introduction to Security: Security Threats, Policies and Mechanisms, Design Issues, Cryptography.
b. Secure Channels: Authentication, message integrity and confidentiality.
c. Access Control: General Issues in Access Control, Firewalls, Denial of Service.
d. Security Management: Key Management, Authorization Management.

Text Books:

1. A.S.Tanenbaum, M. Van Steen , “ Distributed Systems” , Pearson Education 2004.
2. George Coulouris, Jean Dollimore, Tim Kindberg, “Distributed Systems Concepts and Design” , Third Edition – 2002- Pearson Education Asia.

Reference Books:

1. Pradeep K. Sinha, “Distributed Operating Systems”, Prentice Hall of India Private Limited.

2. Sunita Mahajan, Seema Shah, “ Distributed Computing”, Oxford, Second Edition.
3. Randay Chow, Theodore Johnson, “Distributed Operating System and Algorithm Analysis”, Publisher: Pearson (LPE). ISBN – 978-81-317-2859-8.
4. G. SudhaSadasivam, Radha Shankarmani, "Middleware and Enterprise Integration Technologies " , Wiley Precise Textbook.
5. Tom white, “Hadoop: The Definitive Guide” , 2nd E, O’Reilly Media, 2011.

Cryptography & Network Security (Elective II)

COURSE OUTLINE

Course Title	Short Title	Course Code
Cryptography & Network Security	**CNS**	

Course Description:

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	**14**	**42**	**3**

Prerequisite Course(s): Basics of computer networks and security

COURSE CONTENT

Cryptography & Network Security **Semester-VIII**

Teaching Scheme **Examination Scheme**

Lecture: 3 Hours/Week **End Semester Examination (ESE): 80 Marks**
Paper Duration (ESE): 03 Hours
Internal Sessional Exam (ISE): 20 Marks

1. **Introduction** **(08 Hrs. 16 Marks)**
   a. The Need for Security, Security Approaches
   b. Security Attacks
   c. Security Services
   d. Security Mechanisms
   e. Network Security Model
   f. Basics of Cryptography: Symmetric Cipher Model
   g. Substitution Techniques
   h. Transposition Techniques

2. **Cipher Properties & Secret Key Cryptography** **(08 Hrs. 16 Marks)**
   a. Other Cipher Properties- Confusion, Diffusion
   b. Block and Stream Ciphers
   c. Data Encryption Standard(DES)
   d. Strength of DES
   e. Block Cipher Design Principles
   f. Modes of Operations
   g. Triple DES
   h. International Data Encryption algorithm(IDEA)

3. **Public Key Cryptography & IP Security** **(08 Hrs. 16 Marks)**
   a. Principles of Public Key Cryptosystems
   b. RSA Algorithm

c. Diffie-Hellman Key Exchange
d. IP Security Overview
e. Architecture
f. Authentication Header
g. Encapsulating Security Payloads
h. Service provided by IP Security

4. Cryptographic Hash Functions **(08 Hrs. 16 Marks)**

a. Applications of Cryptographic Hash Functions
b. Secure Hash Algorithm
c. Message Authentication Codes – Message Authentication Requirements and Functions
d. HMAC
e. Digital signatures
f. Digital Signature Schemes
g. Authentication Protocols
h. Digital Signature Standards

5. Authentication Applications **(08 Hrs. 16 Marks)**

a. Kerberos
b. Key Management and Distribution
c. X.509 Directory
d. Authentication service
e. Public Key Infrastructure
f. Electronic Mail Security
g. Pretty Good Privacy
h. S/MIME

Text Books:

1. William Stalling, "Cryptography and Network and Network security-Principals and practices", Pearson Education
2. Atul Kahate, "Cryptography and Network Security", Tata McGraw-Hill

Reference Books:

1. Bernard Menezes, "Network Security and Cryptography", Cengage Learning,
2. King, Dalton, and Osmanoglu, "Security Architecture", TMH edition
3. Kaufman, Perlman, and Spenciner, "Network Security", PHI

Neural Networks and Fuzzy Logic (Elective II)

COURSE OUTLINE

Course Title	Short Title	Course Code
Neural Networks and Fuzzy Logic	**NNFL**	

Course Description:

i. To expose the students to the concepts of artificial neural networks.

ii. To provide comprehensive knowledge of fuzzy logic control.

iii. Provide adequate knowledge of application of ANN and fuzzy logic control to real time systems.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Linear Algebra, DSGT, Artificial Intelligence.

COURSE CONTENT

Neural Networks and Fuzzy Logic **Semester-VIII**

Teaching Scheme
Lecture: 3 Hours/Week

Examination Scheme
End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE): 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. **Introduction to Neural Network** **(08Hrs, 16 Marks)**
   a. Human Brain, Biological Neural Networks
   b. Model of Artificial Neuron, McCulloch and pitts models of neuron, Perceptron model, Adaline model
   c. Neural Network Architectures
   d. Neural Learning Laws, Hebb's Law, Perceptron learning Law, Widrow and Hoff Learning, Corelation learning, InStar and out Star learning.
   e. Neural Network Learning Methods, Hebbian learning, Competitive Learning Error Correction Learning, Reinforcement Learning, Stochastic Learning

2. **Multilayer Perceptron Model** **(08Hrs, 16 Marks)**
   a. Multilayer Perceptron
   b. Non-Linear Activation function
   c. Architecture of Backpropagation Network
   d. Backpropagation Learning
   e. Illustration of Backpropagation Learning
   f. Applications of Backpropagation

3. **Associative Memory and Adaptive Resonance Theory** **(08Hrs, 16 Marks)**
   a. Autocorrelators
   b. Hetrocorrelators
   c. Exponential BAM

d. ART1
e. ART2
f. Applications of Associative Memory
g. Applications of Adaptive Resonance Theory

4. Unsupervised Learning **(08Hrs, 16 Marks)**

a. Hamming Net and Maxnet
b. Unsupervised Learning of clusters- clustering and similarity measures, Winner take all Learning
c. Counter Propogation network
d. Feature Mapping
e. Self-Organizing Features Map

5. Fuzzy Logic **(08Hrs, 16 Marks)**

a. Fuzzy Versus Crisp
b. Crisp Relations and Fuzzy Relations
c. Crisp Logic
d. Fuzzy Logic
e. Fuzzy Rule Based System
f. Defuzzification
g. Applications of Fuzzy Logic

Text Books:

1. S. Rajasekaran & G. A. V. Pai, "Neural Networks, Fuzzy logic, and Genetic Algorithms", PHI.
2. J. M. Zurda, "Introduction to Artificial Neural Networks", Jaico Publishing House

Reference Books:

1. S. Haykin, "Neural Networks", Pearson Education, 2nd Ed., 2001.
2. Klir& Yuan, "Fuzzy Sets and Fuzzy Logic", PHI, 1997.
3. Chin-Teng Lin & C. S. George Lee, "Neural Fuzzy Systems", Prentice Hall PTR.
4. V. Kecman, "Learning and Soft Computing", MIT Press, 2001.
5. S. N. Sivanandam& S. N. Deepa, "Principles of Soft Computing", Wiley - India, 2007
6. B.Yegnanarayana, "Artificial Neural Networks ",Prentice Hall of India, 1999.

Mobile Computing (Elective III)

COURSE OUTLINE

Course Title	Short Title	Course Code
Mobile Computing	**MC**	

Course Description:
The objective of this course is to introduce students the knowledge about Mobile Computing Architecture, Mobile Technologies: GSM, Bluetooth, GPRS, CDMA and security issues in Mobile Computing.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	**14**	**42**	**03**

Prerequisite Course(s): Knowledge of Computer Networks.

COURSE CONTENT

Mobile Computing **Semester-VIII**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week
End Semester Examination (ESE): 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1) Introduction **(08 Hrs, 16 Marks)**

a. Mobility of Bits and Bytes,
b. Wireless -The Beginning,
c. Mobile Computing,
d. Dialogue Control,
e. Networks,
f. Middleware and Gateways,
g. Application and Services (Contents),
h. Developing Mobile Computing Applications,
i. Security in Mobile Computing,
j. Standards - Why is it Necessary? , Standard Bodies

Mobile Computing Architecture

k. Internet – The Ubiquitous Network,
l. Architecture for Mobile Computing,
m. Three-Tier Architecture.

2) Emerging Technologies **(08 Hrs, 16 Marks)**

a. Design considerations for Mobile Computing,
b. Mobile Computing through Internet,

c. Making Existing Applications Mobile -Enabled,
d. Bluetooth,
e. Radio Frequency Identification,
f. Wireless Broadband (WiMAX),
g. Mobile IP,
h. Internet Protocol Version 6 (IPv6),
i. Java Card.

3) GSM and GPRS **(08 Hrs, 16 Marks)**

Global System for Mobile Communications (GSM):

a. Global System for Mobile Communications,
b. GSM Architecture,
c. GSM Entities,
d. Call Routing in GSM,
e. PLMN Interfaces,
f. GSM Addresses and Identifiers,
g. Network Aspects in GSM,
h. GSM Frequency Allocation,
i. Authentication and Security.

General Packet Radio Service (GPRS):

j. Introduction,
k. GPRS and Packet Data Network,
l. GPRS Network Architecture,
m. GPRS Network Operations,
n. Data Services in GPRS,
o. Applications for GPRS,
p. Limitations of GPRS,
q. Billing and Charging in GPRS.

4) WAP, CDMA and 3G **(08 Hrs, 16 Marks)**

WAP:

a. Introduction,
b. WAP,
c. MMS,
d. GPRS Application,

CDMA and 3G

e. Introduction,
f. Spread-Spectrum Technology,
g. Is-95,
h. CDMA versus GSM,
i. Wireless Data,
j. Third Generation Networks,
k. Applications on 3G.

5) Security Issues in Mobile Computing **(08 Hrs, 16 Marks)**

a. Introduction,
b. Information Security,
c. Security Techniques and Algorithms,
d. Security Protocols,
e. Public Key Infrastructure,
f. Trust,
g. Security Models,

h. Security Frameworks for Mobile Environment.

Text Book:

1. Asoke K Talukder and Roopa R Yavagal, “Mobile Computing (Technology, Applications and Service Creation)”, Tata Mcgraw-Hill.

Reference Books:

1. Raj Kamal, “Mobile Computing”, Oxford University Press-New Delhi
2. Yi-Bang Lin, ImrichChlamtac, “Wireless and Mobile Network Architectures”, Wiley Publication.
3. Charles Perkins, “Mobile IP”, Addison Wesley.

Bio-Informatics (Elective III)

COURSE OUTLINE

Course Title Short Title Course Code
Bio Informatics **BI**

Course Description:
This course provides a comprehensive view of the Bio Informatics principles and its applications in engineering.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	3

Prerequisite Course(s): Basic knowledge of Biological terms and concepts of database management system.

COURSE CONTENT

Bio Informatics **Semester-VIII**

Teaching Scheme **Examination Scheme**

Lecture: 3 Hours/Week **End Semester Examination (ESE): 80 Marks**
Paper Duration (ESE): 03 Hours
Internal Sessional Exam (ISE): 20 Marks

1. **Introduction to Bioinformatics** **(08 Hrs. 16 Marks)**
   a. Introduction and Historical overview of Bioinformatics,
   b. Bioinformatics Applications,
   c. Molecular biology Basic concepts-Protein and amino acid, DNA and RNA
   d. Tools for web search,
   e. Bioinformatics Major databases,
   f. Data mining of biological databases.

2. **Data Structure & Data Analysis** **(08 Hrs. 16 Marks)**
   a. Sequence Visualization, Structure visualization,
   b. statistical concepts, micro arrays,
   c. Imperfects data, quantitative randomness, data analysis,
   d. Tool selective, Statistics of alignment,
   e. Clustering and classification.

3. **Bioinformatics Databases and Data mining** **(08 Hrs. 16 Marks)**
   a. Introduction, Primary & Secondary database,

b. Biological databases, Protein pattern databases and structure classification databases
c. Methods & Technology overview, infrastructure,
d. Pattern recognition &discovery, machine learning, text mining & tools,
e. Dot matrix analysis,substitution matrices, dynamic programming, word methods,
f. Multiple sequence, alignment, tools for pattern matching.

4. Data Representation, Simulation & Collaboration (08 Hrs. 16 Marks)

a. Drug discovery, fundamentals
b. Protein structure
c. System biology
d. Collaboration & communications, standards
e. Bioinformatics Issues.

5. Human Genome Project and Bioinformatics Tools (08 Hrs. 16 Marks)

a. History, Nucleic Acids, Genes, Genomes
b. Introduction of National Institutes of Health (NIH),
c. Introduction of National Library of Medicine (NLM)
d. Introduction of National center for Biotechnology Information(NCBI)
e. Human Genome Project, it's need, goal, uses and applications
f. Introduction, working with FASTS, working with BLAST,
g. FASTA & BLAST algorithms & comparison

Text Books:

1. S.C.Rastogi, N.Mendiratta, P.Rastogi "Bioinformatics-Methods & Application", [RMR]PHI
2. Bryan Bergeron, "Bioinformatics Computing", Pearson Education [BB].

Reference Books:

1. A.D. Baxevanis and B.F.F. Ouellette, "Bioinformatics: A practical guide to the analysis of genes and proteins" (Eds). 2002 John Wiley and Sons.
2. D.W. Mount, "Bioinformatics: Sequence and Genome Analysis", 2001, Cold Spring Harbor Laboratory Press.
3. S.C. Rastogi, Namita Mendirata, Parag Rastogi ''Bioinformatics concepts Skills and application, CBS publisher.
4. Imtiyaz Alam Khan (IAK) "Elementary Bioinformatics", Pharma Book Syndicate.
5. InduShekhar Thakur (IST) "Environmental Biotechnology", IK International Publication.
6. A.D. Baxevanis and B.F. Ouellettee ,"Bioinformatics, A Practical Guide to the Analysis of Genes and Proteins"
7. David W. Mount,"Bioinformatics: Sequence and Genome Analysis".
8. Stuart M. Brown,"Essentials of Medical Genomics".
9. Jean-Michel Claverie& Cedric Notredame ,'Bioinformatics for Dummies".

Real Time Systems (Elective III)

COURSE OUTLINE

Course Title	Short Title	Course Code
Real Time Systems	**RTS**	

Course Description: The objective of this course is to introduce students the knowledge of Real Time Systems, Task Assignments and Scheduling, Real Time Programming Languages & Tools, Real Time Databases, Communications and Fault Tolerance Techniques.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Knowledge of Microprocessor/Microcontroller and Operating System

COURSE CONTENT

Real Time System **Semester-VIII**

Teaching Scheme **Examination Scheme**

Lecture: 3 Hours/Week

End Semester Examination (ESE)	:	**80 Marks**
Paper Duration (ESE)	:	**03 Hours**
Internal Sessional Exam (ISE)	:	**20 Marks**

1. Introduction To Real Time Systems **(08Hrs, 16 Marks)**

a. Issues in Real Time Computing
b. Structure of Real Time System
c. Performance Measures for Real Time Systems
d. Estimating Program Run Times

2. Task Assignments and Scheduling **(08Hrs, 16 Marks)**

a. Classical Uniprocessor Scheduling
b. Task Assignment-Utilization balancing algorithm
c. Next Fit and Bin Packing Assignment Algorithms
d. Myopic offline Scheduling
e. Focused addressing and bidding(FAB) Algorithm
f. Buddy Strategy
g. Assignments with Precedence Conditions

3. Real Time Programming Languages & Tools **(08Hrs, 16 Marks)**

a. Desired language characteristics
b. data typing, control structures
c. hierarchical decomposition
d. Packages

e. Run Time Error Handling
f. Multitasking
g. Task Scheduling
h. Timing Specification
i. Programming Environment and Run Time Support

4. Real Time Databases and Communications (08Hrs, 16 Marks)

a. Real Time Vs. Generic Purpose Databases
b. Main Memory Databases
c. Concurrency Control Issues
d. Communication Media
e. Real Time Communication Protocols

5. Fault Tolerance Techniques (08Hrs, 16 Marks)

a. Fault Types
b. Fault Detection
c. Fault and Error Containment
d. Redundancy
e. Data Diversity
f. Integrated Failure Handling

Text Books:

1. C.M Krishna and Kang G. Shin, Real Time Systems, TMH
2. Jane W.S Liu, Real time systems, Pearson education, 2003

Reference Books:

1. Jane W.S Liu, Real time systems, Pearson education, 2003
2. Jane W.S Liu, Real time systems, Prentice Hall, 2000
3. Phillip A. Laplante , Real Time Systems Design and Analysis 3rd Edition Wiley India Edition
4. Stuart Bennelt, Real time computer control and introduction, Pearson education, 2003

iPhone Programming (Elective III)

COURSE OUTLINE

Course Title	Short Title	Course Code
iPhone Programming	**IPP**	

Course Description:

This course provides the students the platform to learn and understand the iPhone technology and encourage them to design, develop and deploy Android applications.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	3	14	42	3

Prerequisite Course(s): Basic knowledge of C, C++, JAVA.

COURSE CONTENT

iPhone Programming **Semester-VIII**

Teaching Scheme **Examination Scheme**

Lecture: 3 Hours/Week **End Semester Examination (ESE) : 80 Marks**
Paper Duration (ESE): 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. **Introduction: Basic concepts of Objective C** **(08 Hrs. 16 Marks)**
   a. What is objective C and Xcode , Installing Xcode and compiling objective C
   b. Object oriented programming in objective –C, similarities and differences from C and C++
   c. Objective-**C:** Classes, Objects, Methods, Data Types & Expressions, Program Looping, Decision Making.

2. **The Foundation Framework of Objective-C** **(08 Hrs. 16 Marks)**
   a. Introduction to the Foundation Framework, inheritance, Polymorphism
   b. Dynamic Typing & Binding, Categories and Protocols
   d. The Preprocessor, Numbers, Strings and Collections
   e. Working with Files, Memory Management, Copying Objects

3. **Cocoa, Cocoa Touch and the iOSSDK** **(08 Hrs. 16 Marks)**
   a. **Introduction to Cocoa and Cocoa Touch:** Framework Layers of Cocoa and Cocoa Touch
   b. **Introduction to iOS:** overview of the iOS 5 Architecture, Features of iOS, Registering as a Apple Developer

c. **iOS -Environment Setup:**XCode Installation, Interface Builder, iOS simulator

d. **Writing iOS Applications:** Creating first iOS application, Outlets, Actions and View Controllers

4. Introduction to iPhone application programming (08 Hrs. 16 Marks)

a. A simple iPhone Application

b. Basic UI Elements: UITextField, UIButton, Labels, UIToolbar, UIStatusBar, UITabBar, UIAlert, UISwitch, UISlider, Action Sheet, Accelerometer, Image View, Web View, KeyBoard Inputs

5. iPhone Multimedia and Webservices (08 Hrs. 16 Marks)

a. Accessing Built-in Application, Multimedia (audio and video),

b. Animation with views

c. Webservices, SQLite

Text Books:

1. Stephen G.Kochan ,"Programming in Objective-C" Sixth Edition, ,Addison-Wesley Publications.
2. Wei-Meng Lee ,“Beginning iPhone SDK Programming with Objective-C”, Wiley Publication.

Reference Books:

1. Joe Conway ,"iPhone Programming THE BIG NERD RANCH GUIDE ", Aaron Hillegass. The Big Nerd Ranch Inc.
2. Gary Bennett, Mitch Fisher, Brad Less, "Objective-C for Absolute Beginners", Apress Publication.
3. Neil Smyth,"iPhone iOS 5 Development Essentials".

Compiler Design Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Compiler Design	**CD Lab**	

Course Description:
This laboratory provides students practical approach for the Compiler process. Lab assignments cover the various phases of compiler.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**14**	**28**	**1**

Prerequisite Course(s): Fundamental knowledge of Compilation Process in each phase, C, C++.

LAB COURSE CONTENT

(Note: Minimum Three Experiments from group A and group B each)

Group A

1. Implement a lexical analyzer for a subset of C using LEX Implementation should support Error handling
2. Implement a lexical analyzer of identification of numbers (Numbers can be binary, octal, decimal, hexadecimal, float or exponential)
3. Write an ambiguous CFG to recognize an infix expression and implement a parser that recognizes the infix expression using YACC. Provide the details of all conflicting entries in the parser table generated by LEX and YACC and how they have been resolved
4. Implement a Calculator using LEX and YACC.
5. Implementation of Syntax Tree

Group B

1. Implementation of Context Free Grammar
2. Design of a Predictive parser
3. Implementation of code generator
4. Implementation of code optimization for Common sub-expression elimination, Loop invariant code movement.
5. Implement Deterministic Finite Automata

Guide lines for ICA:
Students must submit ICA in the form of journal. Each experiment should be well documented. Faculty in charge will assess the experiments continuously and will assign grade or mark for each experiment on date of completion, declared for each experiments.

Guidelines for ESE:
In the ESE, the students may be asked to perform the practical assignment with minor modification. Questions will be asked during the practical examination to judge the understanding of the student. It is expected that student knows theoretical aspect of the problem.

Text Books:

1. A V Aho, R. Sethi, .J D Ullman, "Compilers: Principles, Techniques, and Tools", Pearson Education, ISBN 81 - 7758 - 590 - 8

References Books:

1. K. Cooper, L, Torczon, "Engineering a Compiler", Morgan Kaufinann Publishers, ISBN 81-8147-369-8.
2. K. Louden, "Compiler Construction: Principles and Practice", Cengage Learning, ISBN 978-81-315-0132-0
3. J. R. Levine, T. Mason, D. Brown, "Lex & Yacc", O'Reilly, 2000, ISBN 81-7366 -061-X.
4. S. Chattopadhyay, "Compiler Design", Prentice-Hall of India, 2005, ISBN 81-203-2725-X.

Note:-

- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Data Warehousing and Mining Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Data Warehousing and Mining Lab	**DWM Lab**	

Course Description:

	Hours/Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**14**	**28**	**1**

LAB COURSE CONTENT

Group A

1. Develop a program to construct a multidimensional data model (Star, Snowflake or Fact constellations)
2. Develop a program to implement data pre-processing techniques.
3. Develop a program to implement data integration techniques.
4. Implement Apriori algorithm for frequent item set.

Group B

1. Develop a program to implement data generalization and summarization techniques.
2. Develop a program to extract association mining rules.
3. Develop a program for classification of data.
4. Develop a program for implementing one of the clustering techniques.

Note: Concerned Faculty should suitably frame at least **6** practical assignments (**Three** from Group A and **Three** from Group B) out of the above list.
Use of open source Tool/ Technology (like Weka) for Laboratory Assignments is recommended.

Guidelines for ICA:
Students must submit ICA in the form of journal. Each experiment should be well documented. Faculty in charge will assess the experiments continuously and will assign grade or mark for each experiment on date of completion, declared for each experiments.

Guidelines for ESE:
In the ESE, the students may be asked to perform the practical assignment with minor modification. Questions will be asked during the practical examination to judge the understanding of the student. It is expected that student knows theoretical aspect of the problem.

Text Books -

1. Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”,

   Second Edition, Morgan Kaufmann.

Reference Books -

1. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction To Data Mining",Person Education, 2007.
2. G. K. Gupta, "Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006.
3. Alex Berson and Stephen J. Smith, "Data Warehousing, Data Mining & OLAP", Tata McGraw – Hill Edition, Tenth Reprint 2007.

Note:-

- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Software Metrics and Quality Assurance Lab (Elective II Lab)

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Software Metrics and Quality Assurance	**SMQA Lab**	

Course Description:
This laboratory provides students with a comprehensive study of software engineering. The practical's make students able to calculate length, cost, effort size etc. of program.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**14**	**28**	**01**

Prerequisite Course(s): Fundamental knowledge of software engineering and testing.

Any **FIVE** appropriate assignments from following list:

1. To perform the effort estimation based on project specification.
2. Program for finding Length of program.
3. Implementation of program for finding Length of program using Lines of Code.
4. Program for measuring Size of program using Albrecht's Method.
5. Implementation of program for measuring size of program using Function Point Calculation Albrecht's method.
6. Software testing using J-Meter testing tool.
7. Software testing using Selenium testing tool.
8. Schedule estimation using Gantt chart.

Guidelines for ICA:
Students must submit ICA in the form of journal. Each experiment should be well documented. Faculty in charge will assess the experiments continuously and will assign grade or mark for each experiment on date of completion, declared for each experiments.

Guidelines for ESE:
In the ESE, the students may be asked to perform the practical assignment with minor modification. Questions will be asked during the practical examination to judge the understanding of the student. It is expected that student knows theoretical aspect of the problem.

Note:-

- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Distributed System Lab (Elective II Lab)

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Distributed Systems	**DS Lab**	

Course Description:

This laboratory provides students with a comprehensive study of the Distributed Systems. Classroom lectures stress the strengths of Distributed Systems, which provide students with the means of writing efficient, maintainable and portable code and simulating Distributed Systems concepts like Remote Procedure Call (RPC), Client-Server application, Distributed Mutual Exclusion, Distributed Chat Server, Lamport's Logical Clock, Bully and Ring election algorithms and Hadoop.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**14**	**28**	**1**

Prerequisite Course(s): C/C++/Java,Operating Systems and Computer Networks.

(Note: Minimum SIX Experiments from the given list)

1. **Write a Program for Remote Procedure Call (RPC).**
   Implementation of Remote Procedure Call (RPC) concept in C/C++/Java.
2. **Write a Program to implement Echo Client-Server application.**
   Implementation of Echo Client-Server application in C/C++/Java.
3. **Write a Program to find length of given string using thread.**
   Implementation of to find length of given string using thread in C/C++/Java.
4. **Simulate the Distributed Mutual Exclusion.**
   Simulation of the Distributed Mutual Exclusion concept in C/C++/Java.
5. **Implementation of Distributed Chat Server.**
   Implementation of the Distributed Chat Server in C/C++/Java.
6. **Simulate the function of Lamport's Logical Clock.**
   Simulation of the function of Lamport's Logical Clock in C/C++/Java.
7. **Implementation of Date and Time server using Java RMI.**
   Implementation of the Date and Time server using Java RMI.
8. **Implementation of server that adds given two values by the clients using Java RMI.**
   Implementation of the server that adds given two values by the clients using Java RMI.
9. **Write a program for word count using Hadoop.**
   Implementation of the program for word count using Hadoop.
10. **Implement merge sort algorithm and run it using Hadoop for large data set.**
    Implementation of the merge sort algorithm and run it using Hadoop for large

data set.

11. **Write simulation program for synchronization using Bully and Ring election algorithm.**

    Simulation for synchronization concept using Bully and Ring election algorithm.

Guidelines for ICA:

Students must submit ICA in the form of journal. Each experiment should be well documented. Faculty in charge will assess the experiments continuously and will assign grade or mark for each experiment on date of completion, declared for each experiments.

Guidelines for ESE:

In the ESE, the students may be asked to perform the practical assignment with minor modification. Questions will be asked during the practical examination to judge the understanding of the student. It is expected that student knows theoretical aspect of the problem.

Note:-

- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Cryptography & Network Security Lab (Elective II Lab)

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Cryptography & Network Security	**CNS Lab**	

Course Description:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**14**	**28**	**1**

Prerequisite Course(s): Basic knowledge of computer networks and security.

(Note: Minimum FIVE Experiments from the given list)

1. Write a Program to Implement Columanar Cipher Text
2. Write a Program to Implement Encryption/Decryption using Ceaser Cipher.
3. Write a Program to Simulate Diffie-Hellman Key Exchange
4. Write a Program to Implement Play Fair Cipher.
5. Write a Program for Encryption/Decryption using Rail Fence Technique
6. Write a Program to Implement RSA Algorithm

Guidelines for ICA:
Students must submit ICA in the form of journal. Each experiment should be well documented. Faculty in charge will assess the experiments continuously and will assign grade or mark for each experiment on date of completion, declared for each experiments.

Guidelines for ESE:
In the ESE, the students may be asked to perform the practical assignment with minor modification. Questions will be asked during the practical examination to judge the understanding of the student. It is expected that student knows theoretical aspect of the problem.

Note:-

- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Neural Networks and Fuzzy Logic Lab (Elective II Lab)

LAB COURSE OUTLINE

Course Title Short Title Course Code

Neural Networks and Fuzzy LogicLab **NNFL Lab**

Course Description:

Laboratory	Hours/Week	No. of Weeks	Total Hours	Semester Credits
	2	14	28	1

LAB COURSE CONTENT

Group A

1. Implementation of Perceptron Learning
2. Implementation of McCulloh-Pitts model.
3. Implementation of Hopfield model.
4. Implement Delta rule.
5. Implement model for multilayer perceptron.

Group B

1. To implement crisp set
2. To implement Fuzzy Sets.
3. To implement Fuzzy Relations
4. Simulation of Neural supervised Learning in any soft Computing tool.
5. Simulation of Neural unsupervised Learning in any soft Computing tool.

Note: Concerned Faculty should suitably frame at least **6** practical assignments (**Three** from Group A and T**hree** from Group B) out of the above list

Text Books:

1. S. Rajasekaran & G. A. V. Pai, "Neural Networks, Fuzzy logic, and Genetic Algorithms", PHI.
2. J. M. Zurda, "Introduction to Artificial Neural Networks", Jaico Publishing House.

Reference Books:

1. S. Haykin, "Neural Networks", Pearson Education, 2nd Ed., 2001.
2. Klir& Yuan, "Fuzzy Sets and Fuzzy Logic", PHI, 1997.
3. Chin-Teng Lin & C. S. George Lee, "Neural Fuzzy Systems", Prentice Hall PTR.
4. V. Kecman, "Learning and Soft Computing", MIT Press, 2001.
5. S. N. Sivanandam& S. N. Deepa, "Principles of Soft Computing", Wiley - India, 2007.
6. B. Yegnanarayana, "Artificial Neural Networks ",Prentice Hall of India, 1999.

Guidelines for ICA:

Students must submit ICA in the form of journal. Each experiment should be well documented. Faculty in charge will assess the experiments continuously and will assign grade or mark for each experiment on date of completion, declared for each experiments.

Guidelines for ESE:
In the ESE, the students may be asked to perform the practical assignment with minor modification. Questions will be asked during the practical examination to judge the understanding of the student. It is expected that student knows theoretical aspect of the problem.

Note:-

- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Industrial Lecture
COURSE CONTENT

Industrial Lecture | **IL** |
Course Title | Short Title | Course Code

Course Description:
The gap between industry's needs and the academic community's aspirations appears to be considerably large. There exists a strong feeling, at least in the academic circles, that unless technology driven initiatives find a surer place in the industrial sector in this country, the academia-industry interaction is likely to remain confined to developmental activities with limited exploratory or research-based content As institutes committed primarily to creation and growth of technological knowledge, technical institutes have an important role to play in the industrial sector of the country's economy. This fact by way of encouraging mechanisms to foster interaction between the academia and industry. Typically, academic interest in the multidimensionality of a problem leads to a tendency to explore a variety of options to arrive at a solution. This industrial lecture develops ability of student for expectations of the industrialists from the fresh engineers.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	1	14	14	2

COURSE CONTENT

Semester-VIII

Examination Scheme
Total Semester Credits: 02
Internal Continuous Assessment (ICA): 50 Marks

1. There is a need to create avenues for a close academia and industry interaction through all the phases of technology development, starting from conceptualization down to commercialization.
2. List of renowned persons from industry shall be prepared by the committee appointed by Head of the department. After approval from the Principal, Minimum five Industrial lectures in alternate week shall be arranged, which shall be delivered by the experts/Officials from Industries/Govt. organizations/ Private Sectors/Public Sectors / R&D Labs covering the various aspects.
3. Topics of Industrial Lectures shall be Technical in nature and should not be the specific contents from the curriculum.
4. Students shall submit the report based on minimum five lectures giving summary of the lecture delivered.
5. The summary should contain brief resume of the expert, brief information of his organization and brief summary of the lecture in bullet point form.

Guide lines for ICA: Assessment of the Industrial Lecture for award of ICA marks shall be done jointly by departmental committee as per attendance in industrial lecture, report submitted by student and overall performance in semester as per the guidelines given in **Table- D**

Table-D

SN	Name of Student	Attendance (05 Marks per Lecture)	Dept of Understanding (03 Marks per Lecture)	Report Writing	Total
		25	15	10	50

Project-II

Course Title	Short Title	Course Code
Project-II	**Project-II**	

Course Description:
The course explores the knowledge of design, experiment and analysis of data. The course develops ability to work on multidisciplinary teams, Identify, formulate, and solve engineering problems in view of economic, environmental and societal context.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**4**	**14**	**56**	**6**

COURSE CONTENT

Semester-VIII **Examination Scheme**

Total Semester Credits: 06
Internal Continuous Assessment (ICA): 75 Marks
End Semester Examination (ISE):75 Marks
Total: 150Marks

1. Project-I work decided in VII semester shall be continued as Project-II
2. Students should complete implementation of ideas given in synopsis/Abstract, so that project work should be completed before end of semester.
3. Project-II may involve fabrication, design, experimentation, data analysis within realistic constraints such as economic, environmental, social, ethical, health and safety, manufacturability, and sustainability. The stage also includes testing , possible results and report writing
4. Each students project group is required to maintain log book for documenting various activities of Project-II and submit group project report at the end of Semester-VIII in the form of Hard bound.
    1. *Title*
    2. *Abstract*
    3. *Introduction*
    4. *Problem identification and project objectives*
    5. *Literature survey*
    6. *Analysis*
    7. *Design*
    8. *Coding*
    9. *Testing*
    10. *Results & conclusions*
    11. *Future Scope*
    12. *References*

Guide lines for ICA : ICA shall be based on continuous evaluation of students performance throughout semester in project-II and report submitted by the students project group in the form Hard bound. Assessment of the project-II for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given in **Table-D.**

Guide lines for ESE:-
In ESE the student may be asked for demonstration and questions on Project. Evaluation will be based on answers given by students in oral examination.

Assessment of Project-II

Title of the Project: ______________________________

Name of the Guide: ______________________________

Table-D

		Assessment by Guide (50 Marks)				Assessment by Committee (25 Marks)		
SN	**Name of Student**	**Attendance , Participa-tion and team work**	**Material procurement / assembling/ Designing/Programming**	**Case study/ Execution**	**Project Report**	**Dept of Understan-ding**	**Presentation**	**Total**
Marks		**10**	**15**	**15**	**10**	**10**	**15**	**75**

NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Syllabus for Final Year Electrical Engineering

Faculty of Engineering and Technology

COURSE OUTLINE

SEMESTER – VII and VIII

W.E.F 2015 – 2016

PROGRAM EDUCATIONAL OBJECTIVES. (PEOs)

The Board of Studies in Electrical Engineering of North Maharashtra University, Jalgaon(India) has defined a set of program educational objectives. The Program Educational Objectives of Electrical Engineering programs are designed to provide graduates with:

PEO1: Professional Knowledge: Graduates shall acquire the fundamental and advanced knowledge in Electrical Engineering subjects along with additional knowledge about other subjects like Mathematics, Basic Sciences, Inter-disciplinary Engineering, Management and Economics to solve basic and complex engineering problem. Graduates will be able to design system within realistic constraints for sustainable developments.

PEO2: Professional Employment: Graduates will have a successful career in Electrical Engineering. Graduates will succeed in getting the entry-level engineering positions in Generation, Transmission, Manufacturing, Government sectors at regional, national levels and an Entrepreneur.

PEO3: Higher Studies & Life Long Learning: Graduates may pursue their professional development through self learning, advanced degree and continue life-long learning. Graduates will be able to use software and modern engineering tools.

PEO4: Social Engineering: Graduates will aware of social responsibility, ethical values, safety standard, economical and environmental issues so that they serve the society better.

PROGRAM OUTCOMES (POs)

a. An ability to apply knowledge of mathematics, science, and engineering.

b. An ability to design and conduct experiments, as well as to analyze and interpret data.

c. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

d. An ability to function on multidisciplinary teams.

e. An ability to identify, formulates, and solves engineering problems.

f. An understanding of professional and ethical responsibility.

g. An ability to communicate effectively.

h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.

i. Recognition of the need for, and an ability to engage in life-long learning.

j. Knowledge of contemporary issues.

k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

l. An ability to work professionally in both software and hardware system areas including the design and realization of such systems.

North Maharashtra University, Jalgaon
Syllabus Structure For Final Year Electrical Engineering w.e.f year 2015-16
Semester –VII

Course Code	Name of the Course	Group	Teaching Scheme				Evaluation Scheme				Total	Credits
							Theory		Practical			
			Theory Hrs /week	Tutorial Hrs /week	Practical Hrs /week	Total	ISE	ESE	ICA	ESE		
	Industrial Drives & Control (TH)	D	3	_	_	3	20	80	_	_	100	3
	High Voltage Engineering(TH)	D	3	_	_	3	20	80	_	_	100	3
	Interdisciplinary Elective (TH)	E	3	_	_	3	20	80	_	_	100	3
	Elective – I (TH)	E	3	_	_	3	20	80	_	_	100	3
	Power System Operation And Control(TH)	D	3	_	_	3	20	80	_	_	100	3
	Industrial Drives & Control (LAB)	D	_	_	2	2	_	_	25	25 (PR)	50	1
	High Voltage Engineering (LAB)	D	_	_	2	2	_	_	25	25 (OR)	50	1
	Elective – I (LAB)#	E	_	_	2	2	_	_	25	25 (PR)	50	1
	Project – I (LAB)	D	_	_	2	2	_	_	25	25 (OR)	50	2
	Seminar – II	D	_	_	2	2	_	_	25	_	25	2
	Industrial Visit	D	_	_	_	_	_	_	25	_	25	1
	Total		**15**	**0**	**10**	**25**	**100**	**400**	**150**	**100**	**750**	**23**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA : Internal Continuous Assessment**

	Interdisciplinary Elective		**Elective – I**
1	Energy Audit & Conservation	1	Industrial Electrical Engineering
2	Renewable Energy Sources	2	Digital Signal Processing
		3	Control System –II
		4	Electric Traction Engineering

- # Lab for Elective – I (LAB)
- Interdisciplinary Elective shall be offered by the department to the students of other departments. Students from one department can not register for Interdisciplinary Elective of the same department.
- At least 15 students should register for offering any elective.

North Maharashtra University, Jalgaon

Syllabus Structure For Final Year Electrical Engineering w.e.f year 2015-16

Semester –VIII

Course Code	Name of the Course	Group	Teaching Scheme				Evaluation Scheme				Total	Credits
							Theory		Practical			
			Theory Hrs /week	Tutorial Hrs /week	Practical Hrs /week	Total	ISE	ESE	ICA	ESE		
	Power System Stability (TH)	D	3	_	_	3	20	80	_	_	100	3
	Switchgear & Protection (TH)	D	3	_	_	3	20	80	_	_	100	3
	Elective – II (TH)	E	3	_	_	3	20	80	_	_	100	3
	Elective – III (TH)	E	3	_	_	3	20	80	_	_	100	3
	Power System Stability (LAB)	D	_	_	2	2	_	_	25	25 (OR)	50	1
	Switchgear & Protection (LAB)	D	_	_	2	2	_	_	25	25 (PR)	50	1
	Elective – II (LAB)#	E	_	_	2	2	_	_	25	25 (OR)	50	1
	Industrial Lecture*	C	_	_	1*	1	_	_	50	_	50	2
	Project – II	D	_	_	4	4	_	_	75	75(OR)	150	6
	Total		**12**	**0**	**11**	**23**	**80**	**320**	**200**	**150**	**750**	**23**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA : Internal Continuous Assessment**

	Elective-II		**Elective – III**
1	Computer Aided Power System Analysis	1	Flexible AC Transmission System and Power Quality
2	Industrial Automation	2	Generation Planning and Load Dispatch
3	Advance Microprocessor	3	High Voltage Transmission
4	Power System Design Practice	4	Electromechanical Energy Conversion.

- # Lab for Elective – II (LAB)
- * Lectures to be delivered by experts from the industry in alternate weeks. Next week group discussion on the lecture delivered.
- At least 15 students should register for offering any elective.

Course Title	Short Title	Course Code
Industrial Derive and Control	**IDC**	

Course Description:

The subject explores the knowledge of different industrial derives, load characteristic, factor effecting on selection of drives depending upon their electrical, mechanical characteristic. The subject also provides the knowledge of microprocessor based electric drives.

	Hours/Week	No. of Weeks	Total Hours	Semester Credits
Lectures	**03**	**15**	**42**	**03**

Prerequisite Course(s) : Knowledge Electrical Machines, Power Electronics and subjects of Electrical Engineering.

Course Objectives:

The objective of subject is the Introduction to different types of drives and applications in various industries. To know the characteristics of various motors and loads. Gain the knowledge about operation of DC motor speed control using converters and choppers. To understand the modes of operation of a drive in various applications. To enable the students identify the need and choice for various drives. To acquire the knowledge of different speed control methods in AC motors using thyristors based control schemes. Identify the use of drives in industries using microprocessor.

Course outcome

After completion of course students will be able to:

1. Apply the knowledge of electrical engineering subjects in different application of industries like manufacturing, maintenance, operation and safety.
2. Understand different speed control methods in D.C and A.C motors using thyristors based control schemes.
3. Understand the characteristic of load and selection of derive in industrial sectors.
4. Conduct practical and analyze data for proper selection of derive in realistic constrain of load requirement.
5. Understand the impact of electrical characteristic of motor in electric traction system.
6. Discharge professional duties in industries with innovative ideas of operation and control of drives.
7. Do higher study in the field of modern derives and control.

Industrial Drives and Control

(Course Contents)

Semester-VII **Examination Scheme:**

Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**

Lectures : 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**

(ESE) End Semester Exam duration: 03 Hours

Unit- I :- Electric Drives **09 Hours, 16 Marks**

Concept, classification, advantages, parts of drives, choice of electric drives, fundamental torque equation, types of practical mechanical loads, dynamics of electrical drive-stability of an electrical drive, constant**,** torque drive, constant power drive, selection of a D.C and A.C drive, modes of operation.

Selection of Motor Power Rating: Classes of motor duty, determination of motor rating

Unit- II: Converters and control **08 Hours, 16 Marks**

Phase controlled converters: Single phase and three phase half controlled and fully controlled converters, selection of converter circuits. Four quadrant operation, Choppers,

Basic principles of Speed control; closed loop control, current & speed sensing, Phase locked loop, closed loop position control.

Unit-III: : DC motor drives **08 Hours, 16 Marks**

Speed-torque characteristics of DC shunt, PMDC and series motors, single phase and three phase controlled rectifier fed dc drives, multi quadrant operation of dc separately excited motor fed from fully controlled rectifier, chopper controlled dc drives, source current harmonics in choppers, converter ratings and closed loop control

Unit – IV: - Inverters and PWM techniques **08 Hours, 16 Marks**

Voltage source inverters, current source inverters, PWM inverters, sine-triangle comparison, harmonic elimination, hysteresis current controllers, space vector PWM

Unit – V:- AC motor drives **09 Hours, 16 Marks**

Speed control of single phase and three phase induction motors, d-q model of induction motor, VSI control , CSI control, constant flux speed control structure, vector control model, vector control structure.

Energy Conservation in Electric Drives: Losses in Electric drive systems, measurement of Energy conservation in Electric drives. Use of efficient converters, energy efficient operation of drives, Improvement of p.f., improvement of quality of supply.

Reference Books :

1. V. Subramanyam , “Thyristerised Control of Electric Drives”, Tata McGraw Hill, New Dehli.
2. Dubey, Joshi, Sinha, “Thyristor Power Control”, Willey Eastern Publication.
3. M. Rashid, “Power Electronics Circuit Devices & Applications”, Prentice Hall of India.
4. G. K. Dubey , “Fundamentals of Electrical Drives”, Narosa Publishing House.
5. Mohammad A. El-Sarkawi, “Fundamentals of Electrical Drives” , vikas Publishing House.
6. Ned Mohan, “ Electric Machines and Drives”, Wiley India Pvt. Ltd.
7. http://nptel.iitm.ac.in

Course Title	Short Title	Course Code
High Voltage Engineering	**HVE**	

Course Description:

The demand for generation and transmission of large amount of electric power today, necessitates in transmission at extra- high voltages. Electrical engineering students are expected to possess knowledge of high voltage techniques. The subject is not in-depth but explores the knowledge of insulating material, properties, breakdown phenomena in solid, liquid and gases. The subject also provide the platform to understand the generation and measurement of high voltage.

	Hours/Week	No. of Weeks	Total Hours	Semester Credits
Lectures	**03**	**15**	**42**	**03**

Prerequisite Course(s) : Knowledge basic sciences, mathematics and subjects of Electrical Engineering.

Course Objectives:

The objectives are to understand the need of high voltage in tem of technical and economical point of view. Student should understand the properties and breakdown phenomena in solid, liquid and gases. Students also understand the method of generation ,measurement of high voltage and testing.

Course Outcomes:

Upon successful completion of this course the student will be able to:

1. Apply basic knowledge of electrical engineering material for understanding breakdown phenomena in solid, liquid and gases.
2. Understand the lightning stroke and behavior on electrical appliances.
3. Understand the generation and measurement of high voltage for various testing in the field of manufacturing of power plant equipments.
4. Discharge the professional duties in high voltage test laboratories.
5. Higher study in field of high voltage with latest tools and software for sustainable development in EHV transmission field.

High Voltage Engineering

(Course Contents)

Semester-VII **Examination Scheme:**

Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**

Lectures : 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**

(ESE) End Semester Exam duration: 03 Hours

Unit I: - **Breakdown In Gases, Liquids & Solids** **09 Hours, 16 Marks**

Review and classification of insulating material, Breakdown in gases, Townsend's law. Breakdown in electronegative gases, streamer mechanism of spark, Paschen's law, corona discharge, electronegative gases. Breakdown in pure and commercial liquids, solid dielectric and composite dielectric, Breakdown in vacuum .

Unit II: - **Lightning and Switching Over Voltage Protection** **09 Hours, 16 Marks**

Lighting strokes to lines and towers mechanism & characteristics. Over voltage due to switching surge, system fault. Protection of transmission lines from lightning, lightning arrestors, insulation co-ordination of HV and EHV power system .

Unit III : - **Generation of High Voltage & Currents** **08 Hours, 16 Marks**

Generations of high direct current voltage, generation of high alternating voltage, Generation of Impulse voltage and current , generation of lightning surges Classification of High voltage laboratories, Testing facilities provided in High voltage laboratories, grounding of impulse testing laboratories.

Unit IV: - **Measurement of High Voltage And Currents** **08 Hours, 16 Marks**

Methods of measurement of peak voltage, impulse voltage and high direct current, non destructive measurement and testing, high voltage dielectric loss and capacitance measurements, ratio frequency & partial discharge measurements.

Unit V :-Testing and EHV Line Insulation **08 Hours, 16 Marks**

Basic technology , testing of insulators bushing , cables , transformer, surge diverters & threshold current , capacitance of long objects, Electromagnetic interference, E.H.V line insulation design based upon transient over voltages.

Reference Books:-

1. M.S. Naidu & V.Kamaraju , "High Voltage Engg", Tata McGraw Hill.
2. E.Kuffel and W.S Zaenglo, "High Voltage Engg" , PE Rgamon Press
3. ,Rakash Das Begamudre, "Extra High Voltage Transmission", New Age International Publication.
4. C.L. Wadhawa , "High Voltage Engineering" Wley Eastern
5. R.S.Jha , "High Voltage Engineering"
6. http://nptel.iitm.ac.in

Course Title | Short Title | Course Code

Interdisciplinary Elective

i. Energy Audit and Conservation EAC

Course Description:

This course provides knowledge of limited conventional energy generation, energy audit and conservation, financial analysis, energy efficient motors and other electrical gazed, scope of energy saving in domestic, industrial , agricultures sectors and demand side energy managements .Energy conservation is mandatory and answerable to next generation.

Lectures	Hours/Week	No. of Weeks	Total Hours	Semester Credits
	03	15	42	03

Prerequisite Course(s) : Knowledge basic sciences, mathematics and subjects of engineering.

Course Objectives:

The Objectives of subject are to understand the need of energy audit and conservation , social and environmental cause as per Energy conservation Act . Students will able to know the methodology of energy audit for industries and priority of action plan. Students will able to understand the financial analysis for energy audit like payback period. Students will able to understand scope demand side management, energy efficient motor and energy conservation in motors, lighting, furnace and refrigeration.

Course Outcomes:

Upon successful completion of this course the student will be able to:

1. Apply basic knowledge of science and mathematics and engineering in energy conservation and financial.
2. Understand facts, concepts, principles of energy management and conservation in view of social and environmental cause. Students also able to function on multidisciplinary teams.
3. Analyze the characteristics, process of operation in manufacturing, agricultural and transportation sectors to arrive fruitful suggestions for possible energy conservation.
4. Apply Knowledge of electrical subjects for demand side management for sustainable economic deployments, social and environmental issues as life long practices .
5. Discharging duties in energy conservation by understanding an ethical and social responsibility for answerable to next generation.
6. Do higher studies for manufacturing energy efficient machines compliance of energy conservation Act 2001,2003 and 2010, govt of India .

Interdisciplinary Elective

i. Energy Audit and Conservation

(Course Contents)

Semester-VII | **Examination Scheme:**

Teaching Scheme: | **(ESE) End Semester Examination: 80 Marks**

Lectures : 3 Hrs/Week | **(ISE) Internal Sessional Examination: 20 Marks**

(ESE) End Semester Exam duration: 03 Hours

Unit-I Energy Audit **09 Hours, 16 Marks**

Need and concept of energy audit, pre-requisite of energy conservation, principles of energy audit, type and methodology of energy audit: preliminary energy audit and detailed energy audit, procedures of carrying out energy audit. Identification of energy conservation opportunities and priority, energy audit report writing, Instruments used for energy audit. Energy Conservation Act, Progress made in energy conservation in India.

Unit II: - Economics of Energy Conservation **09 Hours, 16 Marks**

Simple payback period analysis, advantages & limitations of payback period, time value of money, net present value method and internal rate of return method, Risk and sensitivity analysis; Financing options, Micro factors and macro factor Study and selection of proper tariff for particular application, fixed & variable components in tariff, impact of tariff on energy management.

Unit III: - Energy Management **08 Hours, 16 Marks**

Concept of energy management –energy inputs in industrial ,residential, commercial, agricultural and public sector management of power factor, power factor improvement ,power demand monitoring.

Concept of demand side management (DSM), scope of DSM, DSM planning and implementation ,load management as DSM strategy Advantages of DSM to consumers, utility and society.

Unit IV: - Energy Conservation **08 Hours, 16 Marks**

1. Motive power: potential for saving electrical energy in motors - over sizing or under loading, improving efficiency of an existing motor, energy efficient motors, use of variable or adjustable speed drives for energy conservation , effect of rewinding on performance and consumption.
2. Lighting: level of illumination for different areas. Use of right source of lamp for different applications, energy efficient lamps, type of light fixtures.
3. Heating & Cooling systems: energy saving in furnace , air conditioners and refrigeration.

Unit -V: - Scope of Conservation **08 Hours, 16 Marks**

1. Energy conservation in industrial, agricultural, commercial, domestic and municipal sectors.
2. Energy conservation in generation, Co-generation, Waste heat recovery,
3. Energy conservation in transmission and distribution

Reference books

1. Umesh Rathore, "Energy Management", S K Kataria and Sons.
2. S. C. Tripathy, "Electrical Energy Utilization and Conservation", THM Publication
3. S.Rao, "Energy Technology"' Khanna Pub.
4. Preceding of the Seminar on " Energy Audit & Demand Side Management" held at Govt. College of Engineering, Pune-5 organized by M.S.E.B.(SEA) ON 16.09.1998.
5. B.E. Kushare, "Hand Book on Energy Efficient Motors" , International Cooper Proposition Council ,
6. Bureau of Energy Efficiency

Course Title Short Title Course Code

Interdisciplinary Elective

ii. Renewable Energy Sources RES

Course Description:

Renewable energy sources are interdisciplinary subjects of science and technology. Energy technology is the back-boon of modern civilization and national economy. It is an applied science dealing with various renewable energy routes comprising the exploration and extraction of energy and by-products, transportation, storage, distribution and supply of secondary forms of energy. This course explores available renewable energy sources and provide the platform to study judicious and economic choice of energy for environment friendly and sustain able developments.

Lectures	Hours/Week	No. of Weeks	Total Hours	Semester Credits
	03	15	42	03

Prerequisite Course(s) : Knowledge basic sciences, mathematics and subjects of engineering.

Course Objectives:

The objectives of this course are to understand the various renewable energy sources, their conversion technology and application. The course will help to bring down gap between energy demand and energy generation with environment friendly. The course also provides basic knowledge for lifelong learning and higher education in field of energy conversion.

Course Outcomes:

Upon successful completion of this course the student will be able to:

1. Apply basic knowledge of science , mathematics and engineering for understanding energy sources and conversion in useful forms.
2. Understand facts, concepts, principles of exploration and extraction of energy for judicious and economic choice of energy for environment friendly and sustain able developments.
3. Function on interdisciplinary subjects of science and technology and analyze the characteristics of different energy sources.
4. Understand contemporary issues of energy and solve engineering problem of energy extraction from different renewable sources by modern tools.
5. Discharging duties in energy development by understanding an ethical and social responsibility for answerable to next generation.
6. Do higher studies for lifelong learning and higher education in field of energy conversion.

Interdisciplinary Elective

ii. Renewable Energy Sources

(Course Contents)

Semester-VII	**Examination Scheme:**
Teaching Scheme:	**(ESE) End Semester Examination: 80 Marks**
Lectures : 3 Hrs/Week	**(ISE) Internal Sessional Examination: 20 Marks**
	(ESE) End Semester Exam duration: 03 Hours

Unit-I Solar Energy **09 Hours, 16 Marks**

Introduction to energy technology and energy sciences, energy and environment, laws of conservation of energy. Essential subsystems in a solar energy plant, phenomena of light and energy, energy from sun, solar constant, power density for various wavelength of sun light, clarity index, angle of latitude and solar insolation at different geographical locations. Solar thermal collectors and its types.

Unit-II Solar Photovoltaic **09 Hours, 16 Marks**

Introduction to solar photovoltaic system, merit and limitations, economic considerations of solar PV system, principle and characteristic of solar cell, efficiency of solar cell , configuration of solar PV panel, solar PV cell technologies and small solar PV system for residence and rural areas.

Unit-III Geothermal Energy **08 Hours, 16 Marks**

Introduction to geothermal energy, geothermal energy resources, origin of geothermal resources, geothermal gradients, hydro geothermal resources, geopressure geothermal resources, geothermal fluid for electric power plants and classification and type of geothermal power plants.

Unit-IV Wind Energy **08 Hours, 16 Marks**

Introduction to wind energy, nature of wind energy conversion system, wind power density, forces on the blades of a propeller, wind turbine efficiency, wind velocity duration characteristic , type of wind turbine-generator unit , planning of wind farm and grid connection.

Unit-V Biomass Energy **08 Hours, 16 Marks**

Introduction to biomass energy resources, biomass conversion process, direct combustion of biomass, gaseous fuels from biomass,

Introduction to urban solid waste –to- energy by incineration process, waste –to- energy incineration process and energy plant, location of plants, wood and wood waste as primary energy source and cogeneration plant.

Reference Books

1. S Rao & Dr. B B Parulekar, " Energy Technology", Khanna Publishers.
2. Dr. H S Mukunda, Understanding Clean Energy and fuels from Biomass", Wiley India
3. http://nptel.iitm.ac.in

Course Title Short Title Course Code

Elective-I

i. Industrial Electrical Engineering IEE

Course Description:

The subject explores the knowledge of different industrial derives, load characteristic, factor effecting on selection of derives depend upon their electrical , mechanical characteristic and service duty.The subject also provides the knowledge of electric traction, ideal requirement of traction motor, operation and control. The subject provides brief knowledge of heat, ventilation and air conditioning system also.

	Hours/Week	No. of Weeks	Total Hours	Semester Credits
Lectures	**03**	**15**	**42**	**03**

Prerequisite Course(s) : Knowledge Electrical Machines and mathematics .

Course Objectives: The object of subject is not to discuss the working operation of motor. The object is select proper motor for given load characteristic. Selection of motor based on load characteristic, electrical , mechanical characteristic and service duty. The subject also provides the knowledge of electric traction, ideal requirement of traction motor, operation and control. The subject provides brief knowledge of heat, ventilation and air conditioning system also.

Course outcome

After completion of course students will be able to:

1. Apply the knowledge of electrical engineering subjects in different application of industries like manufacturing, maintenance, operation and safety.
2. Understand the characteristic of load and selection of derive in industrial sectors.
3. Conduct practical and analyze data for proper selection of derive in realistic constrain of load requirement.
4. Understand the impact of electrical characteristic of motor in electric traction system.
5. Discharge professional duties in industries with innovative ideas of operation and control of drives.
6. Do higher study in the field of modern derives and control.

Elective-I
i. Industrial Electrical Engineering
(Course Contents)

Semester-VII **Examination Scheme:**
Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**
Lectures : 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**
(ESE) End Semester Exam duration: 03 Hours

Unit- I :- Electric Drives **09Hrs, 16 Marks**
Type of drives, Nature of load, Section motors, electrical, mechanical , service capacity and rating and Types of Enclosures.
Electrical Characteristic: Starting, Operating and running, speed control and braking characteristics of DC motor , three phase induction motor and single phase induction motor.
Unit- II: - Types of Duties **09Hrs, 16 Marks**
Type of duty: Continuous, intermittent and short time rating , temperature rise and rating calculations for these duties mechanical features , features of load diagram construction, load equalization & use of flywheel.
Unit- III:- Traction Systems **08Hrs, 16 Marks**
Requirements of ideal traction system, Systems of track electrification and their comparison, speed time curve, factors affecting on schedule speed, Tractive effort, Factors affecting in energy consumption and specific energy consumption.
Unit -IV: - **Traction Motors** **08Hrs, 16 Marks**
General features of traction motors, Control of traction motor: starting, speed control and braking of traction motor , Energy returned during regenerative braking ,overhead equipment control gear .
Unit -V: - **Heat Ventilation and Air Conditioning** **08Hrs, 16 Marks**
Refrigeration cycle, Type of refrigeration, air conditioning, type of air conditioning, Heating of building.
Methods of electric heating & its advantages, resistance oven, induction heating electric welding.

Reference Books:

1. J.B.Gupta , "A Course in Electrical Power"
2. V.V.L.Rao, "Utilization of Electrical Energy", TMH
3. O.E.Taylor , "Utilization of Electrical Energy", TMH
4. S.K.Pillai, "A Course in Electrical Energy", TMH
5. H. Partab, "Art & Science of Utilization of Electrical Energy"
6. http://nptel.iitm.ac.in

Course Title | Short Title | Course Code

Elective-I

ii. Digital Signal Processing **DSP**

Course Description:

Signals play a major role in our life. In general a signal can be function of time, distance, position, temperature, pressure etc and it represents some variable of interest associated with system. Signal processing is a method of extracting information from the signal in turn depends upon the type of signal and nature of information it carries. Thus signal processing is concerned with representing signals in mathematical terms and extracting the information.

Lectures	Hours / Week	No. o f Weeks	Total Hours	Semester Credits
	03	15	42	03

Prerequisite Course(s): Knowledge of programming language c and basic Digital electronics.

Course Objectives:

The objectives of subject are to classify the signal and understanding the basic principles of signal and signal processing . Students will able to understand the application of Z- transform and Discrete and Fast Fourier transform in signal processing.

Course outcomes:

Upon successful completion of this course the students will be able to:

1. Apply basic mathematic to classify and understand the signals
2. Analyze to understand the hidden information in signal with the help of different transformation.
3. Ability to determine the frequency, steady state and transient response of LTI systems.
4. Apply the basic algorithm of digital signal processing in the field of electrical protection system.

Elective-I

ii. Digital Signal Processing

(Course Contents)

Semester-VII | **Examination Scheme:**

Teaching Scheme: | **(ESE) End Semester Examination: 80 Marks**

Lectures: 3 Hrs/Week | **(ISE) Internal Sessional Examination: 20 Marks**

(ESE) End Semester Exam duration: 03 Hours

Unit I: Signal and Fourier Analysis — 09 Hours, 16 Marks

Classification of signal, classification of system Fourier Transform: Properties of Fourier Transform, Fourier Transform of some important signals ,Fourier Transform of power and energy signal.

Unit II:Z- Transform and Linear Time Invariant System — 09 Hours, 16 Marks

Definition of Z- Transform, properties of Z- transform, inverse Z- transform Linear Time Invariant System, property of DSP, impulse and frequency response.

Unit III: Discrete and Fast Fourier Transform — 08 Hours, 16 Marks

Discrete convolution, discrete-time Fourier Transform(DTFT), fast Fourier Transform (FFT), computing an inverse DFT , Short Time Fourier Transform (STFT). Continuous wavelet transforms. Discrete Wavelet Transform (DWT).

Unit IV : Finite Impulse Response (FIR) Filter — 08 Hours, 16 Marks

Introduction to Finite Impulse Response Filter, FIR filter design using different windowing techniques & frequency sampling method. Design of linear phase FIR filter. Basic structure of FIR system.

Unit V : Infinite Impulse Response (IIR) Filter — 08 Hours, 16 Marks

Introduction to Infinite Impulse Response Filter, Design Specification of IIR Low pass filter and frequency transformation, Design of IIR filter using Butterworth, Chebyshev approximation. Digital processor,TM320C 2000 Series processor 2812,28335 and 28027.

References:

1. Proakis, Manolakis “Digital Signal Processing: Principles, Algorithms and Applications”, PHI.
2. Oppenheium, Schaffer ,”Digital Signal Processing”, PHI.
3. A. Nagoor Kani , “Digital Signal Processing”, Tata Mc. Graw Hill.
4. Dr. Shaila D Apte ,”Digital Signal Processing”,Second Edition , Wiley India Pvt Ltd
5. S Salivahanan, A Vallavraj and C Gnanapriya, “Digital Signal Processing” Tata Mc. Graw Hill.
6. http://nptel.iitm.ac.in

Course Title Short Title Course Code

Elective-I

iii. Control System-II CS-II

Course Description:

The study of Control System Engineering is essential for the students of Electrical, Electronics, Mechanical, Aerospace & Chemical Engineering. It has applications ranges from Electrical Power System to process Control System. The course explores the knowledge of basic control systems, control system components, mathematical modeling, time response & frequency response analysis. The course also deals in concept of design & its preliminary consideration.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	3	15	42	3

Prerequisite Course(s): Knowledge of Mathematics, Control System-I and electrical engineering subject

Course Objectives:

Control system engineering is an exciting field in which to apply engineering talents. The object of course to derive mathematical modeling , transfer –functions, time response and frequency response. The objectives are to find transient response and steady state error in given system.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Apply basic mathematical for modeling of control system and responses of first and second order system.
2. Describe the role of control system as an enabling technology in various applications such as in power systems, automation, renewable energy, etc.
3. Understand the response of control system subjected to different input signals, design, set up, and test control system in the laboratory.
4. Analyze and design open and closed control system.
5. Design dc servo motor and stepper motor to meet the characteristics of control system application.
6. Become proficient with computer skills (e.g., PSPICE and MATLAB) for the simulated analysis and design of control system and able to use control system in utility-related applications .

Elective-I

iii. Control System -II

(Course Contents)

Semester-VII **Examination Scheme:**

Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**

Lectures : 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**

(ESE) End Semester Exam duration: 03 Hours

Unit –I State Space Techniques 09 Hours, 16 Marks

Concept of state variable. state model, States variable models of SISO/MIMO linear systems, from differential equations, transfer function and block diagrams. state diagram (Signal flow graphs) Decomposition of transfer functions in phase variable forms, canonical forms, Jordan canonical form, transfer function from the state model, transfer matrix. Concept of Controllability and observability of linear systems. State feedback controller using pole placement , observers.

Unit –II Sample Data Control System 09 Hours, 16 Marks

Representation of sample data (Discrete system) review of Z transforms, sample and hold zero order hold. Sampling theorem Z-transform analysis of sampling data control system. (Open loop and closed loop), Z transfer function of systems. Solutions of different equation by Z transfer methods. Pulse transfer functions of open loop and closed loop system with different sample locations. Stability analysis, relation between S and Z domain, stability by Jury's test and bi-linear transformation and root locus method.

Unit –III Non Linear System Analysis-I 08 Hours, 16 Marks

Behavior of non linear system, various general non linear ties and their characteristics.
Stability analysis by describing function method. Existence and stability of limit cycles.
Limitation of describing function method.

Unit –IV Non Linear System Analysis-II 08 Hours, 16 Marks

Liberalization in a small region operating point. Singular point and their nature. Phase plane method of analysis of nonlinear system, construction of phase trajectories by isoclines method. Limit cycle behavior

Unit –V Stability Analysis By Liapunov Method 08 Hours, 16 Marks

Concept of stability, asymptotic stability in the large, instability, the sense of a Lipunov, Positive of a scale function, quadratic forms. stability theorems, Lipunov fuctions stability of linear time invariant systems, Lipunov equations.

Krasowakii's method for time examining the stability of non-linear time invariant system.

Reference Books:

1. Nagrath & Gopal, “Control System Engineering”, 4th Edition, New age International.
2. K. Ogata, “Modern Control Engineering”, Prentice Hall of India.
3. B.C. Kuo & Farid Golnaraghi, “Automatic Control System” Wiley India Ltd, 2008.
4. Norman s Nise, “Control System Engineering” Wiley India Pvt Ltd
5. Dr. Rajeev Gupta, “NISE’s Control System Engineering” Wiley India Pvt Ltd
6. D.Roy Choudhary, “Modern Control Engineering”, Prentice Hall of India.
7. Ajit K Mandal, “Introduction to Control Engineering” New Age International,2006.
8. R.T. Stefani, B.Shahian, C.J.Savant and G.H. Hostetter, “ Design of Feedback Control Systems”.
9. Narendra Singh Beniwal and Beniwal,”Automatic control system with Matlab Programming “University Science Press.
10. Eugene Xavier S.P. and Joseph Cyril Babu,J.,”Principles of control systems “S.Chand
11. S.Sivangaraju,L.Devi ,”Control Systems Engineering “New Age International Publishers.
12. http://nptel.iitm.ac.in

Course Title Short Title Course Code

Elective-I

iv. Electric Traction Engineering ETE

Course Description

The course explores the knowledge traction engineering, ideal characteristic of traction motor, motor selection, electric braking and speed calculation, transmission and distribution system of electric traction

Lectures	Hours/Week	No. of Weeks	Total Hours	Semester Credits
	03	**15**	**42**	**03**

Prerequisite Course(s) : Knowledge of Power System-I , II and subjects of Electrical Engineering.

Course Objectives:

This course objectives to study the different track electrification , type of supply for electric traction. The course also provides the knowledge of selection of motor based on staring, working and braking characteristic. The course make bridge for higher study in traction engineering.

Course Outcomes:

Upon successful completion of this course the student will be able to:

1. Apply basic knowledge electrical engineering for understand ideal requirement of electric traction.
2. Select the type of motors as per traction load characteristic, control and operation.
3. Analyze the characteristics of traction motor for suitability of different traction systems.
4. Discharging duties as electric traction engineer in technical and professional way.
5. Do higher studies in electric traction with modern tools for increasingly difficult complex electric traction system.

Elective-I

iv Electric Traction Engineering

(Course Contents)

Semester-VII | **Examination Scheme:**

Teaching Scheme: | **(ESE) End Semester Examination: 80 Marks**

Lectures : 3 Hrs/Week | **(ISE) Internal Sessional Examination: 20 Marks**

(ESE) End Semester Exam duration: 03 Hours

Unit -I: - Traction Motors **09Hrs, 16 Marks**

Performance(starting, speed control, torque and braking) of (i) d.c. motors (ii) a.c. single phase series motors at low frequencies and at commercial frequency and (iii) poly phase induction motors, under traction service conditions, specific problems and method of overcoming them, special features of construction effect of differences in driving wheel diameters and speed time curves on division of load, traction motor ratings, speed factor, track and overhead equipments.

Unit -II: - Train Movement and Performance **09Hrs, 16 Marks**

Speed time curve, its analysis and construction, schedule speed and factors affecting it, train resistance and its components. Tractive effort calculations, average acceleration and speed, energy output and consumption.

Unit- III: - Power Transmission and Weight Transference **08Hrs, 16 Marks**

Methods of transmission of power from motor to wheels .Idea about riding quantities of an electric loco motive, grouping of motor and weight transference, adhesive weight factors affecting slip.

Unit -IV: - Power Supply for Traction **08Hrs, 16 Marks**

Overhead and conductor rail system, third rail construction, Bonding of conductor and track rails, overhead construction for trolley, buses and railways, quaternary's construction, temperature effects, current collectors, out times of feeding and distributing system for d.c low frequency, a.c and commercial frequency, a.c. traction voltage drop control, Electrolytic and inductive coordination, power loading curves, Positions of substations and load - sharing .

Unit -V :- Braking On Electrified Railways **08Hrs, 16 Marks**

Mechanical versus electric breaking, rheostatic braking, Regenerative braking, method and energy saved in the process, Magnetic track brakes.

Traction control: Duty cycle, Methods of traction motor control, series-Parallel and other types of controllers, use of interlocks, run back prevented, multiple unit control, Master controllers, Reverses, Dead man's handle, use of Metadyne and Megavolt.

Reference Books:

1. J.B.Gupta , "A Course in Electrical Power"
2. V.V.L.Rao, "Utilization of Electrical Energy", TMH
3. O.E.Taylor , "Utilization of Electrical Energy", TMH
4. S.K.Pillai, "A Course in Electrical Energy", TMH
5. H. Partab, "Art & Science of Utilization of Electrical Energy"
6. http://nptel.iitm.ac.in

Course Title Short Title Course Code

Power System Operation and Control PSOC

Course Description:

Modern power systems have grown larger, expanding over wide geographical area. Interconnection of grids has led to more complex operational problems. Such large systems require very advance computing facilities and techniques. This course explores knowledge of economic load scheduling and dispatch. The course provides knowledge of power system operation and control, need and important, voltage and frequency control. The Course also provides knowledge of static and dynamic behavior of control loops. The Course deals in basic concept of voltage stability, voltage collapse and FACTs devices.

Lectures	Hours/Week	No. of Weeks	Total Hours	Semester Credits
	03	15	42	03

Prerequisite Course(s) : Knowledge of Power System-I, II ,mathematics and other subjects of Electrical Engineering.

Course Objectives:

This course objectives to study power system operation and control. To overcome the stability problem for complex and large capacity units. Voltage and frequency control, static and dynamic behavior. The concept of voltage stability, voltage collapse and FACTs devices. Enhancement of power handling capacity by use of FACTs.

Course Outcomes:

Upon successful completion of this course the student will be able to:

1. Know the complicity of power system and role of engineer in power system operation and control. Able to discharge professional duties in electrical utilities.
2. Know the optimal load scheduling, function & operation of load dispatch centre for economic growth of electric utilities.
3. Know the significance of real power & reactive power flow in the system for effective utilization of electrical installations.
4. Know the concept of automatic voltage control ,their mathematical modeling , static and dynamic analysis.
5. Know the concept of frequency control , mathematical modeling ,static and dynamic response of two area system for higher studies.
6. Understand concept of pool member and their advantages for economical growth and sustainable development.
7. Know the concept of voltage stability and FACT controllers for enhancing power handling capacity of existing transmission lines.

Power System Operation and Control

(Course Contents)

Semester-VII **Examination Scheme:**

Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**

Lectures : 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**

(ESE) End Semester Exam duration: 03 Hours

UNIT I: **Economic Load Dispatch & Optimal Operation of Power System**
09 Hours, 16 Marks

Input Output characteristics, Heat-rate characteristics, Incremental fuel rate and cost, Incremental production cost, , optimum scheduling of generation between different units. (Neglecting transmission losses), Transmission loss as a function of plant generation (A simple system connection two generating plants to load) and incremental transmission loss for optimum economy, Calculation of loss coefficients (Two plants system), Optimum scheduling of generation between different plants considering transmission loss concept and significance of penalty factor, Automatic load dispatch, function and applications

UNIT II: **Generator Voltage Control** **09 Hours, 16 Marks**

Automatic voltage control, generator controllers, Cross coupling between P–f and Q–V control channel, automatic voltage regulator, types of exciters and excitation systems, exciter modeling, transfer function modeling for control static performance and dynamic response of AVR loops.

UNIT III: Load Frequency Control **08 Hours, 16 Marks**

Automatic load frequency control, speed governing system and hydraulic valve actuator for individual generator, Turbine modeling, generator and load modeling transfer function representation of power control mechanism of generator.

UNIT IV: Electric Power Control **08 Hours, 16 Marks**

Concept of control area, division of power system into control areas, Load frequency of single areas, two area and multi area (control) power system with and without integral controls. Advantage of pool operation, tie line bias control area exchange.

UNIT V: **Voltage Stability and Compensation** **08 Hours, 16 Marks**

Power system security, Operating stage (State transition diagram), Voltage stability, Comparison of angle and voltage stability, Reactive power flow and voltage collapse, voltage stability analysis and prevention of voltage collapse.

Compensation in power system: Load compensation, load ability of compensated and uncompensated over head transmission line, compensation of transmission line (Shunt& Series). Introduction of FACTS

Reference Books:

1. Olle L. Elgerd, "Electrical Energy System Theory & Introduction ', TMH.
2. I. J. Nagrath & D. P. Kothari, "Modern Power system Analysis ", TMH.
3. Willium D. Stevenson Jr., "Elements of Power System Analysis" , TMH.
4. Dr. K Uma Rao, " Power System Operation & Control", Wiley India Pvt Ltd.
5. Dr. C.S. Indulkar, "Electric Power Control"
6. L.K. Kirchmayer , "Economic Control of Power System"
7. C L Wadhwa, "Electrical Power System Analysis", New Age International Publication.
8. http://nptel.iitm.ac.in

Course Title	Short Title	Course Code
Industrial Drives & Control Lab	**IDC Lab**	

Lab Course Description:
The subject practical explore the knowledge of different industrial derives, load characteristic, factor effecting on selection of derives depend upon their electrical , mechanical characteristic and service duty. The practical also provides the knowledge of electric traction, ideal requirement of traction motor, operation and control. The practical provides brief knowledge of heat, ventilation and air conditioning system also.

Practical	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	**15**	**28**	**1**

Lab Course Objectives: The object is to select proper motor for given load characteristic. Selection of motor based on load characteristic, electrical, mechanical characteristic and service duty. The practical also provides the knowledge of electric drives, operation and control of electrical drives. The subject provides brief knowledge of four quadrant operation of drives.

Course outcome
After completion of course students will be able to:
1. Apply the knowledge of electrical engineering subjects in different application of industries like manufacturing, maintenance, operation and safety.
2. Understand different speed control methods in D.C and A.C motors using thyristors based control schemes.
3. Understand the characteristic of load and selection of derive in industrial sectors.
4. Conduct practical and analyze data for proper selection of derive in realistic constrain of load requirement.
5. Understand the impact of electrical characteristic of motor in electric traction system.
6. Discharge professional duties in industries with innovative ideas of operation and control of drives.
7. Do higher study in the field of modern derives and control.

Industrial Drives and Control Lab

(Lab Course Contents)

Semester-VII **Examination Scheme:**
Teaching Scheme: **(ICA) Internal Continuous Assessment: 25 Marks**
Practical : 2 Hrs/Week **(ESE) End Semester Examination(PR): 25 Marks**

Teacher should facilitate learning following lab experiments:

1. Determination of Speed Torque characteristic of d.c motor controlled using single phase half controlled rectifier.
2. Determination of Speed Torque characteristic of d.c motor controlled using single phase fully controlled rectifier.
3. Performance analysis of one quadrant chopper control of d.c motor.
4. Performance analysis of two quadrant chopper control of d.c motor.
5. Speed control of single phase induction motor using ac voltage regulator.
6. Study of stepper motor drive circuit.
7. Speed control of universal motor.
8. Study of closed loop control of Dc motor.
9. Study of vector control method for induction motor.
10. Study of reversible drives

Note: Lab file should consist of minimum **Eight** experiments.

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

In ESE the student should be asked to perform any one practical. Evaluation will be based on paper work , practical performance and oral in the practical examination.

Course Title	Short Title	Course Code
High Voltage Engineering Lab	**HVE Lab**	

Lab Course Description:
The demand for generation and transmission of large amount of electric power today, necessitates in transmission at extra- high voltages. Electrical engineering students are expected to possess knowledge of high voltage techniques. The subject is not in-depth but explores the knowledge of insulating material, properties, breakdown phenomena in solid, liquid and gases. The subject also provide the platform to understand the generation and measurement of high voltage.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Practical	**2**	**15**	**28**	**1**

Prerequisite Course(s) : Knowledge basic sciences, mathematics and subjects of Electrical Engineering.

Lab Course Objectives: The lab objectives are to understand the need of high voltage in tem of technical and economical point of view. Student should understand the properties and breakdown phenomena in solid, liquid and gases. Students also understand the method of generation ,measurement of high voltage and testing.

Lab Course Outcomes:

Upon successful completion of this lab course the student will be able to:

1. Apply basic knowledge of electrical engineering material for understanding breakdown phenomena in solid, liquid and gases.
2. Understand the lightning stroke and behavior on electrical appliances.
3. Understand the generation and measurement of high voltage for various testing in the field of manufacturing of power plant equipments.
4. Discharge the professional duties in high voltage test laboratories.
5. Higher study in field of high voltage with latest tools and software for sustainable development of EHV transmission field.

High Voltage Engineering Lab

(Lab Course Contents)

Semester-VII **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 25 Marks**

Practical : 2 Hrs/Week **(ESE) End Semester Examination(OR): 25 Marks**

Teacher should facilitate learning following lab experiments:

1. Measurement of insulation resistance of 11KV/110 V.P.T by Megger.
2. Power frequency withstand test on 11KV, 10/5 amp CT.
3. Study of corona discharge.
4. Determination of insulating break-down strength of solid, liquid and gaseous dielectric media.
5. Power frequency high voltage withstand test on cable.
6. Study of impulse generator.
7. Dry & Wet power frequency withstand test for insulator.
8. Flash over test on insulator.
9. Double voltage double frequency withstand test on transformer.
10. Calibration of sphere gap.
11. Study of 100KV high voltage testing set.

Note: Lab file should consist of minimum **Eight** experiments.

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

In ESE the student may be asked questions on practical. Evaluation will be based on answers given by student in oral examination.

Course Title | Short Title | Course Code

Elective-I

i. Industrial Electrical Engineering Lab IEE Lab

Lab Course Description:

The subject practical explore the knowledge of different industrial derives, load characteristic, factor effecting on selection of derives depend upon their electrical , mechanical characteristic and service duty. The practical also provides the knowledge of electric traction, ideal requirement of traction motor, operation and control. The practical provides brief knowledge of heat, ventilation and air conditioning system also.

Practical	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	**15**	**28**	**1**

Lab Course Objectives: The objects of lab practical are not to discuss the working operation of motor. The object is select proper motor for given load characteristic. Selection of motor based on load characteristic, electrical , mechanical characteristic and service duty. The practical also provides the knowledge of electric traction, ideal requirement of traction motor, operation and control. The subject provides brief knowledge of heat, ventilation and air conditioning system also.

Lab Course outcomes:

1. Apply the knowledge of electrical engineering subjects in different application of industries like manufacturing, maintenance, operation and safety.
2. Understand the characteristic of load and selection of derive in industrial sectors.
3. Conduct practical and analyze data for proper selection of derive in realistic constrain of load requirement.
4. Understand the impact of electrical characteristic of motor in electric traction system.
5. Discharge professional duties in industries with innovative ideas of operation and control of drives.
6. Do higher study in the field of modern derives and control.

Elective-I

i. Industrial Electrical Engineering Lab

(Lab Course Contents)

Semester-VII **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 25 Marks**

Practical : 2 Hrs/Week **(ESE) End Semester Examination(PR): 25 Marks**

Teacher should facilitate learning following lab experiments:

1. Performance characteristics of DC Series motor by load test.
2. Performance characteristics of DC Series motor by Field Test.
3. Performance characteristics of DC Shunt motor by direct load test.
4. Performance characteristics of single phase induction motor by direct load test.
5. Performance characteristics of three phase induction motor by direct load test.
6. Speed control of DC series motor.
7. Speed control of three-phase slip ring induction motor by rotor resistance method
8. Rheostatic braking of DC shunt motor.
9. Study of Air conditioning system.
10. Study of induction heating &Welding.
11. Study of different types of enclosures.

Note: *(Objectives and conclusion should be oriented on the basis of characteristic of load, selection, and application of motors.)*

Note: Lab file should consist of minimum **Eight** experiments.

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

In ESE the student should be asked to perform any one practical. Evaluation will be based on paper work , practical performance and oral in the practical examination.

Course Title Short Title Course Code

Elective-I

ii. Digital Signal Processing Lab DSP Lab

Lab Course Description:

Signals play a major role in our life. In general a signal can be function of time, distance, position, temperature, pressure etc and it represents some variable of interest associated with system. Signal processing is a method of extracting information from the signal in turn depends upon the type of signal and nature of information it carries. Thus signal processing is concerned with representing signals in mathematical terms and extracting the information.

Practical	Hours / Week	No. o f Weeks	Total Hours	Semester Credits
	02	15	28	1

Prerequisite Course(s): Knowledge of programming language c and basic Digital electronics.

Lab Course Objectives:

The lab objectives of subject are to classify the signal and understanding the basic principles of signal and signal processing . Students will able to understand the application of Z- transform and Discrete and Fast Fourier transform in signal processing.

Lab Course outcomes:

Upon successful completion of this course the students will be able to:

1. Apply basic mathematic to classify and understand the signals
2. Analyze to understand the hidden information in signal with the help of different transformation.
3. Ability to determine the frequency, steady state and transient response of LTI systems.
4. Apply the basic algorithm of digital signal processing in the field of electrical protection system.

Elective-I

ii Digital Signal Processing Lab

(Lab Course Contents)

Semester-VII	**Examination Scheme:**
Teaching Scheme:	**(ICA) Internal Continuous Assessment: 25 Marks**
Practical : 2 Hrs/Week	**(ESE) End Semester Examination(PR): 25 Marks**

Teacher should facilitate learning following lab experiments:

1. Shifting and folding of digital signal.
2. Linear convolution.
3. Discrete Fourier transforms.
4. Fast Fourier transforms.
5. Design and implement FIR filter using windowing method.
6. Design and implement IIR filter using Butterwoth approximation.
7. Design and implement IIR filter using Chebeshev approximation.
8. Sine/square wave generation using TMS32OC67XX.
9. FIR filter implementation using TMS32OC67XX.
10. IIR filter implementation using TMS32OC67XX.
11. Filtering Using Discrete Wavelet transforms.

Note: Lab file should consist of minimum **Eight** experiments.

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

In ESE the student should be asked to perform any one practical. Evaluation will be based on paper work , practical performance and oral in the practical examination.

Course Title | Short Title | Course Code

Elective-I

iii. **Control System-II Lab** **CS-II Lab**

Lab Course Description:

The study of Control System Engineering is essential for the students of Electrical, Electronics, Mechanical, Aerospace & Chemical Engineering. It has applications ranges from Electrical Power System to process Control System. The course explores the knowledge of basic control systems, control system components, mathematical modeling, time response & frequency response analysis. The course also deals in concept of design & its preliminary consideration.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Practical	**2**	**15**	**28**	**1**

Prerequisite Course(s): Mathematics and subjects of electrical engineering

Lab Course Objectives: Control system engineering is an exciting field in which to apply engineering talents. The object of practical to derive mathematical modeling, transfer –functions, time response and frequency response. The objectives are to find transient response and steady state error in given system.

Lab Course Outcomes:

Upon successful completion of this practical course the students will be able to:

1. Apply basic of mathematical modeling of control system and responses of first and second order system.
2. Describe the role of Control system as an enabling technology in various applications such as in power systems, energy conservation, renewable energy, transportation etc.
3. Understand the response of control system subjected to different input signals, design, set up, and test control system in the laboratory.
4. Analyze and design open and closed control system.
5. Design dc servo motor and stepper motor to meet the characteristics of control system application.
6. Become proficient with computer skills (e.g., PSPICE and MATLAB) for the simulated analysis and design of control system and able to use control system in utility-related applications.

iii Control System-II Lab

(Lab contents)

Semester-V II	**Examination Scheme:**
Teaching Scheme:	**(ICA) Internal Continuous Assessment: 25 Marks**
Practical : 2 Hrs/Week	**(ESE) End Semester Examination(PR): 25 Marks**

Teacher should facilitate learning following lab experiments:

1. To Study of different MATLAB tools for Control System.
2. Find the Response of the Discrete Time Control System for any two standard inputs.
3. Simulation on State Transition Matrix.
4. State Space Analysis using MATLAB.
5. Pole-Zero plot using MATLAB.
6. To check the controllability and Observability for the given system.
7. Design of control system using pole placement technique.
8. Simulation on multivariable control system.
9. Design of State observer.
10. Design of Discrete Time Control System based on minimization of quadratic performance index.
11. To determine time domain response of a second order system for step input and obtain performance parameters by using MATLAB. .
12. To convert transfer function of a system into state space form and vice-versa, by using MATLAB.

Note: The minimum eight experiments are to be performed from the list of experiments.

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

In ESE the student should be asked to perform any one practical. Evaluation will be based on paper work , practical performance and oral in the practical examination.

Course Title Short Title Course Code

iv. Electric Traction Engineering Lab ETE Lab

Lab Course description:

The course explores the knowledge traction engineering, ideal characteristic of traction motor, motor selection, electric braking and speed calculation, transmission and distribution system of electric traction

Practical	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	**15**	**28**	**1**

Lab Course Objectives:

The objects of lab practical are not to discuss the working operation of motor. The object is select proper motor for given load characteristic. Selection of motor based on load characteristic, electrical , mechanical characteristic and service duty. The practical also provides the knowledge of electric traction, ideal requirement of traction motor, operation and control.

Lab Course Outcomes:

Upon successful completion of this lab course the student will be able to:

1. Apply basic knowledge electrical engineering for understand ideal requirement of electric traction.
2. Select the type of motors as per traction load characteristic, control and operation.
3. Analyze the characteristics of traction motor for suitability of different traction systems.
4. Discharging duties as electric traction engineer in technical and professional way.
5. Do higher studies in electric traction with modern tools for increasingly difficult complex electric traction system.

Elective-I Lab
iv Electric Traction Engineering
(Lab Course Contents)

Semester-VII | **Examination Scheme:**
Teaching Scheme: | **(ICA) Internal Continuous Assessment: 25 Marks**
Practical : 2 Hrs/Week | **(ESE) End Semester Examination(PR): 25 Marks**

Teacher should facilitate learning following lab experiments:

1. Performance characteristics of DC Series motor by load test.
2. Performance characteristics of DC Series motor by Field Test.
3. Performance characteristics of DC Shunt motor by direct load test.
4. Performance characteristics of single phase induction motor by direct load test.
5. Performance characteristics of three phase induction motor by direct load test.
6. Speed control of DC series motor.
7. Speed control of three-phase slip ring induction motor by rotor resistance method
8. Rheostatic braking of DC shunt motor.
9. Study traction transformer.
10. Study of Metadyne for electric locomotive.
11. Study of electric traction substation.

    Note: *(Objectives and conclusion should be oriented on the basis of characteristic of load, selection, and application of motors.)*

Note: Lab file should consist of minimum **Eight** experiments.

Guide lines for ICA :
ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-
In ESE the student should be asked to perform any one practical. Evaluation will be based on paper work , practical performance and oral in the practical examination.

Course Title	Short Title	Course Code
Project-I	**P-I**	

Course Description:

The course explores the knowledge of design, experiment and analysis of data. The course develops ability to work on multidisciplinary teams, Identify, formulate, and solve engineering problems in view of economic, environmental and societal context.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Practical	**2**	**15**	**28**	**2**

Prerequisite Course(s): Knowledge of science, mathematics, computer programming and core subject of engineering.

Course Objectives: The objectives of project are to develop ability to work in group. The scope of work is design and conduct experiments, as well as to analyze and interpret data within realistic constrain such as economic, environmental, social, safety and manufacturability. The project work provides plate form for planning, material procurement, preparing specification and execution of work. The project also develop to work on multidisciplinary teams, communicate effectively and Knowledge of contemporary issues.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Apply knowledge of mathematics, science, and engineering.
2. Design and conduct experiments, as well as to analyze and interpret data.
3. Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
4. Function on multidisciplinary teams, communicate effectively and Knowledge of contemporary issues.
5. Identify, formulate, and solve engineering problems by understanding professional and ethical responsibility.
6. Understand the impact of engineering solutions in a global, economic, environmental, and societal context.
7. Recognition of the need for, and an ability to engage in life-long learning.
8. Use the techniques, skills, modern engineering tools and software necessary for engineering practice.

Project-I

(Lab Course Contents)

Semester-VII	**Examination Scheme:**
Teaching Scheme:	**(ICA) Internal Continuous Assessment: 25 Marks**
Practical : 2 Hrs/Week	**(ESE) End Semester Examination (OR) :25Marks**

1. It is expected that the broad area of Project-I shall be finalized by the student in the beginning of the VII semester / extension of Minor project undertaken may be Project-I.
2. A group of Minimum 3 and Maximum 5 students shall be allotted for Project-I and same project group for Project-II.
3. Exhaustive survey of literature based on a clear definition of the scope and focus of the topic should be carried out by the students. The **Synopsis/Abstract** on the selected topic, after detail literature survey should be submitted to the Project coordinator appointed by Head of the department.
4. Project-I may involve literature survey, problem identification, work methodology preparing specification and material procurement, collection of data , conduction of experiments and analysis. The project work shall involve sufficient work so that students get acquainted with different aspects of fabrication, design or analysis.
5. Approximately more than 50% work should be completed by the end of VII semester.
6. Each student group is required to maintain log book for documenting various activities of Project-I and submit group project report in the form of thermal bound at the end of semester –VII. Submit the progress report in following format:
   a. *Title*
   b. *Abstract*
   c. *Introduction*
   d. *Problem identification and project objectives*
   e. *Literature survey*
   f. *Case study/Analysis/Design Methodology*
   g. *Work to be completed (Progress status)*
   h. *Expected result and conclusion*
   i. *References.*

7. Evaluation Committee comprising of the Guide, Project Coordinator and Expert appointed by the Head of the department will award the marks based on the work completed by the end of semester and the presentation based on the project work.

Guide lines for ICA : The Internal Continuous Assessment shall be based on the active participation of the students in the Project work and knowledge / skill acquired. Assessment of the project-I for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given in **Table-A.**

Guide lines for ESE: The End Semester Examination for Project shall consist of demonstration if any, presentation and oral examinations based on the project report**.**

Assessment of Project-I

Name of the Project: ____

Name of the Guide: ____

Table-A

SN	Name of Student	Problem Identification and project objectives	Literature Survey	Project Methodology/ Design/PCB/ hardware/ simulation/ programming	Progress Status	Present ation	Total
		5	5	5	5	5	25

Course Title Short Title Course Code

Seminar-II

Course Description: The course explores the knowledge of presentation and effective communication. The course develops ability to work on multidisciplinary teams, Identify, formulate, and solve engineering problems in view of economic, environmental and societal context.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Practical	**2**	**14**	**28**	**2**

Prerequisite Course(s): Knowledge of science, mathematics, computer programming and core subject of engineering.

Course Objectives: The objectives of Seminar –II are to develop ability express our view, presentation and effective communication. The scope of seminar-II is study various national and international journal for design , experiments conduct , as well as to analyze and interpret data within realistic constrain such as economic, environmental, social, safety and manufacturability.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Understand literature survey for selection of seminar topics.
2. Apply knowledge of mathematics, science, and engineering for effective presentation of selected topic.
3. Communicate effectively and Knowledge of contemporary issues.
4. Identify, formulate, and solve engineering problems by understanding professional and ethical responsibility.
5. Practice the use of various resources to locate and extract information using offline & online tools, journals.
6. Practice the preparation and presentation of scientific papers and seminars in an exhaustive manner.
7. Understand the impact of engineering solutions in a global, economic, environmental, and societal context.

Seminar-II

(Course Contents)

Semester-VII **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 25 Marks**

Practical : 2 Hrs/Week

1. Each Student shall select a topic for seminar which is not covered in curriculum. Seminar topic should not be repeated and registration of the same shall be done on first come first serve basis.
2. Topic of Seminar shall be registered within a three weeks from commencement of VII Semester and shall be approved by the committee.
3. The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of Seminar-II. Seminar shall be related state of the art topic of his choice approved by the committee.
4. Each student should deliver a seminar in scheduled period (Specified in time table or time framed by department) and submit the seminar report (paper bound copy/Thermal bound)in following format:
   a. *Title*
   b. *Abstract*
   c. *Introduction*
   d. *Literature survey*
   e. *Concept*
   f. *Functional and Technical Details*
   g. *Applications*
   h. Comparison with similar topics / methods
   i. *Future scope*
   j. *References*

ASSESSMENT OF SEMINAR-II

Guide lines for ICA: ICA shall be based on topic selection , presentation and Seminar-II report submitted by the student in the form of thermal bound. Assessment of the Seminar-II for award of ICA marks shall be done jointly by the guide and a departmental committee, as per the guidelines given in **Table- B**

Name of Guide: ____________________________________

Table-B

SN	Name of Student	Seminar Topic	Topic Selection	Literature survey	Report writing	Depth of under-standing	Presentation	Total
			5	5	5	5	5	25

Course Title | Short Title | Course Code

Industrial Visit | IV |

Course Description: The course explores the knowledge industry organization, new trends in manufacturing, maintenance and safety. The industrial visit provide the practical visualization of theoretical study of various engineering subject.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Practical	**-**	**-**	**-**	**1**

Course Objectives: The main objective behind these visits is to explain the working of industrial equipments in running conditions to the students and tell them about the expectations of the industrialists from the fresh engineers.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Understand organizational set up of an industry.
2. Develop our self for expectations of the industrialists from the fresh engineers.
3. Understand manufacturing, material handling , maintenance , safety standard and environmental consideration in industry.
4. Function on multidisciplinary teams, communicate effectively and Knowledge of contemporary issues.
5. Identify, formulate, and solve engineering problems by understanding professional and ethical responsibility.
6. Understand the impact of engineering solutions in a global, economic, environmental, and societal context.

Industrial Visit

(Course Contents)

Semester-VII **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 25 Marks**

1. Industry visits for minimum two industries shall be carried out by each student preferably or college shall arrange the industrial visit during the vacation period otherwise during the regular VII semester.
2. The student should obtain appropriate certificates of visit from the concerned organizations just after the visits.
3. Every Student should submit Industrial Visit report individually at the end of Semester-VII(First Term of Final Year)
4. The report(Thermal Bound) should contain information about the following points:
   a. *The organization - activities of organization and administrative setup technical personnel and their main duties.*
   b. *The project / industry brief description with sketches and salient technical information.*
   c. *The work / processes observed with specification of materials, products, equipments etc. and role of engineers in that organization.*
   d. *Suggestions (if any) for improvement in the working of those organizations.*
5. The evaluation of the report of technical visits will be made by panel of three teachers appointed by Head of the department based on following points:

Guide lines for ICA : ICA shall be based on knowledge gain by student and Industrial Visit Report submitted by the student in the form of Thermal bound. Assessment of the Industrial Visit for award of ICA marks shall be done jointly by industrial visit coordinators departmental committee based on viva -voce as per the guidelines given in **Table- C**

Table-C

SN	Name of Student	Name of Industry	Report writing	Depth of Under-standing	Total
			15	10	25

NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Syllabus for

Final Year Electrical Engineering

Faculty of Engineering and Technology

COURSE OUTLINE

SEMESTER –VIII

W.E.F 2015 – 2016

Course Title	Short Title	Course Code
Power System Stability	**PSS**	

Course Description:
At present the demand for electricity is rising phenomenally especially in developing country like India. This persistent demand is leading to operation of the power system at its limit. On top of this the need for reliable, stable and quality power is also on the rise due to electric power sensitive industries like information technology, communication, electronics etc. In this scenario, meeting the electric power demand is not the only criteria but also it is the responsibility of the power system engineers to provide a stable and quality power to the consumers. These issues highlight the necessity of understanding the power system stability. In this course we will try to understand how to asses the stability of a power system, how to improve the stability and finally how to prevent system becoming unstable.

Lectures	Hours/Week	No. of Weeks	Total Hours	Semester Credits
	03	**15**	**42**	**03**

Prerequisite Course(s) : Knowledge of Power System and Electrical Machines.

General Objectives:
This course objectives to study power system stability and reliability. To overcome the stability problem for complex and large capacity units. Classification of stability on the basis of nature of perturbation and evaluation time. In this course we will try to understand how to asses the stability of a power system, how to improve the stability and finally how to prevent system becoming unstable.

Course Outcomes:
Upon successful completion of this course the student will be able to:

1. To Apply basic knowledge of science and mathematics and electrical engineering in stability studies.
2. Understand facts, concepts and classification of stability on the basis of perturbation and economical aspect of energy exchange.
3. To analyze the characteristics of synchronous alternator under small and large disturbances.
4. Apply Knowledge of electrical subjects for solving stability problem and use method for enhancing stability .
5. Discharging duties as power system engineer in technical and professional way.
6. Do higher studies in stability with modern tools for increasingly difficult complex interconnected power system.

Power System Stability

(Course Contents)

Semester-VIII **Examination Scheme:**

Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**

Lectures : 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**

(ESE) End Semester Exam duration: 03 Hours

UNIT-I: Basic Concept **09 Hours, 16 Marks**

Meaning of stability, rotor, voltage and frequency stability steady state transient & dynamic stability limits, Park's transformation equations, Analysis of transient and subtransient state operation of salient and non salient pole machines, phasor diagrams, voltage behind the transient and subtransient impedances, time constants. Determination of parameters and time constants.

UNIT II: - Steady State Stability **09 Hours, 16 Marks**

SSSL of short transmission lines, Analytical and graphical methods of solutions, loosy lines effect of inertia conservative criterion, synchronizing co efficient multi machine system.

UNIT III: - Factors Affecting Steady State Stability **08 Hours, 16 Marks**

Effect of saturation, saturated reactance, equivalent reactance, graphical method to find equivalent effect of short circuit ration effect of governor action, effect of automatic voltage regulator.

UNIT IV: - Transient State Stability **08 Hours, 16 Marks**

Review of transient stability, swing equation, assumption for swing equation and classical model , shortcoming of classical model, equal area criterion, critical cleaning angle and critical clearing time, point by point solution for transient stability.

UNIT V: - Factors Affecting Transient State Stability **08 Hours, 16 Marks**

Effects of types of fault, effect of grounding, effect of high speed reclosing Precalculated swing curves and their use, effects of fault clearing time, effects of excitation and governing action, Methods of improving stability, multi-machine problem .

Reference Books:

1. Aderson and Ford, "Power System Operation and Control", IEEE
2. E .W. Kimbark , "Power Systems Stability", Vol- I & II , Wiley India Pvt Ltd
3. S. B.Cray , " Power System Stability" , John Wiley
4. Nagrath & Kothari , " Modern Power System Analysi",TMH
5. P. S Bimbhra, "Generalized Electrical Machinery", Khanna Publishers
6. Peter W. Sauer and M A Pai, "Power System Dynamics and Stability", Pearson Education.
7. http://nptel.iitm.ac.in

Course Title	Short Title	Course Code
Switch Gear and Protection	**SGP**	

Course Description :

Switchgear and Protection is a fascinating subject . A protection scheme in a power system is designed to continuously monitor the power system to ensure maximum continuity of electrical supply with minimum damage to life, equipment and property. The subject explores the knowledge of arc interruption, different type of circuit breakers and relay. This knowledge is help full for understanding the characteristic feature and proper selection of protective elements in different protective scheme. The subject also provides knowledge different protection for major and individual power system elements.

Lectures	Hours/Week	No. of Weeks	Total Hours	Semester Credits
	03	**15**	**42**	**03**

Course Objectives: The objectives of subject are that students will able understand the fault characteristic of individual power system elements. One should also be knowledgeable about the tripping characteristics of various protective relays. The students able to understand the job of protection engineer is to devise such scheme where closest possible match between the fault characteristic and tripping characteristic is obtained. The students will able understand protected zone and able to design protective scheme such that relay will detect undesirable conditions and then trip to disconnect the area affected, but remain restrained at all other time. Student should be equipped with sound concept of power system protection to enable them handling unforeseen circumstances in real life.

Course Outcomes:

1. Apply the basic knowledge of science for understanding arc generation and interruption in medium and high voltage circuit.
2. Conduct practical based on testing of relay and analysis data for matching different fault characteristics.
3. Select different protective relay and circuit breakers based on their characteristic feature for different protective scheme.
4. Understand continuously monitor the power system to ensure maximum continuity of electrical supply with minimum damage to life, equipment and property and best safety practices.
5. Discharge his professional duties in field of power system protection, maintenance and manufacturing sector.
6. Do higher study of updated protection technology for complex power system .

Switchgear and Protection
(Course Contents)

Semester-VIII **Examination Scheme:**

Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**

Lectures : 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**

(ESE) End Semester Exam duration: 03 Hours

Unit – I:- Arc Phenomena and Interruption 09 Hours, 16 Marks

Basic requirement of Switching and protection , arc phenomenon, maintenance of arc, properties of arc, interruption theories, transient recovery Voltage, transient analysis, RRRV, Interruption of capacitive current, current chopping,

Unit – II:-Circuit Breakers and Fuses 09 Hours, 16 Marks

Construction & Operation , class , breaking capacity, characteristic and application of: Bulk oil circuit breaker, Minimum oil circuit breaker, air blast circuit breaker, SF6 , Vacuum Circuit Breaker , Earth leakage & Miniature circuit breaker and HRC fuses.

Unit – III:-Protective Relay-I 08 Hours, 16 Marks

Protection system and its attributes: sensitivity, selectivity, speed, reliability and dependability, trip circuit, organization of protection, zones of protection and maloperation. Construction ,working and characteristic features of electromagnetic relay: Over current, instantaneous over-current , definite time over-current, inverse time over-current relay ,directional over current relay and differential relay.

Unit –IV:- Protective Relay-II 08 Hours, 16 Marks

Construction ,working and characteristic features of electromagnetic relay: Impedance relay , reactance relay, Mho relay and their trip law using universal torque equation.
Static Over current relay: Single and double actuating quantity relay, basic principle of static over current relay and directional over current relay.
Evolution Digital relay: basic component of digital relay, digital sub units digital relay as unit. Microprocessor based relay, block diagram, relay for motor and advantages.

Unit –V: Protection Schemes 08 Hours, 16 Marks

Different type of protective scheme: Over current protection, Differential protection, earth fault protection , distance protection and carrier –aided protection. Protective scheme for generator, transformer, bus-bar , transmission line and motor.

Reference Books :-

1. Y G Paithankar and S R Bhide, “Fundamentals of Power System Protection” PHI
2. T.S. Madharao , “ Power System Protection (Static Relay)”, Tata MacGraw Hill.
3. C.R.Mason , “The Art and Science of Protective Relaying”
4. B.Ram &Vishwakarma D.N , “Power System Protection & Switch Gear”,TMH
5. Sunil S.Rao , “Switchgear & Protection”, Khurana Pun
6. B.Ravindranath & M. Chandar, “Power System Protection & Switch Gear”, New age International.
7. A.G. Phadke & Thorpe, “Power System Protection their Theory & Practice “, Chapman & Hall.
8. E. W Kimbark, “ Power Systems Stability” Vol-II, Wiley India Pvt. Ltd.
9. http://nptel.iitm.ac.in

Course Title Short Title Course Code

Elective-II

i. Computer Aided Power System Analysis CAPSA

Course Description :

The present day power systems are characterized by large highly interconnected network. Extensive system studies are required at almost all stages of its planning, operation and control. Simulation and analysis of such a large system is possible only with the help of digital computers. Most of the time, a power system, theoretically, remains under steady state.

Load flow or power flow study is the most frequently carried out steady state analysis, which determines system voltage profile and line flows/losses. The ever growing concern towards secure operation of power systems requires security analysis to be carried out at planning as well as operation stage, which involves analyzing system states following contingencies.

A fault in the power system network results in excessive current flowing through its various components. Fault analysis is important in determining the short circuit levels, which is utilized in proper selection of equipments and determining the protection requirements. A disturbance in the system, including a fault, may sometimes lead to unstable operation of the system.

This course will cover the modeling issues and analysis methods for the power flow, short circuit, contingency and stability analyses, required to be carried out for the power systems.

	Hours/Week	No. of Weeks	Total Hours	Semester Credits
Lectures	**03**	**15**	**42**	**03**

Prerequisite Course(s): Knowledge of Power System at second & third year Engineering.

Course Objectives:

Computer aided power system analysis provides modern tool for the analyses of the complex electrical power system with less computational time and more accuracy The objectives of Computer aided power system analysis is to model issues and analyze methods for the power flow, short circuit, contingency and stability analyses, required to be carried out for the continuous monitoring of power systems.

Course Outcomes:

After successful completion of this lab students will be able to:

1. To describe the role of Computer aided power system analysis as an enabling tool in various analysis such as power flow, short circuit, contingency and stability analyses.
2. To understand the network topology for the representation of power system components and networks.
3. To form the bus impedance and admittance matrices by algorithms.
4. To perform the short circuit studies for proper selection of protection scheme.
5. To perform the load flow studies using N-R method, Gauss seidal method and fast decoupled method.
6. To evaluate simultaneous faults by matrix Transformations.
7. To learn the role of Computer aided power system analysis in utility-related applications which are becoming extremely important.

Elective-II
Computer Aided Power System Analysis
(Course Contents)

Semester-VIII **Examination Scheme:**
Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**
Lectures : 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**
(ESE) End Semester Exam duration: 03 Hours

Unit-I: Network Topology **09 Hours, 16 Marks**
Modeling of Power System Components, Basic Concepts, Single Phase, Three Phase Models, Matrix, Representation of Networks Topology of Electric power system-Network Graphs, Incidence matrices, fundamental loop and cutest matrix, primitive impedance and admittance matrix, singular transformation of network matrix.

Unit – II: Incidence Matrix **09 Hours, 16 Marks**
Formation of bus impedance and admittance matrices by algorithm – Modification of bus impedance and admittance matrix to account for change in networks. Derivation of loop impedance matrix. Algorithm for formulation of 3- phase bus impedance matrix.

Unit – III: Short Circuit Studies **08 Hours, 16 Marks**
Three phase network, Symmetrical components. Thevenin's theorem and short circuit analysis of multimode power system using bus impedance matrix. Short circuit calculations for balanced and unbalanced short circuit bus impedance and loop impedance matrices.

Unit – IV: Load Flow Studies **08 Hours, 16 Marks**
Slack bus, loop buses, voltage control buses, Load flow equations, power flow model using bus admittance matrix, Power flow solution through Gauss-Seidal and N-R methods sensitivity analysis, Second order N-R method, fast decoupled load flow method, Sparsity of matrix.

Unit – V : Fault Analysis **08 Hours, 16 Marks**
Simultaneous faults, Simultaneous Faults by two port network Theory (Z, Y and H-type Faults), Simultaneous faults by matrix Transformations, Analytical simplifications of series and shunt fault.

Reference Books:

1. J. J. Gringer,W.D. Stevenson, "Power System Analysis", McGraw Hill. 1994
2. G.W.Stagg and Al Ebiad,"Computer Methods in Power System Analysis", Mc Graw Hill,
3. I.J.Nagrath and D.P.Kothari, "Modern Power System Analysis", Tata McGraw Hill,1980.
4. G.L.Kusic, "Computer Aided Power System Analysis", Prentice Hall, 1986.
5. Hadi Sadat, "Power System Analysis", Tata McGraw Hill.
6. http://nptel.iitm.ac.in

Course Title | Short Title | Course Code

Elective-II

ii. Industrial Automation IA

Course Description:

This course describes PLC & SCADA based Industrial Automation system which will improve the knowledge of the students about industrial processes using automation. The course will cover SCADA & PLC systems in terms of their architecture, their interface to the process hardware, the functionality and the application development facilities. Also provide an industrial SCADA & PLC system is used for the development of the controls of machinery.

Lectures	Hours/Week	No. of Weeks	Total Hours	Semester Credits
	03	15	42	03

Prerequisite Course(s): Knowledge of c-programming, Industrial organization and management subject of third year, industrial drives and control subject of final year.

Course Objectives:

The objectives of subject are that students will able to understand the role of industrial automation for different processes based on PLC system and its requirement. It also provide basic operation of programmable logic control and its function. Students will learn the input-output devices for the PLC, its operation, its selection according to application and its interfacing. It explores the knowledge of different configuration of PLC, its programming techniques for various application, and it's interfacing with industrial machineries. It also help to understand the application in different industries like power sector, in pharmaceuticals, in automobile industry etc and its installation.

Course Outcomes:

Upon successful completion this course a students will be to

1. Apply the knowledge of automation in machine control.
2. Design and conduct practical in realistic constrain on motors such that it is applicable in manufacturing, testing and maintenance field.
3. Design the automation system for fast and value added quality product for economical growth through technological development.
4. Solve engineering solution for fast growing industrial sector with reliable atomized system using PLC and SCADA system.
5. Discharge professional duty in multidisciplinary teams of installation ,maintenance and operation with séance of safety standards.
6. Do higher study in field of automation and able use updated software and tools.

Elective-II
Industrial Automation
(Course Contents)

Semester-VIII **Examination Scheme:**
Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**
Lectures: 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**
(ESE) End Semester Exam duration: 03 Hours

Unit I:Introduction to Industrial Automation, basics of PLC and Automation strategy. 09 Hours, 16 Marks

Introduction to Industrial Automation, Role of automation industry, Programmable Logic Controller, Basic operation, PLC architecture and components, Programming language, PLC application and Manufacturers, Introduction to Automation tools like PLC, SCADA, DCS, Hybrid DCS etc.

Unit II: - Basics PLC Functions and configuration. 09 Hours, 16 Marks

PLC registers, PLC modules, Addressing System, Field Input/ Output system, PLC timers functions, PLC counters, Industrial process Timing application, Selection of PLC and I/O modules

Unit III:- Instructions , Data handling functions. 08 Hours, 16 Marks

PLC logical instruction, PLC arithmetic instruction, PLC repetitive clock functions, PLC numbering systems, conversion function, PLC master relay control function, Jump , Data Move instructions and other data handling functions, scaling instructions.

Unit-IV: Programming of PLC 08 Hours, 16 Marks

Introduction Ladder/ FBD language, PLC configuration with I/O designations, addressing system in programming, Process to develop ladder language in software, Uploading/ Downloading the program to/ from PLC, To develop ladder for ON/OFF controlling of motor, Traffic signal light, etc.

Unit-V:Application of PLC/Industrial application and Introduction to SCADA system. 08 Hours, 16 Marks

Application development and automation for following industries:-

1. Power
2. Pharmaceuticals
3. Automobile
4. Rubber industry etc.

Introduction to SCADA system

Reference Books:

1. John Webb & Ronald, "PLC Principles and Application" **,** Prentice Hall India.
2. S.K.Sigh, "Computer Aided Process Control" ,Prentice Hall India.
3. John Hackworth & Frederick D Hackworth, "PLC: Programming Methods and Applications",Pearson Education.
4. Krushnakant, "Computer Based Process Control" Prentice Hall India.
5. Prof. Rajesh Mehra and Er. Vikram Vij, "PLC and SCADA", Laxmi Publication, Delhi.
6. http://nptel.iitm.ac.in

Course Title | Short Title | Course Code

Elective-II

iii. Advance Microprocessor **AM**

Course Description:

The course explores knowledge of 8086 microprocessor. The course comprises of architecture, assemble language programming and interfacing of peripherals and their applications. It also explores the knowledge of Pentium microprocessor.

Lectures	Hours/Week	No. of Weeks	Total Hours	Semester Credits
	03	**15**	**42**	**03**

Prerequisite Course(s) : Microprocessor and Microcontroller at TE Electrical

General Objectives:

To meet the challenges of growing technology , student will be conversant with the programmable aspect of microprocessor and microcontroller. Programming is a process of problem solving and communication in language of mnemonics. The object of course is to understand microprocessor and Pentium microprocessor demand, concept and develop skill in two discipline hardware and programming.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Apply basic electronic subject and software algorithm application for understanding architectures assemble language of microprocessor and Pentium microprocessor. .
2. Know the pin configuration and memory organization of 8086 microprocessor and Pentium microprocessor.
3. Develop assemble language programming and interfacing peripherals for wide application in electrical engineering.
4. Develop assembly language source code for applications that use I/O ports, timer and single/multiple interrupts
5. Apply techniques for measurement of electrical quantities by microprocessor.
6. Apply the knowledge of microprocessor and Pentium microprocessor. in application of microprocessor based electrical protection system.
7. Do higher study in the field of automation, operation and control of power system by microprocessor and Pentium microprocessor.

Elective-II
Advance Microprocessor
(Course Contents)

Semester-VIII **Examination Scheme:**
Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**
Lectures: 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**
(ESE) End Semester Exam duration: 03 Hours

Unit I: 8086 Architecture **09 Hours, 16 Marks**

Introduction to 8086 microprocessor, Register Organization, Memory Segmentation. Programming Model. Memory addresses. Physical memory organization. Architecture of 8086, signal descriptions of 8086- common function signals. Interrupts of 8086.

Unit II: Instruction Set and Assembly Language Programming of 8086
9 Hours, 16 Marks

Instruction formats, addressing modes, instruction set, assembler directives, macros, simple programs involving logical, branch and call instructions, sorting, evaluating arithmetic expressions, string manipulations.

Unit III:- I/O Interface **08 Hours, 16 Marks**

8255 Programmable Peripheral interface, various modes of operation of 8255 PPI, interfacing of 8255 with 8086,stepper motor interfacing, D/A and A/D converter.

Unit-IV: Interfacing with advanced devices **08 Hours, 16 Marks**

Memory interfacing to 8086, Interrupt structure of 8086, interrupt vectortable, Interrupt service routine. Introduction to DOS and BIOS interrupts, Interfacing Interrupt Controller 8259 DMA Controller 8257 to 8086.

Unit-V: Introduction to Pentium microprocessor **08 Hours, 16 Marks**

Historical evolution of 80286,386, 486 processors. Pentium features and Architectures, Pentium Real mode, Pentium RISC features, Pentium super-scalar architecture - Pipelining, Instruction paring rules, Branch prediction, Instruction and Data caches. The Floating point Unitfeatures, pipeline stages & data types.

Reference Books:

1. D.V.Hall, “Microprocessors and Interfacing” Tata McGraw Hill Publication, New Delhi.
2. A. Ray, K. Bhurchandi, “Advanced Microprocessors and Peripherals: Architecture, Programming & Interfacing”, Tata McGraw Hill, Third edition, 2004.
3. John E. Uffenbeck, “The 8086/ 8088 Family: Design, Programming and Interfacing”, Pearson, 1987.
4. Barry B Bray, “The Intel Microprocessors-Architecture, Programming and Interfacing”, Pearson LPE/PHI, Second edition.
5. M.T.Savaliya, “8086 Programming and Advanced Processor Architecture”, Wiley India.
6. James Antonakos , “The Pentium Microprocessor” , 2004, Pearson Education ISBN – 81-7808-545-3
7. Intel 8 bit Microcontroller manual.
8. http://nptel.iitm.ac.in

Course Title Short Title Course Code

Elective-II

iv. Power System Design Practice PSDP

Course Description:

This course starts from fundamental concept such as constants of overhead transmission line and the performance of transmission lines and proceed to discuss the design of transmission lines both electrical and mechanical. Also design of EHVAC and HVDC transmission and power has been described. Power system control and methods of compensation are also discussed. Latter part of this deals with the design of distribution systems including their economics. Also the ratings, specification, application, various types of circuit breakers and arrester have been described.

Lectures	Hours/Week	No. of Weeks	Total Hours	Semester Credits
	03	15	42	03

Prerequisite Course(s): Knowledge of Power system and Power System Switchgear and protection.

Course Objectives: The course explores design concept of electrical power system. The course provides ideas of electrical and mechanical design concept of Transmission line. The course also gives economical consideration, project execution and site selection concept. The course also explores the knowledge of substation layout.

Course Outcomes:

Upon successful completion this course a students will be able to:

1. Apply the basic concept of electrical and mechanical for designing the transmission line and substation.
2. Design the project in view of practical and realistic constrain.
3. Understand the selection of various substation equipment and their location with safety standard.
4. Select the material for better technical performance and economical consideration.
5. Perform their professional duties in project execution and operation in the field of design and installation.
6. Able use updated software and tool for designing of substation and transmission line.

Elective-II
Power System Design Practice
(Course Contents)

Semester-VIII **Examination Scheme:**

Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**

Lectures: 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**

(ESE) End Semester Exam duration: 03 Hours

Unit I: - Transmission Design Fundamentals **09 Hours, 16 Marks**

Selection of voltage for high voltage transmission line, choice of conductor, spacing of conductor, Insulators, specification of transmission line, surge impedance loading, Electrical & mechanical design of transmission line. Design of EHV transmission lines, Transmission of electric power at extra high voltage, design consideration of EHV line, insulation coordination, Radio and television interference.

Unit II: - Design of Distribution Systems **09 Hours, 16 Marks**

Type of distribution system arrangement, primary and secondary distribution design, calculation of distribution sizes: voltage drop and regulation, deign of rural and industrial distribution system

Unit III: - Circuit Breakers **08 Hours, 16 Marks**

Circuit breakers: operating mechanism, testing rating and selection, operating under special conditions, specification and technical details for tender preparations.

Unit IV: Lighting Arrestors **08 Hours, 16 Marks**

Rating characteristics, testing technical defects, standards followed for details insulation co ordination. Power transformers different types, tapping , fittings, cooling, cost comparison, testing technical details for ordering and tender preparations.

Unit V: Shunt Capacitors **08 Hours, 16 Marks**

Need, construction, location, connections, protection, analysis, special types, testing, technical details. Earthing: Earthing systems, step potential, touch potential and transfer potential.

Reference Books:

1. Pratapsingh Satnam & P.V. Gupta, "Substation Designed Equipments", Dhanpat Rai & Sons.
2. M. V. Deshpande, "Electrical Power System Design" TMH
3. B.R.Gupta, "Power System Analysis and Design," Wheeler Publishing co.

Course Title Short Title Course Code

Elective-III

i. Flexible AC Transmission System and Power Quality FPQ

Course Description:

Flexible AC Transmission System (FACTS) is one aspect of the power electronics revolution that is taking place in all area of electric energy. In the transmission area, application of power electronics consists of HVDC and FACTS. Is a new technology based on power electronics offers an opportunity to enhance controllability, stability and power transfer capability of AC transmission system. The subject also explores the knowledge of power quality, effect and source of power quality.

Lectures	Hours/Week	No. of Weeks	Total Hours	Semester Credits
	03	15	42	03

Prerequisite Course(s) : Knowledge mathematics and subjects of Electrical Engineering.

Course Objectives:

This course objectives to study power transmission by EHV AC and FACTS. Enhancement of controllability, stability and power transfer capability of AC transmission system. Study different FACTS component and power quality issues.

Course Outcomes:

Upon successful completion of this course the student will be able to:

1. Apply basic knowledge power electronic for enhancing power transfer capability of AC transmission system.
2. Understand FACTS, concepts its location in transmission network.
3. Analyze the characteristics FACTS controller and able to solve engineering problems.
4. Understand the sources of harmonics and its mitigation.
5. Discharging duties as power system engineer in technical and professional way.
6. Do higher studies in stability with modern tools for increasingly complex interconnected power system.

Elective-III

Flexible AC Transmission System and Power Quality

(Course Contents)

Semester-VIII **Examination Scheme:**

Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**

Lectures : 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**

(ESE) End Semester Exam duration: 03 Hours

Unit -I:- FACTS Concept **09 Hours, 16 Marks**

Transmission interconnection and opportunity for FACTS, Basic type of FACTS controller, Brief description of FACTs controller: Shunt, series and combination of shunt and series. Comparison of HVDC and FACTS.

Unit-II:-Static Shunt Compensators: SVC and STATCOM **09 Hours, 16 Marks**

Object of shunt compensation, Midpoint voltage regulation for line segmentation, end of line voltage support. Method of controllable VAR generation: variable impedance type and switching type VAR generators, STATCOM.

Unit-III:- Static Series Compensators **08 Hours, 16 Marks**

Objectives of Series Compensation: Concept of series capacitive compensation, voltage stability. Variable impedance type series compensators: Thyristor switched series capacitor(TSSC) and Thyristor controlled series capacitor (TCSC).

Unit -IV:- Power Quality **08 Hours, 16 Marks**

Power quality definition, need for power quality, nonlinear loads, Type of power quality problems: voltage sags, voltage swells, under-voltage, interruption, transients, voltage unbalance, voltage fluctuation , harmonics and electrical noise. Sources of power quality problems.

Unit -V:- Power Quality effects and Solutions **08 Hours, 16 Marks**

Effect of harmonics in pure resistive, inductive and capacitive circuit, effect of harmonic on induction motor , transformer , power factor correction and lighting installation. Power quality standard and mitigation by active and passive filter.

References,

1. N.G.Hingorani, "Understandig FACTS" , IEEE Press, 1999
2. Yang hue Song, "Flexible AC Transmission Systems (FACTS)", IEEE Press, 199
3. Surajit Chattopadhyay , Madhuchhanda Mitra and Samarjit Sengupta, "Electric Power Quality", Springer
4. http://nptel.iitm.ac.in

Course Title Short Title Course Code

Elective-III

ii. **Generation Planning and Load Dispatch GPLD**

Course Description:

Electric energy generation is an old subject but it is now rejuvenated with important new development. With this in view greater awareness of the environmental effects of electrical generation and economical consideration the subject contain different topics. The subject explores the knowledge the new trends and considerations in generation, generation planning , load forecasting, economics and reliability of generation system.

Lectures	Hours/Week	No. of Weeks	Total Hours	Semester Credits
	03	15	42	03

Prerequisite Course(s) : Knowledge management and subjects of Electrical Engineering.

Course Objectives:

This course objectives to understand the different power generation organization. The students will able to understand the generation planning , coordination and scheduling between different power plant, economical aspects, load forecasting and reliability of generation system.

Course Outcomes:

Upon successful completion of this course the student will be able to:

1. Understand the new trends in power generation for sustainable development.
2. Understand different issues in electrical generation like economical, forecasting, environmental and safety.
3. Analyze cost of generation and load scheduling in different type of power plants.
4. Understand concept of reliability in electrical power generation system.
5. Discharging duties as power system engineer in technical and professional way.
6. Do higher studies in generation planning with modern tools for increasingly complex interconnected power system.

Elective-III
Generation Planning and Load Dispatch
(Course Contents)

Semester-VII **Examination Scheme:**
Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**
Lectures : 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**
(ESE) End Semester Exam duration: 03 Hours

Unit-I: - Generation **09 Hours, 16 Marks**

Growth of electrical energy consumption, electrical energy sources, organization of power sector, role of private sector in energy management, Indian electricity grid code. Environmental issue in electric power generation.

Cogeneration: Scope, advantages, cogeneration technology and industries suitable for cogeneration. Captive power generation: advantages, constrain, government policies, energy banking and energy wheeling. Distributed power generation: advantages and function Electricity deregulation : need advantages, power player ,metering and energy billing deregulation. Roll of load dispatch centers.

Unit-II:-Generation Planning **09 Hours, 16 Marks**

Objectives of generation system planning, long term and short term planning, Low range& short range hydro thermal scheduling of generation the short term and long term hydro thermal scheduling of generation, co ordination equation.

Policy studies, co-ordination of steam, hydro & nuclear power stations. Optimum generation allocation- line losses neglected & including the effect of transmission losses for thermal power generations.

Unit-III:- Load Energy Forecasting **08 Hours, 16 Marks**

Classification of loads, load forecasting methodology. peak demand forecasting- non whether sensitive forecast- weather sensitive forecast-total forecast- annual and monthly peak demand forecast.

Unit-IV: - Generation System Cost Analysis **08 Hours, 16 Marks**

Capacity cost, generation cost, depreciation, effect of load factor on unit energy cost, analysis of fixed and operating cost of steam plant, hydro plants and nuclear plant, Roll of diversity in power system economics, Fuel inventories, off peak energy utilization.

Unit-V:-Generation System Reliability Analysis **08 Hours, 16 Marks**

Probabilistic generation unit- model &load model effective load- reliability analysis for isolated system , reliability of interconnected system.

Reference Books:

1. B.R. Gupta, " Generation of Electric Energy" Euresia Publishing House Pvt. Ltd.
2. R.L.Sullivan, "Power System Planning" , McGraw Hill.
3. Kirchmayers L.K., " Economic Control of Interconnected System" John Wiley & Sons, New York.

Course Title | Short Title | Course Code

Elective-III

iii. High Voltage Transmission HVT

Course Description:

The subject explores the knowledge of high voltage transmission, advantage of high voltage system. The subject provides the knowledge of stability study and causes of over voltage in EHV system. Modern DC power transmission is relatively new technology because of advent of thyristor valves and related technology. The HVDC technology is still undergoing many changes due to continuing innovations directed at improving reliability and reducing cost of converting station. The subject explores the knowledge of HVD in economical and technical constrain.

Lectures	Hours/Week	No. of Weeks	Total Hours	Credits
	03	15	42	03

Prerequisite Course(s) : Knowledge management and subjects of Electrical Engineering.

Course Objectives:

The subject objectives to explore the knowledge of high voltage transmission, advantage of high voltage system. Effect of high voltage like corona loss and audible effects. The objective is to explores the knowledge of HVD in economical and technical constrain. Comparison between EHV and HVDC.

Course Out comes:

After completion of subject students will be able to:

1. Apply knowledge of power transmission to understand new trends in EHV and HVDC transmission system.
2. Analyze the line parameter data to understand power handling capacity of EHV transmission line.
3. Understand technical and economical aspect of EHV and HVDC transmission system .
4. Discharge the professional duties in EHV and HVDC transmission system.
5. Do higher study in the subject for economical development with value added reliability.

Elective-III
High Voltage Transmission
(Course Contents)

Semester-VIII **Examination Scheme:**
Teaching Scheme: **(ESE) End Semester Examination: 80 Marks**
Lectures : 3 Hrs/Week **(ISE) Internal Sessional Examination: 20 Marks**
(ESE) End Semester Exam duration: 03 Hours

Unit -I:-EHV AC Transmission **09 Hours, 16 Marks**

Role of EHV AC Transmission, Standard of transmission voltage, average line parameter, power transmission, power-handling capacity and line loss, corona effect: power loss and audible noise, copper loss and corona loss, corona loss formula, audible noise generation and characteristic. Electrostatic field of EHV lines. Traveling waves and standing waves, Line energization with trapped-charge voltage.

Unit -II:-Maximum Power Transfer and Stability Limit **09 Hours, 16 Marks**

Power Transfer at voltage stability limit of EHV lines, Magnitude of receiving end voltage, Voltage Magnitude of receiving end voltage during maximum power transfer. Magnitude of Maximum power and stability limit. Optimal reactive power at voltage stability limit Voltage collapse in EHV lines, reactive power requirement for voltage in long line. Voltage stability

Unit -III:- Over-voltages in EHV System **08 Hours, 16 Marks**

Origin of over voltage and their types , Over Voltage in EHV system caused by switching operation, by interruption of inductive and capacitive currents, Ferro-response over voltage, calculation surges, Power frequency voltage control and over voltages, Power circle diagram. Surge impedance and insulation coordination.

Unit -IV:-HVDC Transmission **08 Hours, 16 Marks**

Comparison of EHV and HVDC transmission system based on: Economics of power transmission, technical performance and reliability. Description of HVDC transmission system : type of link, converting stations. Principle of DC link converter, characteristic, modification and control characteristic

Unit -V:-Reactive power control and stability **08 Hours, 16 Marks**

Reactive power requirement in steady state, conventional control strategies, alternate control and forced commutation, sources of reactive power, stability: synchronous and asynchronous link.

References Book:

1. A.Chakrabarti, D.P.Kothari, A.K. Mukhopdadhyay, "Performance, Operational & Control of EHV Power System", Wheeler publications.
2. Rakosh Das Begamudre "Extra high-voltage A.C. Transmission Engineering" New Age International.
3. S. Rao, "EHVAC & HVDC Transmission Engineering & Practice" , Khanna Publications.
4. K R padiyar, "HVDC Power Transmission System" New Age International Publication.
5. http://nptel.iitm.ac.in

Course Title Short Title Course Code

Elective-III

***iv.* Electromechanical Energy Conversion** EEC

Course Description:

Conversion of other forms of energies into electrical energy is a command practice.The main advantage of this conversion is that energy in electrical form can be transmitted , utilized and controlled more easily, reliably and efficiently. Energy conversion devices are required first for converting other forms of energies into electrical energy and then converting electrical energy into required useful form. An electro-mechanical energy conversion device is one which converts electrical energy or mechanical energy into electrical energy. Operating principles of energy conversion devices are similar, but their structural details differ depending upon their function.

Lectures	Hours/Week	No. of Weeks	Total Hours	Credits
	03	15	42	03

Prerequisite Course(s) : Knowledge management and subjects of Electrical Engineering.

Course Objectives: The objective of course to provide knowledge and techniques of energy conversion. Understand the mathematical equations related to energy flow. The course objective is to understand the constructional features of machines for efficient conversion process.

Course Outcomes:

1. Apply basic science, mathematics and engineering for understanding energy conversion.
2. Analyze the mathematical equation related to energy conversion .
3. Design energy conversion system, component, or process to meet desired needs within realistic constraints such manufacturability, and sustainability.
4. Higher study multidisciplinary subject for efficient conversion of energy for tomorrow.

Elective-III
Electromechanical Energy Conversion.
(Course Contents)

Semester-VIII | **Examination Scheme:**
Teaching Scheme: | **(ESE) End Semester Examination: 80 Marks**
Lectures : 3 Hrs/Week | **(ISE) Internal Sessional Examination: 20 Marks**
(ESE) End Semester Exam duration: 03 Hours

Unit -I: - Magnetically Coupled Circuits And Transformer: 09 Hours, 16 Marks
Self and mutual flux linkages and inductances. Voltage Equation of coupled circuits. Coefficients of coupling and leakage coefficient. Two winding transformers: Steady state and transient analysis using mutual and self inductances. Variable frequency transformers. Energy flow considerations.

Unit -II: - Electromechanical Energy Conversion Principles: 09 Hours, 16 Marks
Electromechanical System, Energy process in electromagnetic systems.
Law of conversation of energy as applied to electromechanical system. Linear and non-linear, singly and doubly excited magnetic systems; Energy and co-energy, various expressions for forces and torques; Energy, forces and torque in a system of rigid currents. Application to various magnetic field transducers.

Unit-III: -Electric Field And Transducers 08 Hours, 16 Marks
Quasi-static electric fields as coupling medium, Energy forces and torques in a system of charged conductors, Application of electric field transducers. Incremental motion transducers (detailed analysis of few cases).

Unit IV: - Basic Rotating Machines 08 Hours, 16 Marks
Common structural features of rotating machines. Machine windings and their basic properties. Distributed bindings as current sheets. Equivalence between concentrated and distributed windings M.M.F. and flux distribution and various windings. Rotating magnetic field.

Unit -V: - Types of Rotating Machines 08 Hours, 16 Marks
Commutator, Synchronous and asynchronous machines Induced e.m.f.s and electromagnetic torque in non salient pole machines**.**

Reference Books:

1. Rakosh Das, Begamudre, “Electromachinical Energy Conversion” Wiley Eastern Publication.
2. Gourishankar, “Electromechnical Energy Conversion”.
3. Fitzgerald, Kingsley & Kusko, “Eletric Machinary” McGraw Hill Kogo Kusha Ltd.
4. Dr. P S Bimbhra, “Electrical Machinary”, Khanna Publication.
5. Dr. P S Bimbhra, “Generalized Electrical Machinary”, Khanna Publication.
6. R K Srivastava, “ Electrical Machines” Second Eddition, Cengage Learning.

Course Title	Short Title	Course Code
Power System Stability Lab	**PSS Lab**	

Lab Course Description:
In this laboratory, course emphasis on imparting the practical knowledge and understanding of basic principles of power system stability, synchronous machine parameters and time constants. Concept power system stability on small and large disturbances. Method to determine steady state and transient stability limits .

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Practical	**2**	**15**	**28**	**1**

Prerequisite Course(s): Knowledge of Electrical Machines and power system analysis of second and third year Engineering.

Lab Course Objectives:
The objective of the laboratory is to impart the fundamental knowledge of basic principles of power system stability, synchronous machine parameters and time constants. To apply the specific procedures for analyze the experimental results. The students will able to understand the characteristic of Synchronous alternator on infinite bus. Application of different methods to determine steady state and transient stability limits This makes bridge on theoretical knowledge and practical practices.

Lab Course Outcomes:
After successful completion of this lab students will be able to:
1. Apply basic knowledge of science and mathematics and electrical engineering in stability studies.
2. Understand facts, concepts and classification of stability on the basis of perturbation and economical aspect of energy exchange.
3. Analyze the characteristics of synchronous alternator under small and large disturbances.
4. Apply Knowledge of electrical subjects for solving stability problem and able to use method for enhancing stability.
5. Discharging duties as power system engineer in technical and professional way.
6. Do higher studies in stability with modern tools for increasingly difficult complex interconnected power system.

Power System Stability Lab

(Lab Course Contents)

Semester-VIII **Examination Scheme:**
Teaching Scheme: **(ICA) Internal Continuous Assessment: 25 Marks**
Practical : 2 Hrs/Week **(ESE) End Semester Examination(OR): 25 Marks**

Teacher should facilitate learning following lab experiments:

1. Determination of Parameters and time constants of synchronous machines.
2. Synchronous machine of infinite bus: Effect of Excitation
3. Effect of saturation and & determination of equivalent reactance of synchronous machines.
4. Retardation test on synchronous machines to find moment of inertia of rotating part and angular momentum.
5. To obtain power angle characteristics of lossy & lossless lines.
6. To study transient stability by point by point method.
7. To determine the steady state stability limit of short transmission line.
8. To determine SSSL of long transmission line.
9. Study of clerk's diagram.
10. Study of different types of automatic voltage regulator.

Note: Lab file should consist of minimum **Eight** experiments.

Guide lines for ICA :
ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-
In ESE the student may be asked questions on practical. Evaluation will be based on answers given by student in oral examination.

Course Title	Short Title	Course Code
Switchgear and Protection	**SGP Lab**	

Lab Course Description :
Switchgear and Protection is a fascinating subject . A protection scheme in a power system is designed to continuously monitor the power system to ensure maximum continuity of electrical supply with minimum damage to life, equipment and property. The subject practical explores the knowledge of arc interruption, different type of circuit breakers and relay. This knowledge is help full for understanding the characteristic feature and proper selection of protective elements in different protective scheme. The practical also provide knowledge different protection for major and individual power system elements .

Practical	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	15	28	1

Lab Course Objectives: The objectives of subject that students will able understand the fault characteristic of individual power system elements. One should also be knowledgeable about the tripping characteristics of various protective relays. The students able to understand the job of protection engineer is to devise such scheme where closest possible match between the fault characteristic and tripping characteristic is obtained. The students will able understand protected zone and able to design protective scheme such that relay will detect undesirable conditions and then trip to disconnect the area affected, but remain restrained at all other time. Student should be equipped with sound concept pf power system protection to enable them handling unforeseen circumstances in real life.

Lab Course Outcomes:
1. Apply the basic knowledge of science for understanding arc generation and interruption in medium and high voltage circuit.
2. Conduct practical based on testing of relay and analysis data for matching different fault characteristics.
3. Select different protective relay and circuit breakers based on their characteristic feature for different protective scheme.
4. Understand continuously monitor the power system to ensure maximum continuity of electrical supply with minimum damage to life, equipment and property and best safety practices.
5. Discharge his professional duties in field of power system protection, maintenance and manufacturing sector.
6. Do higher study of updated protection technology for complex power system .

Switchgear and Protection

(Lab Course Contents)

Semester-VIII **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 25 Marks**

Practical : 2 Hrs/Week **(ESE) End Semester Examination(PR): 25 Marks**

Teacher should facilitate learning following lab experiments:

1. To conduct and study of Arc extinction phenomenon: Application in air circuit breaker.
2. Study of relaying components and control circuit developments.
3. To conduct and plot the characteristic of rewirable fuses and MCB
4. To conduct and plot operating characteristics of Inverse time over current relay.
5. To conduct Over current & earth fault protection scheme for alternator.
6. To conduct Protection of 3 phase transformer using differential relay (Merz-Price protection scheme)
7. To conduct and study the through fault stability of differential protection scheme applied to transformer.
8. To conduct Protection of transmission line.
9. Study of MHO distance relay to plot. a) R- X diagram b) Relay voltage Vs Admittance characteristic.
10. Study of Static relay.
11. Demonstration of microprocessor base protection.

Note: Lab file should consist of minimum **Eight** experiments.

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

In ESE the student should be asked to perform any one practical. Evaluation will be based on practical, paper work , performance and oral in the practical examination.

Course Title Short Title Course Code

Elective-II

Computer Aided Power System Analysis Lab CMPSA Lab

Course Description:

This laboratory course is designed to impart the computer programming skill to solve the complex power system problems such as the power flow, short circuit, contingency and stability analyses. This course also gives an exposure to various modern computing software such as MATLAB/PSCAD/ETAP which are widely used in industry.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Practical	**2**	**15**	**28**	**1**

Prerequisite Course(s): Knowledge of C language, power system analysis and numerical techniques.

General Objectives:

The objective of the laboratory is to impart the fundamental knowledge of MATLAB programming to solve power system problems. Students will able to develop their ability to apply the numerical techniques and computer programming skills to solve power flow and short circuit problems. The students will able to use MATLAB/PSCAD/ETAP at basic level for the power system analysis.

Course Outcomes:

After successful completion of this lab students will be able to:

1. Apply basic knowledge of numerical techniques, power system and computer programming for the analysis of power flow, short circuit, contingency etc.
2. Use MATLAB/PSCAD/ETAP for power system analysis.
3. Form the bus impedance and admittance matrices by algorithms.
4. Perform load flow by Newton Raphson, Gauss seidal and fast decoupled Method.
5. Perform short circuit study.
6. Perform fault analysis on Power System network of an Electric Utility Company
7. Understand the IEC and ANSI standards for Short circuit analysis.
8. Do higher studies and use modern sophisticated computing tools for complex power system analysis.

Elective-II

Computer Aided Power System Analysis Lab

(Lab Course Contents)

Semester-V **Examination Scheme:**
Teaching Scheme: **(ICA) Internal Continuous Assessment: 25 Marks**
Practical : 2 Hrs/Week **(ESE) End Semester Examination(OR): 25 Marks**

Teacher should facilitate learning following lab experiments/Computer programs using MATLAB/Simulink or PSCAD or ETAP:

1. Program for determination of the parameters of the equivalent circuit.
2. Program for building of Z_{Bus} by addition of branch.
3. Program for building of Z_{Bus} by addition of link.
4. Program for illustration of the Ferranti Effect.
5. Program for the formation of Y_{Bus} by Singular Transformation.
6. Program for load flow by Newton Raphson Method.
7. Program for Balanced Three phase short circuit.
8. Program for Unbalanced short circuits.
9. Program for Fault analysis of Power System network of an Electric Utility Company.
10. Study of IEC and ANSI standards for Short circuit analysis.
11. Introduction to PSCAD
12. Introduction to ETAP

Note: Lab file should consist of minimum **Eight** experiments.

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

In ESE the student may be asked questions on practical. Evaluation will be based on answers given by student in oral examination.

Course Title | Short Title | Course Code

Elective-II

Industrial Automation Lab IA Lab

Lab Course Description:

This lab course describes PLC & SCADA based Industrial Automation system which will improve the knowledge of the students about industrial processes using automation. The course will cover SCADA & PLC systems in terms of their architecture, their interface to the process hardware, the functionality and the application development facilities. Also provide an industrial SCADA & PLC system is used for the development of the controls of machinery.

Practical	Hours/Week	No. of Weeks	Total Hours	Semester Credits
	02	15	28	01

Prerequisite Course(s): Knowledge of c-programming, Industrial organization and management subject of third year, industrial drives and control subject of final year.

Lab Course Objectives:

The objectives of lab course are that students will able to understand the role of industrial automation for different processes based on PLC system and its requirement. It also provide basic operation of programmable logic control and its function. Students will learn the input-output devices for the PLC, its operation, its selection according to application and its interfacing. It explores the knowledge of different configuration of PLC, its programming techniques for various application, and it's interfacing with industrial machineries. It also help to understand the application in different industries like power sector, in pharmaceuticals, in automobile industry etc and its installation.

Course Outcomes:

Upon successful completion this course a students will be to

1. Apply the knowledge of automation in machine control.
2. Design and conduct practical in realistic constrain on motors such that it is applicable in manufacturing, testing and maintenance field.
3. Design the automation system for fast and value added quality product for economical growth through technological development.
4. Solve engineering solution for fast growing industrial sector with reliable atomized system using PLC and SCADA system.
5. Discharge professional duty in multidisciplinary teams of installation ,maintenance and operation with séance of safety standards.
6. Do higher study in field of automation and able use updated software and tools.

Elective-II
Industrial Automation Lab
(Lab Course Contents)

Semester-VIII **Examination Scheme:**
Teaching Scheme: **(ICA) Internal Continuous Assessment: 25 Marks**
Practical : 2 Hrs/Week **(ESE) End Semester Examination(OR): 25 Marks**

Teacher should facilitate learning following lab experiments.

1. Study of programmable logic controller.
2. Study of programming languages.
3. Develop and implement any PLC program using ladder/FBD programming language.
4. Interfacing of PLC to any SCADA through modbus protocol.
5. Developing and implementing any control loop using PLC system.
6. Study of SCADA system.
7. Study of DCS system.
8. Study of interfacing devices/ protocols like modbus, Profibus etc.
9. To controller conveyer belt system from online programming system.
10. To develop total controlling panel for settlement of conveyor based automation system.

Note: Lab file should consist of minimum **Eight** experiments.

Guide lines for ICA :
ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-
In ESE the student may be asked questions on practical. Evaluation will be based on answers given by students in oral examination.

Course Title	Short Title	Course Code
Elective-II		
Advance Microprocessor Lab	**AM Lab**	

Course Description:

The course explores knowledge of 8086 microprocessor. The lab course comprises of architecture, assemble language programming and interfacing of peripherals and their applications. It also explores the knowledge of Pentium microprocessor.

Practical	Hours/Week	No. of Weeks	Total Hours	Semester Credits
	02	**15**	**28**	**01**

Prerequisite Course(s) : Microprocessor and Microcontroller at TE Electrical

General Objectives:

To meet the challenges of growing technology , student will be conversant with the programmable aspect of microprocessor and microcontroller. Programming is a process of problem solving and communication in language of mnemonics. The object of course is to understand microprocessor and Pentium microprocessor demand, concept and develop skill in two discipline hardware and programming.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Apply basic electronic subject and software algorithm application for understanding architectures assemble language of microprocessor and Pentium microprocessor. .
2. Know the pin configuration and memory organization of 8086 microprocessor and Pentium microprocessor.
3. Develop assemble language programming and interfacing peripherals for wide application in electrical engineering.
4. Develop assembly language source code for applications that use I/O ports, timer and single/multiple interrupts
5. Apply techniques for measurement of electrical quantities by microprocessor.
6. Apply the knowledge of microprocessor and Pentium microprocessor. in application of microprocessor based electrical protection system.
7. Do higher study in the field of automation, operation and control of power system by microprocessor and Pentium microprocessor.

Elective-II

Advance Microprocessor Lab

(Lab Course Contents)

Semester-VIII **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 25 Marks**

Practical : 2 Hrs/Week **(ESE) End Semester Examination(OR): 25 Marks**

Teacher should facilitate learning following lab experiments:

1. Study of architecture and instructions set of 8086 microprocessor.
2. Study of architecture of Pentium microprocessor.
3. Microprocessor 8086 assembly language programs based on data transfer instruction
4. Microprocessor 8086 assembly language programs based on arithmetic instruction
5. Microprocessor 8086 assembly language programs based on logical instruction
6. Applications of microprocessor 8086 in measurement of electrical quantity.
7. Applications of microprocessor 8086 in Electrical drives and speed control for stepper motor.
8. Program to convert the temperature in degree centigrade to ferniest by 8086 microprocessor.
9. Program to find highest and lowest marks in the examination by 8086 microprocessor
10. Program to sort the numbers in ascending order and descending order by 8086 microprocessor.
11. Program to find the number of negative numbers in the array by 8086 microprocessor.
12. Program for conversion of BCD to Hex and Hex to BCD

Note: The term work should include a minimum **eight** experiments on hardware kits and simulation.

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

In ESE the student may be asked questions on practical. Evaluation will be based on answers given by students in oral examination.

Course Title | Short Title | Course Code

Elective-II

Power System Design Practice PSDP Lab

Lab Course Description:

This course starts from fundamental concept such as constants of overhead transmission line and the performance of transmission lines and proceed to discuss the design of transmission lines both electrical and mechanical. Also design of EHVAC and HVDC transmission and power has been described. Power system control and methods of compensation are also discussed. Latter part of this deals with the design of distribution systems including their economics. Also the ratings, specification, application, various types of circuit breakers and arrester have been described.

Practical	Hours/Week	No. of Weeks	Total Hours	Semester Credits
	02	15	28	01

Prerequisite Course(s): Knowledge of Power system and Power System Switchgear and protection.

Lab Course Objectives: The course explores design concept of electrical power system. The course provides ideas of electrical and mechanical design concept of Transmission line. The course also gives economical consideration, project execution and site selection concept. The course also explores the knowledge of substation layout.

Lab Course Outcomes:

Upon successful completion this course a students will be able to:

1. Apply the basic concept of electrical and mechanical for designing transmission line and substation.
2. Design the project in view of practical and realistic constrain.
3. Understand the selection of various substation equipment and their location with safety standard.
4. Select the material for better technical performance and economical consideration.
5. Perform their professional duties in project execution and operation in the field of design and installation.
6. Able use updated software and tool for designing of substation and transmission line.

Elective-II
Power System Design Practice Lab
(Lab Course Contents)

Semester-VIII **Examination Scheme:**
Teaching Scheme: **(ICA) Internal Continuous Assessment: 25 Marks**
Practical : 2 Hrs/Week **(ESE) End Semester Examination(OR): 25 Marks**

Teacher should facilitate learning through drawing sheet from the following

1. Draw the substation layout for 400KV.and design the three phase transmission line with electrical consideration.
2. Sag-Tension calculation
3. Different busbar arrangement and isolating switches.
4. Different types of circuit breaker.
5. Different types of Lightning Arresters
6. Design of Earthing system for 132/400KV substation.

Note: Lab file should consist of minimum **five** drawing sheet along with report.

Guide lines for ICA :
ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal and drawing sheet.

Guide lines for ESE:-
In ESE the student may be asked questions on drawing sheet. Evaluation will be based on answers given by students in oral examination.

Course Title	Short Title	Course Code
Industrial Lecture	**IL**	

Course Description:

The gap between industry's needs and the academic community's aspirations appears to be considerably large. There exists a strong feeling, at least in the academic circles, that unless technology driven initiatives find a surer place in the industrial sector in this country, the academia-industry interaction is likely to remain confined to developmental activities with limited exploratory or research-based content As institutes committed primarily to creation and growth of technological knowledge, technical institutes have an important role to play in the industrial sector of the country's economy. This fact by way of encouraging mechanisms to foster interaction between the academia and industry. Typically, academic interest in the multidimensionality of a problem leads to a tendency to explore a variety of options to arrive at a solution. This industrial lecture develops ability of student for expectations of the industrialists from the fresh engineers.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	**1**	**15**	**14**	**2**

Course Objectives: The domains in which interaction is possible are:

a. Placement and entrepreneurship development.
b. Industry participation in technology development involving some exploratory work.
c. Academic intervention in solving specific industry problems.
d. Laboratory utilization by industry.
e. Continuing education program.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Understand need ,requirement and expectation of industry from fresh engineers.
2. Understand importance of laboratory practices throughout carrier of engineer. Design and conduct experiments, as well as to analyze and interpret data.
3. Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
4. Function on multidisciplinary teams, communicate effectively.
5. Identify, formulate, and solve engineering problems by understanding professional and ethical responsibility.
6. Recognition of the need for, and an ability to engage in life-long learning use of modern engineering tools.

Industrial Lecture

(Course Contents)

Semester-VIII **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 50Marks**

Lecture : 1 Hrs/Week

1. There is a need to create avenues for a close academia and industry interaction through all the phases of technology development, starting from conceptualization down to commercialization.
2. List of renowned persons from industry shall be prepared by the committee appointed by Head of the department. After approval from the Principal, Minimum five Industrial lectures in alternate week shall be arranged, which shall be delivered by the experts/Officials from Industries/Govt. organizations/ Private Sectors/Public Sectors / R&D Labs covering the various aspects.
3. Topics of Industrial Lectures shall be Technical in nature and should not be the specific contents from the curriculum.
4. Minimum **five** Lectures to be delivered by experts from the industry in alternate weeks.
5. Students shall submit the report based on minimum five lectures giving summary of the lecture delivered.
6. The summary should contain brief resume of the expert, brief information of his organization and brief summary of the lecture in bullet point form.

Guide lines for ICA : Assessment of the Industrial Lecture for award of ICA marks shall be done jointly by departmental committee as per attendance in industrial lecture, report submitted by student and overall performance in semester as per the guidelines given in **Table- D**

Table-D

SN	Name of Student	Attendance (05 Marks per Lecture)	Dept of Understanding (03 Marks per Lecture)	Report Writing	Total
		25	15	10	50

Course Title	Short Title	Course Code
Project-II	**P-II**	

Course Description:

The course explores the knowledge of design, experiment and analysis of data. The course develops ability to work on multidisciplinary teams, Identify, formulate, and solve engineering problems in view of economic, environmental and societal context.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Laboratory	**4**	**15**	**48**	**6**

Prerequisite Course(s): Knowledge of science, mathematics, computer programming and core subject of engineering.

Course Objectives: The objectives of project are to develop ability to work in group. The scope of work is design and conduct experiments, as well as to analyze and interpret data within realistic constrain such as economic, environmental, social, safety and manufacturability. The project work provides plate form for planning, material procurement, preparing specification and execution of work. The project also develop to work on multidisciplinary teams, communicate effectively and Knowledge of contemporary issues.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Apply knowledge of mathematics, science, and engineering.
2. Design and conduct experiments, as well as to analyze and interpret data.
3. Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
4. Function on multidisciplinary teams, communicate effectively and Knowledge of contemporary issues.
5. Identify, formulate, and solve engineering problems by understanding professional and ethical responsibility.
6. Understand the impact of engineering solutions in a global, economic, environmental, and societal context.
7. Recognition of the need for, and an ability to engage in life-long and self learning.
8. Use the techniques, skills, modern engineering tools and software necessary for engineering practice.

Project-II
(Lab Course Contents)

Semester-VIII **Examination Scheme:**
Teaching Scheme: **(ICA) Internal Continuous Assessment: 75Marks**
Practical : 2 Hrs/Week **(ESE) End Semester Examination (OR) :75Marks**

1. Project-I work decided in VII semester shall be continued as Project-II
2. Students should complete implementation of ideas given in synopsis/Abstract, so that project work should be completed before end of semester.
3. Project-II may involve fabrication, design , experimentation , data analysis within realistic constraints such as economic, environmental, social, ethical, health and safety, manufacturability, and sustainability. The stage also includes testing , possible results and report writing
4. Each students project group is required to maintain log book for documenting various activities of Project-II and submit group project report at the end of Semester-VIII in the form of Hard bound.
    a. *Title*
    b. *Abstract*
    c. *Introduction*
    d. *Problem identification and project objectives*
    e. *Literature survey*
    f. *Case study/Analysis/Design Methodology*
    g. *Project design and implementation details*
    h. *Result and conclusion*
    i. *Future scope*
    j. *references.*

Guide lines for ICA : ICA shall be based on continuous evaluation of students performance throughout semester in project-II and report submitted by the students project group in the form Hard bound. Assessment of the project-II for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given in **Table-D.**

Guide lines for ESE:-
In ESE the student may be asked for demonstration and questions on Project. Evaluation will be based on answers given by students in oral examination.

Assessment of Project-II

Name of the Project: ____

Name of the Guide: ____

Table-D

		Assessment by Guide (50 Marks)				Assessment by Committee (25 Marks)		
SN	Name of Student	Attendance , Participa-tion and team work	Material procurement/ assembling/D esigning/Prog ramming	Case study/ Executio n	Project Report	Dept of Understan-ding	Presentation	Total
Marks		10	15	15	10	10	15	75

NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Final Year Engineering

(E&TC/E&C)

Faculty of Engineering and Technology

COURSE OUTLINE

Semester – VII

W.E.F 2015 – 2016

E&TC

BE Semester - VII

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Digital Signal Processing (TH)	D	3	---	---	3	20	80	---	---	100	3
Fiber Optic Communication (TH)	D	3	---	---	3	20	80	---	---	100	3
Interdisciplinary Elective	E	3	---	---	3	20	80	---	---	100	3
Elective – I	E	3	---	---	3	20	80	---	---	100	3
Computer Communication Network (TH)	D	3	--	---	3	20	80	---	---	100	3
Digital Signal Processing (LAB)	D	---	---	2	2	---	---	25	25(PR)	50	1
Fiber Optic Communication (LAB)	D	---	---	2	2	---	---	25	25(PR)	50	1
LAB#	E	---	---	2	2	---	---	25	25(PR)	50	1
Project – I	D	---	---	2	2	---	---	25	25(OR)	50	2
Seminar – II	D	---	---	2	2	---	---	25	---	25	2
Industrial Visit	D	---	---	---	---	---	---	25	---	25	1
Total		**15**	**---**	**10**	**25**	**100**	**400**	**150**	**100**	**750**	**23**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA: Internal Continuous Assessment**

#Lab for Elective-I

Inter Disciplinary Elective
1. **Automotive Electronics**
2. **Image Processing**

Elective I
1. **VLSI Design**
2. **Broadband Communication**
3. **Biomedical Engineering**
4. **Industrial Automation**

Note 1: For branches like Chemical Engineering and Biotech Engineering, two laboratory hours can be merged to form a four hour slot.
Note 2: Out of 3 practical ESE heads, at least 1 head should be practical.
Note 3: Interdisciplinary Elective shall be offered by the department to the students of other department. Students from one department can not register for Interdisciplinary Elective of the same department.
Note 4: At least 15 students should register for offering any elective.

BE Semester – VIII

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Satellite & Mobile Communication (TH)	D	3	---	---	3	20	80	---	---	100	3
Radiation & Microwave Techniques (TH)	D	3	---	---	3	20	80	---	---	100	3
Elective – II	E	3	---	---	3	20	80	---	---	100	3
Elective – III	E	3	---	---	3	20	80	---	---	100	3
Satellite & Mobile Communication (LAB)	D	---	---	2	2	---	---	25	25(OR)	50	1
Radiation & Microwave Techniques (LAB)	D	---	---	2	2	---	---	25	25(PR)	50	1
LAB#	E	---	---	2	2	---	---	25	25(PR)	50	1
Industrial Lecture*	C	---	---	1*	1	---	---	50	---	50	2
Project – II	D	---	---	4	4	---	---	75	75(OR)	150	6
Total		**12**	**---**	**11**	**23**	**80**	**320**	**200**	**150**	**750**	**23**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA: Internal Continuous Assessment**

#Lab for Elective-II
*** Minimum 6 lectures to be delivered by experts from the industry in alternate weeks. Next week group discussion on the lecture delivered.**

Elective II
1 Embedded System
2 Digital Image Processing
3 Telematics
4 Neural Network and Fuzzy Logic

Elective III
1 Robotics
2 Nanotechnology
3 Telecomm Network Management
4 Antenna and Wave Propagation

Note 1: For branches like Chemical Engineering and Biotech Engineering, two laboratory hours can be merged to form a four hour slot.
Note 2: Out of 3 practical ESE heads, at least 1 head should be practical.
Note 3: Interdisciplinary Elective shall be offered by the department to the students of other department. Students from one department can not register for Interdisciplinary Elective of the same department.
Note 4: At least 15 students should register for offering any elective.

Digital Signal Processing

COURSE OUTLINE

Digital Signal Processing	**DSP**	
Course Title	Short Title	Course Code

Course Description:

Digital Signal Processing (DSP) is concerned with the representation, transformation and manipulation of signals and Systems.

Lecture	**Hours / Week**	**No. Of Weeks**	**Total Hours**	**Semester Credits**
	03	**14**	**42**	**03**

Prerequisite Course(s): A significant prior knowledge of Signals, Infinite series, Complex variables and Linear Algebra.

COURSE CONTENT

Digital Signal Processing **Semester-VII**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Discrete Time Signals and Systems **No of Lect. – 8, Marks: 16**

a) Basic elements of Digital Signal Processing Systems. Advantage and limitation of DSP over ASP.
b) Sampling of Analog signals, Aliasing, Sampling Theorem (Numerical only)
c) Classification of Discrete Time Signals , Classification of Discrete Time System .
d) Linear Convolution, Properties of Convolution, Causality and Stability condition in terms of the Impulse Responses
e) Correlation (Autocorrelation & Crosscorelation of two sequences).

Unit-II: DT System Analysis Using Z- Transform **No of Lect. – 8, Marks: 16**

a) Definition of Z transform, Meaning of ROC, Properties of ROC
b) Properties of Z transform.

c) Inverse Z transform, Power series method, partial fraction expansion method (Numerical only)

d) The one sided Z transform (Unilateral Z-Transform) Response of the system with nonzero initial conditions. (Numerical only)

e) Z-Transform solution of difference equations. (Numerical only)

Unit-III: Fourier Transform of DT Signals and Systems **No of Lect. – 8, Marks: 16**

a) DFT , IDFT ,Properties of DFT.

b) Circular Convolution (Maximum N=8)

c) The DFT as Linear Transformation, Twiddle factor.

d) FFT Algorithms: Radix2 DIT and DIF algorithms to computer DFT. (Numerical Only)

Unit-IV: Design and Realization of Digital Filters **No of Lect. – 8, Marks: 16**

a) IIR Filter structure : Direct form, Cascade form, Parallel form and Transposed structures.

b)IIR Filter Design: Impulse invariance, Bilinear Transformation method of design.

c) FIR Filter Structure: Direct form, cascade form, and linear phase structure.

d)FIR Filter Design: Windowing method. (Numerical on Rectangular, Hamming, Hanning only) Gibbs phenomenon .

Unit-V: Multirate DSP and Introduction to DSP processor **No of Lect. – 8, Marks: 16**

a) Concept of Multirate DSP, Decimation, Interpolation (Theory only)

b) Sampling Rate Conversion by Rational Factor I/D. (Theory only)

c) Application of DSP: Voice processing, Image processing. (Short notes)

d) DSP processor (TMS320C67XX) Architecture: Architectural features of DSP processors: Multiplier and Multiplier Accumulator (MAC), Modified Bus Structures and Memory Access schemes in DSP, Multiple access memory, Multiport Memory, Pipelining, Special addressing modes, On chip Peripherals.

Reference Books:

1. John G. Proakis, Dimitris G. Manolakis, “ Digital Signal Processing: Principles, algorithms and applications” Fourth edition, Pearson Prentice Hall.
2. P. Ramesh Babu "Digital Signal Processing" Fourth edition, Scitech Publications.
3. B.Venkataramani, M.Bhaskar - "Digital Signal Processor, Architecture, Programming and Applications" , TATA McGraw Hill, 2002.

Fiber Optic Communication

COURSE OUTLINE

Fiber Optic Communication	FOC	
Course Title	Short Title	Course Code

Lecture	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
	03	14	42	03

COURSE CONTENT

Fiber Optic Communication **Semester-VII**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: **No of Lect. – 8, Marks: 16**

Introduction to Optical Fiber Communication System:

Block diagram of OFCS, Advantage and Disadvantage of OFCS over other communication systems. Ray theory of transmission and concept of acceptance angle and Numerical Aperture (Numericals based on this), Meridonial and skew propagation, wave theory of optical propagation : cut – off wavelength. Group velocity and Group delay, Types of fibers (According to materials, Refractive index profile, Mode of propagation)

Unit-II: **No of Lect. – 8, Marks: 16**

Light Sources and Detectors:

Sources : Factors or Characteristics for their selection in OFCS,
Light Emitting diodes: Surface emitter, LEDS, Edge emitter LEDS, LED operating Characteristics, Radiation patterns of surface and Edge emitters,
Laser diode: Laser principles, semiconductor laser diode, Hetero junction Laser, strip-gromentry lasers, laser diode operating Characteristics, Radiation patterns.
Detectors: Characteristics or factors for their Selection, P-N photo diode, P-I-N Photo diode, Avalanche photodiode,
Detector parameters: Quantum efficiency, Responsivity, speed of Response (Numericals based on this)

Unit-III: **No of Lect. – 8, Marks: 16**

Losses & Measurements in Optical System

Losses in fibers: Absorption, scattering and bending losses. Signal distortion in optical fiber: Material dispersion, waveguide dispersion, intermodal dispersion.

Noise in optical fiber: Thermal Noise, shot noise, S / N Ratio, Noise equivalent power (Numericals based on this)

Optical Fiber Measurements: Measurement of Attenuation, dispersion, refractive index.

Field Measurements: Optical time domain reflectometry. (OTDR)

Unit-IV: **No of Lect. – 8, Marks: 16**

Optical Transmission & Reception

Optical Transmitter & Receiver Circuit.

Modulation Bandwidth: 3-dB electrical bandwidth, 3-dB optical Bandwidth (Numerical based on this)

Intensity Modulation:: LED Modulation and Circuits (Analog and digital) Analog modulation formats; AM / IM Sub carrier Modulation, FM / IM Sub carrier Modulation.

Detection: (Coherent detection, Heterodyne, Homodyne detection):- Optical heterodyne receivers,

Unit-V: **No of Lect. – 8, Marks: 16**

Advanced Systems and Techniques: -

Fiber Optics System Design: Optical power budgeting, Rise-time budgeting.

Advanced Systems: Optical amplifiers(Semiconductor Amplifire, Raman Amplifier, EDFA), Optical Networks: SONET / SDH.

Advanced Techniques: Optic Frequency Division Multiplexing, Wavelength Division Multiplexing, DWDM.

Optical Sensors: Intensity modulated, Phase mosulated & Spectrally modulated sensors

Reference Books:

1. John M. Senior , "Optical Fiber Communication (principles & Practice)",PearsonEducation

2. Govind P. Agrawal, " Fiber Optic Communication System", Wiley

3. Dr. Subir Kumar Sarkar,"Optical Fibres and Fiber Optic Communication System", S.Chand

Interdisciplinary Elective

1. Automotive Electronics

COURSE OUTLINE

Automotive Electronics

Course Title   Short Title   Course Code

Course Description:

Lecture	**Hours / Week**	**No. Of Weeks**	**Total Hours**	**Semester Credits**
	03	**14**	**42**	**03**

COURSE CONTENT

Automotive Electronics   **Semester-VII**

Teaching Scheme
Lecture: 3 hours / week

Examination Scheme
End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Use of Electronics In The Automobile   **No of Lect. – 8, Marks: 16**

Concept of A System, Control Theory: Open Loop Control & Close loop control, Instrumentation, Signal Processing & Filtering, Electronics Fundamentals, Instrumentation application of Microcomputer

Unit-II: Electronic Engine Control   **No of Lect. – 8, Marks: 16**

Motivation For Electronic Engine Control, Concept of An Electronic Engine Control System, Engine Performance Terms, Electronic Fuel Control System, Analysis of Intake Manifold Pressure, Idle speed control, Electronic Ignition

Unit-III: Sensors and Actuators   **No of Lect. – 8, Marks: 16**

Automotive Control System Applications of Sensors And Actuators, Throttle Angle Sensor, Temperature Sensors, Sensors For Feedback Control: Knock Sensor, Automotive Engine Control Actuators, Electric Motor Actuator, Ignition System & Coil operation

Unit-IV: Digital Powertrain Control Systems **No of Lect. – 8, Marks: 16**

Digital Engine Control & its features, Control Modes for Fuel Control, Discrete Time Idle speed control system, EGR Control, Variable Valve Timing Control, Electronic Ignition Control : knock intensity & detection, Integrated Engine Control System, Hybrid Electric Vehicle

Unit-V: **No of Lect. – 8, Marks: 16**

Vehicle Motion Controls: Representative Cruise Control System, Cruise control Electronics, Advanced Cruise Control, Antilock Braking System, Electronic Suspension Control System, Electronic Steering Control

Automotive instrumentation System & Diagnostics: Modern Automotive & Computer Based Instrumentation System, High Speed Digital Communications & CAN, Electronic Control System Diagnostics

Reference Books:

1. William B. Ribbens – Understanding Automotive Electronics-An Engineering Perspective, Butterworth-Heinemann, An imprint Elsevier, First Indian reprint 2014, ISBN 978-93-5107-151-8

2. Al Santini- Automotive Technology, Cengage Learning, India Edition, 2011, ISBN 978-81-315-1412-2

3. K. K. Ramalingam- Automobile Engineering, Scitek Publication, Second Edition.

Interdisciplinary Elective

2. Image Processing

COURSE OUTLINE

Image Processing	**IP**	
Course Title	Short Title	Course Code

Course Description:

	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	**03**	**14**	**42**	**03**

COURSE CONTENT

Image Processing **Semester-VII**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit I

Digital Image and Video Fundamentals: **No of Lect. – 8, Marks: 16**

Introduction to Digital Image, Digital Image Processing System, Sampling and Quantization, Representation of Digital Image, Connectivity, Image File Formats : BMP, TIFF and JPEG. Colour Models (RGB, HSI, CMY) Introduction to Digital Video, Chroma Sub-sampling, CCIR standards for Digital Video.

Unit II

Image Enhancement: **No of Lect. – 8, Marks: 16**

Gray Level Transformations, Zero Memory Point Operations, Histogram Processing, Neighbourhood Processing, Spatial Filtering, Smoothing and Sharpening Filters, Homomorphic Filtering.

Unit III

Image Segmentation and Representation: **No of Lect. – 8, Marks: 16**

Detection of Discontinuities, Edge Linking using Hough Transform, Thresholding, Region based

Segmentation, Split and Merge Technique, Image Representation and Description, Chain Code, Polygonal Representation, Shape Number, Moments.

Unit IV

Image Transform: **No of Lect. – 8, Marks: 16**

Introduction to Unitary Transform, Discrete Fourier Transform(DFT), Properties of DFT, Fast Fourier Transform(FFT), Discrete Hadamard Transform(DHT), Fast Hadamard Transform(FHT), Discrete Cosine Transform(DCT), Discrete Wavelet Transform(DWT).

Unit V

Image Compression: **No of Lect. – 8, Marks: 16**

Introduction, Redundancy, Fidelity Criteria, Lossless Compression Techniques : Run Length Coding, Arithmetic Coding, Huffman Coding, Differential PCM, Lossy Compression Techniques: Improved Gray Scale Quantization, Vector Quantization, JPEG, MPEG-1.

Text Books :

1. Rafel C. Gonzalez and Richard E. Woods, 'Digital Image Processing', Pearson Education Asia, Third Edition, 2009.
2. S. Jayaraman, E.Esakkirajan and T.Veerkumar, "Digital Image Processing" TataMcGraw Hill Education Private Ltd, 2009.

Reference Books:

1. Anil K. Jain, "Fundamentals and Digital Image Processing", Prentice Hall of India Private Ltd, Third Edition
2. S. Sridhar, "Digital Image Processing", Oxford University Press, Second Edition, 2012.
3. Robert Haralick and Linda Shapiro, "Computer and Robot Vision", Vol I, II, Addison Wesley, 1993.
4. Dwayne Phillps, "Image Processing in C", BPB Publication, 2006
5. B. Chandra and D.Dutta Majumder, "Digital Image Processing and Analysis", Prentice Hall of India Private Ltd, 2011
6. Malay K. Pakhira, "Digital Image Processing and Pattern Recognition", Prentice Hall of India Private Ltd, Third Edition
7. Fred Halshall, "Multimedia Communications: Applications, Networks Protocols and Standards,"Pearson Education 2001
8. David A. Forsyth, Jean Ponce, "Computer Vision: A Modern Approach", Pearson Education, Limited, 2011.

Elective-I

1. VLSI Design

COURSE OUTLINE

VLSI Design	**VLSI**	
Course Title	Short Title	Course Code

Course Description:

This course is to teach students the way digital circuits are designed in practice today. The emphasis is on modern design methodology using CAD tools to meet desired specifications.

	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	**03**	**14**	**42**	**03**

Prerequisite Course(s): A background in digital logic design.

COURSE CONTENT

VLSI Design **Semester-VII**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: **No of Lect. – 10, Marks: 16**

Design Concept: Digital Hardware, the design process, Basic Design Loop, Introduction to CAD tools. Structure of HDL module, Operators and data types of VHDL.

Unit-II: **No of Lect. – 8, Marks: 16**

VHDL: Styles/Types of descriptions.

Data-flow Description (VHDL Programming)**:** Structure of Data-flow Description: Signal declaration and Signal assignment statements, Concurrent signal assignment statements, Constant declaration and assignment statements, Assigning a delay to the signal assignment statements. conditional signal assignment (when….else), selective signal assignment (with….select)

Unit-III: **No of Lect. – 8, Marks: 16**

Behavioral Description (VHDL Programming)**:** Structure of Behavioral Description, variable assignment statement. Sequential statements for VHDL: IF statement, Signal and variable assignment, Case statement, Loop statement, Procedures and Functions statements.
Structural Description (VHDL Programming)**:** Organization of structural design, component declaration and instantiation, binding methods. Example of a state machine.

Unit-IV: **No of Lect. – 8, Marks: 16**

Switch Level Description (VHDL Programming)**:** Single NMOS and PMOS switches: NMOS and PMOS switch description for VHDL, Serial and parallel combinations of switches. Switch level description of: Primitive gates, Combinational logics, Sequential circuits. CMOS switch.

Mixed type Description (VHDL Programming)**,** User defined data types in VHDL, implementation of Arrays.

Unit-V: **No of Lect. – 8, Marks: 16**

VHDL file processing: Concept and built-in procedures for file handling.

Programmable Logic Devices: Complex Programmable Logic Devices (CPLDs) and Field Programmable Gate Arrays, Applications of CPLD's and FPGAs.

Testing of Logic Circuits: Testing combinational logic, stuck-at-fault, Complexity of a Test set, path sensitizing, testing of sequential circuits, built in self test.

Reference Books:

1 Nazeih M. Botros - HDL programming Fundamentals VHDL and Verilog , Thomson Learning Inc.
2 Stephen Brown, Zvonko Vranesic- Fundamentals of Digital Logic with VHDL, Tata McGraw Hill Publishing Company Limited, 2nd Edition.
3 Michael John Sebastian Smith- Application Specific Integrated Circuit, Pearson Education.
4 Douglas Perry - VHDL programming, Tata MC-Graw Hill
5 Sudhakar Yalamanchil - An Introduction to VHDL from Synthesis to Simulation
6 Charles H.Roth, Lizy Kurian John – Principal of Digital System Design using VHDL, Bostan, Thomson Book.
7 Jayaram Bhasker- A VHDL Primer, P T R Prentice Hall

Elective-I

2. Broadband Communication

COURSE OUTLINE

Broadband communication	**BBC**	
Course Title	Short Title	Course Code

Course Description:

This course presents the actual concepts of Broadband Communication Networks Including ISDN and ATM networks to support multimedia applications in networking

	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	**03**	**14**	**42**	**03**

Prerequisite Course(s): A background in basics of computer networks.

COURSE CONTENT

Broadband communication **Semester-VII**

Teaching Scheme
Lecture: 3 hours / week

Examination Scheme
End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

UNIT I: Packet switch WAN Protocols: **Lectures 08, Marks 16**

X.25 protocol, packet Formats, sequence of events
Frame Relay:
Introduction, Frame relay protocols, architecture, comparison with X.25 protocol, frame mode call control, call control protocol.
Frame relay congestion control, Congestion, Approaches, traffic rate management, explicit congestion avoidance, implicit congestion control.

UNIT II : ISDN **Lectures 08., Marks 16**

Introduction to ISDN, IDN, Principles of ISDN, Evolution of ISDN, ISDN Standards, Architecture, Transmission structure, User network interface configuration, ISDN protocol architecture, ISDN Connection, Addressing. Inter working ISDN – ISDN, ISDN – PSTN, ISDN – CSPDN.

Unit-III: B-ISDN **Lectures 08., Marks 16**

Architecture and standards, B-ISDN Services Conversational, Messaging, Retrieval, Distribution, Business and Residential requirements.
B-ISDN protocol: User plane, Control plane, Physical layer, Line coding, Transmission structure, SONET Requirement, Signal Hierarchy, System Hierarchy, Frame format pointer adjustment

Unit-IV: ATM: **Lectures 08., Marks 16**

Overview, Virtual channels, Virtual paths, VP and VC switching, ATM cells, Header format, Generic flow control, Header error control, Transmission of ATM cells, Adaptation layer, AAL services and protocols. ATM switching building blocks, ATM cell processing in a switch, Matrix type switch, Input, Output buffering, central buffering, Performance aspects of buffering switching networks.

Unit-V: ATM Traffic and congestion Control **Lectures 08., Marks 16**

Requirements for ATM Traffic and Congestion Control, Cell-Delay Variation, ATM Service Categories, Traffic and Congestion Control Framework, Traffic Control, Congestion Control,

Reference Books:

1) Williams Stallings - ISDN and Broadband ISDN with frame Relay and ATM , PHI , 4TH Ed

2) Behrouz Forouzan. - Data Communication. and Networking, TMH

3) Balaji kumar - Broadband Communication, MGH

4) Mischa Schwartz - Broadband Internet Network, PHI

Elective-I

3. Biomedical Engineering

COURSE OUTLINE

Biomedical Engineering	**BME**	
Course Title	Short Title	Course Code

Course Description:
This course includes introduction to the Biomedical Instrumentation and Measurement. The Anatomy of Heart, Function of Heart. TheHuman Nervous and Muscular System. Human Respiratory System and Its Measurements, Imaging Techniques & telemetry system. This course is designed to introduce the students to the basic principles and applications of sensors, medical oscilloscopes, analog and digital instruments. It includes basic knowledge of heart, brain and muscular system and different types of signals. This course provides instruction in the theory and application of biomedical instruments.

	Hours/Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	14	42	03

Prerequisite Course(s): Digital Electronics, Microprocessor, Electronics Instrumentation.

COURSE CONTENT

Biomedical Engineering **Semester-VII**

Teaching scheme:
Lectures: 3 hrs/week

Examination scheme:
End Semester Examination (ESE): 80Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

UNIT I **Lectures 09, Marks 16**

Introduction to Human Body and Measurement on It: Basics of biomedical Instrumentation system, Anatomy and Physiology of the Human Body, Cells & Generation of potential in Body, Body potential, Transducers And Sensors. Transducers: Pressure transducers, transducer for temperature measurement, Ultrasonic Transducers, Sensors, Pulse sensors, Respiration sensors, Optical sensors, Recorders and displays. Permanent magnet moving coil instruments, PMMC writing system, X-Y Recorders, Medical oscilloscopes, Multi-beam oscilloscope, Digital storage oscilloscopes. Bedside monitor.

UNIT II **Lectures 08, Marks 16**

The Anatomy of Heart, Function of Heart: The circulatory system, Electrical conduction system of the heart, Electrocardiographs, ECG waveforms, Standard lead system, ECG measurements, ECG preamplifier, Readout device, Heart problems, Heart blocks, Pacemakers, Types of Pacemakers, Defibrillators, Ventricular Fibrillation; Heart rate measurement, Cardiotachometers, Average Heart rate meter, Electrode theory; Biopotential electrode : skin surface, Suction pasteless disspossible & air jet electrode. Unipolar & bipolar limb system, eithoven triangle,Blood pressure measurement, introduction & techniques.

UNIT III **Lectures 08, Marks 16**

Human Respiratory System and Its Measurements:
Respiratory Measurements, Spirometer, Respiratory gas analyzers infra red gas analyzer, oxygen analyzer, nitrogen analyzer, 8-channel EEG system. Blood : Measurement of blood flow, Radiographic technique, Indicator Dye dilution methods, Thermal convection, Magnetic blood flow rate, Ultrasonic blood flow meter, Blood gas Pressure, Blood gas analyzer, PH measurement of blood, Oximetry, Measurement of partial pressure of CO2 in blood, Measurement of blood PaO2, In vitro Oximetry. Patient Safety, Galvanic skin resistance; Patient safety: Macro shock, Macrocurrent shock. Block diagram of visual & auditory evoked potential system.

UNIT IV **Lectures 06, Marks 16**

The Human Nervous and Muscular System: The Nervous System, The peripheral nervous system, Central nervous system, Anatomical and physiological parameter of brain, Behavior and Nervous system, Study of Brain Signals, Different waveforms of the Brain, Evoked potential, Type of electrodes, EEG Amplifier, Recording the EEG signals, Electrode, micro & needle electrode, Artifacts, Processing Artifacts, Analysis of Disease using EEG & sleep patterns, Electromyography, (EMG), How muscles work, paralysis, myograph, Nerve conduction velocity.

UNIT V **Lectures 09, Marks 16**

Imaging Techniques & telemetry system.
Imaging Techniques : X ray imaging and CT Scan : Properties of X ray Production of X ray, Application of X ray in medicine, CAT Scan, X-ray therapy; Digital radiography, ultrasound therapy units: physics, medical ultrasound, basic pulse echo system. Instruments of surgery, Principle, type of electro-surgery technique, surgical diathermy machine, electrode used for surgical diathermy, safety aspects in electro-surgical units, microwave diathermy, Telemetry, single channel telemetry, ECG telemetry, Temperature telemetry, multichannel telemetry.

References:

1) R.S.Khandpur - Bio-medical Instrumentation , TMH 2nd ed
2) Nandini K. Jog - Electronics in Medicine and Biomedical Instrumentation, PHI.
3) Cromwell - Biomedical Instrumentation and Measurements, PHI. 2nd ed/Pearson 4th ed.
4) H. S. Kalsi – Electronics Instrumentation, TMH 2

Elective-I

4. Industrial Automation

COURSE OUTLINE

Industrial Automation | **IA** |
Course Title | Short Title | Course Code

Course Description:

This course presents the actual concepts of Industrial Automation and PLC in order to meet a industrial requirement.

Lecture	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): A background in basic plc knowledge.

COURSE CONTENT

Industrial Automation **Semester-VII**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week
End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Introduction to Industrial Automation **No of Lect. – 8, Marks: 16**

Introduction to Industrial Automation, Role of automation in industries, Introduction to the types of manufacturing industries, Introduction to type of automation system, Benefits of automation. Introduction to Automation pyramid, Introduction to automation tools like PAC, PLC, SCADA, DCS, Hybrid DCS with reference to automation pyramid, Comparison of PLC, PAC, and SCADA on the basis of Performance criteria Control system audit, Performance criteria, Development of User Requirement Specifications (URS) for automation. Functional Design Specifications (FDS) for automation tools.

Unit-II: Basic concept of PLC,Pneumatic & Hydrolic: **No of Lect. – 8, Marks: 16**

Programmable Logic Controller (PLC) Continuous versus Discrete Process Control, Relay based ladder diagram using standard symbols, Limitations of relay based system. Architecture of PLC, Types of Input & Output modules (AI, DI, DO, AO), Wiring diagram, Interfacing pneumatic & Hydraulic systems to PLC, Fixed & Modular PLC (Rack, slot, grouping), PLC specifications, PLC manufacturers, PLC Basic instructions, Timers (ON delay, OFF delay & Retentive) & Counters with timing diagrams, PLC ladder diagram, PLC programming for process applications

Pneumatic components

Pneumatic Power Supply and its components,Pneumatic relay (Bleed & Non bleed, Reverse & direct),Single acting & Double acting cylinder,Special cylinders: Cushion, Double rod, Tandem, Multiple position, Rotary,Filter Regulator Lubricator (FRL),Pneumatic valves (direction controlled valves, flow control etc),Special types of valves like relief valve, pressure reducing etc.,Time delay valve

Hydraulics

Hydraulic components ,Hydraulic supply ,Hydraulic pumps, Actuator (cylinder & motor),Hydraulic valves

Unit-III: Instrumentation Standard Protocols: **No of Lect. – 8, Marks: 16**

Definition of protocol, Introduction to Open System Interconnection (OSI) model, Communication standard (RS232, RS485), Modbus (ASCII/RTU), Introduction to third party interface, concept of OPC (Object linking and embedding for Process Control), HART Protocol: Introduction, frame structure, programming, implementation examples, benefits, advantages and limitation. Foundation Fieldbus H1: Introduction, frame structure, programming, implementation examples, benefits, advantages and limitation. Comparison of HART, Foundation Fieldbus, Devicenet, Profibus, Controlnet, Industrial Ethernet.

Unit-IV: PLC Configuration, Applications and Machine automation:
No of Lect. – 8, Marks: 16

PLC programming methods as per IEC 61131, Developing programs using Sequential Function Chart, Functional Block Diagram, Analog control using PLC (PID controller configuration), Interfacing PLC to SCADA/DCS using communication link (RS232,RS485) , Protocols (Modbus ASCII/RTU) and OPC, Development stages involved for PLC based automation systems. Introduction Computer Numerically Controlled (CNC) Machines, Basic CNC Principle, servo control, types of servo control for motion axes, Control system of CNC, Introduction to G-code.

Unit-V: Distributed Control System: **No of Lect. – 8, Marks: 16**

DCS introduction, Various function Blocks, DCS components/block diagram, DCS Architecture of different makes, comparison of these architectures with automation pyramid, DCS specification , DCS support to Enterprise Resources Planning (ERP) DCS detail Engineering, configuration and programming, functions including database management, reporting, alarm management, Historical database management, and user access management, communication, third party interfaces .

Text Books:

1. Introduction to Programmable Logic Controller, Gary Dunning, DELMAR Cengage Learning.
2. Process Control, Instrument Engineering Hand book, B.G. Liptak, Butterworth-Heinemann Ltd
3. Distributed computer control for industrial automation, Ppovik Bhatkar, Dekkar Pub.

Reference Books:

4. Industrial Electronics, Petruzella, McGraw-Hill
5. Pneumatic Instrumentation, Majumdhar, TMH
6. The management of control system: Justification and Technical Auditing, N.E. Bhttiha, ISA
7. Computer aided process control, S.K.Singh, PHI.
8. Programmable Logic Controllers: Principles and Applications, Webb &Reis, PHI.

Computer Communication Network

COURSE OUTLINE

Computer Communication Network	**CCN**	
Course Title	Short Title	Course Code:

Course Description: To understand the concept of Computer Network, architecture, protocol and its Applications.

	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	**03**	**14**	**42**	**3**

COURSE CONTENT

Computer Communication Network **Semester-VII**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE)	**: 80 Marks**
Paper Duration (ESE)	**: 03 Hours**
Internal Sessional Exam (ISE)	**: 20 Marks**

Unit I: Physical Layer **No of Lect. – 8, Marks: 16**

1) Introduction to Computer Network, Network Topologies
2) ISO/OSI Reference Model
3) TCP/IP Reference Model
4) LAN,MAN,WAN
5) Guided and unguided media: Transmission media: Twisted pair, Baseband coaxial cable, Broadband coaxial cable, Fiber optics. Wireless Transmission: Radio transmission, Microwave transmission, Infrared and light wave Transmission.
6) ISDN: Narrowband ISDN: ISDN services, System architecture, Interface. Broadband ISDN
7) ATM reference model and ATM Switches.

Unit II: Data Link Layer **No of Lect. – 8, Marks: 16**

1) Design issues
2) Framing,
3) Error and Flow Control Flow control Data Link Protocols: Unrestricted Simplex Protocol, stop and wait protocol, Simplex Protocol for a Noisy Channel. Sliding Window Protocols: One bit sliding window, Using Go-Back n, Protocol using Selective Repeat

4) HDLC
5) Multiple Access Protocols: ALOHA, Carrier Sense Multiple Access, CSMA,CSMA/CD,CSMA/CA

Unit III: Network Layer **No of Lect. – 8, Marks: 16**

1) Design Issue of Network Layer
2) Comparison of Virtual circuit and Datagram subnets
3) Routing Algorithms, Shortest Path Routing, Flooding, Hierarchical Routing,
4) Broad Cast Routing, Multicast routing,
5) Congestion Control Algorithms
6) Congestion Prevention Policies
7) Choke Packets
8) Internet Protocol: Internetworking, IPV4 Datagram, IPV6 Addresses

Unit IV: Network Layer and Transport Layer **No of Lect. – 8, Marks: 16**

1) ARP,RARP
2) ICMP,IGMP
3) Transmission Control Protocol(TCP)
4) User Datagram Protocol(UDP)
5) Congestion Control of Transport Layer
6) Quality of Service(QoS)
7) Techniques to improve QoS

Unit V: Application Layer **No of Lect. – 8, Marks: 16**

1) Domain Name System(DNS)
2) SNMP
3) Network Security, Cryptography, Public key algorithms
4) Digital Signature
5) Authentication Protocols
6) Firewalls
7) Introduction to VOIP

References:

1. Andrew S Tanebaum - Computer Networks, 4th Ed. PHI/ Pearson education.
2. Behrouz A Forouzan - Data Communication and Networks, 3rd Ed. TMH.
3) Irvine Olifer - Computer Networks: Principles, Technology and Protocols, Wiley India.
4) William Stalling – Data and Computer communications, 7th Ed. PHI

Digital Signal Processing Lab

LAB COURSE OUTLINE

Digital Signal Processing Lab	**DSP LAB**	
Course Title	Short Title	Course Code

Course Description:
In this laboratory course emphasis is on the hand on design practice and implementation and testing of various circuits (discrete and IC based) in laboratory.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	15	30	1

Total Semester Credits: 1

Prerequisite Course(s): A background in basic electronics and circuit theory.

LAB COURSE CONTENT

(Note: Minimum EIGHT experiments to be performed)

1. Basic operations (Addition, Multiplication, Subtraction, Division and Scaling)on sequences of equal and unequal length.
2. Write a program for different waveform generation (Sin, Cos, Impulse, Unit step, delayed unit step, rising exponential, decaying exponential, Fliplr ie x(-n))
3. Sample an analog signal with different sampling frequencies and see the aliasing effect, thus verifying sampling theorem.
4. To study the circular convolution for calculation of linear convolution and aliasing effect. Take two sequences of length 4. Write a program to find 4 point circular convolution and compare the result with 8 point circular convolution to study aliasing in time domain.
5. Find DFT of a discrete sequence and also find its IDFT.
6. Solve Difference equation and find system response using Z transform.
7. To study the effect of different windows on FIR filter response.
8. Design Butterworth filter using Bilinear transformation method for LPF.
9. Design and implement two stage sampling rate converter
10. Implementation of digital filter using DSP Kit.
11. Sampling audio signal at different sampling rate using DSP kit.
12. Using ADC and DAC for signal acquisition and play back after processing.

Note: Minimum **EIGHT** practical's are to be performed. At least **TWO** on DSP Hardware Platform.

Guide lines for ESE:-

ESE will be based on practical assignment submitted by the student in the form of journal. Evaluation will be based on paper work and performance in the practical.

Fiber Optic Communication Lab

LAB COURSE OUTLINE

Fiber Optic Communication	**FOC LAB**	
Course Title	Short Title	Course Code

Course Description:
In this laboratory course emphasis is on the hand on practice of various optical circuits in laboratory.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	14	28	1

Total Semester Credits: 1

Prerequisite Course(s): A background in basic electronics and optical theory.

LAB COURSE CONTENT

(Note: Minimum eight experiments to be perform)

1. **Electrical Characteristics of (Different type LED).**
   a) To plot the VI characteristics of LED.
2. **Electrical Characteristics of Laser Diode.**
3. **Photometric characteristics of LED/LD(Polar plot/Intensity Measurement)**
   a) To plot the Photometric characteristics of LED/LD of different wavelengths.
4. **NA Measurement for Single/Multi mode, GI/SI, Fiber**
   a) To measure Numerical Aperture of SM-GI/SI fiber
   b) To measure Numerical Aperture of MM-GI/SI fiber.
5. **Attenuation Measurement of optical fiber.**
   a) To measure attenuation due to angular misalignment.
   b) To measure attenuation due to longitudinal misalignment.
   c) To measure attenuation due to axial/lateral misalignment.
6. **Study of different fiber losses.**
   a) To measure propagation loss of given fiber.
   b) To measure bending loss of given fiber.
7. **Spectral characteristics of LED/LD.**
   a) To study spectral characteristics of LED/LD.
8. **Fiber optic Analog transmitter/Receiver parameter measurement**.
   a) To set up analog link and measure the various parameters.

9. **Fiber optic Digital transmitter/Receiver parameter measurement**.
    a) To set up digital link and measure the various parameters.
10. **Study of fiber optical connectors.**
11. **Parameter measurement of opto isolator.**
12. **Study of OTDR**.

Guide lines for ESE:-

ESE will be based on practical assignment submitted by the student in the form of journal. Evaluation will be based on paper work and performance in the practical.

Elective-I Lab

1. VLSI Design Lab

LAB COURSE OUTLINE

VLSI Design Lab	**VLSI LAB**	
Course Title	Short Title	Course Code

Course Description:
In this laboratory course emphasis is on the hand on design practice and implementation and testing of various circuits (discrete and IC based) in laboratory.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	14	28	1

Total Semester Credits: 1

Prerequisite Course(s): A background in digital electronics.

LAB COURSE CONTENT

(Note: Group A is compulsory minimum three experiments to be performed from each group B and C)

List of Practical:
Practical consists of writing VHDL code, simulation, synthesis and implementation on CPLD / FPGA devices.

Group A

Realization of a full adder circuit using dataflow, behavioral, structural and mixed type of description.

Group B
1. Realization of all 2 input and 3 input Logic Gates.
2. Realization of 2 to 4 decoder/3 to 8 decoder.
3. Realization of 4 to 1 multiplexer/ 8 to 1 multiplexer.
4. Realization of 4 bit binary to Gray converter/ BCD to seven segment decoder .

Group C

5. Realization of JK and T flip-flop .
6. Realization of 4 bit binary up down counter with Asynchronous reset.
7. Realization of 4 bit BCD counter with Synchronous reset.
8. Realization of 4 Bit Left / Right Shift Reg

Elective-I Lab

2. Broadband Communication Lab

LAB COURSE OUTLINE

Broadband Communication Lab	**BBC LAB**	
Course Title	Short Title	Course Code

Course Description:
In this laboratory course emphasis is on the study and analysis of varius concepts in Switching ,ISDN

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**10**	**20**	**1**

Total Semester Credits: 3

Prerequisite Course(s): A background in basic of networking concepts

LAB COURSE CONTENT

(Note: Minimum eight experiments to be perform)

1. Introduction to Electronic Private Automatic Branch Switching Exchanges
 Study of working of a Manual and Automatic matrix switching Network,
2. Learning Broadband communication and its various protocol and connection using simtel Netsys software.
3. Study of different types of ISDN interfaces
4. To set basic configuration of ISDN system using Emulator, ISDN Telephones, terminal Adapter and Analog Telephones
5. To analyze simple Trace using Protocol Analyzer after establishing, voice communication between two ISDN telephones.
6. Study of Different types of Numbering in ISDN System.
7. Study of point to point/multipoint connections in ISDN System

8 Study of filtering in ISDN analyzer

9. Study of ISDN Telephone Features
10. Study of Euro-/SDN ETSI standards with Fault Finding

Elective-I Lab

3. Biomedical Engineering Lab

LAB COURSE OUTLINE

Biomedical Engineering Lab	**BME Lab**	
Course Title	Short Title	Course Code

Course Description:
In this laboratory course emphasis is on the understanding of Biomedical electronics components & system application.

Laboratory	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	2	**14**	**28**	**1**

LAB COURSE CONTENT

(Note: Minimum EIGHT Experiments from below list.)

1. Study of blood pressure measurement.
a. Measurement of systolic & diastolic pressure

2. Study of ECG amplifier to measure amplitude and frequency components.
a. Measurement of ECG Waveform & amplitude

3. Measurement of pulse Rate.
a. Measurement of pulse rate.

4. Study of measurement of temperature of human body direct and indirect method.
a. Measurement of body temperature.

5. Study of pace maker unit to compare the operation of heart with the normal functioning of heart.
a. Demonstration of pace maker working & modes of pacemaker.

6. Study of blood cell counter to measure cell counts.
a. Measure cell count

7. Study of spectrophotometer.
a. Analysis of chemical composition of body fluids.

8. Use of ultrasound in medical electronics.

a. Measurement of Blood Flow using ultrasound Blood flow meter.

9. Study of temperature telemetry system to measure the received data.
a. Observe sending & receiving data

10.Study of Different Biomedical Electrodes.

a. Observe and Mount diff. Skin surface Electrodes.

b. Study and Observe Micro electrodes and Needle electrodes.

Guidelines for ICA:
ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.
Guide lines for ESE:
ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of 8. Evaluation will be based on paper work and performance in the practical.

Elective-I Lab

4. Industrial Automation Lab

LAB COURSE OUTLINE

Industrial Automation Lab	**IA LAB**	
Course Title	Short Title	Course Code

Course Description:

In this laboratory course emphasis is on the hand on design practice and implementation and testing of various circuits (discrete and IC based) in laboratory.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	**15**	**30**	**1**

Total Semester Credits: 1

Prerequisite Course(s): A background in basic electronics and circuit theory.

LAB COURSE CONTENT

(Note: Minimum eight experiments to be performed)

1. Study of relay and contactor logic for load control
2. Study of fully automatic DOL & star-delta starters
3. Study of temperature controller
4. Study and verification of PID functions using controller.
5. Study and verification of counter functions
6. Study of AC drives and verification of start, stop, jog and direction control features
7. Study of types, functioning and symbols of various hydraulic components
8. Study of types, functioning and symbols of various pneumatic components.
9. Development of timer and counter functions using PLC.
10. Development of interface of I/O devices using PLC.
11. Communication, downloading / uploading of PLC programs
12. Basic Analog Inputs (AI) and Analog Output (AO) programming techniques using scaling functions.

13. Understanding GUI features of HMI (WinCC flexible / other compatible)
14. System graphic designing using SCADA (WinCC / other compatible)
15. Mini-hardware project: Integration of 1DI, 1DO & 1AI with PLC

Guide lines for ESE:-

ESE will be based on practical assignment submitted by the student in the form of journal. Evaluation will be based on paper work and performance in the practical.

Project-I

Project-I
Course Title | Short Title | Course Code

Course Description:
The course explores the knowledge of design, experiment and analysis of data. The course develops ability to work on multidisciplinary teams, Identify, formulate, and solve engineering problems in view of economic, environmental and societal context.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	**15**	**30**	**2**

COURSE CONTENT

Project-I **Semester-VII**

Lab:2 Hrs/week **Examination Scheme**

Total Semester Credits: 02
Internal Continuous Assessment (ICA): 25 Marks
End Semester Examination(ESE)-Oral:25 Marks
Total: 50Marks

1. It is expected that the broad area of Project-I shall be finalized by the student in the beginning of the VII semester / extension of Minor project undertaken may be Project-I.
2. A group of Minimum 3 and Maximum 5 students shall be allotted for Project-I and same project group for Project-II.
3. Exhaustive survey of literature based on a clear definition of the scope and focus of the topic should be carried out by the students. The **Synopsis/Abstract** on the selected topic, after detail literature survey should be submitted to the Project coordinator appointed by Head of the department.
4. Project-I may involve literature survey, problem identification, work methodology preparing specification and material procurement, collection of data , conduction of experiments and analysis. The project work shall involve sufficient work so that students get acquainted with different aspects of fabrication, design or analysis.
5. Approximately more than 50% work should be completed by the end of VII semester.
6. Each student group is required to maintain log book for documenting various activities of Project-I and submit group project report in the form of thermal bound at the end of semester –VII. Submit the progress report in following format:
    a. *Title*
    b. *Abstract*
    c. *Introduction*
    d. *Problem identification and project objectives*
    e. *Literature survey*
    f. *Case study/Analysis/Design Methodology*

g. *Work to be completed (Progress status)*
h. *Expected result and conclusion*
i. *References.*

7. Evaluation Committee comprising of the Guide, Project Coordinator and Expert appointed by the Head of the department will award the marks based on the work completed by the end of semester and the presentation based on the project work.

Guide lines for ICA : The Internal Continuous Assessment shall be based on the active participation of the students in the Project work and knowledge / skill acquired. Assessment of the project-I for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given in **Table-A.**

Guide lines for ESE: The End Semester Examination for Project shall consist of demonstration if any, presentation and oral examinations based on the project report**.**

Assessment of Project-I

Name of the Project: ______________________________________

Name of the Guide: ______________________________________

Table-A

SN	Name of Student	Problem Identification and project objectives	Literature Survey	Project Methodology/ Design/PCB/ hardware/ simulation/ programming	Progress Status	Present ation	Total
		5	5	5	5	5	25

Seminar-II

COURSE CONTENT

Seminar-II
Course Title Short Title Course Code

Course Description: The course explores the knowledge of presentation and effective communication. The course develops ability to work on multidisciplinary teams, Identify, formulate, and solve engineering problems in view of economic, environmental and societal context.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	15	30	2

COURSE CONTENT

Seminar-II **Semester-VII**

Examination Scheme
Practical : 2 Hrs/Week **Total Semester Credits: 02**
Internal Continuous Assessment (ICA): 25 Marks

1. Each Student shall select a topic for seminar which is not covered in curriculum. Seminar topic should not be repeated and registration of the same shall be done on first come first serve basis.
2. Topic of Seminar shall be registered within a three weeks from commencement of VII Semester and shall be approved by the committee.
3. The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of Seminar-II. Seminar shall be related state of the art topic of his choice approved by the committee.
4. Each student should deliver a seminar in scheduled period (Specified in time table or time framed by department) and submit the seminar report (paper bound copy/Thermal bound)in following format:
   a. *Title*
   b. *Abstract*
   c. *Introduction*
   d. *Literature survey*
   e. *Concept*
   f. *Functional and Technical Details*
   g. *Applications*
   h. Comparison with similar topics / methods
   i. *Future scope*
   j. *References*

ASSESSMENT OF SEMINAR-II

Guide lines for ICA: ICA shall be based on topic selection , presentation and Seminar-II report submitted by the student in the form of thermal bound. Assessment of the Seminar-II for award of ICA marks shall be done jointly by the guide and a departmental committee, as per the guidelines given in **Table- B**

Name of Guide: ___________________________________

Table-B

SN	Name of Student	Seminar Topic	Topic Selection	Literature survey	Report writing	Depth of under-standing	Presentation	Total
			5	5	5	5	5	25

Industrial Visit

Industrial Visit

Course Title	Short Title	Course Code

Course Description: The course explores the knowledge industry organization, new trends in manufacturing, maintenance and safety. The industrial visit provide the practical visualization of theoretical study of various engineering subject.

COURSE CONTENT

Semester-VII

Examination Scheme
Total Semester Credits: 01
Internal Continuous Assessment (ICA): 25 Marks

1. Industry visits to minimum two industries shall be carried out by each student preferably/college shall arrange the industrial visit during the vacation period otherwise during the regular VII semester.
2. The student should obtain appropriate certificates of visit from the concerned organizations just after the visits.
3. Every Student should submit Industrial Visit report individually at the end of Semester-VII(First Term of Final Year)
4. The report(Thermal Bound) should contain information about the following points:
   a. *The organization - activities of organization and administrative setup technical personnel and their main duties.*
   b. *The project / industry brief description with sketches and salient technical information.*
   c. *The work / processes observed with specification of materials, products, equipments etc. and role of engineers in that organization.*
   d. *Suggestions (if any) for improvement in the working of those organizations.*
5. The evaluation of the report of technical visits will be made by panel of three teachers appointed by Head of the department based on following points:

Guide lines for ICA : ICA shall be based on knowledge gain by student and Industrial Visit Report submitted by the student in the form of Thermal bound. Assessment of the Industrial Visit for award of ICA marks shall be done jointly by industrial visit coordinators departmental committee based on viva -voce as per the guidelines given in **Table- C**

Table-C

SN	Name of Student	Name of Industry	Report writing	Depth of Under-standing	Total
			15	10	25

NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Final Year Engineering

(E&TC/E&C)

Faculty of Engineering and Technology

COURSE OUTLINE

Semester – VIII

W.E.F 2015 – 2016

Satellite & Mobile Communication

COURSE OUTLINE

Satellite & Mobile Communication	**S&MC**	
Course Title	Short Title	Course Code

Course Description:

This course describes the basics of Satellite and Mobile communication to the undergraduate students. Mobile communications provide terrestrial coverage in densely populated areas, while satellite communications enable wireless communication in regions where mobile networking is not cost-effective. The program gives you an in-depth understanding of the engineering aspects of these important current and future technologies.

Lecture	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
	03	13	39	03

Prerequisite Course(s): Communication System-I, Communication System-II.

COURSE CONTENT

Satellite & Mobile Communication **Semester -VIII**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE): 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Overview of Satellite Systems, Orbits and Launching Methods

No of Lect. –7, Marks: 16

a. Introduction – Frequency Allocations for Satellite Services
b. Intelsat, Polar Orbiting Satellites
c. Kepler's First , Second and Third Law
d. Definitions of Terms for Earth orbiting Satellites – Orbital Elements – Apogee and Perigee Heights
e. Orbital Perturbations, and sun-synchronous orbit

Unit-II: Geostationary orbit, Wave Propagation and Polarization

No of Lect. – 8, Marks: 16

a. Antenna look angles, antenna mount, limits of visibility,
b. Earth eclipse of satellite, sun transit outage, launching of geostationary satellites
c. Atmospheric losses, ionospheric effects, rain attenuation

d. Antenna polarization,
e. polarization of satellite signals,
f. cross polarization discrimination, Ionospheric depolarization rain depolarization, ice depolarization

Unit-III: Satellite Antenna and Link Design **No of Lect. –12, Marks: 16**

a. Antenna basics, aperture antennas. Parabolic reflectors,
b. Offset feed, double reflector antenna
c. Introduction, equivalent isotropic radiated power, Transmission losses
d. The link power budget equation, System noise, carrier to noise ratio
e. The uplink
f. The downlink
g. Effects of rain, combined Uplink and Downlink C/N ratio

Unit-IV: Introduction to Wireless Communications and Modern Wireless Communications system **No of Lect. – 4, Marks: 16**

a) Evolution of Mobile radio communication
b) Mobile Radio systems around the world
c) wireless communication system
d) Trends in cellular radio and personal communications
e) Second generation(2G) cellular networks
f) Third generation(3G) wireless networks
g) wireless local loop(WLL) and wireless Local Area Networks(WLANs)

Unit-V: Cellular Concept and System Design Fundamentals, Wireless systems and Standards **No of Lect. – 9, Marks: 16**

a) Introduction, Frequency reuse, channel assignment strategies
b) Handoff strategies, Interference and system capacity, Trucking and grade of service
c) Improving coverage and capacity in cellular systems
d) Global System for Mobile (GSM)

Reference Books:

1. D. Roddy, “Satellite Communications”, Tata McGraw-Hill, 4th Edition, ISBN-0-07-007785-1.
2. T. Rappaport, “Wireless Communications-Principles and Practice, 2nd Edition, ISBN-978-81-317-3186-4.

Radiation and Microwave Techniques

COURSE OUTLINE

Radiation and Microwave Techniques	**RMT**	
Course Title	Short Title	Course Code

Course Description:

This course will help students to understand the essentials of microwave engineering, active and passive microwave devices, microwave tubes and applications of microwave.

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	03	**14**	**42**	**03**

Prerequisite Course(s): A background of Electromagnetic field theory and communication system.

COURSE CONTENT

Radiation and Microwave Techniques **Semester-VIII**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Microwave Transmission Lines **No of Lect. – 8, Marks: 16**

Transmission Line equivalent circuit, Transmission line parameter, Transmission line equation, Transmission coefficient, reflection coefficient, Impedance matching, quarter wave transmission line, single stub, double stub matching, Solution of single stub by using smith chart. Application of smith chart

Unit-II: Microwave waveguides and components **No of Lect. – 8, Marks: 16**

Wave guide Theory: Waveguide types rectangular and circular. Wave propagation through rectangular waveguide, Solution of wave equation in rectangular waveguide, Rectangular wave guide modes, Waveguide characteristics for TE and TM modes (for rectangular waveguide), equation for cut off wavelength, guided wavelength, guided velocity, group velocity
Microwave components: S parameters**,** S matrix, E-plane, H-plane, Magic Tee, Directional couplers, Ferrite devices – Isolator, Circulator. Waveguide Terminations, short circuit plunger, Waveguide corners, bends & twists, Attenuators.

Unit-III: Microwave Tubes and Solid State Devices **No of Lect. – 9, Marks: 16**

Microwave Tubes: Limitations of conventional Tubes, Klystron tubes, Two cavity Klystron, Multi cavity Klystron, Reflex klystron, Travelling Wave Tube (TWT), Magnetron.

Solid state Devices: PIN diode, GUNN diode, IMPATT diode, Microwave strip lines, and Monolithic Microwave Integrated circuits.

Unit-IV: Microwave Measurement and antennas **No of Lect. – 8, Marks: 16**

Microwave Measurements: Power, Frequency, VSWR, attenuation, Impedance measurement.
Microwave Antennas: Fundamental parameters of antennas**,** Horn antenna, Parabolic reflector with all types of feeding methods, slotted antenna, Lens antenna, Microwave strip line antennas.

Unit-V: Application of Microwaves - RADAR **No of Lect. – 8, Marks: 16**

RADAR: Principle of Radar System, Radar range equation, Pulse radar, Doppler Effect, Blind Speed, MTI Radar, CW Doppler Radar, FMCW Doppler Radar.

Industrial Applications of Microwaves- Microwave heating, microwave oven, Thickness measurement, Medical applications of microwaves.

Reference Books:

1. Samuel Liao, Microwave Devices and Circuits, Pearson Education, 3/e,
2. Annapurna Das, Sisir Das, Microwave Engineering, TMH, 2/e
3. David M. Pozar, Microwave Engineering, Wiley India, 4/e
4. Sisodia, Gupta, Microwaves : Introduction to Circuits, Devices and Antennas, New Age, 1/e
5. Manojit Mitra, Microwave Engineering, Dhanpat Rai, 3/e
6. Robert E Collin, Foundations for Microwave Engineering, Wiley India, 2/e
7. Simon Ramo, Fields and Waves in Communication Electronics, Wiley India, 3/e
8. K K Sharma, Fundamentals of Microwave and Radar Engineering, S Chand. 1/e

Elective-II

1. Embedded System

COURSE OUTLINE

Embedded System	**ES**	
Course Title	Short Title	Course Code

Course Description:

This course presents the fundamentals of embedded system hardware and firmware design. Issues such as embedded processor selection, firmware debugging will be discussed. A very popular microcontroller LPC 2148 and Real time operating system concept will be studied to meet the real time system requirement.

	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	**03**	**14**	**42**	**03**

Prerequisite Course(s): Knowledge of microprocessor and microcontroller architecture, digital design, and the C programming language.

COURSE CONTENT

Embedded System **Semester-VIII**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Embedded System Introduction **No of Lect. – 8, Marks: 16**

Introduction to Embedded System, History, Design challenges, optimizing design metrics, time to market, applications of embedded systems and recent trends in embedded systems, embedded design concepts and definitions, hardware and software design and testing, communication protocols like CAN, bluetooth and Zig-bee.

Unit-II: ARM Embedded System **No of Lect. – 8, Marks: 16**

RISC Design Philosophy, comparision between CISC and RISC, ARM Design Philosophy, Embedded System hardware, Embedded System software.

ARM Processsor fundamentals - ARM core architecture, data flow model, Register, Current Program Status Register, Pipeline, Exceptions, Interrupts and Vector Table, Core Extensions, ARM Processor families.

Unit-III: ARM Processor **No of Lect. – 8, Marks: 16**

ARM-7 processor LPC 2148 Block diagram and pin diagram, operating modes: ARM mode & Thumb mode, study of on-chip peripherals like I / O ports, timers, counters, interrupts, on-chip ADC, DAC, RTC modules, WDT, PLL, PWM and USB.

Unit-IV: Programming & Interfacing for LPC2148 **No of Lect. – 8, Marks: 16**

Hardware interfacing of LPC2148 using Embedded C language: LED, Switches, LCD Display & stepper motor. On chip programming: UART, Timer, Real Time Clock & ADC.

Unit-V: Real Time Operating System Concept **No of Lect. – 8, Marks: 16**

Architecture of kernel, task and task scheduler, ISR, Mutex, Semaphores, mailbox, message queues, pipes, events, timers, Priority inversion problem, priority Inheritance, RTOS services in contrast with traditional OS.

Introduction to Ucos II RTOS and it's features, study of kernel structure of Ucos II.

Case study of digital camera and automatic chocolate vending machine (without codes)

Reference Books:

1. Rajkamal - Embedded Systems, TMH, Second edition
2. Andrew sloss " Arm System Developer guide"
3. Data sheet and User manual of LPC2148.
4. Dr.K.V.K.K. Prasad - Embedded / real time system, Dreamtech.
5. Steve Furber - ARM System-on-Chip Architecture, Pearson
6. Jean J Labrose - MicroC / OS-II, Indian Low Price Edition

Elective-II

2. Digital Image Processing

COURSE OUTLINE

Digital Image Processing	**DIP**	
Course Title	Short Title	Course Code

Course Description:

This course presents the fundamentals and mathematical models in digital image processing, develop time and frequency domain techniques for image enhancement, expose the students to current technologies and issues and develop image processing applications in practice.

	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	**03**	**14**	**42**	**03**

Prerequisite Course(s): A background in basics of digital signal processing.

COURSE CONTENT

Digital Image Processing **Semester-VIII**
Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination(ESE) :80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Image Fundamentals **No of Lect. – 8, Marks: 16**

a) Introduction and Examples of Fields that use Digital Image Processing,
b) Fundamental Steps and components in Digital Image Processing,
c) Image Sensing ,Acquisition, Sampling and Quantization,
d)Spatial and Gray level Resolution, Basic pixel relationship,
e) Distance Measures, Statistical Properties

Unit-II: Image Enhancement: **No of Lect. – 8, Marks: 16**

Enhancement in Spatial Domain:

a) Basic Gray Level Transformations
b) Histogram Processing
c) Enhancements using arithmetic and logical operations
d) Smoothening and sharpening Spatial filters

Enhancement in Frequency Domain:
a)Smoothening and Sharpening frequency Domain Filters.

Unit-III: Image Coding and Compression: **No of Lect. – 8, Marks: 16**

a)Image Coding Fundamentals, Image Compression Model
b) Error Free Compression
c) Lossless Predictive Coding
d) Lossy-Compression, Lossy Predictive Coding, Transform Coding,
e) Image Compression Standards, JPEG Baseline Coder Decoder.

Unit-IV: Image Restoration and Color Image Processing: **No of Lect. – 9, Marks: 16**

a) Image Degradation Model, Noise Models,
b) Restoration in Presence of Noise in spatial Domain
c) Linear Filtering
d) Inverse Filter, Wiener Filter
e)Constrained Least Square Restoration, Geometrical Transformation
f) Spatial Transformation, and Grey Level Transformation.
g) Color Image Processing
h) Color models, RGB to HIS and vice versa
i) Color Transforms, Smoothing and Sharpening

Unit-V: Image Analysis and Image Processing Applications **No of Lect. – 8, Marks: 16**

a) Edge detection
b) Boundary representation by chain codes and B splines,
c) Morphological Image Processing: Dilation, Erosion, Opening, Closing on Binary Images,
d) Segmentation: Point, line. Edge detection, Boundary detection and Thresholding.
e) Applications: Character Recognition, Fingerprint Recognition, Remote Sensing.
f) Medical imaging, electron microscopy

Reference Books:

1) Gonzalez and Woods, "Digital Image Processing", Pearson Education,
2) A. K. Jain, "Fundamentals of Digital Image Processing"; Pearson Education
3) Pratt William, "Digital Image Processing", John Wiley & Sons
4) Arthur Weeks Jr., "Fundamentals of Digital Intake Processing", PHI.

Elective-II

3. Telematics

COURSE OUTLINE

Telematics	**Telematics**	
Course Title	Short Title	Course Code

Course Description:

This course presents the actual concepts of wired, wireless communication system and mobile communication system.

Lecture	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
	03	**14**	**42**	**03**

Prerequisite Course(s): A background in basic communication system.

COURSE CONTENT

Telematics **Semester-VIII**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Telephone switching and Traffic Engineering **No of Lect. – 8, Marks: 16**

a) Evolution of telecommunication, simple telephone communication, basics of switching systems
b) Dialing mechanism, electronics switching, digital switching system,
c) SPC configuration, Architecture features, centralized and distributed SPC, enhanced services.
d) Traffic Engineering, Introduction, Traffic usages, traffic measurement unit, traffic distribution, Grade of service, Blocking probability

Unit-II: Introduction to Wireless Communication System **No of Lect. – 8, Marks: 16**

a) History and evolution of mobile radio systems,
b) Examples of wireless communication systems, Paging, Cordless Telephone systems,
c) Cellular Telephone systems, Trends in cellular radio and Personal communications,
d) Wireless local loop and LMDS, Wireless Local Area Networks, Bluetooth and Personal Area Networks, IEEE 802.15, IEEE-802.16

Unit-III: Mobile cellular Telephony **No of Lect. – 8, Marks: 16**

a) Limitations of conventional mobile Telephone system, Frequency band allocation, Basic cellular system components,
b) Operations of a cellular system, Calculation of maximum number of calls per hour per cell, frequency channels per cell, concept of frequency reuse, cell splitting,
c) Hand off mechanism, Delayed hand off, Forced hand off. Mobile assisted hand off. Cell site hand off, Inter system hand off, co-channel Interference reduction factor, fading. Multi-user communication. TDMA, FDMA and CDMA.

Unit-IV: Digital cellular systems **No of Lect. – 8, Marks: 16**

a) GSM, radio aspects, features of GSM. Architecture details channel structure, security aspects, Authentication and ciphering key.
b) Different call flow sequences in GSM, North American CDMA cellular standard,
c) Radio aspect, forward link and Reverse link structure, key features of standard.

Unit-V: IP telephony **No of Lect. – 8, Marks: 16**

a) Introduction to VOIP, low level protocols, - RTP / RTCP / UDP,
b) Voice activity detection and discontinuous transmissions. IP telephony protocols: - H.323 standard, session Initiation protocol (SIP),
c) Gateway location protocol, QOS requirements, RSVP Architecture, message format, reservation merging.

Reference Books:

1. Vishwanathan - Telecommunication switching systems, PHI

2. William C.Y. LEE - Wireless and cellular Telecommunications, MGH , 3rd Ed, 4th Ed

3. Raj Pandya - Mobile and personal communication systems , PHI

4. Rappaport - Wireless communication, PHI

5. Andrew S Tanenbaum- Computer Networks, 4th ED, PHI/ Pearson Education

6. Alberto Leon Garcia - Communication network, TMH

7. Andreas F. Molisch - Wireless communication, Wiley

Elective-II

4. Neural Network and Fuzzy Logic

COURSE OUTLINE

Neural Network and Fuzzy Logic	**NNFL**	
Course Title	Short Title	Course Code

Course Description:
This course gives introduction to the artificial neural network and fuzzy logic which is basic requirement for intelligent system.

Lecture	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
	03	**14**	**42**	**03**

Prerequisite Course(s): A background in basic mathematics & set theory is required.

COURSE CONTENT

Neural Network and Fuzzy Logic **Semester-VIII**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) :03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Fundamentals of Neural Networks **No of Lect. – 8, Marks: 16**

a) Fundamental Concept: Artificial Neural Network, Biological Neural Network.
b) Evolution of Neural Networks.
c) Basic Models of ANN: Types based on Connections, Learning & Activation functions. Terminologies of ANN.
d) McCulloch-Pitts Neuron**:** Theory & Architecture.Linear & Non-Linear Separability.
e) Hebb Network: Thery, Training Algorithm.
f) Perceptron: Theory, Architecture.
g) Numericals.

Unit-II: Supervised Learning Networks **No of Lect. – 8, Marks: 16**

a) Perceptron Networks: Theory, Architecture, Perceptron learning rule, Flow Chart for Training Algorithm, Training algothms for single output classes & multiple output classes, Testing Algorithms.

b) Adaptive Linear Neuron (Adaline): Theory, Architecture, Delta rule for learning, Flowchart for training, Training Algorithm, Testing Algorithm.
c) Multiple adaptive Linear Neurons (Medaline): Theory, Architecture, Rule for learning, Flowchart for training, Training Algorithm, Testing Algorithm.
d) Back-Propagation Network: Theory, Architecture, Flowchart for Training Process, Training Algorithm,Learning Factors of BPN, Testing Algorithm.
e) Associative Memory Networks: Training algorithms for Pattern Association, Hebb Rule, Outer Product Rule.
f) Autoassociative Memory Network: Theory, Architecture, Flowchart for Training Process, Training Algorithm, Testing Algorithm.
g) Hetero Associative Memory Network: Theory, Architecture, Flowchart for Training Process, Training Algorithm, Testing Algorithm.
h) Bidirectional Associative Memory (BAM): Theory, Architectures.

Unit-III: Fundamentals of Fuzzy Logic No of Lect. – 8, Marks: 16

a) Fundamental Concept: Introduction to Fuzzy Logic. Applications.
b) Introduction to Classical Sets & Fuzzy Sets: **Classical Stes**- Operations, Properties, Function Mapping, **Fuzzy Sets**- Operations, Properties.
c) Classical Relations & Fuzzy Relations: **Classical Relations** – Cardinality, Operations, Properties, Composition of Classical Relations. **Fuzzy Relations** - Cardinality, Operations, Properties, Composition of Fuzzy Relations
d) Membership Functions: Features of membership function, Fuzzification, Various methods of membership value assignments.
e) Defuzzification: Lambda-Cuts on Fuzzy Sets, Lambda-Cuts on Fuzzy Relations, Various Defuzzification methods.

Unit-IV: Fuzzy Arithmetic, Measure & Rule Base Approximate Reasoning No of Lect. – 8, Marks: 16

a) Fuzzy Arithmetic: Interval Analysis, Fuzzy Numbers, Fuzzy Ordering, Fuzzy Vectors
b) Extension Principle
c) Fuzzy Measures: Belief & Plausibility Measures, Probability Measures, Possibility & Neccessity Measures.
d) Fuzzy Rule base & Approximate Reasoning: Truth Values & Tables in Fuzzy Logic, Fuzzy Propositions, Formation of Rules
e) Decomposition of Rules, Aggregation of Fuzzy Rules.
f) Fuzzy Inference System.

Unit-V: Applications & Advanced Systems No of Lect. – 8, Marks: 16

a) **Applications of Neural Networks:** Character Recognition Networks, Control System, Robot Kinematics, Expert Systems for Medical Diagnosis.
b) **Applications of Fuzzy Logic:** Pattern Recognition, Control System.

Reference Books:

1) Principles of Soft Computing by S. N. Sivanandam & S. N. Deepa, Wiley India, Edition
2) Fuzzy Logic with Engineering Applications by Timuthi J. Ross, Wiely.
3) Introduction to Artificial Neural Systems by Jacek M. Zurada, West Publishing Company

Elective-III

1. Robotics

COURSE OUTLINE

Robotics

Course Title | Short Title | Course Code

Course Description:

Lecture	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
	03	14	42	03

COURSE CONTENT

Robotics **Semester-VIII**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Introduction **No of Lect. – 8, Marks: 16**

Automation and Robotics, Definition, Laws of robotics, Basic Structure of Robots, Classification of Robots based on co-ordinate system, Present trends and future trends in robotics, Overview of robot subsystems, Components of Robot system-Manipulator, Controller, Power conversion unit etc, Specifications of robot, programming robots.

Unit-II: Dynamics & Kinematics **No of Lect. – 8, Marks: 16**

Dynamic constraints, velocity & acceleration of moving frames, Robotic Mass Distribution & Inertia, Tension, Newton's equation, Euler equations, Dynamic Modeling of Robotic Manipulators. Homogeneous co-ordinate vector operations, matrix operations, co-ordinate reference frames, Homogeneous transformation and manipulator orientation relative points reference frames, forward Kinematics - Link co-ordinate frames, D-H matrix, Inverse or back solutions- problem of obtaining inverse solution, techniques of using direct & geometric approach.

Unit-III: End Effectors and Actuators **No of Lect. – 8, Marks: 16**

Different types of grippers, vacuum & other methods of gripping, overview of actuators, Internal & External sensors, position, relocking and acceleration sensors, proximity sensors, force sensors, touch slip sensor, laser range finder, camera.

Unit-IV: Motion Planning and Controllers **No of Lect. – 8, Marks: 16**

On-off trajectory, relocking and acceleration profile, Cartesian motion of manipulator, joint interpolated control, Jacobian in terms of D-H matrix, Obstacle avoidance, Basic control system, control loops of robotic system, Fuzzy controllers.

Unit-V: Robot Vision **No of Lect. – 8, Marks: 16**

Machine Vision system, (description, sensing, Digitizing, Image Processing and Analysis), architecture of robotic vision system, and Application of Machine Vision System, Robotic assembly sensors & Intelligent Sensors.

Text Books:

1. Fundamentals of Robotics: Analysis and Control – Robert J Schilling,PHI, NewDelhi
2. Robotic Engineering – Klafter, Thomas, Negin,PHI, New Delhi
3. Robotics and Control- R. K. Mittal, I. J. Nagrath, TMH, NewDelhi

Reference Books:

1.Robotics for Engineers – Yoram Koren,McGraw Hill, New York
2.Fundamentals of Robotics– T.C. Manjunath, Nandu Publishers, Mumbai
3.MEMS and Microsystems Design and Manufacture- HSU, TMH , NewDelhi

Elective-III

2. Nanotechnology

COURSE OUTLINE

Nanotechnology	**Nanotech**	
Course Title	Short Title	Course Code

Course Description:

This course presents the actual concepts of nanoelectronics, Nano CMOS devices and nano material in order to meet a given system specification.

Lecture	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
	03	**14**	**42**	**03**

Prerequisite Course(s): A background in electronic circuits and VLSI .

COURSE CONTENT

Nanotechnology **Semester-VIII**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) :03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Introduction to Nanotechnology **No of Lect. – 8, Marks: 16**

a) Introduction: Evolution of science and technology, Introduction to Nanotechnology.

b) Nanotechnology–Definition–Difference between Nanoscience and Nanotechnology.

c) Feynman Predictions on Nanotechnology.

d) Role of Bottom up and top down approaches in nanotechnology, challenges in Nanotechnology.

Unit-II: Physical Chemistry of Solid Surfaces **No of Lect. – 8, Marks: 16**

a) Introduction, Surface Energy
b) Chemical potential as function of surface curvature.
c)Electrostatic Stabilization .
d) Steric Stabilization.

Unit-III: Nano particles and Nanotubes **No of Lect. – 8, Marks: 16**

a) Properties of Nano particles: Metal nanostructures and semiconducting nanoparticles.
b) Carbon nanostructure: carbon molecules, cluster, Nanotubes.
c) Properties of Nanotubes strength and elasticity.
d) Applications of Carbon Nanotubes.

Unit-IV: Special Nanomaterial **No of Lect. – 8, Marks: 16**

a) Characterization and tool: carbon nano tubes, nano composites, carbon fullerenes.
b) Micro and mesoporous material, core shell structure. Organic-Inorganic Hybrid
c) Intercalation Compounds, Nanocomposite & Nanograined material.
d) Inverse opals,Bio induced nanomaterial.

Unit-V: Nanotechnology in Electronics **No of Lect. – 8, Marks: 16**

a) Nanomachines and nano devices, NEMS and MEMS and their fabrication.
b) Use of nanotechnology in electronics, Application of nano structure in electronics, sensor, optics, energy capture, transformation and storage.
c) Applications of nanotechnology in biomedical electronics. Drug & Drug Delivery
d) Photodynamic therapy, Molecular motors, Neuroelectronic interface

Reference Books:

1) Mark Ratner and Daniel Ratner," Nanotechnology: A Gentle introduction to next big Idea". Pearson Education.
2) Introduction to Nanotechnology-by Charles P. Poole Jr. Frank J. Owens-John Wiley & Sons.
3) Nano structure & Nano material by Guozhong cao, Imperial College Press.

Elective-III

3. Telecomm Network Management

COURSE OUTLINE

Telecomm Network Management	**TNM**	
Course Title	Short Title	Course Code

Course Description: To understand the concept of Telecom Network Management, architecture, protocol and its Applications.

Lecture	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): A background basic in Network Management system.

COURSE CONTENT

Telecomm Network Management
Semester-VIII
Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Foundations and TMN architecture: **No of Lect. – 8, Marks: 16**

a) Network management standards, network management model,
b) organization model, information model,
c) abstract syntax notation 1 (ASN. 1),
d) encoding structure, macros, functional model. Terminology, functional TMN architecture, Information architecture,
e) physical architecture, TNN tube
f) TMN and OSI

UNIT II : Network managements: **No of Lect. – 8, Marks: 16**

a)Configuration management, fault management.
b) Performance management.
c) Error correlation technology.
d) Security management.
e) Accounting management, service level management,
f) Management service.

UNIT III : TMN modeling & service **No of Lect. – 8, Marks: 16**

a) CMISE model, service definitions,
b) Errors, scooping and filtering features,
c) Synchronization, functional units, association services,
d) Common management information protocol specification.
e) Rationale for information modeling, management information model, object oriented modeling paradigm,
f) Management information base (MIB)

UNIT IV: SNMP **No of Lect. – 8, Marks: 16**

a) SNMPv1: managed networks, SNMP models, organization model, information model b)

b)**SNMPv2:** communication model, functional model, major changes in SNMPv2, structure of management information (SMI), MIB.

c) SNMPv2 protocol compatibility with SNMPv1.

d) **SNMPv3:** architecture, applications, MIB security.

e) Remote monitoring SM and MIB, RMON1 and RMON2.

UNIT V: Network management and tools **No of Lect. – 8, Marks: 16**

a) ATM integrated local management interface, ATM, MIB M1, M 2, M 3, M 4 interfaces,
b) ATM digital exchange interface management,
c) Digital subscriber loop (DSL) and asymmetric DSL technologies,
d) Network statistics management.
e) Management platform case studies: OPENVIEW, ALMAP

Reference Books:

1. Mani Subramaniam, ―Network Management Principles and Practise", Addison Wisely, New York, 2000.
2. Lakshmi G. Raman, ― Fundamental of Telecommunications Network Management" Eastern Economy Edition, IEEE Press New Delhi.
3. Salh Aiidarons, Thomas Plevoyak ―Telecommunications Network Technologies and implementations" Eastern Economy Edition, IEEE press New Delhi-1998.
4. Telecommunication Network Management - Haojin Wang Mc-Graw Hill Professional Publication.

Elective-III

4. Antenna and Wave Propagation

COURSE OUTLINE

Antenna and Wave Propagation	**A&WP**	
Course Title	Short Title	Course Code

Course Description:

The objective of this course is to provide an in- depth understanding of modern antenna concepts, and practical antenna design for various applications. The course will explain the theory of different types of antennas used in communication systems

	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	**03**	**14**	**42**	**03**

Prerequisite Course(s): The course requires knowledge about fundamental antenna theory and advanced electromagnetic field theory. The following experience is useful: understating vector calculus, some knowledge of Maxwell's equations, electrical engineering principles.

COURSE CONTENT

Antenna and Wave Propagation **Semester-VIII**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Antenna Fundamental Concepts: **No of Lect. – 8, Marks: 16**

Definitions – Radiation intensity – Directive gain – Directivity – Power gain – Beam width – Band width – Gain and radiation resistance of current element – Half-wave dipole and folded dipole – Reciprocity principle – Effective length and effective area, Relation between gain, effective length and radiation resistance. Physical concept of radiation, Radiation pattern, near- and far-field regions, effective aperture, polarization, input impedance, efficiency, Friis transmission equation, radiation integrals and auxiliary potential functions.

Unit-II:Antenna Arrays, Radiation from Wires and Loops: **No of Lect. – 8, Marks: 16**

Antenna array concept, Analysis of uniformly spaced arrays with uniform and non-uniform excitation amplitudes, extension to planar arrays.

Infinitesimal dipole, finite-length dipole, linear elements near conductors, dipoles for mobile communication, small circular loop.

Unit-III: Aperture Antennas: **No of Lect. – 8, Marks: 16**

Huygens' principle, radiation from rectangular and circular apertures, design considerations, Babinet's principle, Radiation from sectoral and pyramidal horns, design concepts.

Broadband Antennas: Broadband concept, Log-periodic antennas, frequency independent antennas.

Unit-IV: Microstrip Antennas: **No of Lect. – 8, Marks: 16**

Concept, Advantages and disadvantages, Basic characteristics of microstrip antennas, feeding methods, methods of analysis, design of rectangular and circular patch antennas.

Unit-V: Wave Propagation **No of Lect. – 8, Marks: 16**

The three basic types of propagation: Ground wave, space wave and sky wave propagation.

Sky Wave Propagation: Structure of the ionosphere – Effective dielectric constant of ionized region – Mechanism of refraction – Refractive index – Critical frequency – Skip distance – Effect of earth's magnetic field – Energy loss in the ionosphere due to collisions – Maximum usable frequency – Fading and diversity reception.

Space Wave Propagation: Reflection from ground for vertically and horizontally polarized waves – Reflection characteristics of earth – Resultant of direct and reflectedray at the receiver – Duct propagation.

Ground Wave Propagation: Attenuation characteristics for ground wave propagation – Calculation of field strength at a distance.

Reference Books:

1. C. A. Balanis, "Antenna Theory and Design", 3rd Ed., John Wiley & Sons., 2005.
2. Antennas And Wave Propagation by: K.D.PRASAD
3. Harish A. R., Antenna and wave propagation, Oxford University Press.

Satellite & Mobile Communication Lab

LAB COURSE OUTLINE

Satellite & Mobile Communication Lab	**SMC LAB**	
Course Title	Short Title	Course Code

Course Description:

This course describes the basics of Satellite and Mobile communication to the undergraduate students. Mobile communications provide terrestrial coverage in densely populated areas, while satellite communications enable wireless communication in regions where mobile networking is not cost-effective. The program gives you an in-depth understanding of the engineering aspects of these important current and future technologies.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	15	30	1

Total Semester Credits: 3

Prerequisite Course(s): Communication System-I, Communication System-II.

LAB COURSE CONTENT

(Note: Minimum FOUR Experiments from each group.)

Group A

1. To set up Direct link
2. To set up Active Satellite link
3. To Study Satellite transponder
4. To set up Satellite communication link
5. To transmit and receive function generator waveforms through Satellite link.
6. To understand the shape of Earth. Measurement of latitude and longitude.
7. To understand the principle of PRN code in GPS.

Group B

8. To establish PC-to-PC Communication using Satellite Communication link.
9. To establish the link between GPS Satellite and GPS Trainer.
10. Mobile Transmitter and Receiver (Trainer Kit)
11. To study GSM architecture
12. To Study cordless Telephone system
13. To study CDMA
14. To study VOIP
15. To study RSVP Architecture.
16. Study of GSM AT commands.

Guide lines for ESE:-

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of Group A and Group B. Evaluation will be based on paper work and performance in the practical.

References:

1. D. Roddy, "Satellite Communications", Tata McGraw-Hill, 4^{th} Edition, ISBN-0-07-007785-1.
2. T. Rappaport, "Wireless Communications-Principles and Practice, 2^{nd} Edition, ISBN-978-81-317-3186-4.

Radiation & Microwave Techniques Lab

LAB COURSE OUTLINE

Radiation and Microwave Techniques	**RMT LAB**	
Course Title	Short Title	Course Code

Course Description:

The objective of this lab is to familiarize the students with microwave communication techniques, different sources, passive devices and antennas used in microwave communication.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**14**	**28**	**1**

Total Semester Credits: 1

Prerequisite Course(s): A background of Electromagnetic field theory, and communication system.

LAB COURSE CONTENT

(Note: Minimum Eight experiments to be perform)

SN	Experiment Title
1	Plot and study V-I Characteristics of GUNN Diode
2	Plot and study Reflex Klystron Characteristics
3	Measurement of Attenuation (Fixed and Variable)
4	Microwave Junction: Power splitting Characteristics (E / H/ EH plane tee)
5	Measurement of coupling factor, insertion loss, directivity and isolation of Directional coupler
6	Study of Circulators (Y or T Type) and Isolators (measurement of isolation)
7	Measurement of VSWR (using V_{max} / V_{min} method)
8	Plot radiation pattern of horn antenna.
9	Plot radiation pattern of parabolic antenna.
10	Measurement of unknown impedance using smith chart
11	Study of MIC components.

Guide lines for ESE:- ESE will be based on practical assignment submitted by the student in the form of journal. Evaluation will be based on paper work and performance in the practical.

Elective-II Lab

1. Embedded System Lab

LAB COURSE OUTLINE

Embedded System Lab

Course Title	Short Title	Course Code

Course Description:
The objective of this lab is to familiarize the students with LPC 2148 and the real time operating system concepts.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	12	24	1

Total Semester Credits: 1

LAB COURSE CONTENT

1. Study of IDE (integrated development environment)
2. C-Program to explore timers / counter.
3. C-programs for interrupts.
4. Program to interface LED and switch.
5. Program to interface LCD.
6. Program to interface Keyboard and display key pressed on LCD.
7. Program to interface stepper motor.
8. Writing basic C-programs for I / O operations.
9. Implementation of USB protocol and transferring data to PC.
10. Implementation of algorithm /program for the microcontroller for low power modes.
11. Program to demonstrate RF communication.
12. Writing a scheduler / working with using RTOS for 4 tasks with priority. The tasks may be keyboard, LCD, LED etc. and porting it on microcontroller/ microprocessor

Note: Lab file should consist of minimum eight experiments.

Guide lines for ESE:-

ESE will be based on practical assignment submitted by the student in the form of journal. Evaluation will be based on paper work and performance in the practical.

Elective-II Lab

2. Digital Image Processing Lab

LAB COURSE OUTLINE

Digital Image Processing	**DIP LAB**	
Course Title	Short Title	Course Code

Course Description:
In this laboratory course Image processing has grown considerably due to fast computational systems. Many important real life applications indiverse fields are therefore possible.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	14	28	1

Total Semester Credits: 1

Prerequisite Course(s): A background in basic Digital signal processing.

LAB COURSE CONTENT

(Note: Minimum Eight experiments to be perform)

1. **Study of different file formats e.g. BMP, TIFF and extraction of attributes of BMP.**
a. BMP.
b. TIFF and extraction of attributes of BMP.

2. **Study of statistical properties- mean, standard deviation, profile, variance and Histogram plotting.**
   a. Study of statistical properties-mean, standard deviation and profile.
   b. Study of statistical properties- variance and Histogram plotting.

3. **Histogram equalization and modification of the image.**

   a. Histogram equalization of the image.

   b. modification of the image.

4. **Gray level transformations such as contrast stretching, negative, power law transformation.**

   a. Contrast Stretching, negative.

   b. Power Law Transformation.

5. Spatial Domain filtering- smoothing and sharpening filters.

a. Spatial Domain filtering- smoothing filters.

b. Spatial Domain filtering- sharpening filters.

6. DCT / IDCT of given image.

a. DCT of given image.

b. IDCT of given image.

7. Edge detection using Sobel, Prewitt and Roberts operators.

a.Edge detection using Sobel,Prewitt operators.

b.Edge detection using Roberts operators.

8. Capturing image through grabber card from camera and Process it.

9. Application Development

a. Biometric Authentication such as Face / Finger Print / Signature Recognition.

b.Human Expression Detection.

10. Creating noisy image and filtering using MATLAB.

11. Study of morphological processing in digital image.

12. Converting color image to B / W image and vice versa.

Note: Lab file should consist of minimum Eight experiments.

All experiments must performed using MATLAB or Scilab only.

Guide lines for ESE:-

ESE will be based on practical assignment submitted by the student in the form of journal. Evaluation will be based on paper work and performance in the practical.

Elective-II Lab

3. Telematics Lab

Telematics

Course Title	Short Title	Course Code

Course Description: In this laboratory course emphasis is the study and testing of various trainer kit in laboratory

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	**15**	**30**	**1**

Total Semester Credits: 1

Prerequisite Course(s): A background in basic communication system.

LAB COURSE CONTENT

(Note: Minimum eight experiments to be perform)

1. To Study Electronic Telephone exchange (C-Dot. OR E-10B)

a. CDOT MAX-XL switching network on PSTN platform
b. Trunk group setup and call flow analysis on CDOT MAX-XL switching system
c. Subscribers Management and features in CDOT MAX-XL switching system
d. SS7 signaling setup in CDOT MAX-XL switching system

2. Traffic Measurement calculations

a. Study of different traffic parameters and calculations

3. To Study Digital cordless Telephone system

a. Study the functional block diagram and operation of all sections of Digital Cordless Telephone system - Base unit
b. Study the Polarity protection block
c. Study the functional block diagram and operation of all sections of Handset unit
d. Study the charging circuit (with Base unit as well as with adaptor)

4. To Study Telephone Trainer Kit

a. Understanding of Telephone
b. Study of Telephone features

c. Study of Speech Circuits, ringers, tone dialing, pulse dialing and switching mechanism between subscribers: incoming and outgoing calls.

5. Study of Mobile Transmitter and receiver

a. Study and observe Transmitted/Received RF signals
b. Study and observe Tx IQ/ Rx IQ signals
c. Study and observe signal constellation of GMSK signal (Tx I/Q) & (Rx I/Q)
d. Study and measure Battery voltages the Battery charging phenomena
e. Study and analyze Different sections & fault finding

6. Study of DTMF signaling including DTMF decoder

a. Study of the Telephone by Line Connection
b. Study of the Polarity Protection Block
c. Study of the Working of Voltage Dropper Circuit in Telephone

7. To study GSM architecture

a. GSM Theory & Standards
b. Understanding of GSM technology, its network, GSM capability & data services

8. Study of GSM AT commands

a. Understanding RF environment & study of GSM network by actually connecting to the GSM environment by any service provider.
b. Command Level Study
c. Real Time study of GSM 07.05 & 07.07 commands

9. To study CDMA

a. To study theory of CDMA DSSS Modulation & 4 Demodulation
b. To generate CDMA-DSSS signal
c. To demodulate CDMA-DSSS signal using BPSK
d. To study pseudo random bit sequence generation.

10. To study of VOIP

a. To Study the Block Diagram and Working principle of VOIP

11. To study of RSVP architecture

a. To study the RSVP as part of the integrated services approach that provide QOS to individual application

Reference Books:

1. Vishwanathan - Telecommunication switching systems, PHI
2. William C.Y. LEE - Wireless and cellular Telecommunications, MGH , 3rd Ed, 4^{th} Ed
3. Raj Pandya - Mobile and personal communication systems , PHI
4. Rappaport - Wireless communication, PHI
5. Andrew S Tanenbaum- Computer Networks, 4^{th} ED, PHI/ Pearson Education
6. Alberto Leon Garcia - Communication network, TMH
7. Andreas F. Molisch - Wireless communication, Wiley

Elective-II Lab

4. Neural Network and Fuzzy Logic Lab

LAB COURSE OUTLINE

Neural Network and Fuzzy Logic	**NNFL LAB**	
Course Title	Short Title	Course Code

Course Description:
In this laboratory course emphasis is on the hand on practice of various Neural network & Fuzzy logic techniques in laboratory.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	14	28	1

Total Semester Credits: 1

Prerequisite Course(s): A background in NNFL theory.

LAB COURSE CONTENT

(Note: Minimum eight experiments to be perform)

1. To study and implement AND, OR, NAND etc logic function using perceptron.
2. To study and implement EX—OR logic function using perceptron
3. To study and implement MEDALINE network.
4. To study and implement back propagation network.
5. To study and implement BAM algorithm.
6. To study and implement fuzzy compositions of given examples.
7. To study and implement fuzzification methods.
8. To study and implement defuzzification methods.
9. To study and implement fuzzy rule base system.
10. To study fuzzy inference system.
11. To study and implement neural system for Character Recognition/ Control System/ Expert Systems for Medical Diagnosis.
12. To study and implement Fuzzy Logic system for Pattern Recognition/Control system.

Note: All the experiments should be performed by using Scilab/Matlab only.

Guide lines for ESE:-

ESE will be based on practical assignment submitted by the student in the form of journal. Evaluation will be based on paper work and performance in the practical.

Industrial Lecture

COURSE CONTENT

Industrial Lecture

Course Title	Short Title	Course Code

Course Description:

The gap between industry's needs and the academic community's aspirations appears to be considerably large. There exists a strong feeling, at least in the academic circles, that unless technology driven initiatives find a surer place in the industrial sector in this country, the academia-industry interaction is likely to remain confined to developmental activities with limited exploratory or research-based content As institutes committed primarily to creation and growth of technological knowledge, technical institutes have an important role to play in the industrial sector of the country's economy. This fact by way of encouraging mechanisms to foster interaction between the academia and industry. Typically, academic interest in the multidimensionality of a problem leads to a tendency to explore a variety of options to arrive at a solution. This industrial lecture develops ability of student for expectations of the industrialists from the fresh engineers.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	**1**	**15**	**15**	**2**

COURSE CONTENT

Semester-VIII

Examination Scheme
Total Semester Credits: 02
Internal Continuous Assessment (ICA): 50 Marks

1. There is a need to create avenues for a close academia and industry interaction through all the phases of technology development, starting from conceptualization down to commercialization.
2. List of renowned persons from industry shall be prepared by the committee appointed by Head of the department. After approval from the Principal, Minimum five Industrial lectures in alternate week shall be arranged, which shall be delivered by the experts/Officials from Industries/Govt. organizations/ Private Sectors/Public Sectors / R&D Labs covering the various aspects.
3. Topics of Industrial Lectures shall be Technical in nature and should not be the specific contents from the curriculum.
4. Students shall submit the report based on minimum five lectures giving summary of the lecture delivered.
5. The summary should contain brief resume of the expert, brief information of his organization and brief summary of the lecture in bullet point form.

Guide lines for ICA : Assessment of the Industrial Lecture for award of ICA marks shall be done jointly by departmental committee as per attendance in industrial lecture, report submitted by student and overall performance in semester as per the guidelines given in **Table- D**

Table-D

SN	Name of Student	Attendance (05 Marks per Lecture)	Dept of Understanding (03 Marks per Lecture)	Report Writing	Total
		25	15	10	50

Project-II

Project-II
Course Title | Short Title | Course Code

Course Description:
The course explores the knowledge of design, experiment and analysis of data. The course develops ability to work on multidisciplinary teams, Identify, formulate, and solve engineering problems in view of economic, environmental and societal context.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	4	**15**	**60**	**6**

COURSE CONTENT

Semester-VIII

Examination Scheme
Total Semester Credits: 06
Internal Continuous Assessment (ICA): 75 Marks
End Semester Examination (ESE):75 Marks
Total:150Marks

1. Project-I work decided in VII semester shall be continued as Project-II
2. Students should complete implementation of ideas given in synopsis/Abstract, so that project work should be completed before end of semester.
3. Project-II may involve fabrication, design , experimentation , data analysis within realistic constraints such as economic, environmental, social, ethical, health and safety, manufacturability, and sustainability. The stage also includes testing , possible results and report writing
4. Each students project group is required to maintain log book for documenting various activities of Project-II and submit group project report at the end of Semester-VIII in the form of Hard bound.
   a. Title
   b. Abstract
   c.Introduction
   d. Problem identification and project objectives
   e. Literature survey
   f. Case study/Analysis/Design Methodology
   g. Project design and implementation details
   h. Result and conclusion
   i. Future scope
   j. references.

Guide lines for ICA : ICA shall be based on continuous evaluation of students performance throughout semester in project-II and report submitted by the students project group in the form Hard bound. Assessment of the project-II for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given in **Table-D.**

Guide lines for ESE:-
In ESE the student may be asked for demonstration and questions on Project. Evaluation will be based on answers given by students in oral examination.

Assessment of Project-II

Name of the Project: ____

Name of the Guide: ____

Table-D

		Assessment by Guide (50 Marks)				Assessment by Committee (25 Marks)		
SN	Name of Student	Attendance , Participa-tion and team work	Material procurement / assembling/Designing/Programming	Case study/ Execution	Project Report	Dept of Understan-ding	Presentation	Total
Marks		10	15	15	10	10	15	75

NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Final Year Engineering

(Information Technology)

Faculty of Engineering and Technology

COURSE OUTLINE

Semester – VII

W.E.F. 2015– 2016

Annexure - I

BE Semester - VII

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Advanced Unix Programming*	D	3	---	---	3	20	80	---	---	100	3
Enterprise Resource Planning	D	3	---	---	3	20	80	---	---	100	3
Interdisciplinary Elective	E	3	---	---	3	20	80	---	---	100	3
Elective - I	E	3	---	---	3	20	80	---	---	100	3
Embedded System*	D	3	--	---	3	20	80	---	---	100	3
Advanced Unix Programming Lab*	D	---	---	2	2	---	---	25	25**(PR)**	50	1
Embedded System Lab*	D	---	---	2	2	---	---	25	25**(OR)**	50	1
Elective – I Lab #	E	---	---	2	2	---	---	25	25**(OR)**	50	1
Project – I*	D	---	---	2	2	---	---	25	25**(OR)**	50	2
Seminar – II*	D	---	---	2	2	---	---	25	---	25	2
Industrial Visit*	D	---	---	---	---	---	---	25	---	25	1
Total		**15**	**---**	**10**	**25**	**100**	**400**	**150**	**100**	**750**	**23**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA: Internal Continuous Assessment**

#Lab for Elective-I

Inter Disciplinary Elective
1 Software Engineering & Project Management
2 Enterprise Resource Planning and SAP

Elective I
1 Pattern Recognition
2 Android Programming*
3 Human Computer Interaction*
4 Artificial Intelligence

*** Common Subjects with BE Comp**

BE Semester – VIII

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Internet Security	D	3	---	---	3	20	80	---	---	100	3
Data Warehousing & Mining*	D	3	---	---	3	20	80	---	---	100	3
Elective - II	E	3	---	---	3	20	80	---	---	100	3
Elective - III	E	3	---	---	3	20	80	---	---	100	3
Internet Security Lab	D	---	---	2	2	---	---	25	25**(PR)**	50	1
Data Warehousing & Mining Lab*	D	---	---	2	2	---	---	25	25**(OR)**	50	1
Elective - II Lab#	E	---	---	2	2	---	---	25	25**(OR)**	50	1
Industrial Lecture$	C	---	---	1*	1	---	---	50	---	50	2
Project – II*	D	---	---	4	4	---	---	75	75 **(OR)**	150	6
Total		**12**	**---**	**11**	**23**	**80**	**320**	**200**	**150**	**750**	**23**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA: Internal Continuous Assessment**

#Lab for Elective-II

$ Minimum 6 lectures to be conducted by experts from the industry in alternate weeks. Next week group discussion on the lecture conducted.

Elective II

1 Software Metrics & Quality Assurance*
2 Distributed System*
3 Cryptography & Network Security*
4 Neural Network & Fuzzy Logic*

Elective III

1 Mobile Computing*
2 Bio-Informatics*
3 Cloud Computing
4 iPhone Programming*

*** Common Subjects with BE Comp**

Advanced UNIX Programming

COURSE OUTLINE

Course Title	Short Title	Course Code
Advanced UNIX Programming	**AUP**	

Course Description:

The principle objective of this course is to teach students

a. How UNIX is designed and structured.
b. How to write programs on and for Unix Platforms.
c. How to work efficiently within Unix Environment.
d. Command level view of Unix OS.
e. The important parts of the Unix Operating system's application programming interface.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	3	14	42	3

Prerequisite Course(s): Basic Knowledge of operating system (Unix/Linux) and C Programming.

COURSE CONTENT

Advanced UNIX Programming **Semester-VII**

Teaching Scheme **Examination Scheme**

Lecture: 3 Hours/Week

End Semester Examination (ESE)	:	**80 Marks**
Paper Duration (ESE)	:	**03 Hours**
Internal Sessional Exam (ISE)	:	**20 Marks**

1. **(8 Hrs, 16 Marks)**

a. **Unix System Overview-** Introduction, UNIX Architecture, Logging In, Files and Directories, Input and Output
b. Programs and Processes, Error Handling, User Identification, Signals
c. Time Values, System Calls and Library Functions
d. **File I/O-** Introduction, File Descriptors, open Function, creat Function, close Function, lseek Function, read Function, write Function
e. File Sharing, Atomic Operations- Appending to a file, Creating a file

f. dup and dup2 Functions, sync, fsync, and fdatasync functions, fcntl function

2. **(8 Hrs, 16 Marks)**

a. **Files and Directories**- Introduction, stat, fstat, and lstat Functions, File Types, File Access Permissions, access Function, umask Function
b. chmod and fchmod Functions, Sticky Bit, File Size, File Truncation, File Systems,link,unlink,remove and rename function
c. Symbolic Links, symlink and readlink Functions, File Times, mkdir and rmdir Functions, chdir, fchdir, and getcwd Functions
d. **System Data Files and Information** – Introduction, Password File-getpwuid, getpwnam, getpwent, setpwent, endpwent, Shadow Passwords- getspnam, getspent, setspent, endspent
e. Group File- getgrgid, getgrnam, getgrent, setgrent, endgrent, Login Accounting, System Identification- uname, gethostname
f. Time and Date Routines- time, gettimeofday, gmtime, localtime, mktime, asctime,ctime, strftime

3. **(8 Hrs, 16 Marks)**

a. **Process Environment-** Introduction, main Function, Process Termination- Exit Functions, atexit Function
b. Command-Line Arguments, Environment List, Memory Layout of a C Program, Memory Allocation- malloc , calloc, realloc, free
c. Environment Variables
d. **Process Control** – Introduction, Process Identifiers- getpid, getppid, getuid, geteuid, getgid, getegid
e. fork Function- file sharing, vfork Function, wait and waitpid Functions
f. Race Conditions, exec Functions- execl, execv, execle, execve, execlp, execvp, Process Accounting

4. **(8 Hrs, 16 Marks)**

a. **Signals** – Introduction, Signal Concepts, signal Function, Unreliable Signals
b. Interrupted System call ,Reliable-Signal Terminology and Semantics, kill and raise Functions, alarm and pause Functions
c. Signal Sets- sigemptyset, sigfillset, sigaddset, sigdelset, sigismember, sleep Function
d. **Threads** – Introduction, Thread Concepts, Thread Identification-pthread_equal, pthread_self, Thread Creation- pthread_create, Thread Termination-pthread_exit,pthread_join,pthread_cancel, pthread_cleanup_push, pthread_cleanup_pop, pthread_detach
e. Thread Synchronization-pthread_mutex_init, pthread_mutex_destroy, pthread_mutex_lock, pthread_mutex_trylock, pthread_mutex_unlock
f. **Daemon Processes** – Introduction, Daemon Characteristics, Coding Rules, Error Logging

5. (8 Hrs, 16 Marks)

- **a. Interprocess Communication** – Introduction, Pipes, FIFOs-mkfifo, XSI IPC, identifires and keys, ftok
- **b.** Message Queues- msgget, msgctl, msgsnd, msgrcv, Semaphores-semget, semctl, semop, Shared Memory-shmget, shmctl, shmat, shmdt
- **c. Network IPC-** Socket Descriptors- socket, shutdown
- **d.** Associating Addresses with sockets- bind
- **e.** Connection Establishment- connect, listen, accept
- **f.** Data Transfer- send, recv

Text Book:

1. W. Richard Stevens and Stephen A. Rago, Advanced Programming in the UNIX Environment, 2/E, Pearson Education

Reference Book:

1. W. Richard Stevens, Unix Network Programming - Interprocess Communications, Volume 2, 2/E, Pearson Education

Enterprise Resource Planning

COURSE OUTLINE

Course Title	Short Title	Course Code
Enterprise Resource Planning	**ERP**	

Course Description:

This course is aimed at introducing foundation understanding of enterprise systems and how these systems fit into today's business operations. Enterprise Systems are now essential infrastructure to both large corporate entities, as well as to small-to-medium organization, as they remove the need to have a large number of separate individual computer-based applications.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	**3**	**14**	**42**	**3**

Prerequisite Course(s): None

COURSE CONTENT

Enterprise Resource Planning **Semester-VII**

Teaching Scheme **Examination Scheme**

Lecture: 3 Hours/Week

End Semester Examination (ESE)	:	**80 Marks**
Paper Duration (ESE)	:	**03 Hours**
Internal Sessional Exam (ISE)	:	**20 Marks**

1. Introduction to Enterprise Resource Planning (8 Hrs, 16 Marks)

a. Introduction: A brief history of ERP, Reasons for the growth of the ERP market, The advantages of ERP.

b. Enterprise- An Overview: Business functions and business processes, Integrated management information, The role of the Enterprise, Business modeling, Integrated data model.

c. Benefits of ERP: Information integration, Reduction of lead-times, on-time shipment, Reduction in cycle time, improved resource utilization, Better customer satisfaction, Improved supplier performance, Increased flexibility, Reduced quality costs, Better analysis and planning capabilities, Improved information accuracy and decision making capability, Use of latest technology.

2 ERP and Related Technologies (8 Hrs, 16 Marks)

a. ERP Related Technologies: Business process re-engineering(BPR), Business intelligence(BI), Business analytics(BA), Data Warehousing, Data Mining, On-line analytical processing (OLAP), Product-life cycle management(PLM), Supply chain management (SCM), Customer relationship management (CRM), Geographic information systems (GIS), Intranets and Extranets.

b. ERP Security: Technological advancements, Computer Crimes, ERP and security, Computer security, Crime and security.

3 ERP Marketplace and Functional Modules (8 Hrs, 16 Marks)

a. ERP Marketplace and Marketplace Dynamics: Market overview, ERP market Tiers, Saas, Iaas and Paas, Marketplace dynamics- on-premise ERP and on-demand ERP, Industry-wise ERP market share, ERP: The Indian scenario.

b. Business Modules of an ERP Package: Functional modules of ERP software, Integration of ERP, Supply chain and customer relationship applications.

4 ERP Implementation (8 Hrs, 16 Marks)

a. ERP Implementation Basics: Why ERP?, Technical, operational and business reasons for implementing ERP, Challenges to successful ERP implementation, The implementation challenges.

b. ERP Implementation Life Cycle: Objectives of ERP implementation, Different phases of ERP implementation, Why do many ERP implementation fails?

c. ERP Package Selection: Why many ERP package implementations fail?, ERP package evaluation and selection, The selection process, ERP packages: make or buy?

5 ERP- Present and Future (8 Hrs, 16 Marks)

a. ERP and E-Business: ERP and E-Business, E-Business: supply chain integration, The E-Business process model, Components of the E-Business supply chain, ERP/E-Business integration.

b. ERP, The Internet and WWW-ERP II: The Internet explosion, ERP, the Internet and WWW, ERP to ERP II: bringing ERP to the entire enterprise, Best practices of ERP II.

c. Future Directions and Tends in ERP: New markets, New Channels, Faster implementation methodologies, Easier customization tools, Reduction in implementation time, Growth of third party service providers, Growth of Saas and Cloud ERP market, Industry specific solutions, Mobile ERP solutions.

d. ERP Case Studies: SAP, Oracle JD Edwards, Oracle Peoplesoft, QAD.

Text Books:

1. Alexis Leon, "Enterprise Resource Planning", Third Edition, Tata McGraw Hill, 2014.
2. Vinod Kumar Garg, N.K Venkitakrishna, "ERP Concepts and Practice", PHI
3. S. Sadagopan, "ERP – A Managerial Perspective", Tata McGraw Hill

Reference Books:

1. V.K. Garg, N .K. Venkita Krishnan, "ERP Ware: ERP Implementation Framework ", PHI.
2. Henandez, "The SAP R/3 Handbook", 2nd ED., Tata McGraw Hill
3. Ravi Shankar , S. Jaiswal, "Enterprise Resource Planning", Galgotia.
4. AnnettaClewwto and Dane Franklin, "Guide to Planning ERP Application",McGRaw-Hill, 1997.
5. Dr. Ravi Kalakota, "E-Business Network Resource planning using SAP R/3 Baan and Peoplesoft : A Practical Roadmap For Success".

Software Engineering & Project Management

(Inter Disciplinary Elective)

COURSE OUTLINE

Course Title	Short Title	Course Code
Software Engineering & Project Management	**SEPM**	

Course Description: The objective of this course is to introduce students from other engineering streams to get the knowledge of Software Development Life Cycle, application of analysis, design, testing principles and project planning & management concepts to develop quality software economically.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Software Engineering

COURSE CONTENT

Software Engineering & Project Management **Semester-VII**

Teaching Scheme **Examination Scheme**

Lecture: 3 Hours/Week **End Semester Examination (ESE): 80 Marks**
Paper Duration (ESE): 03 Hours
Internal Sessional Exam (ISE): 20 Marks

1. Introduction to Software Engineering **(08Hrs, 16 Marks)**

a. Nature of Software
b. Software Process
c. Software Engineering Practice
d. Software Myths
e. Generic Process model
f. Process Assessment and Improvement
g. Perspective Process Models
h. Specialized Process Models
i. Personal and Team Process Models

2. Introduction to Project Management **(08Hrs, 16 Marks)**

a. What is project
b. The triple constraint
c. What is project management , Stakeholders, Project Management Knowledge Area , Project Management tools and techniques
d. Role of a Project Manager , Project Manager's job description, Suggested Skills for Project Manager , Importance of people and leadership skills
e. Project Management
f. Organizational Structure
g. Project Life Cycle and Phases
h. Nature of IT projects

i. Characteristics of IT project Team members
j. Trends affecting IT Project Management, Globalization , Outsourcing , Virtual Teams

3. Project Integration & Scope Management (08Hrs, 16 Marks)

a. Project Selection
b. Developing Project Charter
c. Developing Project Management Plan
d. Collecting Requirements
e. Creating Work Breakdown Structure
f. Controlling Scope

4. Project Time & Cost Management (08Hrs, 16 Marks)

a. Defining and Sequencing Project Activities and Dependencies
b. Developing Schedule, Gantt Chart, Critical Path Method , Incorporating Project Uncertainty - PERT , Critical Chain Method
c. Resource loading and Resource Leveling
d. Schedule Controlling
e. Estimating Techniques
f. Earned Value Management
g. Project Quality Management
h. Planning Quality
i. Performing Quality Assurance
j. Quality Control, Tools and Techniques

5. Project Resource & Communication Management (08Hrs, 16 Marks)

a. Development of Human Resource Plan
b. Project Organizational Chart and Responsibility Assignment
c. Multi project Scheduling and Resource Allocation
d. Identifying Stakeholders
e. Planning Communication

Text Books:

1. Pressman Roger S., "Software Engineering: A Practitioners Approach", 7th Edition, Tata McGraw Hill.
2. Joseph Phillips, PMP Project Management Professional Study Guide, Third Edition McGraw Hill.

Reference Books:

1. Samuel Mantel, Jack Meredith, Scott Shafer, Margaret M. Sutton, With M.R. Gopalan,"Project Management Core Text Book", Wiley India Edition.
2. K.K. Chitkara, UddeshKohli, "Project Management Handbook", Tata McGraw-Hill Education Pvt. Ltd., 2006

Enterprise Resource Planning and SAP

(Inter Disciplinary Elective)

COURSE OUTLINE

Course Title	Short Title	Course Code
Enterprise Resource Planning and SAP	**ERP & SAP**	

Course Description: This course is aimed at introducing foundation understanding of enterprise systems and how these systems fit into today's business operations. Enterprise Systems are now essential infrastructure to both large corporate entities, as well as to small-to-medium organization, as they remove the need to have a large number of separate individual computer-based applications.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Industrial Management

COURSE CONTENT

Enterprise Resource Planning and SAP **Semester-VII**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week **End Semester Examination (ESE) : 80 Marks**
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. **ERP Introduction** **(08 Hours, 16 marks)**
   a Enterprise – An Overview: Introduction, Business Function and Business Processes, Integrated management Information, Role of enterprising ERP system, Business Modeling, Integrated data model
   b Introduction to ERP: Introduction, Common ERP Myths, A Brief History of ERP, The Advantages of ERP, Roadmap for the successful ERP Implementation

2. **ERP Risk, Benefits and Related Technologies** **(08 Hours, 16 marks)**
   a Risks and Benefits of ERP: The quantifiable benefits from ERP system, The Intangible Benefits of ERP, Risks of ERP, Risks factor of ERP implementation, Benefits of ERP

   b ERP and Related Technologies: Introduction, BPR, Data warehousing, Data Mining, OLAP, PLM, SCM, CRM, GIS, Internet and Extranet

3. **ERP Functional Modules and Implementation** **(08 Hours, 16 marks)**

   a ERP Functional Modules: Introduction, Functional Modules of ERP software, Supply chain and customer relationship application

   b ERP Implementation Life Cycle: Introduction, Objective of ERP Implementation, Different phases of ERP Implementations

4. **ERP Consultants, Vendor & Employees, eBusiness and Future Direction** **(08 Hours, 16 marks)**

   a Consultants, Vendors and Employees: Introduction, In-house implementation-Pros and Cons, Vendors, Consultants, Employee and Employee resistance, Reason for employee resistance, Dealing with employee resistance

   b ERP and eBusiness: Introduction, ERP and eBusiness, eBusiness-supply chain integration, The eBusiness process model, Components of the eBusiness supply chain, ERP/eBusiness integration, ERP internet and WWW

   c Future Direction and Trends in ERP: Introduction, New market new channel and faster implementation methodologies

5. **SAP Introduction and Architecture of Web Application Server** **(08 Hours, 16 marks)**

   a SAP Introduction: SAP Transformation into a Global Business, SAP for industries, SAP R/3 Releases and Fundamentals, SAP Enterprise Core Application Overview, SAP Services Overview

   b The Architecture of the SAP Web Application Server: The SAP Web Application Server, Basic Architectural Concepts, Services Work Process Types, Building the Client/Server SAP web AS System

Text Books:

1. Alexis Leon, " Enterprise Resource Planning", Second Edition, Tata Mcgraw Hill
2. Jose A. Hernandez, Jim Keogh, Franklin Foster Mertinez, " SAP R/3 Handbook", Third Edition, Tata McGraw Hill

Reference Books:

1. V.K. Garg, N .K. Venkita Krishnan, "ERP Ware: ERP Implementation Framework, PHI.
2. Annetta Clewwto and Dane Franklin, "Guide to Planning ERP Application", McGRaw-Hill, 1997.
3. George Anderson, Danielle Larocca, "Teach yourself SAP in 24 hours", Pearson Education.

Pattern Recognition (Elective I)

COURSE OUTLINE

Course Title	Short Title	Course Code
Pattern Recognition	**PR**	

Course Description:

Lecture	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	03	**14**	**42**	**03**

Prerequisite Course(s): Computer Architecture

COURSE CONTENT

Advanced Computer Architecture **Semester-VII**

Teaching Scheme **Examination Scheme**

Lecture: 3 Hours/Week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1 Introduction and mathematical (08 Hrs. 16 Marks)

a. What is Pattern recognition; Applications and Examples
b. Clustering vs. Classification; Supervised vs. unsupervised
c. Relevant basics of Linear Algebra, vector spaces
d. Probability Theory basics
e. Basics of Estimation theory
f. Decision Boundaries, Decision region / Metric spaces/ distances

2 Classification (8 Hrs, 16 Marks)

a. Bayes decision rule, Error probability
b. Normal Distribution
c. Linear Discriminant Function (equal covariance matrices)
d. K-NN Classifier
e. Fisher's LDA

f. Single Layer Perceptron Multi-layer Perceptron

g. Training set, test set; standardization and normalization

3 Clustering (8 Hrs, 16 Marks)

a. Basics of Clustering; similarity / dissimilarity measures; clustering criteria.

b. Different distance functions and similarity measures

c. Minimum within cluster distance criterion

d. K-means algorithm;

e. Single linkage and complete linkage algorithms,

f. K-medoids, DBSCAN

g. Data sets - Visualization; Unique Clustering; No existence of clusters

4 Feature selection (8 Hrs, 16 Marks)

a. Problem statement and Uses; Algorithms - Branch and bound algorithm, sequential forward / backward selection algorithms

b. Probabilistic separability based criterion functions, interclass distance based

5 Feature Extraction (8 Hrs, 16 Marks)

a. PCA + Kernel PCA

Recent advances in Pattern Recognition

a. Structural PR, SVMs, FCM, Soft-computing and Neuro-fuzzy techniques, and real-life examples

Text Book:

1. R.O.Duda, P.E.Hart and D.G.Stork, Pattern Classification, John Wiley, 2001.
2. Statistical pattern Recognition; K. Fukunaga; Academic Press, 2000.

Reference Book:

1. S.Theodoridis and K.Koutroumbas, Pattern Recognition, 4th Ed., Academic Press, 2009.

Related Links:

1. http://www.ph.tn.tudelft.nl/PRInfo/
2. http://kdd.ics.uci.edu/
3. http://morden.csee.usf.edu/nnc/index1.html
4. http://www.iapr.org/

Android Programming (Elective I)

COURSE OUTLINE

Course Title	Short Title	Course Code
Android Programming	**AP**	

Course Description: This course provides the students the platform to learn and understand the Android technology and encourage them to design, develop and deploy Android applications.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	3	**14**	**42**	**3**

Prerequisite Course(s): Basics knowledge of object oriented concepts.

COURSE CONTENT

Android Programming **Semester-VII**

Teaching Scheme **Examination Scheme**

Lecture: 3 Hours/Week
End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE): 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. **Introduction to Mobile Operating Systems and Mobile Application Development** **(08 Hrs. 16 Marks)**
   a. **Introduction to Mobile OS:** Palm OS, Windows CE, Embedded Linux, J2ME (Introduction), Symbian (Introduction)
   b. **Overview of Android:** Devices running android, Why Develop for Android, Features of Android, Architecture of Android, Libraries.
   c. **Setup Android Development Environment:**
   Android development Framework- - Android-SDK Eclipse, Emulators – What is an Emulator / Android AVD? , Creating & setting up custom Android emulator, Android Project Framework

2. **Android Activities, UI Design and Database** **(08 Hrs. 16 Marks)**
   a. Understanding Intent, Activity, Activity Lifecycle and Manifest, Form widgets, Text Fields
   b. **Layouts:** Relative Layout, Table Layout, Frame Layout, Linear Layout, Nested layouts
   c. **UI design:** Time and Date, Images and media, Composite, Alert Dialogs & Toast, Popup

d. **Menu:** Option menu, Context menu, Sub menu
e. **Database:** Introducing SQLite, SQLite Open Helper, SQLite Database, Cursor
f. **Content providers:**defining and using content providers, example-Sharing database among twodifferent applications using content providers, Reading and updating Contacts, Reading bookmarks

3. Preferences, Intents and Notifications (08 Hrs. 16 Marks)

a. **Preferences:**Shared Preferences, Preferences from xml
b. **Intents:** Explicit Intents, Implicit intents
c. **Notifications:** Broadcast Receivers, Services (Working in background) and notifications, Alarms

4. Telephony, SMS and Location Based Services (08 Hrs. 16 Marks)

a. **Telephony:** Accessing phone and Network Properties and Status, Monitoring Changes in Phone State, Phone Activity and data Connection
b. **SMS:** Sending SMS and MMS from your Application, sending SMS Manually, Listening for incoming SMS
c. **Location based Services:** Using Location Based Services, Working with Google Maps, Geocoder

5. Accessing Android Hardware (08 Hrs. 16 Marks)

a. **Networking:** An overview of networking, checking the network status, communicating with a server socket, Working with HTTP, Web Services
b. **Bluetooth:** Controlling local Bluetooth device, Discovering and bonding with Bluetooth devices, Managing Bluetooth connections, communicating with Bluetooth
c. **Audio and Video:** Playing Audio and Video, Recording Audio and Video, Using Camera and Taking Picture

Text/Reference Books:

1. Reto Meier, “Professional Android™ Application Development”, Wrox Publications.
2. Lauren Dercy and Shande Conder, “Sams teach yourself Android application development” , Sams publishing
3. Hello Android, Introducing Google’s Mobile Development Platform, Ed Burnette, Pragmatic Programmers, ISBN: 978-1-93435-617-3

Human Computer Interaction (Elective –I)

COURSE OUTLINE

Course Title	Short Title	Course Code
Human Computer Interaction (Elective-I)	**HCI**	

Course Description:

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	3	14	42	3

Prerequisite Course(s): Software Engineering

COURSE CONTENT

Human Computer Interaction **Semester-VII**

Teaching Scheme **Examination Scheme**

Lecture: 3 Hours/Week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Introduction **(08Hrs, 16 Marks)**

a. Importance of user interface
b. Importance of good design
c. GUI-Benefits of good UI
d. Concept of Direct Manipulation
e. Graphical systems :Advantage and disadvantage
f. Characteristics of GUI
g. The web user Interface
h. Characteristics of Web UI

2. Design Process **(08Hrs, 16 Marks)**

a. The Human interaction with computer
b. Important human characteristics in design
c. Human consideration in design
d. Human Interaction Speeds
e. Understand the Principles of Good Screen Design

3. Models in HCI **(08Hrs, 16 Marks)**

a. Cognitive models
b. Goals and task hierarchies
c. Design focus, GOMS
d. Linguistics models
e. Physical and device models
f. Cognitive Architectures

4. Interaction styles (08Hrs, 16 Marks)

a. Menus
b. Windows
c. Device based controls
d. Screen based controls

5. Communication (08Hrs, 16 Marks)

a. text messages
b. feedback and guidance
c. Graphics
d. Icons and images
e. colours

Text Books:

1. Alan Dix, J. E. Finlay, G. D. Abowd, R. Beale "Human Computer Interaction", Prentice Hall.
2. Wilbert O. Galitz, "The Essential Guide to User Interface Design", Wiley publication.

Reference Books:

1. Ben Shneidermann "Designing the user interface ", Pearson Education Asia.
2. Donald A. Norman, "The design of everyday things", Basic books.
3. Rogers Sharp Preece, "Interaction Design:Beyond Human Computer Interaction",Wiley.
4. Guy A. Boy "The Handbook of Human Machine Interaction", Ashgate publishing Ltd.
5. Alan Cooper, Robert Reimann, David Cronin, "About Face3: Essentials of Interaction design", Wiley publication.
6. Jeff Johnson, "Designing with the mind in mind", Morgan Kaufmann Publication.

Artificial Intelligence (Elective I)

COURSE OUTLINE

Course Title	Short Title	Course Code
Artificial Intelligence	**AI**	

Course Description:

The objective of this course is to introduce the students to the fundamentals of Artificial Intelligence, Expert Systems and Neural Networks and enable them to apply these concepts for solving real world problems.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s):

COURSE CONTENT

Artificial Intelligence **Semester-VII**

Teaching Scheme **Examination Scheme**

Lecture: 3 Hours/Week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Introduction to Artificial Intelligence (08Hrs, 16 Marks)

a. Definitions of AI, History
b. Turing test
c. AI Problem and Techniques: Problem as State Space Search, Problem characteristics
d. Production System: Water Jug problem
e. Heuristic Search Techniques: BFS, DFS, A*, AO*, Mean Ends Analysis

2. Knowledge Engineering (08Hrs, 16 Marks)

a. Knowledge Representation Issues
b. Knowledge Representation using Predicate Logic
c. Knowledge Representation using Rules
d. Weak and Strong Filler Structures for Knowledge: Semantic net, Frames, Script, Conceptual dependency

3. Game Playing and Planning (08Hrs, 16 Marks)

a. Game Tree
b. Minimax Search with Additional Refinements
c. Overview of Planning and types
d. Goal Stack Planning : Block World, STRIPS
e. Nonlinear, Hierarchical and Other Planning Techniques

4. Understanding , NLP and Expert System (08Hrs, 16 Marks)

a. Understanding as a constraint Satisfaction: Waltz's algorithm, Constraint determination, Trihedral figures labeling
b. Natural Language Processing Steps
c. Learning Techniques
d. Introduction to Expert system
e. Architecture of Expert System
f. Expert System Shell
g. Knowledge Acquisition in Expert System

5. Neural Network (08Hrs, 16 Ma

a. Characteristics of Neural Networks: Features of Biological Neural Networks, Biological Neural Networks, Performance Comparison of Computer and Biological Neural Networks
b. Historical Development of Neural Network
c. Artificial Neural Networks: Terminology
d. Models of Neuron: McCulloch-Pitts Model, Perceptron, Adeline
e. Topology
f. Basic Learning Laws
g. Learning Methods: Supervised and unsupervised

Text Books:

1. Elaine Rich, Kevin Knight and ShivshankarNair "Artificial Intelligence". 3rd Edition TMH.
2. B. Yegnanarayana "Artificial Neural Networks " PHI 2005

Reference Books:

1. S. Rajasekaran and G.A. Vijayalakshmi, "Neural Networks, Fuzzy Logic, and Genetic Algorithms" PHI
2. Timothy J Ross, "Fuzzy Logic with Engineering Application", TMH
3. Dan W. Patterson, "Introduction to artificial intelligence and expert system", PHI

Embedded System

COURSE OUTLINE

Course Title	Short Title	Course Code
Embedded System	**ES**	

Course Description: The objective of this course is to introduce students the knowledge of Embedded System, Architecture of embedded system, programming, and process of embedded system development, interfaces, real time OS concept and creation of target image.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Knowledge of Microprocessor/Microcontroller and Operating System

COURSE CONTENT

Embedded System **Semester-VII**

Teaching Scheme **Examination Scheme**

Lecture: 3 Hours/Week

Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. **Introduction to Embedded System** **(08Hrs, 16 Marks)**
   a. What is Embedded System?
   b. Application areas
   c. Categories of the Embedded System
   d. Overview of Embedded System architecture
   e. Specialties of Embedded System
   f. Recent trends in Embedded System
   g. Hardware architecture-CPU, Memory, Clock Circuitry, WDT, Chip Select, Communication Interfaces.
   h. Communication Protocols-I^2C, SPI & CAN

2. **Process of Embedded System Development** **(08Hrs, 16 Marks)**
   a. The development process
   b. Requirement engineering
   c. Design
   d. Implementation
   e. Integration and Testing
   f. Packaging
   g. Configuration Management
   h. Managing Embedded System development projects

3. **ARM System Architecture** **(08Hrs, 16 Marks)**
   a. RISC design philosophy, ARM design philosophy

b. Embedded system hardware, Embedded system software
c. Registers, Current program status register
d. Pipeline, Exception, Interrupts Vector table
e. Core Extensions
g. Architecture revision
h. ARM Processor families

4. Real Time Operating System **(08Hrs, 16 Marks)**

a. Architecture of kernel
b. Tasks & Task Scheduler
c. Interrupt Service Routines, Semaphores, Mutex, Mailbox, Message queues
d. Pipes, Event Register, Timers, Signals, Memory management
e. Priority Inversion Problem
f. RTOS services in contrast with traditional OS.
g. Introduction to uCOSII RTOS, Salient Features of uCOSII, Study of kernel structure of uCOSII
h. Synchronization in uCOSII, Inter-task communication in uCOSII, Porting of RTOS.

5. Embedded Linux **(08Hrs, 16 Marks)**

a. Introduction to the Linux kernel,
b. Configuring and booting the kernel
c. The root file system
d. Root file directories, /bin, /lib etc.,
e. Linux file systems,
f. Types of file system: Disk, RAM, Flash and Network
g. Some debug techniques- Syslog and Strace, GDB
h. TCP/IP Networking- Network configuration

Text Books:

1. Dr. K.V.K.K. Prasad, "Embedded /Real-Time System: Concepts, Design & Programming", Dreamtech, Edition 2010.
2. Andrew. N. Sloss, DomnicSymes, Chris Wright, "ARM System Developer's Guide", Elsevier, edition 2004.

Reference Books:

1. KarimYaghmour , "Building Embedded Linux Systems**",** 2003 O'Reilly & Associates,
2. Rajkamal, "Embedded Sytems ", TMH.
3. David Simon, "Embedded systems software primer", Pearson
4. Steve Furber, "ARM System-on-Chip Architecture", Pearson
5. Iyer, Gupta, "Embedded real systems Programming", TMH

Advanced UNIX Programming Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Advanced UNIX Programming Lab	**AUP Lab**	

Course Description:

This laboratory provides students with a comprehensive study of Unix commands. The practical's make students able for designing program for process creation, atexit function, file management and status information and various interprocess communications because of these students able to write efficient, maintainable, and portable code.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Prerequisite Course(s): Fundamental knowledge of C.

LAB COURSE CONTENT

(Note: Minimum FOUR Experiments each from group A and B)

Group A

1. Write a program for File Management (any 7 option)
2. Write a program for Simulation of various commands(any7 option)
3. Write a program to display user and system information
4. Write a program to display file status flags on specified descriptor
5. Write any program using atexit function
6. Write a program for process creation using fork and vfork function

Group B

1. Write a program for Inter Process Communication using pipe
2. Write a program for catching of Signals
3. Write a program for Daemon process
4. Write a program for multithreading
5. Write a program for client server communication using socket
6. Write a program for Inter Process Communication using Message Queue

Guidelines for ICA:
Students must submit ICA in the form of journal. Each experiment should be well documented. Faculty in charge will assess the experiments continuously and will assign grade or mark for each experiment on date of completion, declared for each experiments.

Guidelines for ESE:

In the ESE, the students may be asked to perform the practical assignment with minor modification. Questions will be asked during the practical examination to judge the understanding of the student. It is expected that student knows theoretical aspect of the problem.

Text Book:

1. W. Richard Stevens and Stephen A. Rago, Advanced Programming in the UNIX Environment, 2/E, Pearson Education

Reference Book:

1. W. Richard Stevens, Unix Network Programming - Interprocess Communications, Volume 2, 2/E, Pearson Education

Note:-

- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Embedded System Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Embedded System Lab	**ES Lab**	

Course Description:

Laboratory	Hours/Week	No. of Weeks	Total Hours	Semester Credits
	2	14	28	1

LAB COURSE CONTENT

(Note: Minimum FOUR Experiments each from group A and B)

Group A

1. Writing basic C-programs for I/O operations.
2. Program to interface LCD.
3. Program to demonstrate I2C Protocol.
4. Program to demonstrate CAN Protocol.
5. Program to interface Keyboard and display key pressed on LCD.
6. Program to interface stepper motor.
7. Program to interface Graphics LCD.

Group B

1. Program to interface Touch Panel.
2. Program to implement AT commands and interface of GSM modem.
3. Interfacing 4 x 4 matrix keyboards and 16 x 2 character LCD display to microcontroller /Microprocessor and writing a program using RTOS for displaying a pressed key.
4. Writing a scheduler / working with using RTOS for 4 tasks with priority. The tasks may be keyboard LCD, LED etc. and porting it on microcontroller/ microprocessor.
5. Implement a semaphore for any given task switching using RTOS on microcontroller board.
6. Create two tasks, which will print some characters on the serial port, Start the scheduler and observe the behavior.
7. Program for exploration of (Process creation, Thread creation) using Embedded Real Time Linux.

Guidelines for ICA:

Students must submit ICA in the form of journal. Each experiment should be well documented. Faculty in charge will assess the experiments continuously and will assign grade or mark for each experiment on date of completion, declared for each experiments.

Guidelines for ESE:

In the ESE, the students may be asked to perform the practical assignment with minor modification. Questions will be asked during the practical examination to judge the understanding of the student. It is expected that student knows theoretical aspect of the problem.

Text Books:

1. Dr. K.V.K.K. Prasad, "Embedded /Real-Time System: Concepts, Design & Programming", Dreamtech, Edition 2010.
2. Andrew. N. Sloss, DomnicSymes, Chris Wright, "ARM System Developer's Guide", Elsevier, edition 2004.

Reference Books:

1. KarimYaghmour , "Building Embedded Linux Systems", 2003 O'Reilly & Associates,
2. Rajkamal, "Embedded Sytems ", TMH.
3. David Simon, "Embedded systems software primer", Pearson
4. Steve Furber, "ARM System-on-Chip Architecture", Pearson
5. Iyer,Gupta, "Embedded real systems Programming", TMH

Note:-

- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Pattern Recognition Lab (Elective I Lab)

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Pattern Recognition	**PR**	

Course Description: This laboratory provides students with a comprehensive study of Pattern Recognition.

Laboratory	Hours/Week	No. of Weeks	Total Hours	Semester Credits
	2	**14**	**28**	**1**

Prerequisite: Vector spaces and Linear Algebra; Algorithms. Probability theory; Statistics.

LAB COURSE CONTENT

(**Note: Minimum SIX Experiments from the list given below**)

1. Write program to build a Bayesian classifier
2. Write a program to recognize line patterns in a given set of points.
3. Implement Image Block matching by 2D Log Search and Brute-force approach
4. Write a program to implement Edit Distance Problem
5. Implement model for Single Layer Perceptron Multi-layer Perceptron.
6. Write program for K-Means Clustering
7. Simulation of Neural supervised and Unsupervised Learning in any soft Computing tool.
8. To implement Fuzzy Sets and Fuzzy Relations
9. Exploring different feature spaces - using Fourier shape descriptors, experimenting with wavelet transform, template matching.
10. Using and interpretation of ROC curves, experiments with PCA and ICA

Guidelines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guidelines for ESE:

The oral examination will be based on the assignments performed by the candidates as part of ICA. Questions will be asked during the oral examination to judge the understanding of the student. It is expected that student knows theoretical (Software Engineering) aspect of the problem.

Text Book:

1. R.O.Duda, P.E.Hart and D.G.Stork, Pattern Classification, John Wiley, 2001.
2. Statistical pattern Recognition; K. Fukunaga; Academic Press, 2000.

Reference Book:

1. S.Theodoridis and K.Koutroumbas, Pattern Recognition, 4th Ed., Academic Press, 2009.

Note:-

- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Android Programming Lab (Elective I Lab)

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Android Programming Lab	**AP Lab**	

Course Description: This course provides the students the platform to learn and understand the Android technology and encourage them to design, develop and deploy Android applications.

Laboratory	Hours/Week	No. of Weeks	Total Hours	Semester Credits
	02	14	28	01

Prerequisite Course(s) : Basic knowledge of object oriented concepts.

LAB COURSE CONTENT

Term Work:

Any **SIX** lab assignments should be framed by concern staff member based on above syllabus. The Practical should be carried out using JDK 6.0 or above, Android SDK and Eclipse.

These tools are available for free download at

1. www.developer.android.com
2. www.eclipse.org
3. www.sun.com

1. Program to show use of UI elements
2. Program to show demo of layouts
3. Program to create Menus and Dialog box.
4. Program to show how to use intents (implicit and explicit)
5. Program to work with database (create, insert ,delete ,update ,select operations)
6. Program to show how to use notifications
7. Program to make call, send and receive SMS.
8. Program to work with Google maps.
9. Program to play Audio and video files
10. Program to send and receive file using Bluetooth
11. Program to show how to use Networking and web-services in Android

Guidelines for ICA:

Students must submit ICA in the form of journal. Each experiment should be well documented. Faculty in charge will assess the experiments continuously and will assign grade or mark for each experiment on date of completion, declared for each experiments.

Guidelines for ESE:

In the ESE, the students may be asked to perform the practical assignment with minor modification. Questions will be asked during the practical examination to judge the understanding of the student. It is expected that student knows theoretical aspect of the problem.

Text Books/Reference Books:

1. Reto Meier, “Professional Android™ Application Development”, Wrox Publications
2. Lauren Dercy and Shande Conder, “Sams teach yourself Android application development”, Sams publishing
3. Hello Android, Introducing Google’s Mobile Development Platform, Ed Burnette, Pragmatic Programmers, ISBN: 978-1-93435-617-3

Note:-

- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Human Computer Interaction Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Human Computer Interaction Lab	**HCI Lab**	

Course Description:

Laboratory	Hours/Week	No. of Weeks	Total Hours	Semester Credits
	2	14	28	1

Prerequisite Course(s): Web Technology lab

LAB COURSE CONTENT

(Note: Minimum FOUR Experiments each from group A and B)

Group A

1. Know your client –
   Children (3-4 years of age): An application to teach Alphabets , shapes.
2. Learn HCI design principles –Identify 3 different websites catering to one specific goal ze.g. Goal – on-line shopping and 3 different websites – ebay, amazon, flipkart, zovi, myntra) and perform a competitive analysis on them to understand how each one caters to the goal, the interactions and flow of the payment system and prepare a report on the same.
3. Learn the importance of menus and navigation – website redesign: News websites like CNN are always cluttered with information
4. Menu designing: Choose a unique domain, design a menu and show how it can be accommodated on an interface.
5. Icon designing: Choose a unique domain, design a few icons and show how it can be accommodated on an interface.
5. Understand the need of colors and animation – web site for an artist: A celebrity in some form of art like music, dance, painting, martial arts, etc (not actors). This site will be used to display his works and should portray his character.
7. Any other new relevant topics covering the above syllabus

Group B

1. Online shopping website
2. E -learning web site
3. Video/ Audio on demand web site
4. Travel reservation system
5. ATM Interface
6. Online trading on stock market
7. University web site
8. Placement agency

(**Note**: A project with a team of minimum 2 and maximum 3 students. The purpose of the project is focused on User interaction and NOT on the implementation of the entire project. Explain technology in interface Design; explain the user interface design process; coloring guidelines; Speech Recognition and speech generation; Types of windows; Components of UI, such as Text Boxes, List Boxes, Messages, Icons, Multimedia; Mental models; Importance of the mental models in UI design.)

Guidelines for ICA:
Students must submit ICA in the form of journal. Each experiment should be well documented. Faculty in charge will assess the experiments continuously and will assign grade or mark for each experiment on date of completion, declared for each experiments.

Guidelines for ESE:
In the ESE, the students may be asked to perform the practical assignment with minor modification. Questions will be asked during the practical examination to judge the understanding of the student. It is expected that student knows theoretical aspect of the problem.

Text Books:

1. Alan Dix, J. E. Finlay, G. D. Abowd, R. Beale "Human Computer Interaction", Prentice Hall.
2. Wilbert O. Galitz, "The Essential Guide to User Interface Design", Wiley publication.

Reference Books:

1. Ben Shneidermann "Designing the user interface ", Pearson Education Asia.
2. Donald A. Norman, "The design of everyday things", Basic books.
3. Rogers Sharp Preece, "Interaction Design:Beyond Human Computer Interaction",Wiley.
4. Guy A. Boy "The Handbook of Human Machine Interaction", Ashgate publishing Ltd.
5. Alan Cooper, Robert Reimann, David Cronin, "About Face3: Essentials of Interaction design", Wiley publication.
6. Jeff Johnson, "Designing with the mind in mind", Morgan Kaufmann Publication.

Note:-

- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Artificial Intelligence (Elective I Lab)

COURSE OUTLINE

Course Title	Short Title	Course Code
Artificial Intelligence	**AI Lab**	

Course Description:
The objective of this course is to introduce the implementation of the fundamentals of Artificial Intelligence, Expert Systems and Neural Networks and enable them to apply these concepts for solving real world problems.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	02	14	28	01

LAB COURSE CONTENT

(Note: Minimum FOUR experiments from the Group A and FOUR experiments from the Group B .)

Group A

1. Implementation of single perceptron training algorithm.
2. Implementation of Unification Algorithm.
3. Implementation of Hill Climbing Algorithm.
4. Implementation of Game playing with Min/Max Search.
5. Development of Mini PC Troubleshooting Expert System
6. Implementation of A* Algorithm

Group B

1. Implementation of Dynamic database.
2. Implementation of parsing method implementation.

3 Development of Mini Medical Expert System

4. Application development using Neural Network.
5. Development of Intelligent Perception System.
6. Implementation of basic learning neural learning algorithm

Text Books:

1. Elaine Rich, Kerin Knight and Shivshankar Nair "Artificial Intelligence", 3rd Edition TMH
2. B. Yegnanarayana "Artificial Neural Networks", PHI 2005

Reference Books:

1. S. Rajasekaran and G.A. Vijayalakshmi, "Neural Networks, Fuzzy Logic, and Genetic Algorithms" PHI
2. Timothy J Ross, "Fuzzy Logic with Engineering Application", TMH
3. Dan W. Patterson, "Introduction to artificial intelligence and expert system", PHI

Note:-

- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Project-I

Project-I	**P-I**	
Course Title	Short Title	Course Code

Course Description:
The course explores the knowledge of design, experiment and analysis of data. The course develops ability to work on multidisciplinary teams, Identify, formulate, and solve engineering problems in view of economic, environmental and societal context.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**14**	**28**	**2**

COURSE CONTENT

Project-I **Semester-VII**

Lab:2 Hrs/week **Examination Scheme**

Total Semester Credits: 02
Internal Continuous Assessment (ICA): 25 Marks
End Semester Examination (ESE)-Oral:25 Marks
Total: 50Marks

1. It is expected that the broad area of Project-I shall be finalized by the student in the beginning of the VII semester / extension of Minor project undertaken may be Project-I.
2. A group of Minimum 3 and Maximum 5 students shall be allotted for Project-I and same project group for Project-II.
3. Exhaustive survey of literature based on a clear definition of the scope and focus of the topic should be carried out by the students. The **Synopsis/Abstract** on the selected topic, after detail literature survey should be submitted to the Project coordinator appointed by Head of the department.
4. Project-I may involve literature survey, problem identification, work methodology preparing specification and material procurement, collection of data , conduction of experiments and analysis. The project work shall involve sufficient work so that students get acquainted with different aspects of fabrication, design or analysis.
5. Approximately more than 50% work should be completed by the end of VII semester.
6. Each student group is required to maintain log book for documenting various activities of Project-I and submit group project report in the form of thermal bound at the end of semester –VII. Submit the progress report in following format:

1. *Title*
2. *Abstract*
3. *Introduction*
4. *Literature survey*
5. *Concept*
6. *Functional and Technical Details*
7. *Applications*
8. Comparison with similar topics / methods
9. *Future scope*
10. *References*

7. Evaluation Committee comprising of the Guide, Project Coordinator and Expert appointed by the Head of the department will award the marks based on the work completed by the end of semester and the presentation based on the project work.

Guide lines for ICA: The Internal Continuous Assessment shall be based on the active participation of the students in the Project work and knowledge / skill acquired. Assessment of the project-I for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given in **Table-A.**

Guide lines for ESE: The End Semester Examination for Project shall consist of demonstration if any, presentation and oral examinations based on the project report**.**

Assessment of Project-I (ICA)

Title of the Project: ________________________________

Name of the Guide: ________________________________

Table-A

SN	Name of Student	Problem Identification and project objectives	Literature Survey	Project Methodology/ Design/PCB/ hardware/ simulation/ programming	Progress Status	Presentation	Total
		5	5	5	5	5	25

Seminar-II
COURSE CONTENT

Seminar-II	**S-II**	
Course Title	Short Title	Course Code

Course Description: The course explores the knowledge of presentation and effective communication. The course develops ability to work on multidisciplinary teams, Identify, formulate, and solve engineering problems in view of economic, environmental and societal context.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	14	28	2

COURSE CONTENT

Seminar-II **Semester-VII**

Examination Scheme

Practical : 2 Hrs/Week

Total Semester Credits: 02

Internal Continuous Assessment (ICA): 25 Marks

1. Each Student shall select a topic for seminar which is not covered in curriculum. Seminar topic should not be repeated and registration of the same shall be done on first come first serve basis.
2. Topic of Seminar shall be registered within a three weeks from commencement of VII Semester and shall be approved by the committee.
3. The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of Seminar-II. Seminar shall be related state of the art topic of his choice approved by the committee.
4. Each student should deliver a seminar in scheduled period (Specified in time table or time framed by department) and submit the seminar report (paper bound copy/Thermal bound)in following format:
    1. *Title*
    2. *Abstract*
    3. *Introduction*
    4. *Literature survey*
    5. *Concept*
    6. *Functional and Technical Details*
    7. *Applications*
    8. Comparison with similar topics / methods
    9. *Future scope*
    10. *References*

ASSESSMENT OF SEMINAR-II

Guide lines for ICA: ICA shall be based on topic selection, presentation and Seminar-II report submitted by the student in the form of thermal bound. Assessment of the Seminar-II for award of ICA marks shall be done jointly by the guide and a departmental committee, as per the guidelines given in **Table- B**

Name of Guide: ____________________________________

Table-B

SN	Name of Student	Seminar Topic	Topic Selection	Literature survey	Report writing	Depth of under-standing	Presentation	Total
			5	5	5	5	5	25

Industrial Visit

Industrial Visit	**IV**	Course Title
Short Title	Course Code	

Course Description: The course explores the knowledge industry organization, new trends in manufacturing, maintenance and safety. The industrial visit provides the practical visualization of theoretical study of various engineering subject.

COURSE CONTENT

Semester-VII **Examination Scheme**

Total Semester Credits: 01

Internal Continuous Assessment (ICA): 25 Marks

1. Industry visits to minimum two industries shall be carried out by each student preferably or college shall arrange the industrial visit during the vacation period otherwise during the regular VII semester.
2. The student should obtain appropriate certificates of visit from the concerned organizations just after the visits.
3. Every Student should submit Industrial Visit report individually at the end of Semester-VII(First Term of Final Year)
4. The report(Thermal Bound) should contain information about the following points:
   a. *The organization - activities of organization and administrative setup technical personnel and their main duties.*
   b. *The project / industry brief description with sketches and salient technical information.*
   c. *The work / processes observed with specification of materials, products, equipments etc. and role of engineers in that organization.*
   d. *Suggestions (if any) for improvement in the working of those organizations.*
5. The evaluation of the report of technical visits will be made by panel of three teachers appointed by Head of the department based on following points:

Guide lines for ICA: ICA shall be based on knowledge gain by student and Industrial Visit Report submitted by the student in the form of Thermal bound. Assessment of the Industrial Visit for award of ICA marks shall be done jointly by industrial visit coordinators departmental committee based on viva -voce as per the guidelines given in **Table- C**

Table-C

SN	Name of Student	Name of Industry	Report writing	Depth of Under-standing	Total
			15	10	25

NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Final Year Engineering
(Information Technology)
Faculty of Engineering and Technology

COURSE OUTLINE

Semester – VIII

W.E.F. 2015– 2016

Internet Security

COURSE OUTLINE

Course Title	Short Title	Course Code
Internet Security	**IS**	

Course Description:
This course provides a comprehensive view of the network security principles and measures to prevent vulnerabilities and security attacks in the systems. Also provide skills to design security protocols for recognize security problems.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	3	14	42	3

Prerequisite Course(s): Basic knowledge of security.

COURSE CONTENT

Internet Security **Semester-VIII**

Teaching Scheme **Examination Scheme**

Lecture: 3 Hours/Week
End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE): 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. **Security Basics** **(08 Hrs. 16 Marks)**
   a. Information security
   b. History of security-physical, communications, emissions, network and Information Security
   c. Information security as process- Anti-virus Software, Accesses controls, smartcards, biometrics, intrusion detection, policy management Encryption, physical security mechanism
   d. Type of attacks- access attack, modification attack, denial of service attack and repudiation attacks
   e. Encryption: private key, public key, ciphers,DES, RSA &Diffie-Hellman key exchange algorithm

2. **Hacking Techniques** **(08 Hrs. 16 Marks)**
   a. Hackers, hackers motivations- challenge, greed, malicious Intent
   b. Historical hacking techniques-open Sharing, bad passwords, unwise programming, social engineering, buffer overflows, denial of service
   c. Advanced hacking techniques-sniffing switch networks, IP spoofing

d. Policy- importance of policy and types of policy
e. Risk – risk, identification of risk, measure risk

3. Information Security Processand IDS (08 Hrs. 16 Marks)

a. Information security process- assessment, policy, implementation, training and audit
b. Introduction to hash function and digital signature
c. Intrusion Detection System (IDS) and types of intrusion detection-host based and network based
d. Set up an IDS, manage an IDS
e. Intrusion prevention system (IPS)

4. Internet Security Protocol and Authentication Mechanism (08 Hrs. 16 Marks)

a. Internet Security Protocol:SSL,SET, SSL Versus SET
b. Email Security: Introduction, SMTP protocol, PEM, PGP, S/MIME
c. Biometric authentication
d. Kerberos

5. Network Security (08 Hrs. 16 Marks)

a. Firewalls: Introduction, types, configuration, Demilitarized zone networks, limitations of firewall
b. IP Security: Introduction, IPSec Overview, IPSec Management
c. Virtual Private Networks: Introduction, Architecture

Text Books:

1. Eric Maiwald, "Network Security A Beginner's Guide", Osborne/Tata McGraw-Hill
2. Atul Kahate, "Cryptography and Network Security", Tata McGraw Hill

Reference Books:

1. William Stalling, "Cryptography and Network and Network security", Pearson Education , Fourth Edition.
2. Bernard Menezes, "Network Security and Cryptography", Cengage Learning.

Data Warehousing & Mining

COURSE OUTLINE

Course Title	Short Title	Course Code
Data Warehousing & Mining	**DWM**	

Course Description: The objective of this course is to introduce the students to Learn and practice data modeling using the multidimensional database schemas and developing data warehouse to extract knowledgeable information for decision support system.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Knowledge of Database Management System

COURSE CONTENT

Data Warehousing & Mining **Semester-VIII**

Teaching Scheme **Examination Scheme**

Lecture: 3 Hours/Week

End Semester Examination (ESE): 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. **Introduction to Data Warehousing** **(08Hrs, 16 Marks)**
   a. What is a Data Warehouse?
   b. A Multidimensional data model
   c. Data Warehouse Architecture
   d. From Data Warehousing to Data Mining
   e. Why preprocess data?
   f. Data Cleaning
   g. Data Integration and Transformation
   h. Data Reduction
   i. Data discretization and concept hierarchy generation

2. **Introduction to Data Mining** **(08Hrs, 16 Marks)**
   a. What is Data Mining?
   b. Data Mining Functionalities: What kinds of Patterns can be Mined?
   c. Classification of Data Mining Systems
   d. Data Mining Task Primitives
   e. Integration of Data Mining system with a Data Warehouse System
   f. Major issues in Data Mining
   g. Data Mining statics: Guidelines for successful Data Mining
   h. Applications and Trends in Data Mining

3. **Mining Frequent Patterns** **(08Hrs, 16 Marks)**

a. Mining frequent pattern
b. Associations: Basic concepts
c. Market basket analysis
d. Apriori Algorithm
e. Association rules from frequent item sets
f. Mining multilevel association rules
g. Constraint based association mining
h. Association mining to correlation analysis

4. **Classification and Prediction** **(08Hrs, 16 Marks)**

a. Introduction to Classification and Prediction
b. Classification by Decision tree Induction
c. Bayesian classification
d. Rule based classification
e. Classification by Back propagation
f. Other classification methods
g. Prediction: Linear Regression
h. Non-linear regression

5. **Cluster Analysis** **(08Hrs, 16 Marks)**

a. What is Cluster Analysis and Outliers
b. Types of data in cluster analysis
c. Categorization of clustering methods
d. Classical Partitioning methods: k-Means and k-Medoids
e. Hierarchical Methods: Agglomerative and divisive
f. Density Based Methods: DBSCAN
g. Grid Based Methods: STING
h. Outlier analysis

Text Books -

1. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Second Edition, Morgan Kaufmann.

Reference Books -

1. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction To Data Mining",Person Education, 2007.
2. G. K. Gupta, "Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006.
3. Alex Berson and Stephen J. Smith, "Data Warehousing, Data Mining & OLAP", Tata McGraw – Hill Edition, Tenth Reprint 2007.

Software Metrics and Quality Assurance (Elective II)

COURSE OUTLINE

Course Title	Short Title	Course Code
Software Metrics and Quality Assurance	**SMQA**	

Course Description:

This course introduces the students about the concepts software measurement and metrics. It includes scope of software metrics, internal product attributes, and external product attributes Software quality and quality assurance techniques. This course also describes about cost estimation, documentation and testing tools, etc.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	**03**	**14**	**42**	**03**

Prerequisite Course(s): Software Engineering.

COURSE CONTENT

Software Metrics and Quality Assurance **Semester-VIII**

Teaching Scheme **Examination Scheme**

Lecture: 3 Hours/Week

End Semester Examination (ESE): 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Introduction to Software Measurement: **(08Hrs, 16 Marks)**

a. Measurement in everyday life
b. Measurement in Software Engineering
c. The scope of software metrics
d. The representational theory of measurement
e. Measurement and Models
f. Measurement scales and scales types
g. Meaningfulness in measurement
h. Classifying software measures & Determining what to measure

2. Measuring internal product attributes: **(08Hrs, 16 Marks)**

a. Measuring internal product attributes: Size
b. Aspects of software size, Length & Reuse
c. Functionality & Complexity
d. Measuring internal product attributes: Structure
e. Types of Structural measures - Control Flow Structures
f. Modularity and Information Flow attributes & Data structures

g. Difficulties with general “complexity” measures

3. Measuring external product attributes: (08Hrs, 16 Marks)

a. Software Quality - Modelling Software Quality & Measuring aspects of Quality
b. Software Reliability:
c. Basics of Reliability Theory
d. The Software Reliability Problem
e. Parametric Reliability Growth Models
f. Predictive Accuracy
g. The importance of the operational environment

4. Cost estimation & Documentation: (08Hrs, 16 Marks)

a. Making Process Predictions - Good Estimates
b. Cost estimation-Problems and approaches
c. Models of Effort and cost
d. Software Documentation

5. Quality Assurance Techniques: (08Hrs, 16 Marks)

a. Quality Assurance Techniques- Testing Principles, Goals, Testing Life Cycle, Phases of Testing Manual Testing- Test case design criteria.
b. Automated Testing Introduction of Testing Tools- J-Meter, Win Runner, QTP, Selenium etc.
c. ISO-9000 Model
d. SEI’s CMM Model
e. Comparison of the ISO-9000 model with SEI’s CMM model

Text Books:

1. Flanton, Pfleeger, “Software Metrics- A Rigorous and Practical Approach” Thompson Learning.
2. Mordechai Ben-menachem/Garry S.Marliss, “Software Quality”, Thompson Learning.
3. Software Testing, Second Edition By: Ron Patton,Pearson Education ISBN -13: 978-0-672-32798-8.

Reference Books:

1. Roger S. Pressman, “Software Engineering- A Practitioner’s Approach”, TMH.
2. Swapna Kishore and Rajesh Naik, “ISO 9001:2000 for Software Organizations”, TMH.

Distributed System (Elective II)

COURSE OUTLINE

Course Title	Short Title	Course Code
Distributed Systems	**DS**	

Course Description:

This course introduces students to the principles, design and implementation of distributed systems. The lectures focus primarily on the principles and design of distributed systems and cover processes, communication, naming, synchronization, security, access control and security management.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	**3**	**14**	**42**	**3**

Prerequisite Course(s): Operating Systems, Computer Networks.

COURSE CONTENT

Distributed System **Semester-VIII**

Teaching Scheme **Examination Scheme**

Lecture: 3 Hours/Week

End Semester Examination (ESE): 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1 Introduction to Distributed Systems and Architectures

(08Hrs, 16 Marks)

d. Introduction: Definition of a Distributed system.
e. Goals: Making Resources Accessible, Distribution Transparency, Openness, Scalability, Pitfalls.
f. Types of Distributed System: Distributed Computing Systems, Distributed Information Systems, Distributed Pervasive Systems.
g. Architectural Styles: Layered architectures, Object-based architectures, Data-centered architectures, Event-based architectures.
h. System Architectures: Centralized Architectures, Decentralized Architectures, Hybrid Architectures.

2 Processes

(08Hrs, 16 Marks)

c. Threads: Introduction to Threads, Threads in Distributed Systems.
d. Virtualization: The Role of Virtualization in Distributed Systems, Architectures of Virtual Machines.
e. Clients: Networked User Interfaces, Client-Side Software for Distribution Transparency.
f. Servers: General Design Issues, Server Clusters, Managing Server Clusters.
g. Code Migration: Approaches to Code Migration , Migration and Local Resources , Migration in Heterogeneous Systems.

3 Communication

(08Hrs, 16 Marks)

a. Fundamentals: Layered Protocols , Types of Communication.
b. Remote Procedure Call: Basic RPC Operation, Parameter Passing , Asynchronous RPC.
c. Message-Oriented Communication: Message-Oriented Transient Communication, Message-Oriented Persistent Communication.
d. Stream-Oriented Communication: Support for Continuous Media, Streams and Quality of Service, Stream Synchronization.

4 Synchronization and Election

(08Hrs, 16 Marks)

d. Clock Synchronization: Physical Clocks, Global Positioning System, Clock Synchronization Algorithms.
e. Logical Clocks: Lamport's Logical Clocks, Vector Clocks.
f. Mutual Exclusion: A Centralized Algorithm, A Decentralized Algorithm, A Distributed Algorithm, A Token Ring Algorithm.
g. Global State: Needs, Properties and Various Global States
h. Election Algorithm: Bully and Ring Algorithm.

5 Security, Access Control and Security Management

(08Hrs, 16 Marks)

e. Introduction to Security: Security Threats, Policies and Mechanisms, Design Issues, Cryptography.
f. Secure Channels: Authentication, message integrity and confidentiality.
g. Access Control: General Issues in Access Control, Firewalls, Denial of Service.
h. Security Management: Key Management, Authorization Management.

Text Books:

1. A.S.Tanenbaum, M. Van Steen , " Distributed Systems" , Pearson Education 2004.
2. George Coulouris, Jean Dollimore, Tim Kindberg, "Distributed Systems Concepts and Design" , Third Edition – 2002- Pearson Education Asia.

Reference Books:

1. Pradeep K. Sinha, "Distributed Operating Systems", Prentice Hall of India Private Limited.

2. Sunita Mahajan, Seema Shah, “ Distributed Computing”, Oxford, Second Edition.
3. Randay Chow, Theodore Johnson, “Distributed Operating System and Algorithm Analysis”, Publisher: Pearson (LPE). ISBN – 978-81-317-2859-8.
4. G. SudhaSadasivam, Radha Shankarmani, "Middleware and Enterprise Integration Technologies " , Wiley Precise Textbook.
5. Tom white, “Hadoop: The Definitive Guide” , 2nd E, O’Reilly Media, 2011.

Cryptography & Network Security (Elective II)

COURSE OUTLINE

Course Title	Short Title	Course Code
Cryptography & Network Security	**CNS**	

Course Description:

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	3

Prerequisite Course(s): Basics of computer networks and security

COURSE CONTENT

Cryptography & Network Security **Semester-VIII**

Teaching Scheme **Examination Scheme**

Lecture: 3 Hours/Week **End Semester Examination (ESE): 80 Marks**
Paper Duration (ESE): 03 Hours
Internal Sessional Exam (ISE): 20 Marks

1. **Introduction** **(08 Hrs. 16 Marks)**
    a. The Need for Security, Security Approaches
    b. Security Attacks
    c. Security Services
    d. Security Mechanisms
    e. Network Security Model
    f. Basics of Cryptography: Symmetric Cipher Model
    g. Substitution Techniques
    h. Transposition Techniques
2. **Cipher Properties & Secret Key Cryptography** **(08 Hrs. 16 Marks)**
    a. Other Cipher Properties- Confusion, Diffusion
    b. Block and Stream Ciphers
    c. Data Encryption Standard(DES)
    d. Strength of DES
    e. Block Cipher Design Principles
    f. Modes of Operations
    g. Triple DES
    h. International Data Encryption algorithm(IDEA)

3. **Public Key Cryptography & IP Security** **(08 Hrs. 16 Marks)**
    a. Principles of Public Key Cryptosystems
    b. RSA Algorithm
    c. Diffie-Hellman Key Exchange

d. IP Security Overview
e. Architecture
f. Authentication Header
g. Encapsulating Security Payloads
h. Service provided by IP Security

4. Cryptographic Hash Functions (08 Hrs. 16 Marks)

a. Applications of Cryptographic Hash Functions
b. Secure Hash Algorithm
c. Message Authentication Codes – Message Authentication Requirements and Functions
d. HMAC
e. Digital signatures
f. Digital Signature Schemes
g. Authentication Protocols
h. Digital Signature Standards

5. Authentication Applications (08 Hrs. 16 Marks)

a. Kerberos
b. Key Management and Distribution
c. X.509 Directory
d. Authentication service
e. Public Key Infrastructure
f. Electronic Mail Security
g. Pretty Good Privacy
h. S/MIME

Text Books:

1. William Stalling, "Cryptography and Network and Network security-Principals and practices", Pearson Education
2. Atul Kahate, "Cryptography and Network Security", Tata McGraw-Hill

Reference Books:

1. Bernard Menezes, "Network Security and Cryptography", Cengage Learning,
2. King, Dalton, and Osmanoglu, "Security Architecture", TMH edition
3. Kaufman, Perlman, and Spenciner, "Network Security", PHI

Neural Networks and Fuzzy Logic (Elective II)

COURSE OUTLINE

Course Title	Short Title	Course Code
Neural Networks and Fuzzy Logic	**NNFL**	

Course Description:

i. To expose the students to the concepts of artificial neural networks.

ii. To provide comprehensive knowledge of fuzzy logic control.

iii. Provide adequate knowledge of application of ANN and fuzzy logic control to real time systems.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Linear Algebra, DSGT, Artificial Intelligence.

COURSE CONTENT

Neural Networks and Fuzzy Logic **Semester-VIII**

Teaching Scheme
Lecture: 3 Hours/Week

Examination Scheme
End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE): 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. Introduction to Neural Network **(08Hrs, 16 Marks)**

a. Human Brain, Biological Neural Networks
b. Model of Artificial Neuron, McCulloch and pitts models of neuron, Perceptron model, Adaline model
c. Neural Network Architectures
d. Neural Learning Laws, Hebb's Law, Perceptron learning Law, Widrow and Hoff Learning, Corelation learning, InStar and out Star learning
e. Neural Network Learning Methods, Hebbian learning, Competitive Learning, Error Correction Learning, Reinforcement Learning, Stochastic Learning

2. Multilayer Perceptron Model **(08Hrs, 16 Marks)**

a. Multilayer Perceptron
b. Non-Linear Activation function
c. Architecture of Backpropagation Network
d. Backpropagation Learning
e. Illustration of Backpropagation Learning
f. Applications of Backpropagation

3. Associative Memory and Adaptive Resonance Theory **(08Hrs, 16 Marks)**

a. Autocorrelators
b. Hetrocorrelators
c. Exponential BAM

d. ART1
e. ART2
f. Applications of Associative Memory
g. Applications of Adaptive Resonance Theory

4. Unsupervised Learning **(08Hrs, 16 Marks)**

a. Hamming Net and Maxnet
b. Unsupervised Learning of clusters- clustering and similarity measures, Winner take all Learning
c. Counter Propogation network
d. Feature Mapping
e. Self-Organizing Features Map

5. Fuzzy Logic **(08Hrs, 16 Marks)**

a. Fuzzy Versus Crisp
b. Crisp Relations and Fuzzy Relations
c. Crisp Logic
d. Fuzzy Logic
e. Fuzzy Rule Based System
f. Defuzzification
g. Applications of Fuzzy Logic

Text Books:

1. S. Rajasekaran & G. A. V. Pai, "Neural Networks, Fuzzy logic, and Genetic Algorithms", PHI.
2. J. M. Zurda, "Introduction to Artificial Neural Networks", Jaico Publishing House

Reference Books:

1. S. Haykin, "Neural Networks", Pearson Education, 2nd Ed., 2001.
2. Klir& Yuan, "Fuzzy Sets and Fuzzy Logic", PHI, 1997.
3. Chin-Teng Lin & C. S. George Lee, "Neural Fuzzy Systems", Prentice Hall PTR.
4. V. Kecman, "Learning and Soft Computing", MIT Press, 2001.
5. S. N. Sivanandam& S. N. Deepa, "Principles of Soft Computing", Wiley - India, 2007
6. B.Yegnanarayana, "Artificial Neural Networks ",Prentice Hall of India, 1999.

Mobile Computing (Elective III)

COURSE OUTLINE

Course Title	Short Title	Course Code
Mobile Computing	**MC**	

Course Description:
The objective of this course is to introduce students the knowledge about Mobile Computing Architecture, Mobile Technologies: GSM, Bluetooth, GPRS, CDMA and security issues in Mobile Computing.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	**14**	**42**	**03**

Prerequisite Course(s): Knowledge of Computer Networks.

COURSE CONTENT

Mobile Computing **Semester-VIII**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week
End Semester Examination (ESE): 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1) Introduction **(08 Hrs, 16 Marks)**
a. Mobility of Bits and Bytes,
b. Wireless -The Beginning,
c. Mobile Computing,
d. Dialogue Control,
e. Networks,
f. Middleware and Gateways,
g. Application and Services (Contents),
h. Developing Mobile Computing Applications,
i. Security in Mobile Computing,
j. Standards - Why is it Necessary? , Standard Bodies

Mobile Computing Architecture
k. Internet – The Ubiquitous Network,
l. Architecture for Mobile Computing,
m. Three-Tier Architecture.

2) Emerging Technologies **(08 Hrs, 16 Marks)**
a. Design considerations for Mobile Computing,
b. Mobile Computing through Internet,
c. Making Existing Applications Mobile -Enabled,

d. Bluetooth,
e. Radio Frequency Identification,
f. Wireless Broadband (WiMAX),
g. Mobile IP,
h. Internet Protocol Version 6 (IPv6),
i. Java Card.

3) GSM and GPRS **(08 Hrs, 16 Marks)**

Global System for Mobile Communications (GSM):

a. Global System for Mobile Communications,
b. GSM Architecture,
c. GSM Entities,
d. Call Routing in GSM,
e. PLMN Interfaces,
f. GSM Addresses and Identifiers,
g. Network Aspects in GSM,
h. GSM Frequency Allocation,
i. Authentication and Security.

General Packet Radio Service (GPRS):

j. Introduction,
k. GPRS and Packet Data Network,
l. GPRS Network Architecture,
m. GPRS Network Operations,
n. Data Services in GPRS,
o. Applications for GPRS,
p. Limitations of GPRS,
q. Billing and Charging in GPRS.

4) WAP, CDMA and 3G **(08 Hrs, 16 Marks)**

WAP:

a. Introduction,
b. WAP,
c. MMS,
d. GPRS Application,

CDMA and 3G

e. Introduction,
f. Spread-Spectrum Technology,
g. Is-95,
h. CDMA versus GSM,
i. Wireless Data,
j. Third Generation Networks,
k. Applications on 3G.

5) Security Issues in Mobile Computing **(08 Hrs, 16 Marks)**

a. Introduction,
b. Information Security,
c. Security Techniques and Algorithms,
d. Security Protocols,
e. Public Key Infrastructure,
f. Trust,
g. Security Models,
h. Security Frameworks for Mobile Environment.

Text Book:

1. Asoke K Talukder and Roopa R Yavagal, “Mobile Computing (Technology, Applications and Service Creation)”, Tata Mcgraw-Hill.

Reference Books:

1. Raj Kamal, “Mobile Computing”, Oxford University Press-New Delhi
2. Yi-Bang Lin, ImrichChlamtac, “Wireless and Mobile Network Architectures”, Wiley Publication.
3. Charles Perkins, “Mobile IP”, Addison Wesley.

Bio-Informatics (Elective III)

COURSE OUTLINE

Course Title | Short Title Course Code
Bio Informatics | **BI**

Course Description:
This course provides a comprehensive view of the Bio Informatics principles and its applications in engineering.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	3

Prerequisite Course(s): Basic knowledge of Biological terms and concepts of database management system.

COURSE CONTENT

Bio Informatics **Semester-VIII**

Teaching Scheme **Examination Scheme**

Lecture: 3 Hours/Week **End Semester Examination (ESE): 80 Marks**
Paper Duration (ESE): 03 Hours
Internal Sessional Exam (ISE): 20 Marks

1. **Introduction to Bioinformatics** **(08 Hrs. 16 Marks)**
   a. Introduction and Historical overview of Bioinformatics,
   b. Bioinformatics Applications,
   c. Molecular biology Basic concepts-Protein and amino acid, DNA and RNA
   d. Tools for web search,
   e. Bioinformatics Major databases,
   f. Data mining of biological databases.

2. **Data Structure & Data Analysis** **(08 Hrs. 16 Marks)**
   a. Sequence Visualization, Structure visualization,
   b. statistical concepts, micro arrays,
   c. Imperfects data, quantitative randomness, data analysis,
   d. Tool selective, Statistics of alignment,
   e. Clustering and classification.

3. **Bioinformatics Databases and Data mining** **(08 Hrs. 16 Marks)**
   a. Introduction, Primary & Secondary database,
   b. Biological databases, Protein pattern databases and structure classification databases

c. Methods & Technology overview, infrastructure,
d. Pattern recognition &discovery, machine learning, text mining & tools,
e. Dot matrix analysis,substitution matrices, dynamic programming, word methods,
f. Multiple sequence, alignment, tools for pattern matching.

4. Data Representation, Simulation & Collaboration (08 Hrs. 16 Marks)

e. Drug discovery, fundamentals
f. Protein structure
g. System biology
h. Collaboration & communications, standards
i. Bioinformatics Issues.

5. Human Genome Project and Bioinformatics Tools (08 Hrs. 16 Marks)

d. History, Nucleic Acids, Genes, Genomes
e. Introduction of National Institutes of Health (NIH),
f. Introduction of National Library of Medicine (NLM)
g. Introduction of National center for Biotechnology Information(NCBI)
h. Human Genome Project, it's need, goal, uses and applications
i. Introduction, working with FASTS, working with BLAST,
j. FASTA & BLAST algorithms & comparison

Text Books:

1. S.C.Rastogi, N.Mendiratta, P.Rastogi "Bioinformatics-Methods & Application", [RMR]PHI
2. Bryan Bergeron, "Bioinformatics Computing", Pearson Education [BB].

Reference Books:

3. A.D. Baxevanis and B.F.F. Ouellette, "Bioinformatics: A practical guide to the analysis of genes and proteins" (Eds). 2002 John Wiley and Sons.
4. D.W. Mount, "Bioinformatics: Sequence and Genome Analysis", 2001, Cold Spring Harbor Laboratory Press.
5. S.C. Rastogi, Namita Mendirata, Parag Rastogi ''Bioinformatics concepts Skills and application, CBS publisher.
6. Imtiyaz Alam Khan (IAK) "Elementary Bioinformatics", Pharma Book Syndicate.
7. InduShekhar Thakur (IST) "Environmental Biotechnology", IK International Publication.
8. A.D. Baxevanis and B.F. Ouellettee ,"Bioinformatics, A Practical Guide to the Analysis of Genes and Proteins"
9. David W. Mount,"Bioinformatics: Sequence and Genome Analysis".
10. Stuart M. Brown,"Essentials of Medical Genomics".
11. Jean-Michel Claverie& Cedric Notredame ,'Bioinformatics for Dummies".

Cloud Computing (Elective III)

COURSE OUTLINE

Course Title	Short Title	Course Code
Cloud Computing	**CC**	

Course Description:

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s):

COURSE CONTENT

Cloud Computing **Semester-VIII**

Teaching Scheme **Examination Scheme**

Lecture: 3 Hours/Week **End Semester Examination (ESE): 80 Marks**
Paper Duration (ESE): 03 Hours
Internal Sessional Exam (ISE): 20 Marks

1. Cloud Computing Introduction (08Hrs, 16 Marks)

a. Defining cloud computing, Cloud types- The NIST model, The cloud cube model, Deployment models and Service models
b. Examining characteristics of cloud computing- Paradigm shift, Advantages of cloud computing , Disadvantages of cloud computing

2. Understanding Cloud Architecture (08Hrs, 16 Marks)

a. Exploring the Cloud Computing Stack- Composability, Infrastructure, Platforms, Virtual Appliances, Communication Protocols, Applications
b. Connecting to the Cloud- The Jolicloud Netbook OS, Chromium OS: The Browser as an Operating System

3. Cloud Services (08Hrs, 16 Marks)

a. Defining Infrastructure as a Service (IaaS), IaaS workloads, Defining Platform as a Service (PaaS), Defining Software as a Service (SaaS), SaaS characteristics,Open SaaS and SOA, Salesforce.com and CRM SaaS
b. Defining Identity as a Service (IDaaS) - What is an identity?, Networked identity service classes, Identity system codes of conduct, IDaaS interoperability, Defining Compliance as a Service

(CaaS)

4. Managing Clouds (08Hrs, 16 Marks)

a. Administrating the Clouds, Management responsibilities, Lifecycle management, Cloud Management Products
b. Identity and access management- Trust boundaries and IAM, Why IAM? , IAM challenges, IAM definitions, IAM architecture

5. Cloud Security (08Hrs, 16 Marks)

a. Security Management in the Cloud, Availability Management, Access Control, Security Vulnerability, Patch, and Configuration Management
b. Privacy- Privacy, Data Life Cycle, Key Privacy Concerns in Cloud

Reference Books:

1. Barrie Sosinsky, “Cloud Computing Bible”, WileyPublication,India, 2011.
2. Tim Mather, SubraKumaraswamy and ShahedLatif “Cloud Security and Privacy”, O’REILLY

iPhone Programming (Elective III)

COURSE OUTLINE

Course Title	Short Title	Course Code
iPhone Programming	**IPP**	

Course Description:

This course provides the students the platform to learn and understand the iPhone technology and encourage them to design, develop and deploy Android applications.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	3	**14**	**42**	**3**

Prerequisite Course(s): Basic knowledge of C, C++, JAVA.

COURSE CONTENT

iPhone Programming **Semester-VIII**

Teaching Scheme **Examination Scheme**

Lecture: 3 Hours/Week **End Semester Examination (ESE) : 80 Marks**
Paper Duration (ESE): 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

1. **Introduction: Basic concepts of Objective C (08 Hrs. 16 Marks)**
   a. What is objective C and Xcode , Installing Xcode and compiling objective C
   b. Object oriented programming in objective –C, similarities and differences from C and C++
   c. Objective-**C:** Classes, Objects, Methods, Data Types & Expressions, Program Looping, Decision Making.

2. **The Foundation Framework of Objective-C (08 Hrs. 16 Marks)**
   a. Introduction to the Foundation Framework, inheritance, Polymorphism
   b. Dynamic Typing & Binding, Categories and Protocols
   d. The Preprocessor, Numbers, Strings and Collections
   e. Working with Files, Memory Management, Copying Objects

3. **Cocoa, Cocoa Touch and the iOSSDK (08 Hrs. 16 Marks)**
   a. **Introduction to Cocoa and Cocoa Touch:** Framework Layers of Cocoa and Cocoa Touch
   b. **Introduction to iOS:** overview of the iOS 5 Architecture, Features of iOS, Registering as a Apple Developer
   c. **iOS -Environment Setup:**XCode Installation, Interface Builder, iOS simulator

d. **Writing iOS Applications:** Creating first iOS application, Outlets, Actions and View Controllers

4. Introduction to iPhone application programming (08 Hrs. 16 Marks)

a. A simple iPhone Application
b. Basic UI Elements: UITextField, UIButton, Labels, UIToolbar, UIStatusBar, UITabBar, UIAlert, UISwitch, UISlider, Action Sheet, Accelerometer, Image View, Web View, KeyBoard Inputs

5. iPhone Multimedia and Webservices (08 Hrs. 16 Marks)

a. Accessing Built-in Application, Multimedia (audio and video),
b. Animation with views
c. Webservices, SQLite

Text Books:

1. Stephen G.Kochan ,"Programming in Objective-C" Sixth Edition, ,Addison-Wesley Publications.
2. Wei-Meng Lee ,“Beginning iPhone SDK Programming with Objective-C”, Wiley Publication.

Reference Books:

1. Joe Conway ,"iPhone Programming THE BIG NERD RANCH GUIDE ", Aaron Hillegass. The Big Nerd Ranch Inc.
2. Gary Bennett, Mitch Fisher, Brad Less, "Objective-C for Absolute Beginners", Apress Publication.
3. Neil Smyth,"iPhone iOS 5 Development Essentials".

Internet Security Lab

LAB COURSE OUTLINE

Course Title	Short Title Course Code
Internet Security Lab	**IS Lab**

Course Description:
This laboratory provides students with a comprehensive study of the Network Security and Cryptography. This laboratory provides the students with the means of implementing the security concepts using programming languages.

Laboratory	Hours/Week	No. of Weeks	Total Hours	Semester Credits
	02	14	28	01

Prerequisite Course(s) Basic knowledge of security related concepts.

LAB COURSE CONTENT

Any FIVE lab assignments should be framed by concern staff member based on above syllabus. Concern staff should implement the experiments using any programming language C/C++/Java.

1. Implementing Substitution Ciphers
   Mono-Alphabetic
   Poly-Alphabetic
2. Implementing Vernam Cipher
3. Implement Encryption/Decryption using Ceaser Cipher
4. Implementing DES key generation Algorithm
5. Implementing RC4/RC5 algorithm
6. Creation & export of digital certificates
7. Implementation of digital signature
8. Implementation of RSA algorithm
9. Implement Diffie-Hellman Key Exchange algorithm

Guidelines for ICA:
Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guidelines for ESE:
The oral examination will be based on the assignments performed by the candidates as part of ICA. Questions will be asked during the oral/practical examination to judge the understanding of the student. It is expected that student knows theoretical (Internet Security) aspect of the problem.

Note:-

- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Data Warehousing and Mining Lab

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Data Warehousing and Mining Lab	**DWM Lab**	

Course Description:

Laboratory	Hours/Week	No. of Weeks	Total Hours	Semester Credits
	2	14	28	1

LAB COURSE CONTENT

Group A

1. Develop a program to construct a multidimensional data model (Star, Snowflake or Fact constellations)
2. Develop a program to implement data pre-processing techniques.
3. Develop a program to implement data integration techniques.
4. Implement Apriori algorithm for frequent item set.

Group B

1. Develop a program to implement data generalization and summarization techniques.
2. Develop a program to extract association mining rules.
3. Develop a program for classification of data.
4. Develop a program for implementing one of the clustering techniques.

Note: Concerned Faculty should suitably frame at least **6** practical assignments (**Three** from Group A and **Three** from Group B) out of the above list.
Use of open source Tool/ Technology (like Weka) for Laboratory Assignments is recommended.

Guidelines for ICA:
Students must submit ICA in the form of journal. Each experiment should be well documented. Faculty in charge will assess the experiments continuously and will assign grade or mark for each experiment on date of completion, declared for each experiments.

Guidelines for ESE:
In the ESE, the students may be asked to perform the practical assignment with minor modification. Questions will be asked during the practical examination to judge the understanding of the student. It is expected that student knows theoretical aspect of the problem.

Text Books -

1. Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”,

   Second Edition, Morgan Kaufmann.

Reference Books -

1. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction To Data Mining",Person Education, 2007.
2. G. K. Gupta, "Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006.
3. Alex Berson and Stephen J. Smith, "Data Warehousing, Data Mining & OLAP", Tata McGraw – Hill Edition, Tenth Reprint 2007.

Note:-

- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Software Metrics and Quality Assurance Lab (Elective II Lab)

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Software Metrics and Quality Assurance	**SMQA Lab**	

Course Description:
This laboratory provides students with a comprehensive study of software engineering. The practical's make students able to calculate length, cost, effort size etc. of program.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Laboratory	**02**	**14**	**28**	**01**

Prerequisite Course(s): Fundamental knowledge of software engineering and testing.

Any **FIVE** appropriate assignments from following list:

1. To perform the effort estimation based on project specification.
2. Program for finding Length of program.
3. Implementation of program for finding Length of program using Lines of Code.
4. Program for measuring Size of program using Albrecht's Method.
5. Implementation of program for measuring size of program using Function Point Calculation Albrecht's method.
6. Software testing using J-Meter testing tool.
7. Software testing using Selenium testing tool.
8. Schedule estimation using Gantt chart.

Guidelines for ICA:
Students must submit ICA in the form of journal. Each experiment should be well documented. Faculty in charge will assess the experiments continuously and will assign grade or mark for each experiment on date of completion, declared for each experiments.

Guidelines for ESE:
In the ESE, the students may be asked to perform the practical assignment with minor modification. Questions will be asked during the practical examination to judge the understanding of the student. It is expected that student knows theoretical aspect of the problem.

Note:-

- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Distributed System Lab (Elective II Lab)

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Distributed Systems	**DS Lab**	

Course Description:

This laboratory provides students with a comprehensive study of the Distributed Systems. Classroom lectures stress the strengths of Distributed Systems, which provide students with the means of writing efficient, maintainable and portable code and simulating Distributed Systems concepts like Remote Procedure Call (RPC), Client-Server application, Distributed Mutual Exclusion, Distributed Chat Server, Lamport's Logical Clock, Bully and Ring election algorithms and Hadoop.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**14**	**28**	**1**

Prerequisite Course(s): C/C++/Java,Operating Systems and Computer Networks.

(Note: Minimum SIX Experiments from the given list)

1. **Write a Program for Remote Procedure Call (RPC).**
   Implementation of Remote Procedure Call (RPC) concept in C/C++/Java.
2. **Write a Program to implement Echo Client-Server application.**
   Implementation of Echo Client-Server application in C/C++/Java.
3. **Write a Program to find length of given string using thread.**
   Implementation of to find length of given string using thread in C/C++/Java.
4. **Simulate the Distributed Mutual Exclusion.**
   Simulation of the Distributed Mutual Exclusion concept in C/C++/Java.
5. **Implementation of Distributed Chat Server.**
   Implementation of the Distributed Chat Server in C/C++/Java.
6. **Simulate the function of Lamport's Logical Clock.**
   Simulation of the function of Lamport's Logical Clock in C/C++/Java.
7. **Implementation of Date and Time server using Java RMI.**
   Implementation of the Date and Time server using Java RMI.
8. **Implementation of server that adds given two values by the clients using Java RMI.**
   Implementation of the server that adds given two values by the clients using Java RMI.
9. **Write a program for word count using Hadoop.**
   Implementation of the program for word count using Hadoop.
10. **Implement merge sort algorithm and run it using Hadoop for large data set.**

Implementation of the merge sort algorithm and run it using Hadoop for large data set.

11. **Write simulation program for synchronization using Bully and Ring election algorithm.**

    Simulation for synchronization concept using Bully and Ring election algorithm.

Guidelines for ICA:

Students must submit ICA in the form of journal. Each experiment should be well documented. Faculty in charge will assess the experiments continuously and will assign grade or mark for each experiment on date of completion, declared for each experiments.

Guidelines for ESE:

In the ESE, the students may be asked to perform the practical assignment with minor modification. Questions will be asked during the practical examination to judge the understanding of the student. It is expected that student knows theoretical aspect of the problem.

Note:-

- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Cryptography & Network Security Lab (Elective II Lab)

LAB COURSE OUTLINE

Course Title Short Title Course Code
Cryptography & Network Security **CNS Lab**

Course Description:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**14**	**28**	**1**

Prerequisite Course(s): Basic knowledge of computer networks and security.

(Note: Minimum FIVE Experiments from the given list)

1. Write a Program to Implement Columanar Cipher Text
2. Write a Program to Implement Encryption/Decryption using Ceaser Cipher.
3. Write a Program to Simulate Diffie-Hellman Key Exchange
4. Write a Program to Implement Play Fair Cipher.
5. Write a Program for Encryption/Decryption using Rail Fence Technique
6. Write a Program to Implement RSA Algorithm

Guidelines for ICA:
Students must submit ICA in the form of journal. Each experiment should be well documented. Faculty in charge will assess the experiments continuously and will assign grade or mark for each experiment on date of completion, declared for each experiments.

Guidelines for ESE:
In the ESE, the students may be asked to perform the practical assignment with minor modification. Questions will be asked during the practical examination to judge the understanding of the student. It is expected that student knows theoretical aspect of the problem.

Note:-
- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Neural Networks and Fuzzy Logic Lab (Elective II Lab)

LAB COURSE OUTLINE

Course Title | Short Title Course Code
Neural Networks and Fuzzy LogicLab | **NNFL Lab**

Course Description:

Laboratory	Hours/Week	No. of Weeks	Total Hours	Semester Credits
	2	**14**	**28**	**1**

LAB COURSE CONTENT

Group A

1. Implementation of Perceptron Learning
2. Implementation of McCulloh-Pitts model.
3. Implementation of Hopfield model.
4. Implement Delta rule.
5. Implement model for multilayer perceptron.

Group B

1. To implement crisp set
2. To implement Fuzzy Sets.
3. To implement Fuzzy Relations
4. Simulation of Neural supervised Learning in any soft Computing tool.
5. Simulation of Neural unsupervised Learning in any soft Computing tool.

Note: Concerned Faculty should suitably frame at least **6** practical assignments (**Three** from Group A and T**hree** from Group B) out of the above list

Text Books:

1. S. Rajasekaran & G. A. V. Pai, "Neural Networks, Fuzzy logic, and Genetic Algorithms", PHI.
2. J. M. Zurda, "Introduction to Artificial Neural Networks", Jaico Publishing House.

Reference Books:

1. S. Haykin, "Neural Networks", Pearson Education, 2nd Ed., 2001.
2. Klir& Yuan, "Fuzzy Sets and Fuzzy Logic", PHI, 1997.
3. Chin-Teng Lin & C. S. George Lee, "Neural Fuzzy Systems", Prentice Hall PTR.
4. V. Kecman, "Learning and Soft Computing", MIT Press, 2001.
5. S. N. Sivanandam& S. N. Deepa, "Principles of Soft Computing", Wiley - India, 2007.
6. B. Yegnanarayana, "Artificial Neural Networks ",Prentice Hall of India, 1999.

Guidelines for ICA:

Students must submit ICA in the form of journal. Each experiment should be well documented. Faculty in charge will assess the experiments continuously and will assign grade or mark for each experiment on date of completion, declared for each experiments.

Guidelines for ESE:
In the ESE, the students may be asked to perform the practical assignment with minor modification. Questions will be asked during the practical examination to judge the understanding of the student. It is expected that student knows theoretical aspect of the problem.

Note:-

- Use of Open Source Tool/Technology is recommended for laboratory assignments of concern subject.

Industrial Lecture
COURSE CONTENT

Industrial Lecture **IL**
Course Title Short Title Course Code

Course Description:
The gap between industry's needs and the academic community's aspirations appears to be considerably large. There exists a strong feeling, at least in the academic circles, that unless technology driven initiatives find a surer place in the industrial sector in this country, the academia-industry interaction is likely to remain confined to developmental activities with limited exploratory or research-based content As institutes committed primarily to creation and growth of technological knowledge, technical institutes have an important role to play in the industrial sector of the country's economy. This fact by way of encouraging mechanisms to foster interaction between the academia and industry. Typically, academic interest in the multidimensionality of a problem leads to a tendency to explore a variety of options to arrive at a solution. This industrial lecture develops ability of student for expectations of the industrialists from the fresh engineers.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	1	14	14	2

COURSE CONTENT

Semester-VIII **Examination Scheme**
Total Semester Credits: 02
Internal Continuous Assessment (ICA): 50 Marks

1. There is a need to create avenues for a close academia and industry interaction through all the phases of technology development, starting from conceptualization down to commercialization.
2. List of renowned persons from industry shall be prepared by the committee appointed by Head of the department. After approval from the Principal, Minimum five Industrial lectures in alternate week shall be arranged, which shall be delivered by the experts/Officials from Industries/Govt. organizations/ Private Sectors/Public Sectors / R&D Labs covering the various aspects.
3. Topics of Industrial Lectures shall be Technical in nature and should not be the specific contents from the curriculum.
4. Students shall submit the report based on minimum five lectures giving summary of the lecture delivered.
5. The summary should contain brief resume of the expert, brief information of his organization and brief summary of the lecture in bullet point form.

Guide lines for ICA: Assessment of the Industrial Lecture for award of ICA marks shall be done jointly by departmental committee as per attendance in industrial lecture, report submitted by student and overall performance in semester as per the guidelines given in **Table- D**

Table-D

SN	Name of Student	Attendance (05 Marks per Lecture)	Dept of Understanding (03 Marks per Lecture)	Report Writing	Total
		25	15	10	50

Project-II

Course Title	Short Title	Course Code
Project-II	**Project-II**	

Course Description:
The course explores the knowledge of design, experiment and analysis of data. The course develops ability to work on multidisciplinary teams, Identify, formulate, and solve engineering problems in view of economic, environmental and societal context.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	**4**	**14**	**56**	**6**

COURSE CONTENT

Semester-VIII **Examination Scheme**

Total Semester Credits: 06
Internal Continuous Assessment (ICA): 75 Marks
End Semester Examination (ISE):75 Marks
Total: 150Marks

1. Project-I work decided in VII semester shall be continued as Project-II
2. Students should complete implementation of ideas given in synopsis/Abstract, so that project work should be completed before end of semester.
3. Project-II may involve fabrication, design , experimentation , data analysis within realistic constraints such as economic, environmental, social, ethical, health and safety, manufacturability, and sustainability. The stage also includes testing , possible results and report writing
4. Each students project group is required to maintain log book for documenting various activities of Project-II and submit group project report at the end of Semester-VIII in the form of Hard bound.
    1. *Title*
    2. *Abstract*
    3. *Introduction*
    4. *Problem identification and project objectives*
    5. *Literature survey*
    6. *Analysis*
    7. *Design*
    8. *Coding*
    9. *Testing*
    10. *Results & conclusions*
    11. *Future Scope*
    12. *References*

Guide lines for ICA : ICA shall be based on continuous evaluation of students performance throughout semester in project-II and report submitted by the students project group in the form Hard bound. Assessment of the project-II for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given in **Table-D.**

Guide lines for ESE:-

In ESE the student may be asked for demonstration and questions on Project. Evaluation will be based on answers given by students in oral examination.

Assessment of Project-II

Title of the Project: ______________________________

Name of the Guide: ______________________________

Table-D

		Assessment by Guide (50 Marks)				Assessment by Committee (25 Marks)		
SN	**Name of Student**	**Attendance , Participa-tion and team work**	**Material procurement / assembling/ Designing/Programming**	**Case study/ Execution**	**Project Report**	**Dept of Understan-ding**	**Presentation**	**Total**
Marks		**10**	**15**	**15**	**10**	**10**	**15**	**75**

NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Syllabus for

Final Year Mechanical Engineering

Faculty of Engineering and Technology

Course Outline

SEMESTER – VII and VIII

W.E.F 2015 – 2016

North Maharashtra University, Jalgaon
Syllabus Structure for Final Year Mechanical Engineering w.e.f year 2015-16
Semester –VII

Course Code	Name of the Course	Group	Teaching Scheme				Evaluation Scheme				Total	Credits
							Theory		Practical			
			Theory Hrs /week	Tutorial Hrs /week	Practical Hrs /week	Total	ISE	ESE	ICA	ESE		
	Refrigeration and Air Conditioning	D	3	---	---	3	20	80	---	---	100	3
	Computer Aided Design and Computer Aided Manufacturing	D	3	---	---	3	20	80	---	---	100	3
	Interdisciplinary Elective	E	3	---	---	3	20	80	---	---	100	3
	Elective-I	E	3	---	---	3	20	80	---	---	100	3
	Operation Research	D	3	---	---	3	20	80	---	---	100	3
	CAD/CAM	D	---	---	2	2	---	---	25	25	50	1
	RAC	D	---	---	2	2	---	---	25	25 PR	50	1
	Elective-I	E	---	---	2	2	---	---	25	25	50	1
	Project–I	D	---	---	2	2	---	---	25	25	50	2
	Seminar-II	D	---	---	2	2	---	---	25	---	25	2
	Industrial Visit	D	---	---	---	---	---	---	25	---	25	1
	Total		15	---	10	25	100	400	150	100	750	23

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA: Internal Continuous Assessment**

	Interdisciplinary Elective		**Elective – I**
1	Operation Research Techniques	1	Mechatronics
2	Energy Resources and Technology	2	Advanced Machine Design
		3	Machine Tool Design
		4	Automobile Engineering – I

North Maharashtra University, Jalgaon
Syllabus Structure For Final Year Electrical Engineering w.e.f year 2015-16
Semester –VIII

Course Code	Name of the Course	Group	Teaching Scheme				Evaluation Scheme				Total	Credits
							Theory		Practical			
			Theory Hrs /week	Tutorial Hrs /week	Practical Hrs /week	Total	ISE	ESE	ICA	ESE		
	Mechanical Vibration	D	3	---	---	3	20	80	---	---	100	3
	Finite Element Analysis and Simulation Techniques	D	3	---	---	3	20	80	---	---	100	3
	Elective-II	E	3	---	---	3	20	80	---	---	100	3
	Elective-III	E	3	---	---	3	20	80	---	---	100	3
	Mechanical Vibration	D	---	---	2	2	---	---	25	25	50	1
	Finite Element Analysis and Simulation Techniques	D	---	---	2	2	---	---	25	25 PR	50	1
	Elective-II	D	---	---	2	2	---	---	25	25	50	1
	Industrial Lecture*	E	---	---	1*	1	---	---	50	---	50	2
	Project–II	D	---	---	4	4	---	---	75	75	150	6
	Total		12	---	11	23	80	320	200	150	750	23

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA: Internal Continuous Assessment**

	Elective-II		**Elective – III**
1	Tribology	1	Introduction to Robotics
2	Power Plant Engineering	2	Advanced Welding Technology
3	Process Equipment Design	3	Energy Conservation and Management
		4	Automobile Engineering – II
		5	Thermal Equipment design

Course Outline

Refrigeration and Air Conditioning **RAC**

Course Title: Short Title Course Code

Branch- Mechanical Engineering **Year–Fourth Year**

Course Description: This course Familiarize under graduate students with the terminologies associated with refrigeration & air conditioning, basic principles of psychrometry and applied psychometrics, refrigerants; vapor compression refrigeration and multi-stage vapor compression systems, components of vapor compression systems and other types of cooling systems.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03
Practical	02	14	28	01

Examination scheme:

End semester exam (ESE)	80 Marks	Duration: 03 hours
Internal Sessional exam (ISE)	20 Marks	

Purpose of Course: Degree Requirement

Prerequisite Course(s): Fundamental knowledge of Engineering Thermodynamics, Applied Thermodynamic, and Heat Transfer

Outline of Content: This course contains:

UNIT-I

1.	**Refrigeration systems**	**No. of Lectures –9, Marks : 16**
	a	Introduction, standard rating of refrigerating machine, coefficient of performance of refrigerator and heat pump.
	b	Reversed Carnot cycle and its limitations, reversed Brayton cycle, application to air craft refrigeration, Bootstrap refrigeration cycle, reduced ambient air cooling system, regenerative air cycle system.
	c	Designation of refrigerant, selection of refrigerant, chemical, physical and thermodynamic requirements of refrigerants, lubricant in refrigerating system, secondary refrigerant, azeotropes and its uses.

UNIT-II

2.	Vapour compression refrigeration system	No. of Lectures–9, Marks : 16
	a	Vapour compression refrigeration system study of theoretical and actual vapour compression cycle, use of p-h & T-s charts, effect of evaporator and condenser pressure and temperature on the performance of the refrigeration cycle, effect of sub cooling and super heating.
	b	Compound vapour compression system with inter cooling, flash chamber, multi compressor and multi evaporators systems.
	c	Cascade refrigeration system, production of dry ice.

UNIT - III

3.	Vapour absorption refrigeration systems	No. of Lectures–8, Marks : 16
	a	Vapour absorption refrigeration simple & modified vapour absorption refrigeration systems, Electrolux refrigerator.
	b	Desirable properties of soIVent, absorbent & refrigerant combinations, aqua ammonia & lithium bromide refrigeration system use of enthalpy concentration charts.

UNIT - IV

4.	Basic of Psychometric	No. of Lectures –8, Marks : 16
	a	Psychometric- properties of moist air, psychometric chart and process, mixing of air stream, bypass factor, sensible heat factor, room sensible heat factor, Gross sensible heat factor, humidifying efficiency, air washer.
	b	Study of various types of psychometers, sling, aspirating, and industrial type.

UNIT-V

5.	Air Conditioning System	No. of Lectures –8, Marks : 16
	a	Introduction to industrial and comfort air conditioning, human requirements of comfort, effective temperature and comfort chart.
	b	Air conditioning load calculations, inside and outside design conditions, Building cooling & heating load calculation, Effective sensible heat factor advanced psychrometry.
	c	Window and central air conditioning systems year round air conditioning.

Text Book and Reference Books

1. Arora C. P., “Refrigeration and air conditioning”, TMH, New Delhi.
2. Monohar Prasad, “Refrigeration and air conditioning”, New Age Publishers, New Delhi.
3. Ananthnarayanan, “Basics of Refrigeration”, TMH, and New Delhi.
4. Stocker W. F. and Jones, “Refrigeration and air conditioning”, McGraw Hill.
5. Dossat, “Principles of Refrigeration”, John Wiley Inc.
6. Arora and Domkundawar, “Refrigeration and air conditioning”, Dhanpatrai and sons, New Delhi.
7. Faye C McQuistom, “Heating Ventilatgingnad Air conditioning”, Wiley India Pvt. Ltd. New Delhi

Course Outline

Computer Aided Design and Computer Aided Manufacturing CAD/CAM

Course Title: Short Title Course Code

Branch- Mechanical Engineering **Year–Fourth Year**

Course Description: The course presents the elements of solid modeling, creation of parts of increasing complexity and the assembly of parts to form a final design, along with mechanism simulation. The operation and programming of CNC machines is covered.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03
Practical	02	14	28	01

Examination scheme:

End semester exam (ESE)	80 Marks	Duration: 03 hours
Internal Sessional exam (ISE)	20 Marks	

Purpose of Course: Degree Requirement

Prerequisite Course(s): Fundamental knowledge about the Design and Automation of Manufacturing Process, Strength of Materials, Engineering Mechanics, etc

Outline of Content: This course contains:

UNIT-I

1.	**Introduction To CAD/CAM And Networking**	**No. of Lectures–9, Marks : 16**
	a	Define CAD/CAM, Product Life Cycle & CAD/CAM, and Application of Computers for Design Process, Selection of a CAD system, Desirable relationship of CAD/CAM database, Benefits & Application of CAD.
	b	Hardware in CAD, Introduction, The Design Work Station, The graphics terminal, Operator input/output devices,
	c	Computer communication, Principle of networking, Classification of network, Transmission media & interface, LAN system.

UNIT - II

2.		Computer Aided Graphics No. of Lectures –9, Marks : 16
	a	Introduction, Graphic Primitives, Point plotting, Drawing of lines, Co ordinate system used in graphic element, Transformation in graphics,
	b	2D transformation, Homogeneous transformation, Concatenate co ordinate transformation, Translation, Rotation, Scaling, Mirror, Reflection, Inverse co ordinate transformation, clipping,
	c	3D transformation, View Port, Windowing, Standardization in graphics IGES files.

UNIT - III

3.		Computer Aided Modeling & Automation No. of Lectures–8, Marks : 16
	a	Requirement of Geometric Modeling, Geometric Model, Geometric Model Construction Method: Wire Frame Modeling, Surface Modeling, Solid Modeling, Representation of Curve & Surfaces, Design of curve shape, Cubic Spline, Bezier curve, B-spline curve
	b	AUTOMATION: Concept of Automation, Types of Automation, Advantages & limitations of Automation, Levels of Automation, Advanced Automation Function.

UNIT - IV

4.		Computer Aided Manufacturing No. of Lectures –8, Marks : 16
	a	INDUSTRIAL CONTROL SYSTEM Continuous control system, Discrete control system, Computer process control, Forms of CPC, Computer process Monitoring, Direct Digital Control, Numerical Control & Robotics, Programmable logic controller, Supervisory control, Distributed Control & Personnel Computers
	b	CNC PROGRAMMING Axis of CNC Machines, Manual Part Programming using G and M codes Adoptable to Fanuc Controller for Lathe.

UNIT-V

5.		Introduction to FMS, GT and Robotics No. of Lectures–8, Marks : 16
	a	FMS – Introduction, Components of FMS, Types of FMS, Application & Benefits, Planning & implementation issue, Typical FMS layout.
	b	GT – Part families, Part classification & coding, optic coding system, Multiclass coding system, Application of GT.
	c	Robotics – Robot Anatomy, Robot Control System, End effectors, Sensors, Industrial Robot, Application and its selection.

Text Book and Reference Books

Text Book and References Books

1. Ibrahim Zeid and R. Sivasubramanian - CAD/CAM – Theory and Practice Tata McGraw Hill Publishing Co. 2009
2. Ibraim Zeid, "Mastering CAD/CAM" – Tata McGraw Hill Publishing Co. 2000

3. Chandrupatla T.R. And Belegunda A.D. -Introduction to Finite Elements in Engineering" -Prentice Hall India
4. Segerling L.J. - Applied Finite Elements Analysis" John Wiley and Sons.
5. Rao P.N., Introduction to CAD/CAM Tata McGraw Hill Publishing Co.
6. Groover M.P.-Automation, production systems and computer integrated manufacturing‟ -Prentice Hall of India
7. Yoram Koren - Robotics McGraw Hill Publishing Co.
8. James G. Keramas, Robot Technology Fundamentals, Delmar Publishers.
9. S.R.Deb, Robotics Technology and Flexible Automation, Tata McGraw Hill.
10. Lakshiminarayana H. V. Finite Element Analysis (Procedures in Engineering), University Press, 2004.
11. Chandrupatla T. R., Finite Element Analysis for Engineering and Technology, University Press, 2009.
12. Seshu P. Text book of Finite Element Analysis, PHI Learning Private Ltd. New Delhi, 2010.
13. P. Radhkrishnan, S. Subramanyam, V. Raju ,"CAD/CAM/CIM" , New Age Publication.
14. Mikell P. Grover, Emory W. Zimmers ,"Computer Aided Design and Manufacturing", P.H.I.
15. Zeid ,"CAD/CAM" ,T.M.H.
16. B.S.Pabla, M.Adithan ,"CNC Machine ", New Age International(P) Ltd.
17. Rao, Tiwari, Kundra ,"Computer Aided Manufacturing" ,T.M.H.
18. CAD/CAM & AUTOMATION by FarazdakHaidri

Interdisciplinary Elective
Course Outline

Operation Research Techniques **ORT**

Course Title: Short Title Course Code

Branch- Mechanical Engineering **Year–Fourth Year**

Course Description: This course introduces under graduate students to imparting knowledge of various decision making techniques.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03

Examination scheme:

End semester exam (ESE)	80 Marks	Duration: 03 hours
Internal Sessional exam (ISE)	20 Marks	

Purpose of Course: Degree Requirement

Prerequisite Course(s): Fundamental knowledge about mathematics & statics.

Outline of Content: This course contains:

UNIT-I

1.		**Linear Programming** **No. of Lectures –9, Marks : 16**
	a	**Operation Research – An Introductions** The history of OR, Definition, Features, of OR, models and modeling in OR, OR approach to problem soIVing, methods for soIVing OR models, phases of OR, Advantages of OR study, Shortcomings of OR approach, OR Models in Practice, Applications of OR.
	b	**Linear Programming**- Introduction, general Stricture of LP model, Assumption of an LP model, Advantages and Limitations of Linear programming, Applications areas of LP, steps of LP Model formulation, Graphical solution methods of LP problem, maximization, minimization, feasible, infeasible and unbounded solution.

UNIT - II

2.		**Linear Programming** **No. of Lectures –9, Marks : 16**
	a	Linear programming – The simplex method Introduction, standard form of an LP problem, simplex algorithm (maximization, minimization case) Degeneracy in simplex problem, unbounded Infeasible solution.
	b	Duality in Linear programming, formulation of dual LPP, Advantages of duality, rules for constructing the Dual from primal, sensitivity Analysis in LP

UNIT - III

3.		Transportation Theory No. of Lectures –8, Marks : 16
	a	Transportation problem introduction, mathematical model of transportation problem, Algorithm, methods for finding initial solution northwest corner method ,Least cost method, vogels Approximation method, test for optimality steps of MODI method, maximization problem, unbalanced, degeneracy, prohibited transportation Routes problem.
	b	Assignment problem- introduction, mathematical models of assignment problem, solution method of assignment problem, Hungarian method, maximization case, unbalanced Restrictions on assignment, travelling salesman, problem

UNIT - IV

4.		Decision Making Theory No. of Lectures –8, Marks : 16
	a	Decision Theory- Introduction, steps in decision making process types of decision making Environments, Decision tree
	b	Theory of games- introduction ,Two person Zero sum game, pure strategies, maximin, minimax principles, game with saddle point, mixed strategy games, The principles of dominance ,games without saddle point,algebraic method, arithmetic method, sub game method, Graphical method.

UNIT-V

5.		Sequencing No. of Lectures –8, Marks : 16
	a	Replacement and maintenance method- Introduction, types of failure- gradual failure ,sudden failure Replacement of items whose efficiency deteriorates with time, Replacement of items that completely fail, individual replacement policy, Group replacement policy, staffing problem ,failure trees.
	b	Sequencing problem- Introduction notations, Terminology, and assumptions of sequencing problem, Processing n jobs through two machines, Processing n jobs through three machines, Processing n jobs through four machines, Processing n jobs through five machines

Text Book and Reference Books

1. Hira , Gupta ,"Operation Research
2. Taha ,"Operation Research"
3. S.D. Sharma, "Operation Research", Khanna Publication
4. Manohar Mahajan, "Operation Research.
5. J. K. Sharma ,"Operation Research, Problem and Solution" , Macmillan
6. N. D. Vohra ,"Quantitative Techniques in Management" ,TATA McGraw Hill
7. Ravindran," Operation Research Principles and Practice ",Wiley India Pvt.Ltd. New Delhi

Interdisciplinary Elective

Course Outline

Energy Resources and Technology **ERT**

Course Title: Short Title Course Code

Branch- Mechanical Engineering **Year–Fourth Year**

Course Description: This course provides an introduction to energy systems, renewable energy resources, with a scientific examination of the energy field and an emphasis on alternate energy sources and their technological applications. The course will explore society's present needs and future energy demands and also focus on renewable energy sources and technological aspects of solar, biomass, wind power, geothermal, and nuclear energy conservation methods.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03

Examination scheme:

End semester exam (ESE)	80 Marks	Duration: 03 hours
Internal Sessional exam (ISE)	20 Marks	

Purpose of Course: Degree Requirement

Prerequisite Course(s): Fundamental knowledge of Thermodynamics.

Outline of Content: This course contains:

UNIT-I

1.	**Energy Overview and Thermal Power Plants**	**No. of Lectures–9, Marks : 16**
	A	Energy Overview: Basics of energy – Types of energy and its utilization – Energy Characteristics – Energy Measures – global energy scenario – India energy scenario – Types of energy and its utilization, Environmental aspects of energy utilization – Public health issues related to environmental Pollution
	B	Overview of Thermal Power Plants, Types of fuels – Coal quality, By products of combustion, Thermal power plant cycle, General layout of modern thermal power plants, Environmental aspects of thermal power plants

UNIT - II

2.	Solar Photovoltaic Energy Conversion	No. of Lectures–9, Marks : 16
	a	Photovoltaic Conversion, Silicon Solar Cells, Photovoltaic Modules, Module efficiency, PV panels and arrays, Solar Photovoltaic Systems(SPS), Solar PV lighting systems, PV Lanterns, Solar water Pumping, PV Roof top technology, Life cycle cost estimates.

UNIT - III

3.	Solar Thermal Energy Conversion	No. of Lectures –8, Marks : 16
	a	Liquid Plat Plate collectors, transmissivity, heat losses and heat loss coefficients, thermal analysis, Concentrating collectors, types, performance analysis of cylindrical parabolic collector.
	b	Solar water heating system, solar cookers, Solar Distillation, Solar Cooling, Solar Ponds, Solar power plants, Concentrated Solar Power Plants.

UNIT - IV

4.	Wind and Nuclear Energy Conversion	No. of Lectures–8, Marks : 16
	a	Wind Energy Conversion-Principles of wind energy conversion, Site selection considerations, Wind, Power plant design, Types of wind power conversion systems, Operation, maintenance and economics.
	b	Nuclear Energy Conversion - Chemical and nuclear equations, Nuclear reactions, Fission and fusion , Energy from fission and fuel burn-up , Radioactivity , Neutron energies , Fission reactor types ,Nuclear power plants , Fast breeder reactor and power plants , Production of nuclear fuels.

UNIT-V

5.	Biomass, Geothermal and Ocean Thermal Energy Conversion No. of Lectures –8, Marks : 16	
	A	Energy from biomass - Sources of biomass ,Different species, Conversion of biomass into fuels, Energy through fermentation, Pyrolysis, gasification and combustion, Aerobic and anaerobic bio-conversion, Properties of biomass, Biogas plants, Types of plants, Design and operation, Properties and characteristics of biogas.
	B	Geothermal energy – Availability, system development and limitations Ocean thermal energy conversion – Wave and tidal energy – Scope and economics

Text Book and Reference Books

1. K.M. Mittal: Non-conventional Energy Systems-Principles, Progress and Prospects, Wheeler Publications, 1997.
2. Kothari: Renewable Energy Sources and Emerging Technologies, PHI, Eastern Economy Edition, 2012
3. G.N. Tiwari: Solar Energy-Fundamentals, Design, Modelling and Applications, Narosa Publishers, 2002.
4. M.M. E1- Wakil; Power Plant Technology, McGraw Hill, 1985.
5. M.M. E1-Wakil: Nuclear Power Engineering, McGraw Hill, 1962.
6. Mukherjee and Chakrabarti, Fundamentals of Renewable Energy systems, New age International Publishers, 2004.
7. S.P. Sukhatme, Solar Energy: Principles of Thermal Collection and Storage,Tata McGraw Hill,2003.

Elective-I

Course Outline

Mechatronics	**MTX**	
Course Title:	Short Title	Course Code

Branch- Mechanical Engineering **Year–Fourth Year**

Course Description: This course introduces to graduate students the basic mechatronics system components, and the design principles of using mechatronics to meet functionality requirements of products, processes and systems.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03
Practical	02	14	28	01

Examination scheme:

End semester exam (ESE)	80 Marks	Duration: 03 hours
Internal Sessional exam (ISE)	20 Marks	

Prerequisite Course(s): Fundamental knowledge of Electrical and Electronic systems and Drives.

Outline of Content: This course contains:

UNIT-I

1.	**Introduction to Mechatronics system**	**No. of Lectures–9, Marks : 16**
	a	Mechatronics system, Modeling and Design, Design concept evolution, Application areas.
	b	Dynamic Models, Model types, Model Development, Lumped model of a distributed system, Kinetic energy equivalence, Natural frequency equivalence, Analogies to mechanical, electrical, thermal and fluid elements

UNIT - II

2.	**Component Interconnection and Signal Conditioning**	**No. of Lectures –9, Marks : 16**
	a	Introduction to Basic components, need of interconnections, impedance characteristics, resistance, inductors, capacitors, amplifiers.
	b	Introduction to Analog and digital filters, Analog to Digital and Digital to Analog converters, Bridge circuits (Wheatstone, Maxwell), Signal Analyzers and Display devices.

UNIT - III

3.	Sensors and Transducers	No. of Lectures –8, Marks : 16
	a	Motion transducers, potentiometer, variable inductance transducers, Permanent magnet transducers, variable capacitance transducers, Piezoelectric Sensors, Effort Sensors, strain gauges, torque sensors, tactile
	b	Optical sensor and Lasers, Thermo-Fluid Sensors, shaft encoders, optical encoders, Digital tachometer, Hall effect Sensors, Linear encoders, Digital resolvers

UNIT - IV

4.	Electrical Actuators	No. of Lectures –8, Marks : 16
	a	Stepper motors, construction and Principle of operation, torque motion characteristics, damping, control, selection and applications of stepper motors
	b	D.C. motors, construction and operations, static torque characteristic, brushless D. C. Motors, control and selection of D.C. Motor
	C	Induction Motors, construction, working, characteristic, torque speed relationship, Consecution, working and control of synchronous motors.

UNIT-V

5.	Mechanical Actuators	No. of Lectures –8, Marks : 16
	a	Linear Actuators, Hydraulic and Pneumatic actuators, components of Hydraulic control system
	b	Pumps, motors, valves, feedback control, constant flow systems, pump controlled hydraulic actuators, pneumatic control system, Flapper valves, and hydraulic circuits.

Text Book and Reference Books

1. Clarence W de SiIva, Mechatronics: An Integrated Approach, CRC Press ISBN 0849312744
2. W Bolton, Mechatronics: A multi-disciplinary approach, Fourth edition, Pearson education ISBN 9788131732533.
3. Boucher, T. O., Computer automation in manufacturing - an Introduction, Chapman and Hall, 1996.
4. HMT ltd. Mechatronics, Tata McGraw-Hill, New Delhi, 1988.
5. Deb, S. R., Robotics technology and flexible automation, Tata McGraw-Hill, New Delhi, 1994.
6. Bolton, W., Mechatronics: electronic control systems in mechanical and electrical engineering, Longman, Singapore, 1999.

Elective-I

Course Outline

Advanced Machine Design	**AMD**	
Course Title:	Short Title	Course Code

Branch- Mechanical Engineering **Year–Fourth Year**

Course Description: This course provides a broad treatment of stress, strain, and strength with reference to engineering design and analysis. Major emphasis is placed on the analytical and experimental methods of determination of stresses in relationship to the strength properties of machine elements under various loading conditions. Also considered are deflection, post-yield behavior, residual stresses, thermal stresses, creep, and extreme temperature effects as applied to the design of fasteners, shafts, power trains, and rotational machinery.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03
Practical	02	14	28	01

Examination scheme:

End semester exam (ESE)	80 Marks	Duration: 03 hours
Internal Sessional exam (ISE)	20 Marks	

Purpose of Course: Degree Requirement

Prerequisite Course(s): Fundamental knowledge of Theory of Machine, Machine Design.

Outline of Content: This course contains:

UNIT-I

1.	**CAMS**	**No. of Lectures –9, Marks : 16**
	a	Advanced curves: 2-3 polynomial, 3-4-5 polynomial, 4-5-6-7 polynomial & higher order polynomial.
	b	Polydyne cams: 3-4-5 cam, cycloidal cam.
	c	Pressure angle, radius of curvature, force on follower and cam, cam design with elasticity of part is considered, ramps.

UNIT - II

2.		Springs — No. of Lectures –9, Marks : 16
	a	Helical springs under static and fatigue or variable loading, buckling of helical compression spring, vibration and surging of helical springs, Optimum design of helical spring.
	b	Design analysis of Belleville springs, ring spring, volute spring, rubber springs and mountings.

UNIT - III

3.		Design Against Fatigue — No. of Lectures –8, Marks : 16
	a	Fatigue Damage theories, Cycle counting Techniques, Stress based fatigue Analysis & design: one dimensional analysis, multiaxial analysis, and Cumulative damage.
	b	Strain based fatigue Analysis & design: one dimensional analysis, multiaxial analysis .Surface integrity & fatigue life improvement.

UNIT - IV

4.		System Approach — No. of Lectures –8, Marks : 16
	a	Introduction, System approach to design mathematical model, Dynamic response to a distributed system, Dynamic response to a lumped system
	b	Modeling the elasticity's, Modeling the masses, Modeling the inertia, Modeling friction and damping
	C	Mathematical model for shock analysis, Cam system, Value engineering approach to design problem.

UNIT-V

5.		Optimum Design — No. of Lectures –8, Marks : 16
	a	Introduction to optimum design, Adequate design, Johnson's method of optimum design.
	b	Case of normal specifications, Case of redundant specifications, Case of incompatible specifications.

Text Book and Reference Books

1. Dr. Rajendra Karwa ," A text book of Machine Design", Laxmi Publications (P) Ltd, New Delhi.
2. J. Uicker, "Theory of Machines and Mechanism", 3ed., Oxford University Press, New Delhi.
3. FarazdakHaideri ," Machine Design", Nirali Prakashan.
4. M.F. Spotts," Design of Machine Elements", Pearson Education.
5. N. C. Pandya ," Element of Machine Design", Charotar book stall, Anand.
6. Norton ," Dynamics of Machinery", Tata Mc-Graw Hill, New Delhi.
7. P. C. Sharma ,"Machine Design", S K Katuria & Sons.
8. R. S. Khurmi ," A text book of Machine Design", Eurasis Publishing House Pvt. Ltd, Delhi.
9. R. B. Patil ,"Design of Machine Elements", Tech- Max Publications, Pune

Elective-I

Course Outline

Machine Tool Design	**MTD**	
Course Title:	Short Title	Course Code

Branch- Mechanical Engineering **Year–Fourth Year**

Course Description: The course aim of imparting the knowledge of Machine tool Design the background required include a knowledge of Mathematics, Engineering materials, Theory of Machines, Engineering Mechanics.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03
Practical	02	14	28	01

Examination scheme:

End semester exam (ESE)	80 Marks	Duration: 03 hours
Internal Sessional exam (ISE)	20 Marks	

Purpose of Course: Degree Requirement

Prerequisite Course(s): Fundamental knowledge of Workshop Practice, Manufacturing Process.

Outline of Content: This course contains:

UNIT-I

1.	**Principles of Machine Tool Design and Drives**	**No. of Lectures–9, Marks : 16**
	a	Introduction – Machine tools, classification. Working and auxiliary motion in machine tools.
	b	Mechanical and Hydraulic transmission elements.
	c	Devices for Intermittent motion. Reversing and differential mechanism.
	d	General requirement of machine tool design. Engineering Design process applied to machine tools.
	e	Machine tool drive – Types of speed and feed regulation, classification of speed and feed boxes.
	f	Design of speed box - Stepped regulation of speed, selection of range ratio, geometric progression, structural diagram.
	g	Design of feed box in details.
	h	Development of gearing diagram.

UNIT - II

2.	Design of machine tool structure	No. of Lectures–9, Marks : 16
	a	Function of machine tool, structure and their requirements, design criteria for machine tool structure.
	b	Materials and its properties, dynamic and static stiffness.
	c	Profile of machine tool structure, factors affecting on the stiffness of machine tool structures.
	d	Basic design procedure machine tool structure.
	e	Design of beds and columns.
	f	Design of Housing, Design of bases and tables.
	g	Design of Cross rails, arms, saddle and carriages.
	h	Design of Rams.

UNIT - III

3.	Design of Guide ways and power Screws	No. of Lectures–8, Marks : 16
	a	Function and types of Guide ways, types of slide ways and types of anti friction ways.
	b	Design of slide ways – Shapes, materials, method of adjusting clearance in slide ways.
	c	Design criteria and calculation for slide ways – (i) for wear (ii) for stiffness
	d	Guide ways operating under liquid friction conditions – (i) hydrodynamic slide ways (ii) Hydrostatic slide ways
	e	Design of Aerostatic and anti-friction guide ways.
	f	Combination guide ways and protecting devices for slide ways.
	g	Design of Power screw – (i) Design of sliding friction power screw
	h	(ii) Design of rolling friction power screw.

UNIT - IV

4.	Design of Spindles and Spindle supports.	No. of Lectures–8, Marks :
	a	Function of spindle unit and requirement, material of spindle
	b	Effect of machine tool compliance on machinery accuracy.
	c	Design calculation of spindles – Deflection of spindle axes due to bending and compliance of spindle support. Optimum spacing between spindle support.
	d	Deflection due to compliance of tapered joint permissible deflection and design for stiffness.
	e	Anti-friction bearings and sliding bearings.
	f	Dynamics of machine tools – Forced vibration in machine tools.

	g	Dynamic characteristics of machine elements
	h	Stability analysis – Static and dynamic cutting processes, characteristics. Regenerative chatter.

UNIT-V

5.	**Control System in Machine tools and Industrial Robots. No. of Lectures–8, Marks : 16**	
	a	Function, requirements and classification, control system for changing speeds and feed with simple centralized control
	b	Control system for changing speeds and feed with pre-selective control Control system for changing speeds and feed with Selective control
	c	Control system for executing and forming auxiliary motion. Manual control system.
	d	Automatic control system and adaptive control system.
	e	Industrial robot and its application.- Introduction and basic function of robotic elements, mobility of robot.
	f	Reliability in operation and various control system in robots.
	g	Robot language – Robot language outline, general description of programming language. Real time, geometric modeling, movements.
	h	Sensors, tools, programming ARL, HARL, AL, VAL, AML, IRL, LM and MCL.

Text Book and Reference Books

1. D. K Pal, S. K. Basu, "Design of Machine Tool", 4th Edition. Oxford IBH 2005, ISBN 81-204-0968.
2. F. Koenigsberger, "Design Principles of Metal Cutting Machine Tools", The Macmillan Company New York 1964.
3. Bhattacharya and S. G. Sen., "Principles of Machine Tool", New central book agency Calcutta, ISBN 81-7381-1555.
4. N. S. Acherkan, "Machine Tool", Vol. I, II, III and IV, MIR publications.
5. N.K. Mehta, "Machine Tool Design", Tata McGraw Hill, ISBN 0-07-451775-9.
6. DR. V. P. Singh, "Mechanical Vibration", S. Chand &Sons., New Delhi.

Elective-I

Course Outline

Automobile Engineering I **AE-I**

Course Title: Short Title Course Code

Branch- Mechanical Engineering **Year–Fourth Year**

Course Description: The course aim of imparting the knowledge of different parts uses in automobile, the background required include knowledge of Engineering materials, IC engine.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03
Practical	02	14	28	01

Examination scheme:

End semester exam (ESE)	80 Marks	Duration: 03 hours
Internal Sessional exam (ISE)	20 Marks	

Purpose of Course: Degree Requirement

Prerequisite Course(s): Fundamental knowledge of IC engine, Theory of Machine.

Outline of Content: This course contains:

UNIT-I

1.		**Introduction to Automobile No. of Lectures –9, Marks : 16**
	a	Introduction to Automobile, History of Automobile, Types of Automobile, Automobile Industry
	b	Special Purpose Vehicle, Chassis, Classification of Chassis, Integral and Chassis less Construction
	c	Frame, Function s of the frame, Types of the Frame, Defects in Frame, Sub Frame, Body
	d	Introduction to Safety System, Seat Belt System, Power Seats, Air Bag System, Electric Mirrors, Central Locking and Electric Window, Electric Horns, Windscreen Wiper System, Analog and Digital Speedometer

UNIT - II

2.	Automobile Suspension No. of Lectures –9, Marks : 16	
	a	Introduction, Function of Suspension system, Requirements of a Suspension System, Torque Rod
	b	Stabilizer Bar, Air Suspension, Hydraulic Suspension
	c	Types of Suspension Spring, Plastic springs for motor cars, Shackle, Shock Absorber
	d	Front Axle Suspension System, Rear Suspension System, Spring and Suspension trouble shooting chart

UNIT - III

3.	Automobile Steering No. of Lectures –8, Marks : 16	
	a	Introduction, Principle of Correct Steering, Requirements of steering system, Steering system functions
	b	General arrangement of steering system, Steering gears and linkages
	c	Power steering, Reversible and irreversible steering, Factor Affecting under-steering and over-steering
	d	Steering Gear, Steering gear ratio, Turning radius, Wheel alignment, Caster and Camber angle, Toe-in Toe-out, Steering Trouble and Causes, Factor Affecting the Steering Operation

UNIT - IV

4.	Automobile Wheels, Tyres and Tubes No. of Lectures–8, Marks :	
	a	Introduction, Wheel Assembly, Wheel and Tyre Sizes, Types of wheels, Wheels balance, Rims
	b	Tyres, Types of tyres, Tyres Construction and Constituents, Tyres thread Patterns, Load Ratings
	c	Tyres Selections and Tyre Properties, Tyres Pressure and wear, Causes of Tyre Wear, Tyre size, Tyres maintenance, Factors increase life of tyres
	d	Tubes , Types of Tubes, Wheels and tyre troubles

UNIT-V

5.	Automobile Transmission (Gear Box & Clutch) No. of Lectures–8, Marks : 16	
	a	Introduction, Purpose of Transmission, Types of Transmission, Gear-boxes with different speed gear, Three speed and Four speed Gear-box, Gear shifting, Gear box troubles Lubrication of gear box
	b	Introduction., Clutch and its functions, Principles of Operations, Requirement of Clutch, Main Parts of clutch, Types of friction materials, Properties of good clutch lining, Types of clutches, Clutch Maintenance, Clutch troubles and their causes Factors Affecting the Power Transmitted by the Clutch, Propeller Shaft, Universal Joint, Rear Axle

Text Book and Reference Books

1. Automobile Engineering Vol. 1 & 2 by Dr. Kripal Singh, (Standard Publishers Distributors)
2. A textbook of Automobile Engineering I & II by P. S. Gill, (S. K. Kataria& Son's).
3. Automobile Engineering by R. B. Gupta, (SatyaPrakashan).
4. Automobile Engineering by Dr. V. M. Domkundwar, (DhanpatRai&Company).
5. A textbook of Automobile Engineering by R. K. Rajput, (Laxmi Publication Pvt. Ltd.).
6. Automobile Engineering by K. M. Moeed, (S. K. Kataria& Son's).
7. Automobile Engineering by Dr. A. K. Basu, (S. Chand Company Pvt. Ltd.).

Course Outline

Operation Research **OR**

Course Title: Short Title Course Code

Branch- Mechanical Engineering **Year–Fourth Year**

Course Description: This course introduces under graduate students to imparting knowledge of various decision making techniques.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03

Examination scheme:

End semester exam (ESE)	80 Marks	Duration: 03 hours
Internal Sessional exam (ISE)	20 Marks	

Purpose of Course: Degree Requirement

Prerequisite Course(s): Fundamental knowledge about mathematics & statics.

Outline of Content: This course contains:

UNIT-I

1.	**Linear Programming**	**No. of Lectures –9, Marks : 16**
	a	**Operation Research – An Introductions** The history of OR, Definition, Features, of OR, models and modeling in OR, OR approach to problem solving, methods for solving OR models, phases of OR, Advantages of OR study, Shortcomings of OR approach, OR Models in Practice, Applications of OR.
	b	**Linear Programming**- Applications and model formulation, Introduction, general Stricture of LP model, Assumption of an LP model, Advantages and Limitations of Linear programming, Applications areas of LP, steps of LP Model formulation, Graphical solution methods of LP problem, maximization, minimization, feasible, infeasible and unbounded solution.

UNIT - II

2.		**Linear Programming** **No. of Lectures –9, Marks : 16**
	a	Linear programming – The simplex method Introduction, standard form of an LP problem, simplex algorithm (maximization, minimisation case) Degeneracy in simplex problem, unbounded Infeasible solution.
	b	Duality in Linear programming, formulation of dual LPP, Advantages of duality, rules for constructing the Dual from primal, sensitivity Analysis in LP

UNIT - III

3.		**Transportation Theory** **No. of Lectures –8, Marks : 16**
	a	Transportation problem introduction, mathematical model of transportation problem, Algorithm, methods for finding initial solution northwest corner method ,Least cost method, vogels Approximation method, test for optimality steps of MODI method, maximization problem, unbalanced, degeneracy, prohibited transportation Routes problem.
	b	Assignment problem- introduction, mathematical models of assignment problem, solution method of assignment problem, Hungarian method, maximization case, unbalanced Restrictions on assignment, travelling salesman, problem

UNIT - IV

4.		**Decision Making Theory** **No. of Lectures –8, Marks : 16**
	a	Decision Theory- Introduction, steps in decision making process types of decision making Environments, Decision tree
	b	Theory of games- introduction ,Two person Zero sum game, pure strategies, maximin, minimax principles, game with saddle point, mixed strategy games, The principles of dominance ,games without saddle point,algebraic method, arithmetic method, sub game method, Graphical method.

UNIT-V

5.		**Sequencing** **No. of Lectures –8, Marks : 16**
	a	Replacement and maintenance method- Introduction, types of failure- gradual failure ,sudden failure Replacement of items whose efficiency deteriorates with time, Replacement of items that completely fail, individual replacement policy, Group replacement policy, staffing problem ,failure trees.
	b	Sequencing problem- Introduction notations, Terminology, and assumptions of sequencing problem, Processing n jobs through two machines, Processing n jobs through three machines, Processing n jobs through four machines, Processing n jobs through five machines

Text Book and Reference Books

1. L.C. Jhamb ,"Quantities Techniques" Vol I and II, Everest Publication
2. Hira , Gupta ,"Operation Research
3. Taha ,"Operation Research".
4. S.D. Sharma, "Operation Research", Khanna Publication.
5. ManoharMahajan, "Operation Research.
6. J. K. Sharma ,"Operation Research, Problem and Solution" , Macmillan
7. N. D. Vohra ,"Quantitative Techniques in Management" ,TATA McGraw Hill.
8. Ravindran," Operation Research Principles and Practice ",Wiley India Pvt. Ltd. New Delhi

Lab Course Outline

Computer Aided Design & Computer Aided Manufacturing **CAD/CAM LAB**

Course Title : Short Title Course Code

Branch- Mechanical Engineering **Year–Fourth Year**

Course Description: The course presents the elements of solid modeling, creation of parts of increasing complexity and the assembly of parts to form a final design, along with mechanism simulation.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Evaluation scheme:

Internal Continuous Assessment (ICA) 25Marks 50Marks

End Semester exam (ESE) (OR) 25Marks

Prerequisite Course(s): Basic knowledge about of Engineering Drawing, Computer Graphics, SOM, Design & Manufacturing.

Outline of Content: This course contains:

A. Introduction to Modelling (Using any CAD software).

1. 2D drawing using sketcher- 2 Drawings 2 Hrs.
2. 3D modelling using 3D features (Modelling of any four components of any mechanical assembly)
3. Assembling and drafting (Above assembly) with proper mating conditions and interference checking.
4. Surface Modelling (Any 2 of the above components). 4 Hrs.

B. Three assignments based on above syllabus.

Note : Oral will be based on the prescribed term-work presented in the form of certified journal.

Lab Course Outline

Refrigeration and Air Conditioning	**RAC LAB**	
Course Title :	Short Title	Course Code

Branch- Mechanical Engineering **Year–Fourth Year**

Course Description: This course Familiarize under graduate students with the terminologies associated with refrigeration & air conditioning, basic principles of psychrometry and applied psychometrics, refrigerants; vapor compression refrigeration and multi-stage vapor compression systems, components of vapor compression systems and other types of cooling systems.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Evaluation scheme:

Internal Continuous Assessment (ICA)	25Marks	50Marks
End Semester exam (ESE) (Practical)	25Marks	

Prerequisite Course(s): Basic knowledge of Engineering Thermodynamics, Applied Thermodynamic, and Heat Transfer.

Outline of Content: This course contains:

1.Trial on vapour compression refrigeration system.

2.Trial on ice plant/domestic refrigeration system.

3.Study and trial on vapour absorption refrigeration system.

4.Study and trial on window/central air conditioner.

5.Study and trial on heat pump test rig.

6.Study of construction of hermetically sealed compressor and actual viewing of a cut model of the same (reciprocating, rotary and car A/C compressor).

7.Study of evacuation and charging of refrigeration system.

8.Study and trial on cooling towers.

9.Study of expansion devices, solenoid vaIVe and safety devices used in vapor compression system.

10.Study of thermostat and humidistat, dryer, oil separator.

11.Study of measuring instruments and various tools used in refrigeration and air-conditioning systems.

12.Visit to cold storage/ice plant/ central air conditioning system.

13. Cooling load calculation of any laboratory / class room in the institute & suggest the requirement of Air conditioner unit in terms of capacity.

Note : Lab file should contain any eight experiments out of the above to be performed with minimum three trials.

ESE (Practical Examination)

ThePracticalExaminationwillcompriseofperformingtheexperimentandvivaonthe Practical's.

Instructions for practical Exam.:-

1.FourexperimentsshouldbeselectedforPracticalExamination.

2.TheNumberofStudentsforeachPracticalsetupshouldnotbemorethan5Students.

3.OralwillbebasedonthePracticalPerformedintheexaminationandtheexperimentsincludedintheJournal

Lab Course Outline
Elective- I

Mechatronics	**MTX LAB**	
Course Title :	Short Title	Course Code

Branch- Mechanical Engineering Year–Fourth Year
Course Description: This course introduces to graduate students the basic mechatronics system components, and the design principles of using mechatronics to meet functionality requirements of products, processes and systems.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Evaluation scheme:

Internal Continuous Assessment (ICA)	25Marks	50Marks
End Semester exam (ESE) (OR)	25Marks	

Prerequisite Course(s): Basic knowledge of Electrical and Electronic systems and Drives.

Outline of Content: This course contains any five experiments and three assignments.

1) Study of Basic block diagram of mechatronics system components.
2) Study and demonstration of motion / force transducers.
3) Study and demonstration of temperature / pressure transducers.
4) Study and demonstration of AD / DA converter
5) Study and demonstration of hydraulic actuator / pneumatic actuator.
6) Study and demonstration of graphic / magnetic tape recorders.
7) Study of Microprocessors and Microcontrollers
8) Study of Robot / Autonomous guided vehicle

Note : Oral will be based on the prescribed certified journal.

Lab Course Outline
Elective- I

Advanced Machine Design	**AMD LAB**	
Course Title :	Short Title	Course Code

Branch- Mechanical Engineering Year–Fourth Year

Course Description: This course provides a broad treatment of stress, strain, and strength with reference to engineering design and analysis. It consist study of deflection, post -yield behavior, residual stresses, thermal stresses, creep, and extreme temperature effects as applied to the design of fasteners, shafts, and rotational machinery.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Evaluation scheme:

Internal Continuous Assessment (ICA)	25Marks	50Marks
End Semester exam (ESE) (OR)	25Marks	

Prerequisite Course(s): Fundamental knowledge of Theory of Machine, Machine Design.

Outline of Content: This course contains:

Term work shall consist of two assignments, two drawing sheets and two design software based problems based on above syllabus.

Lab Course Outline
Elective- I

Machine Tool Design	**MTD LAB**	
Course Title :	Short Title	Course Code

Branch- Mechanical Engineering Year–Fourth Year

Course Description: The course aim of imparting the knowledge of Machine tool Design the background required include a knowledge of Mathematics, Engineering materials, Theory of Machines, Engineering Mechanics.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Evaluation scheme:

Internal Continuous Assessment (ICA) 25Marks 50Marks

End Semester exam (ESE) (OR) 25Marks

Prerequisite Course(s): Basic knowledge of Workshop Practice, Manufacturing Process, Gear Design.

Outline of Content: This course contains:

Term work shall consist of minimum five assignments and drawing sheet based on above syllabus covering all units.

Lab Course Outline
Elective- I

Automobile Engineering – I	**AE-I LAB**	
Course Title :	Short Title	Course Code

Branch- Mechanical Engineering Year- Fourth Year

Course Description: The course aim of imparting the knowledge of different parts uses in automobile, the background required include knowledge of Engineering materials, IC engine.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Evaluation scheme:

Internal Continuous Assessment (ICA)	25Marks	50Marks
End Semester exam (ESE) (OR)	25Marks	

Prerequisite Course(s): Basic Knowledge of Engines, Working of Brakes and Clutches**.**

Outline of Content: This course contains:

1. Study of layout of a chassis and its different components of a vehicle.
2. To study model trends in automobile.
3. Study of trouble shooting in various suspension systems.
4. Study of trouble shooting in power steering.
5. Measurement of steering geometry angle for wheels alignment.
6. Study of impact on steering geometry angle of vehicle.
7. Study of different types of tyres, tubes and their defects.
8. Visit to wheel balancing and alignment center.

Term work consists of minimum six practical’s from above list.

Course Title	Short Title	Course Code
Project-I	**P-I**	

Course Description:
The course explores the knowledge of design, experiment and analysis of data. The course develops ability to work on multidisciplinary teams, Identify, formulate, and soIVe engineering problems in view of economic, environmental and societal context.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**14**	**28**	**2**

Prerequisite Course(s): Knowledge of science, mathematics, computer programming and core subject of engineering.
General Objectives: The objectives of project are to develop ability to work in group. The scope of work is design and conduct experiments, as well as to analyze and interpret data within realistic constrain such as economic, environmental, social, safety and manufacturability. The project work provides plate form for planning, material procurement, preparing specification and execution of work. The project also develop to work on multidisciplinary teams, communicate effectively and Knowledge of contemporary issues.
Course Outcomes:
Upon successful completion of this course the students will be able to:

1. Apply knowledge of mathematics, science, and engineering.
2. Design and conduct experiments, as well as to analyze and interpret data.
3. Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
4. Function on multidisciplinary teams, communicate effectively and Knowledge of contemporary issues.
5. Identify, formulate, and soIVe engineering problems by understanding professional and ethical responsibility.
6. Understand the impact of engineering solutions in a global, economic, environmental, and societal context.
7. Recognition of the need for, and an ability to engage in life-long learning.
8. Use the techniques, skills, modern engineering tools and software necessary for engineering practice.

Project-I
(Lab Course Contents)

Semester-VII **Examination Scheme:**

Teaching Scheme: **(ICA) Internal Continuous Assessment: 25 Marks**

Practical: 2 Hrs/Week **(ESE) End Semester Examination (OR): 25Marks**

- It is expected that the broad area of Project-I shall be finalized by the student in the beginning of the VII semester / extension of Minor project undertaken may be Project-I.
- A group of Minimum 3 and Maximum 5 students shall be allotted for Project-I and same project group for Project-II.
- Exhaustive survey of literature based on a clear definition of the scope and focus of the topic should be carried out by the students. The **Synopsis/Abstract** on the selected topic, after detail literature survey should be submitted to the Project coordinator appointed by Head of the department.
- Project-I may invoIVe literature survey, problem identification, work methodology preparing specification and material procurement, collection of data, conduction of experiments and analysis. The project work shall invoIVe sufficient work so that students get acquainted with different aspects of fabrication, design or analysis.
- Approximately more than 50% work should be completed by the end of VII semester.
- Each student group is required to maintain log book for documenting various activities of Project-I and submit group project report in the form of thermal bound at the end of semester –VII. Submit the progress report in following format:
    a. *Title*
    b. *Abstract*
    c. *Introduction*
    d. *Problem identification and project objectives*
    e. *Literature survey*
    f. *Case study/Analysis/Design Methodology*
    g. *Work to be completed (Progress status)*
    h. *Expected result and conclusion*
    i. *References.*

- Evaluation Committee comprising of the Guide, Project Coordinator and Expert appointed by the Head of the department will award the marks based on the work completed by the end of semester and the presentation based on the project work.

  Guide lines for ICA : The Internal Continuous Assessment shall be based on the active participation of the students in the Project work and knowledge / skill acquired. Assessment of the project-I for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given in **Table-A.**

  Guide lines for ESE: The End Semester Examination for Project shall consist of demonstration if any, presentation and oral examinations based on the project report**.**

Assessment of Project-I

Name of the Project: ____

Name of the Guide: ____

Table-A

SN	Name of Student	Problem Identification and project objectives	Literature Survey	Project Methodology/Design/PCB/ hardware/ simulation/ programming	Progress Status	Presentation	Total
		5	**5**	**5**	**5**	**5**	**25**

Course Title	Short Title	Course Code
Seminar-II		

Course Description: The course explores the knowledge of presentation and effective communication. The course develops ability to work on multidisciplinary teams, Identify, formulate, and solve engineering problems in view of economic, environmental and societal context.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Practical	**2**	**14**	**28**	**2**

Prerequisite Course(s): Knowledge of science, mathematics, computer programming and core subject of engineering.

General Objectives: The objectives of Seminar –II are to develop ability express our view, presentation and effective communication. The scope of seminar-II is study various national and international journal for design, experiments conduct, as well as to analyze and interpret data within realistic constrain such as economic, environmental, social, safety and manufacturability.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Understand literature survey for selection of seminar topics.
2. Apply knowledge of mathematics, science, and engineering for effective presentation of selected topic.
3. Function on multidisciplinary teams, communicate effectively and Knowledge of contemporary issues.
4. Identify, formulate, and solve engineering problems by understanding professional and ethical responsibility.
5. Understand the impact of engineering solutions in a global, economic, environmental, and societal context.
6. Practice the use of various resources to locate and extract information using offline & online tools, journals.
7. Practice the preparation and presentation of scientific papers and seminars in an exhaustive manner.

Seminar-II
(Course Contents)

Semester-VII **Examination Scheme:**
Teaching Scheme: **(ICA) Internal Continuous Assessment: 25 Marks**
Practical: 2 Hrs/Week

1. Each Student shall select a topic for seminar which is not covered in curriculum. Seminar topic should not be repeated and registration of the same shall be done on first come first serve basis.
2. Topic of Seminar shall be registered within a three weeks from commencement of VII Semester and shall be approved by the committee.
3. The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of Seminar-II. Seminar shall be related state of the art topic of his choice approved by the committee.
4. Each student should deliver a seminar in scheduled period (Specified in time table or time framed by department) and submit the seminar report (paper bound copy/Thermal bound)in following format:
   a. *Title*
   b. *Abstract*
   c. *Introduction*
   d. *Literature survey*
   e. *Concept*
   f. *Functional and Technical Details*
   g. *Applications*
   h. Comparison with similar topics / methods
   i. *Future scope*
   j. *References*

ASSESSMENT OF SEMINAR-II

Guide lines for ICA: ICA shall be based on topic selection, presentation and Seminar-II report submitted by the student in the form of thermal bound. Assessment of the Seminar-II for award of ICA marks shall be done jointly by the guide and a departmental committee, as per the guidelines given in **Table- B**

Name of Guide: ______________________

Table-B

SN	Name of Student	Seminar Topic	Topic Selection	Literature survey	Report writing	Depth of under-standing	Presentation	Total
			5	5	5	5	5	25

Course Title	Short Title	Course Code
Industrial Visit	**IV**	

Course Description: The course explores the knowledge industry organization, new trends in manufacturing, maintenance and safety. The industrial visit provides the practical visualization of theoretical study of various engineering subject.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Practical	**-**	**-**	**-**	**1**

General Objectives: The main objective behind these visits is to explain the working of industrial equipments in running conditions to the students and tell them about the expectations of the industrialists from the fresh engineers.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Understand organizational set up of an industry.
2. Develop our self for expectations of the industrialists from the fresh engineers.
3. Understand manufacturing, material handling, maintenance, safety standard and environmental consideration in industry.
4. Function on multidisciplinary teams, communicate effectively and Knowledge of contemporary issues.
5. Identify, formulate, and solve engineering problems by understanding professional and ethical responsibility.
6. Understand the impact of engineering solutions in a global, economic, environmental, and societal context.

Industrial Visit
(Course Contents)

Semester-VII **Examination Scheme:**
Teaching Scheme: **(ICA) Internal Continuous Assessment: 25 Marks**

1. Industry visits to minimum two industries shall be carried out by each student preferably or college shall arrange the industrial visit during the vacation period otherwise during the regular VII semester.
2. The student should obtain appropriate certificates of visit from the concerned organizations just after the visits.
3. Every Student should submit Industrial Visit report individually at the end of Semester-VII(First Term of Final Year)
4. The report(Thermal Bound) should contain information about the following points:
   a. *The organization - activities of organization and administrative setup technical personnel and their main duties.*
   b. *The project / industry brief description with sketches and salient technical information.*
   c. *The work / processes observed with specification of materials, products, equipments etc. and role of engineers in that organization.*
   d. *Suggestions (if any) for improvement in the working of those organizations.*
5. The evaluation of the report of technical visits will be made by panel of three teachers appointed by Head of the department based on following points:

Guide lines for ICA : ICA shall be based on knowledge gain by student and Industrial Visit Report submitted by the student in the form of Thermal bound. Assessment of the Industrial Visit for award of ICA marks shall be done jointly by industrial visit coordinators departmental committee based on viva - voce as per the guidelines given in **Table- C**

Table-C

SN	Name of Student	Name of Industry	Report writing	Depth of Under-standing	Total
			15	**10**	**25**

NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Syllabus for

Final Year Mechanical Engineering

Faculty of Engineering and Technology

Course Outline

SEMESTER –VIII

W.E.F 2015 – 2016

Course Outline

Mechanical Vibration	**MV**	
Course Title:	Short Title	Course Code

Branch- Mechanical Engineering **Year–Fourth Year**

Course Description: This course introduces undergraduate students to Mechanical Vibration. The background required includes a sound knowledge of Mathematics (Calculus), Engineering Mechanics, Strength of materials and Theory of mechanics of second year and Third year Level. The course aims at imparting knowledge of Mechanical vibration.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03
Practical	02	14	28	01

Examination scheme:

End semester exam (ESE)	80 Marks	Duration: 03 hours
Internal Sessional exam (ISE)	20 Marks	

Purpose of Course: Degree Requirement

Prerequisite Course(s): Mathematics (Calculus) at First year level and strength of Materials, Theory of Machines at Second year Level.

Outline of Content: This course contains:

UNIT-I

1.		**Fundamental of Vibrations & Undamped Free Vibrations** **No. of Lectures– 9, Marks : 16**
	a	**Fundamental of Vibrations :-** Introduction, Definitions, Vector method of representing harmonic motions, Addition of two simple harmonic motions of the same frequency, Beat phenomenon.
	b	Complex method of representing harmonic vibrations, Work done by a harmonic force on a harmonic motion.
	c	**Undamped Free Vibrations of Single Degree of Freedom Systems**: - Introduction, Derivation of differential equation, Solution of differential equation, Torsional vibrations, Equivalent stiffness of spring combinations, Energy method.

UNIT-II

2.		**Damped Free &Forced Vibrations of Single Degree of Freedom Systems No. of Lectures– 9, Marks : 16**
	a	**Damped Free Vibrations of Single Degree of Freedom Systems: -** Introduction, Different types of dampings, Free vibrations with viscous damping, Logarithmic decrement.
	b	Viscous dampers, Dry friction or coulomb damping, Solid or structural damping, Slip or interfacial damping.
	c	**Forced Vibrations of Single Degree of Freedom Systems:-** Introduction, Forced vibrations with constant harmonic excitation, Forced vibrations with rotating and reciprocating unbalance, Forced vibrations due to excitation of support.
	d	Energy dissipated by damping, Forced vibrations with coulomb damping, Forced vibrations with structural damping, Vibration isolation and transmissibility.

UNIT-III

3.		**Two Degree of Freedom Systems No. of Lectures–8, Marks : 16**
	a	Introduction, Principal modes of vibration, Other cases of simple two degree of freedom systems, Combined rectilinear and angular modes.
	b	Undamped forced vibrations with harmonic excitation, Vibration absorbers.
	c	Critical speed of shaft- Introduction, critical speed of light shaft having single disc without damping, critical speed of light shaft having single disc with damping

UNIT-IV

4.		**Multi Degree of Freedom Systems Exact Analysis& Numerical Methods No. of Lectures – 8, Marks : 16**
	a	**Multi Degree of Freedom Systems Exact Analysis**: - Introduction, Free vibrations equations of motion, Influence coefficients, Generalized coordinates and coordinate coupling.
	b	Natural frequencies and mode shapes, Forced vibrations by Newtons second law of motion, Torsion vibrations of multi-rotor systems.
	c	**Multi Degree of Freedom Systems Numerical Methods: -** Introduction, Rayleigh's method, Dunkerley's method, Stodola's method.

UNIT-V

5.		**Continuous Systems & Non-Linear Vibrations. No. of Lectures– 8, Marks : 16**
	a	**Continuous Systems: -** Vibrations of strings, Longitudinal vibrations of bars, Torsional vibrations of circular shafts, Lateral vibrations of beams.
	b	**Non-Linear Vibrations: -** Introduction, Examples of non-linear systems, Phase plane, Undamped free vibration with nonlinear spring forces.
	c	Pertubation method, Forced vibration with non-linear spring forces, Self excited vibrations.

Text Book and Reference Books

1. Dilip Kumar Adhwarjee "Theory and Applications of Mechanical Vibrations" Laxmi Publications (p) Ltd., New Delhi.
2. G.K. Grover "Mechanical Vibrations" New Chand & Bros Roorkee (U.P.)
3. Leonard Meirovitch "Element of Vibration Analysis" Tata McGraw-Hill Publishing Company Limited, New Delhi
4. Singiresu S. Rao "Mechanical Vibrations "Pearson Education Ptd. Ltd., Delhi.

5. S. Graham Kelly “ Schaum’sOut lines Mechanical Vibrations “ Tata McGraw-Hill Publishing Company Limited, New Delhi.
6. Thompson,” Theory of Vibration with Application”, Pearson Education.
7. V. P. Singh “Mechanical Vibrations “ Dhanpat Rai & Co. (P) Ltd., Delhi.
8. B. H. Tongue,” Principles of Vibration”, 2/ed. Oxford University Press, New Delhi.
9. Sadhu singh“ Mechanical vibration & Noise control” published by Khanna Publisher New delhi.

Course Outline

Finite Element Analysis and Simulation Techniques **FEAST**

Course Title: Short Title Course Code

Branch- Mechanical Engineering **Year–Fourth Year**

Course Description: This course introduces undergraduate students to Finite Element Analysis and Simulation Technique. The background required includes a sound knowledge of Mathematics, Strength of materials and Machine Design. The course aims at imparting knowledge of Finite Element Analysis and Simulation Technique.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03
Practical	02	14	28	01

Examination scheme:

End semester exam (ESE)	80 Marks	Duration: 03 hours
Internal Sessional exam (ISE)	20 Marks	

Purpose of Course: Degree Requirement

Prerequisite Course(s): Mathematics, Computational Methods, Design, Vibration, SOM etc.

Outline of Content: This course contains:

UNIT-I

1.		**Introduction to FEA** **No. of Lectures –9, Marks : 16**
	a	Introductory Concepts: Introduction to FEM , Discritization going from part to whole approach, Physical problem, mathematical models and finite element solution, FEA as a integral part of CAD. FEM Software's - Preprocessing, processing and post processing. Advantages and disadvantages of FEM.
	b	Conventional Numerical Methods- Finite difference method, weighted residual techniques, method of Least squares, Galerkin methods, Rayleigh-Ritz method, and Boundary Value problems, Displacement methods, equilibrium method.
	c	Finite Elements Types: One dimensional element such as two nodded & three nodded Spar or truss element. Two and three dimensional elements, triangular, rectangular quadrilateral.

UNIT-II

2.		**One-Dimensional Analysis No. of Lectures –9, Marks : 16**
	a	Discritization. Derivation of Shape functions, interpolation function, Stiffness matrices, global stiffness matrix, application of boundary, and force vectors.
	b	Assembly of Matrices - solution of problems in one dimensional structural analysis, Stepped and Taper Bars, Torsion of circular shaft, thin vaIVe tubes steady state heat conduction& convection, laminar pipe flow.
	c	FEM direct approach elements stiffness, potential energy approach, treatment of boundary conditions, temperature effects.
	d	Analysis of Plane Trusses, Analysis of Beams.

UNIT-III

3.		**Two-Dimensional Analysis No. of Lectures – 8, Marks : 16**
	a	Introduction. Finite element analysis for two dimensional problems.
	b	Natural coordinates and coordinates transformations, Derivation of shape functions for triangular element.
	c	Application of heat transfer, analysis of structural vibration. Finite element formation of beams.

UNIT-IV

4.		**Two Dimensional Vector analysis No. of Lectures– 8, Marks : 16**
	a	Equations of elasticity – Plane stress, plane strain problems.
	b	Automatic mesh generation and imposition, Eigen value problems.
	c	Jacobian matrix, stress analysis of CST element.
	d	Applications to free vibration problems of rod and beam. Lumped and consistent mass matrices.

UNIT-V

5.		**Simulation Theory and Application No. of Lectures– 8, Marks : 16**
	a	**System models and studies:** - concepts of a system, system environment, stochastic activities, continuous and discrete systems, system modeling, types of models, principles used in modeling, types of system studies.
	b	**System simulation:-**The techniques of simulation, Monte Carlo method, comparison of simulation and analytical methods, analog computers and methods, hybrid computer, simulators, continuous system simulation languages, system dynamics, growth models, logistic curves, multi segments models, probability concepts in simulation, system simulation, events, representation of time, arrival pattern.

Text Book and Reference Books

1. J.N. Reddy, an Introduction to Nonlinear Finite Element Analysis, OUP.
2. C.S. Krishnamoorthy., Finite element analysis TMH.
3. J.N. Reddy, Finite element methods, McGraw hill publication ltd.
4. Robert Cook, Concept an application of Finite element analysis .
5. Klaus-Jurgen Bhate, finite element analysis, PHI .
6. C.S. Desai and J.F. Abel, Introduction to finite element methods ,CBS.
7. Tirapati R. Chandrupatla, Finite element analysis by, PHI.
8. Geoffery Gordon ,System simulation .
9. Narsingh Deo ,System simulation with digital computers .
10. Kenneth Lt. Huebner," The FEM for Engineers", Wiley India Pvt. Ltd. New Delhi

Elective- II
Course Outline

Tribology	**TRB**	
Course Title:	Short Title	Course Code

Branch- Mechanical Engineering **Year–Fourth Year**

Course Description: The course aim of imparting the knowledge of Tribology. The background required includes knowledge of mathematics, chemistry, engineering materials, fluid mechanics. The objective of the course is to understand the tribilogical concept, bearing design and its application, lubrication practices.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03
Practical	02	14	28	01

Examination scheme:

End semester exam (ESE)	80 Marks	Duration: 03 hours
Internal Sessional exam (ISE)	20 Marks	

Purpose of Course: Degree Requirement

Prerequisite Course(s): Fundamental Knowledge of Physics, Chemistry, Engineering Maths, Fluid Mechanics, Machine Design and Engineering materials.

Outline of Content: This course contains:

UNIT-I

1.	**Introduction to Tribology and friction and Wear No. of Lectures–9, Marks : 16**	
	a	Introduction and scope, Tribology in design
	b	Tribology in Industry, Economical considerations.
	c	Friction of metals, kinds and measurements of frictions, stick slip oscillation (Vibration) and its elimination
	d	Theories of friction, frictional heating.
	e	Wear- Mechanism of wear, types of wear, measurement of wear (wear testing and wear debris analysis)
	f	Theory of wear, factor affecting on wear rate.

UNIT - II

2.	**Lubrication and Hydrostatic bearings** **No. of Lectures–9, Marks : 16**	
	a	Construction, operation, Advantages, Limitations and Application of Hydrostatic Bearing (Circular Step bearing)
	b	Flow rate and pressure distribution, Load carrying capacity and film thickness, Power losses and temperature rises in Hydrostatic Step bearing.
	c	Optimum design of hydrostatic step bearing,

UNIT - III

3.	**Hydrodynamic Journal Bearing** **No. of Lectures–8, Marks : 16**	
	a	Theory of hydrodynamic lubrication, Mechanism of Pressure development in oil film.
	b	Two dimensional Reynold Equation, (i) By Direct method (ii) By Navier's Stokes equation
	c	Infinitely long Journal Bearing, Infinitely short Journal bearing
	d	Finite length Journal bearing. Design consideration in hydrodynamic Journal bearing.
	e	Relations of variable (Raimondi & Boyd). Dimensionless parameters. Temperature rises and Heat Balance, Pettrof equation.
	f	Selection of bearing design parameters. Numerical on infinitely long bearing.

UNIT - IV

4.	**Hydrodynamic Thrust Bearing and Elastro Hydrodynamic lubrication.** **No. of Lectures–8, Marks : 16**	
	a	Introduction and analysis of flat pad thrust bearing (tapered pad thrust bearing)
	b	Analysis of tilting pad thrust bearing and tapper land fixed pad bearing
	c	Analysis of Reyligh step thrust bearing, spring mounted thrust bearing
	d	Hydrodynamic pocket thrust bearing, quantity of oil flow with circumferential groove and hole.
	e	Elastro hydrodynamic lubrication, basic concept, hydrodynamic equation, Hertz equation for pressure and deformation.
	f	Ertel-Grubin equation. Application of Elastro hydrodynamic lubrication.

UNIT-V

5.	**Hydrostatic Squeeze film and gas lubrication.** **No. of Lectures–8, Marks :**	
	a	Introduction, Practical Situation of Hydrostatic squeeze film lubrication. Analysis for a circular plate approaching a plane.

	b	Analysis for a approximation of square plate by using a circular plate. Analysis for rectangular plate approaching a plane.
	c	Gas Lubrication – Introduction, requirements, merits, demerits and application, Reynold Equation for a gas lubrication.
	d	Tilting pad air bearing, magnetic recording disc with flying head, porous gas bearings.
	e	Seals – Classification, functions and application in detail.

Text Book and Reference Books

1. Stolarski T.A., "Tribology of Machine Design", Butterworth Heinemann, Oxford, 2000.
2. Bowden F.P. and Tobor D., "Friction and Lubrication of Solids", Clarendon Press, Oxford, 1986.
3. B. C. Majumdar "Introduction Tribology and Bearings", H. Wheeler and Company Pvt. Ltd.
4. Fuller D. D., "Theory and Practice of Lubrication for Engineers". John Wiley and Sons.
5. Cameron A. "Basic Lubrication Theory, Wiley Eastern Ltd.
6. Hrassan & Powel, "Gas Bearing".
7. Halling J. "Principles of Tribology", McMillan Press Ltd.
8. Bharat Bhushan and Gupta B.K., "Handbook of Tribology", McGraw Hill, New Delhi, 1991

Elective- II
Course Outline

Power Plant Engineering **PPE**

Course Title: Short Title Course Code

Branch- Mechanical Engineering **Year–Fourth Year**

Course

Description: To understand the various components, operations and applications of different types ofpower plants.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03
Practical	02	14	28	01

Examination scheme:

End semester exam (ESE)	80 Marks	Duration: 03 hours
Internal Sessional exam (ISE)	20 Marks	

Purpose of Course: Degree Requirement

Prerequisite Course(s): Fundamental knowledge of Engineering Thermodynamic, Turbo Machinery.

Outline of Content: This course contains:

UNIT-I

1.		**Thermal Power Plants** **No. of Lectures –9, Marks : 16**
	a	Thermal power stations. Main components and working of power stations, thermodynamics cycles, fuel handling, combustion and combustion equipment, problem of ash disposal, circulating water schemes and supply of makeup water.
	b	Choice of pressure of steam generation and steam temperature, selection of appropriate vacuum economizer, air pre-heater, feed water heaters and dust collection. Characteristics of turbo alternators, steam power plant, heat balance and efficiency.
	c	Boilers and steam generation, general classification, fire tube and water tube boilers, natural circulation and forced circulation boilers, high pressure, high temperature boilers, supercritical pressure boilers, boiler mounting and accessories, feed pumps, economizers, super heaters, air pre-heaters; boiler furnaces, heat generation rates, water walls.

UNIT-II

2.		**Diesel and Gas turbine Power Plant No. of Lectures–9, Marks : 16**
	a	Diesel power plants: Diesel engine performance and operation, plant layout, log sheets, selections of engine size.
	b	Gas turbine plants: Plant layout, methods of improving output and performance fuel and fuel systems, methods of testing, open and closed cycle plants, operating characteristics

UNIT- III

3.		**Hydroelectric and Nuclear Power Plant No. of Lectures–8, Marks : 16**
	a	Hydroelectric plants: Penstocks, water turbines, specific speed, turbine governors, hydro-plant auxiliaries, plant layout, automatic and remote control of hydroplants, pumped projects, cost of hydroelectric project.
	b	Nuclear power plants: Elements of nuclear power plants, nuclear reactor fuel moderators, coolants, control.
	c	Fusion energy: Control through fusion of hydrogen and helium. Energy release rates-present status and problems. Future possibilities.

UNIT- IV

4.		**Renewable Energy Power Plant No. of Lectures–8, Marks : 16**
	a	Basic bio-conversion mechanism; source of waste; simple digester; composition and calorific values of bio-gas.
	b	Wind energy generation; Special characteristics; Turbine parameters and optimum operation; Electrical power generation from wind/tidal energy.
	c	Ocean thermal energy conversion; Geothermal energy-hot springs and steam injection; Power plant based on OTEC and geothermal springs.

UNIT-V

5.		**Solar Energy Power Plant No. of Lectures –8, Marks : 16**
	a	Energy from the sun: Techniques of collection; Storage and utilisation; Types of solar collectors; Selective surfaces; Solar thermal processes; Heating; Cooling; Drying; Power generation, etc.
	b	Direct energy conversion methods: Photoelectric, thermoelectric, thermionic, MHD (magneto-hydrodynamics) and electro-chemical devices; Solar cells, Solar Concentrators

Text Book and Reference Books

1. Domkundwar and Arora "Power Plant Engineering", DhanpatRai and Sons, New Delhi
2. E.I. Wakil, "Power Plant Engineering", Publications, New Delhi
3. P. K. Nag, "Power Plant Engineering", Tata McGraw Hill, New Delhi
4. R. K. Rajput," Power Plant Engineering", Laxmi Publications, New Delhi.
5. R. Yadav - Steam and Gas turbines, central publishing house, Allahabad
6. G. D. RaiNon conventional energy sources,

Elective- II
Course Outline

Process Equipment Design **PED**

Course Title: Short Title Course Code

Branch- Mechanical Engineering **Year–Fourth Year**

Course Description: The student should have basic understanding of Mechanical and Process Design aspects of Process Equipment Design. Introduction to various codes (ASTM, API, Japanese, German etc.) used in chemical process industries and their application. Basic Engineering design approach and selection of pressure vessel components such as Head, closure, flanges, gasket, nozzles etc, Design of process vessel support Mechanical design of process equipment such as pressure vessel, shell & tube

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03
Practical	02	14	28	01

Examination scheme:

End semester exam (ESE)	80 Marks	Duration: 03 hours
Internal Sessional exam (ISE)	20 Marks	

Purpose of Course: Degree Requirement

Prerequisite Course(s): Fundamental knowledge of mathematics, thermodynamic, machine design.

Outline of Content: This course contains:

UNIT-I

1.	**Introduction to Process Equipment Design No. of Lectures–9, Marks : 16**	
	a	Nature of process equipments, General design procedure.
	b	Fabrication techniques, choice of materials, resistance to corrosion, Design considerations.
	c	Stress, Elastic instability, theories of failure, creep, economic consideration

UNIT-II

2.	Design of Machine Elements	No. of Lectures –9, Marks : 16
	a	Introduction, shaft, keys and pins, couplings, bearing, belt and pulley.
	b	Chain drive, gear drives, joints, fasteners, brackets, gaskets, mechanical seal.

UNIT-III

3.	Design of Pressure Vessels	No. of Lectures –8, Marks : 16
	a	Introduction, operating condition, uses, codes.
	b	Selection of material, design conditions and stress.
	c	Design of shell and its components, supports, thermal stress

UNIT-IV

4.	Design of Heat Exchangers and Evaporators	No. of Lectures–8, Marks : 16
	a	Introduction, type of heat exchangers, design of shell.
	b	Design of tube heat exchangers
	c	Evaporators:- Introduction, types, materials, design considerations.

UNIT-V

5.	Process Equipment Design and Standards	No. of Lectures–8, Marks : 16
	a	Role of process equipment designers, basic process requirements of plants/projects.
	b	Introduction of design codes and standards IS, ASME, API, BS and its application.
	c	Plant design management system.

Text Book and Reference Books

1. Joshi M.V. and Mahajan V.V., "Process Equipment Design", McMillan, India, 1996.
2. Harvey J.F., "Pressure Vessels Design", Van Nostrand Co., 1974.
3. Singh K.P. &Soler A. L., "Mechanical Design of Heat Exchangers ", Arcturus Publishers, New Jersey, 1984.
4. Moss Demis R., "Pressure Vessel Design Manual", Gulf Publishing Co., Houston, 1987.
5. "Handbook of Piping Design", CRC Press, 1992.
6. IS 2825: 1969, Code for Unfired Pressure Vessels.
7. "ASHRAE Handbook : Fundamentals", ASHRAE, 1985. 8. ASME Code, Section 8th, Divison -I, Division-II.

Elective- III
Course Outline

Introduction to Robotics	**Robotics**	
Course Title:	Short Title	Course Code

Branch- Mechanical Engineering **Year–Fourth Year**

Course Description: This course is aimed to provide exposure on the Robot anatomy, sensors, kinematics, applications and problems associated with their design.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03
Practical	02	14	28	01

Examination scheme:

End semester exam (ESE)	80 Marks	Duration: 03 hours
Internal Sessional exam (ISE)	20 Marks	

Purpose of Course: Degree Requirement

Prerequisite Course(s): Fundamental knowledge of Mathematics, Automation, Mechatronics.

Outline of Content: This course contains:

UNIT-I

1.		**Basic Concept In Robotics** **No. of Lectures –9, Marks : 16**
	a	Historical perspective of robot, classification of robot, automation and robotics, robot anatomy, basic structure of robotics.
	b	resolution, accuracy and repeatability, classification and structure of robotics system, point to point and continuous past system, control loop of
	c	Robotic application Current and future.

UNIT-II

2.		**Mechanical Systems: Components, Dynamics And Modeling** **No. of Lectures–9, Marks : 16**
	a	Objectives, Motivation, Review elementary concept, Motion Conversion, Modeling of Mechanical systems.
	b	Kinematics chain, Forces encountered in Moving coordinate systems, Lagrange's Analysis of Manipulator.

UNIT-III

3.		**Drives And Control System No. of Lectures –8, Marks : 16**
	a	Hydraulic, DC servomotors, basic control system, concept and models, control system analysis.
	b	Robot activation and feedback component, positional and velocity sensors.
	c	Actuators, power transmission system, Application of robot in manufacturing.

UNIT-IV

4.		**End Effectors, Sensors And Vision Systems No. of Lectures-8Marks:16**
	a	End Effectors Types of end effectors, mechanical grippers, vacuum, magnetic, adhesive grippers, tools as end effectors, Gripper selection and
	b	Introduction to Sensors: Need of sensors in a robotic system, selection of sensors, photo sensors, limit switches.
	c	Range sensors, proximity sensors, touch / sensors. VISION SYSTEMS: concept of low level and high-level vision in a robotic system.

UNIT-V

5.		**Robot Programming No. of Lectures –8, Marks : 16**
	a	Methods of robot programming, lead through programming methods, a robot program as a path in space.
	b	Motion interpolation WAIT, SIGNAL, AND DELAY commands.
	c	ROBOT LANGUAGES: The textural robot languages, generation of robot programming languages, robot language structure, constant, variables and

Text Book and Reference Books

1. Richard D. Klafter, Thomas A. Chmielewski and Michael Negin, "Robotic Engineering - An Integrated Approach", Prentice Hall India, 2002.
2. Groover," Industrial Robotics", McGraw Hill Publication Co. Ltd.
3. John J. Craig, "Introduction to Robotics Mechanics and Control", Pearson Education Inc.,
4. M. P. Groover, "Industrial Robotics - Technology, Programming and Applications".
5. Niku," Introduction to Robotics: Analysis System and Application", Pearson Education

Elective- III
Course Outline

Advanced Welding Technology **AWT**

Course Title: Short Title Course Code

Branch- Mechanical Engineering **Year–Fourth Year**

Course Description: This course is aimed to provide deeper knowledge of materials technology of welding, quality techniques at production by welding, Knowledge of current computer systems and cost for welding operations.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03
Practical	02	14	28	01

Examination scheme:

End semester exam (ESE) 80 Marks Duration: 03 hours

Internal Sessional exam (ISE) 20 Marks

Purpose of Course: Degree Requirement

Prerequisite Course(s): Fundamental knowledge of workshop technology, manufacturing process, material science.

Outline of Content: This course contains:

UNIT-I

1.		**Conventional welding Technology** **No. of Lectures–9, Marks : 16**
	a	Introduction: Importance and application of welding, classification of welding process. Selection of welding process
	b	Brief review of conventional welding process: Gas welding, Arc welding, MIG, TIG welding. Resistance welding. Electroslag welding, Friction welding etc. Welding of MS.CI, Al, and Stainless steel & Maurer/Schaefflar Diagram. Soldering & Brazing.

UNIT-II

2.		**Advanced welding Techniques** **No. of Lectures–9, Marks : 16**
	a	Principle and working and application of advanced welding techniques such as Plasma Arc welding, Laser beam welding, Electron beam welding, Ultrasonic welding etc.

UNIT- III

3.		**Advanced welding Techniques** **No. of Lectures–8, Marks : 16**
	a	Advanced welding Techniques (continued): Principle and working and application of advanced welding techniques such as explosive welding/ cladding, Underwater welding, Spray-welding / Metallising, Hard facing.

UNIT- IV

4.		**Metallurgy and Weld Life** **No. of Lectures –8, Marks : 16**
	a	Weld Design: Welding machines/equipments and its characteristics and arc-stability, Weld defects and distortion and its remedies, Inspection/testing of welds, Weld Design, Welding of pipe-lines and pressure vessels.
	b	Life predication. 4 51 Thermal and Metallurgical consideration: Thermal considerations for welding, temperature distribution, Analytical/Empirical analysis/formulae, heating & cooling curves.
	c	Metallurgical consideration of weld, HAZ and Parent metal, micro & macro structure. Solidification of weld and properties.

UNIT-V

5.		**Advance welding** **No. of Lectures –8, Marks : 16**
	a	Welding Under The Influence Of External Magnetic Field: Parallel Field, Transverse Magnetic Field, Longitudinal Magnetic Field, Improvement Of Weld Characteristics By The Application Of Magnetic Field, Magnetic Impelled Arc Welding.
	b	Fundamentals Of Underwater Welding- Art And Science: Comparison Of Underwater And Normal Air Welding, Welding Procedure, Types Of Underwater Welding, Underwater Wet Welding Process Development.

Text Book and Reference Books

1. Little R.L., "Welding Technology", Tata McGraw Hill, New Delhi, 1994.
2. Ghosh A. and Mallik A.K., "Manufacturing Science", East West Press, 1985.
3. Davies A.C., "The Science and Practice of Welding", Cambridge University, New York, 1989.
4. Balchin N.C., "Health and Safety in Welding and Allied Processes", Jaico Publishing House, Mumbai, 1989.
5. Rao P. N., "Manufacturing Technology", Tata McGraw Hill, 1990.
6. Mukharjee P. C., "Fundamental of Metal Casting Technology", Tata McGrew Hill, 1970.
7. Jeffus Larry “Welding Principles and Applications” Delmar Publishers, 1999.

Elective- III
Course Outline

Energy Conservation and Management	**ECM**	
Course Title:	Short Title	Course Code

Branch- Mechanical Engineering **Year–Fourth Year**

Course Description: Compare and contrast energy management practices and opportunities, including monitoring. Describe and analyse energy efficiency tools. Describe key issues in energy resource management and green building. Discuss and discern the history of energy sources and the conservation of and future of resources needed to maintain our economy. Describe and discuss a variety of world and regional energy policies. Communicate reasons for environmental protection and renewable energy implementation. Explain energy accounting and analysis and how it is used in energy assessment. Demonstrate understanding of rate of return and life cycle cost analysis.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03

Examination scheme:

End semester exam (ESE)	80 Marks	Duration: 03 hours
Internal Sessional exam (ISE)	20 Marks	

Purpose of Course: Degree Requirement

Prerequisite Course(s): Fundamental knowledge of basic thermodynamic, energy conservation systems, Applied Thermodynamics and Fluid Mechanics.

Outline of Content: This course contains:

UNIT-I

1.	**Energy Scenario**	**No. of Lectures –9, Marks : 16**
	a	Commercial and Non-commercial energy, primary energy resources, commercial energy production, final energy consumption, Indian energy
	b	2Sectoral energy consumption (domestic, industrial and other sectors), energy needs of growing economy, energy intensity, long term energy
	c	Energy security, energy conservation and its importance, energy strategy for the future, Energy Conservation Act 2001 and its features.

UNIT-II

2.	**Basics of Energy its various forms and conservation** **No. of Lectures–9, Marks : 16**	
	a	Electricity basics – Direct Current and Alternative Currents, electricity tariff, Thermal Basics-fuels, thermal energy contents of fuel, temperature and pressure, heat capacity, sensible and latent heat, evaporation, condensation, steam, moist air and humidity and heat transfer.
	b	Evaluation of thermal performance – calculation of heat loss – heat gain, estimation of annual heating & cooling loads, factors that influence thermal performance, analysis of existing buildings setting up an energy management programme and use management – electricity saving

UNIT-III

3.	**Energy Management & Audit No. of Lectures –8, Marks : 16**	
	a	Definition, energy audit, need, types of energy audit. Energy management (audit) approach-understanding energy costs.
	b	Bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel and energy substitution.
	c	Financial Management: Investment-need, appraisal and criteria, financial analysis techniques-simple payback period, return on investment, net present value, internal rate of return, cash flows, risk and sensitivity analysis; financing options, energy performance contracts and role of Energy Service Companies (ESCOs).

UNIT-IV

4.	**Energy Monitoring and Measurement No. of Lectures–8, Marks : 16**	
	a	Defining monitoring & targeting, elements of monitoring & targeting, data and information-analysis, techniques – energy consumption, production, cumulative sum of differences (CUSUM). Energy Management Information Systems (EMIS)
	b	Basic measurements – Electrical measurements, Light, Pressure, Temperature and heat flux, Velocity and Flow rate, Vibrations, etc. Instruments Used in Energy systems: Load and power factor measuring equipments, Wattmeter, flue gas analysis, Temperature and thermal loss measurements, air quality analysis etc. Mathematical and statistical modelling and analysis.

UNIT-V

5.	**Energy Efficiency in Thermal Utilities and systems** **No. of Lectures–8, Marks : 16**	
	a	Energy efficiency in thermal utilities like boilers, furnaces, pumps and fans , compressors, cogeneration (steam and gas turbines), heat exchangers, lighting system, Motors belts and drives, refrigeration system.
	b	Heat Recovery and Co-generation:- Heat recovery from ventilation, air co-generation of heat and electricity, heat recovery and bottoming cycles.

Text Book and Reference Books

1. Energy Engineering and Management Amlan Chakrabarti Prentice hall India 2011
2. Energy Management Principles, CB Smith, Pergamon Press, New York,
3. Bureau of energy efficiency –Hand outs New Delhi .
4. Energy Management Hand Book. W. C. Turner. John Wiley and sons
5. Handbook on Energy Efficiency, TERI, New Delhi, 2009
6. Energy Auditing and Conservation; Methods, Measurements, Management & Case Study, Hamies, Hemisphere Publishing , Washington, 1980.
7. Industrial Energy Management & Utilization, Write, Larry C Hemisphere Publishers, Washington, 1998.
8. Energy Conservation In Process Industry, W. F. Kenny

Elective- III
Course Outline

Automobile Engineering – II **AE-II**

Course Title: Short Title Course Code

Branch- Mechanical Engineering **Year–Fourth Year**

Course Description: This course introduces undergraduate students to Automobile Engineering.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03

Examination scheme:

End semester exam (ESE)	80 Marks	Duration: 03 hours
Internal Sessional exam (ISE)	20 Marks	

Purpose of Course: Degree Requirement

Prerequisite Course(s): Basic knowledge of theory of machine, IC Engine, Applied Thermodynamic.

Outline of Content: This course contains:

UNIT-I

1.		**Automobile Brakes** **No. of Lectures –9, Marks : 16**
	a	Introduction, Braking Requirements, Function of the brakes, Classification of the brakes
	b	Hydraulic Brakes, Power Brakes, Air Brakes, Brake Efficiency & Stopping Distance, Factor Controlling the Stop of an Automobile
	c	Brake Lining, Brake Testing & Testers, Brake Service

UNIT-II

2.		**Automobile Electrical System** **No. of Lectures–9, Marks : 16**
	a	Introduction to Starting System, Lead-Acid Battery, Recharging of Battery, Charging procedure, Battery voltage, Battery Capacity, Battery Rating, Battery Life, Factors affecting Battery life, Battery testing, Battery troubles
	b	Introduction to Ignition System-Types, Introduction Charging System, Spark Plug Introduction To Wiring System, Standard Color coding, Tracking faults in wiring, Functioning of the Electrical system in an Automobile, Improvement in Electrical system in an Automobile

UNIT- III

3.		**Automobile Heating, Ventilation and Air Conditioning No. of Lectures–8, Marks : 16**
	a	Nature of Heat, Heating System, Air Conditioning System and its Operational Principle, Air Conditioning System and its Operational Principle, Air Conditioning Components, Effect of Air Conditioning on Fuel Economy
	b	Air Conditioning System Refrigerant, Conventional Heating and Ventilation, Air Distribution Parts, Automatic Climate Control, Automatic Temperature Control System, Air Conditioning Troubleshooting, Heating System Troubleshooting

UNIT- IV

4.		**Alternative Fuelled Automobiles No. of Lectures–8, Marks : 16**
	a	Introduction, Battery of Electrical Vehicle(EV), Fuel Cell-as a Source of Energy, Solar Powered Automobiles, Hybrid Drives, Drive Motors
	b	Compressed Natural Gas (CNG) Operated Automobiles, Liquefied Petroleum Gas (LPG) as a Substitute Fuel
	c	Future Alternative Fuels for IC Engine, Particular tips for getting more Mileage, How to Save Fuel, Biodiesel- Another substitute for existing fuel, Future Trends in Automobile Development

UNIT-V

5.		**Automobile Emissions and its Control No. of Lectures–8, Marks : 16**
	a	Introduction, Air Pollution- Environment & Health Impacts, Major Pollutants and their Sources of Emission, Pollutants and Mechanism of their Formation, Mechanism of Pollutants Formation in SI Engine
	b	Smoke, Causes of Smoke, Factor Affecting Diesel Smoke, Comparison of Diesel & Gasoline Engine emission, Harmful Effects of Different Pollutants, Emission Control System
	c	Regulation and Norms on Exhaust Emission, Introduction to Green House Effect and Global Warming, Noise Pollution and its Control, EURO & Indian Emission Standards

Text Book and Reference Books

1. Automobile Engineering Vol. 1 & 2 by Dr. Kripal Singh, (Standard Publishers Distributors).
2. A textbook of Automobile Engineering I & II by P. S. Gill, (S. K. Kataria& Son's)
3. Automobile Engineering by R. B. Gupta, (Satya Prakashan)
4. Automobile Engineering by Dr. V. M. Domkundwar, (Dhanpat Rai& Company)
5. A textbook of Automobile Engineering by R. K. Rajput, (Laxmi Publication Pvt. Ltd.)
6. Automobile Engineering by K. M. Moeed, (S. K. Kataria & Son's)
7. Automobile Engineering by Dr. A. K. Basu, (S. Chand Company Pvt. Ltd.)

Elective- III
Course Outline

Thermal Equipment Design **TED**

Course Title: Short Title Course Code

Branch- Mechanical Engineering **Year–Fourth Year**

Course Description: This course introduces undergraduate students to Thermal equipment design. The background required includes a sound knowledge of Mathematics, Engineering Thermodynamics, Applied Thermodynamics and Fluid Mechanics, Heat transfer and Refrigeration and Air-conditioning. The course aims at imparting knowledge of design of thermal equipments.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	03	14	42	03

Examination scheme:

End semester exam (ESE)	80 Marks	Duration: 03 hours
Internal Sessional exam (ISE)	20 Marks	

Purpose of Course: Degree Requirement

Prerequisite Course(s): Mathematics, Engineering Thermodynamics, Applied Thermodynamics and Fluid Mechanics, Heat transfer and Refrigeration and Air-conditioning.

Outline of Content: This course contains:

UNIT-I

1.	**Engineering Design**	**No. of Lectures –9, Marks : 16**
	a	Introduction to engineering design, Decision in an Engineering undertaking, Design Vs Analysis, Synthesis for Design, Selection Vs Design.
	b	Designing a workable system: workable system design and analysis, creativity in concept selection, workable Vs. optimum system,
	c	Economics: Interest, Lump sum compounded annually and more than annually, compound amount factor, present worth factor, future and uniform series amount, Gradient factor, Shift in time, Taxes , Depreciation
	d	Decision making to design a food freezing plant
	e	Decision making to optimize thickness of insulation in refrigerated ware house
	f	Decision making to optimize of natural convection air cooled condenser

UNIT-II

2.	**Modeling of thermal equipments and simulation No. of Lectures–9, Marks : 16**	
	a	Matrices, Solution of simultaneous equation, Polynomial presentation(polynomial, one variable a function of other variable and n+1 data points),simplification.
	b	Method of Least square, the art of equation fitting,
	c	Selecting Vs simulating, (Heat exchanger), System simulation, Information flow diagrams, Successive substitution method, pitfalls in successive substitution method
	d	Newton Raphson method for multivariable and convergence characteristics, Compare successive substitution method and Newton Raphson method

UNIT-III

3.	**Optimization**	**No. of Lectures –8, Marks : 16**
	a	Introduction, levels of optimization, Mathematical representation of optimization problem
	b	Setting up the mathematical statement of optimization problems, Properties of objective function, Unconstrained optimization and Constrained optimization problem
	c	Mathematical proof of Lagrange multiplier method, Test of Maxima and minima, Kunhn-tuker conditions, Unimodal function and search method
	d	(Only basic introduction to all methods no numerical will be asked)Dichotomous search, Fibonacci search method, Introduction to multivariable optimization, Multivariable optimization, Conjugate gradient method

UNIT-IV

4.	**Mathematical Modeling- Thermodynamic properties No. of Lectures–8, Marks : 16**	
	a	Introduction, Criteria for fidelity of representation, Linear and non linear regression analysis.
	b	Thermodynamic properties, Internal energy, enthalpy, clayperon equation, P-T relation at saturated condition, specific heats, Maxwell relation.
	c	P-V-T equation (Vander walls equation),Building and full set of data.
	d	Introduction to steady state simulation, convergence and divergence in successive substitution, partial substitution in successive substitution, Evaluation of Newton Rapson Technique and characteristics for heat

UNIT-V

5.	Dynamic behavior of thermal system	No. of Lectures–8, Marks : 16
	a	Introduction, Significance, Scope, Approach,One dynamic element in stead state simulation for refrigeration plant etc. (Heat exchanger)
	b	Laplace Transform and Inverse of Laplace transforms, Blocks, Block Diagram and Transfer function, Feed control loop, Time constant block (Consider Temperature sensing bulb in a fluid duct)
	c	Stability analysis, Normalizing the variable for Inversion to the time (Take the case to regulate the air pressure in a reservoir)
	d	Translating the physical situation in block diagram (take example for air heating system and its control), non linearity's

Text Book and Reference Books

1. J.P. Holman 1992 "Heat Transfer" McGraw Hill VII Edition.
2. P. Kothandaraman "Fundamentals of Heat and Mass Transfer".
3. D.S. Kumar "Heat and Mass Transfer" D. S. Kumar S. K. Kataria& Sons, Delhi.
4. P. K. Nag "Heat Transfer" Tata McGraw Hill Publishing Company Ltd., New Delhi.
5. Thermal Design and Optimization, Adrian Bejan, George T satsaronis, Michael J. MoranJohn Wiley & Sons, 1996.
6. Design and Optimization of Thermal Systems, Second Edition (Mechanical Engineering)by Yogesh Jaluria.
7. Design of thermal systems, W. F. Stoecker, McGraw hill book company.

Lab Course Outline

Mechanical Vibration	**MV LAB**	
Course Title :	Short Title	Course Code

Branch- Mechanical Engineering **Year–Fourth Year**

Course Description:

This lab includes different practical of Mechanical Vibration. The course aims at imparting knowledge of natural frequency and modes of vibration.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Evaluation scheme:

Internal Continuous Assessment (ICA)	25Marks	50Marks
End Semester exam (ESE) (OR)	25Marks	

Prerequisite Course(s): Mathematics (Calculus) at First year level and strength of Materials, Theory of Machines at Second year Level.

Outline of Content: This course contains:

1) To study the torsional vibrations of single rotor system.
2) To study the torsional vibrations of two rotor system.
3) To study damped torsional vibrations of single rotor system.
4) To study undamped free vibrations of a spring.
5) To study the natural vibrations of a spring mass system.
6) To study forced damped vibrations of a spring mass system.
7) To study the forced damped vibrations of simply supported beam.
8) To determine critical speed of a single rotor system.

Note : Lab file should contain at list five experiments from above mentioned list.
ESE (Oral Examination). The Oral Examination will comprise of viva on the above experiments.

Lab Course Outline

Finite Element Analysis and Simulation Techniques **FEAST LAB**

Course Title:	Short Title	Course Code
Finite Element Analysis and Simulation Techniques	**FEAST LAB**	

Branch- Mechanical Engineering **Year-Fourth Year**

Course Description: The background required includes a sound knowledge of Mathematics, Strength of materials and Machine Design. The course aims at imparting knowledge of Finite Element Analysis and Simulation Technique.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Evaluation scheme:

Internal Continuous Assessment (ICA)	25Marks	50Marks
End Semester exam(ESE)(PR)	25Marks	

Prerequisite Course(s): Mathematics, Computational Methods, Design, Vibration, SOM etc.

Outline of Content: This course contains:

1. Analysis of I-cantilever beam.
2. Analyzing Flow in a System of Pipes.
3. Analysis of Trusses.
4. Modal Analysis of Spring-Mass System.
5. Modal Analysis of continuous System.
6. Thermal analysis of any component.
7. Stress strain analysis of any component.
8. Kinematic Analysis and simulation of slider crank Mechanism.

Note : Lab file should contain any five experiments by using any design software

ESE (Practical Examination) ThePracticalExaminationwillcompriseofperformingtheexperimentandvivao nthe Practical's.

Lab Course Outline
Elective- II

Tribology	**TRB LAB**	
Course Title :	Short Title	Course Code

Branch- Mechanical Engineering **Year-Fourth Year**

Course Description: The background required includes knowledge of mathematics, chemistry, engineering materials, fluid mechanics. The objective of the course is to understand the tribilogical concept, bearing design and its application, lubrication practices.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Evaluation scheme:

Internal Continuous Assessment (ICA)	25Marks	50Marks
End Semester exam (ESE) (OR)	25Marks	

Prerequisite Course(s): Fundamental Knowledge of Physics, Chemistry, Engineering Maths, Fluid Mechanics, Machine Design, and Engineering materials.

Outline of Content: This course contains:

Any EIGHT of the following performance practical and Assignments.

01	Practical on Journal Bearing apparatus.
02	Practical on Tilting pad thrust bearing apparatus
03	Friction in Journal Bearing
04	Practical on Brake line friction test rig.
05	Practical using Pin on disc test rig.

Note : Any 03experiments should be performing from above list and 03assignment include in the course based on curriculum of this course.

Guidelines for ICA: ICA will be based on Practical assignments submitted by the student in the form of journal.

Lab Course Outline
Elective- II

Power Plant Engineering	**PPE LAB**	
Course Title :	Short Title	Course Code

Branch- Mechanical Engineering Year- Fourth Year

Course Description: To understand the various components, operations and applications of different types of power plants.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Evaluation scheme:

Internal Continuous Assessment (ICA)	25Marks	50Marks
End Semester exam (ESE) (OR)	25Marks	

Prerequisite Course(s):

Outline of Content: This course contains:

1. Study of Fluidized Bed Combustor.
2. Study of Environmental Impact of Thermal Power Plant.
3. Study of Demand supply scenario of Electricity.
4. Study or visit of Co-generation Plant.
5. Study or visit of Non conventional power plant.
6. Efficiency measurement of Standalone Solar PV System.
7. Measurement of current-voltage characteristics of two solar cells connected

   a) in series and b) in parallel.

Note : Lab file should consist of any six experiments to be performed from above list

ESE (Oral Examination)
The Oral Examination will be based on the all five units of Power Plant Engineering.

Lab Course Outline
Elective- II

Process Equipment Design	**PED LAB**	
Course Title :	Short Title	Course Code

Branch- Mechanical Engineering Year- Fourth Year

Course Description: The student should have basic understanding of Mechanical and Process Design aspects of Process Equipment Design. Basic Engineering design approach and selection of pressure vessel components such as Head, closure, flanges, gasket, nozzles etc, Design of process vessel support Mechanical design of process equipment.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Evaluation scheme:

Internal Continuous Assessment(ICA) 25Marks 50Marks

End Semester exam (ESE) (OR) 25Marks

Prerequisite Course(s): Fundamental knowledge of mathematics, thermodynamic, machine design and engineering drawing.

Outline of Content: This course contains:

1. Design and drawing of pressure vessels.
2. Design and drawing of storage vessels.
3. Assignment on safety measure in process equipment design.
4. Study of pressure relief devices.
5. Study of vessels under external pressure.
6. Study of design codes and standards.

Note : Lab file should consist of minimum **five experiments**.

Guide lines for ICA :
ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-
In ESE the student may be asked questions on practical. Evaluation will be based on answers given by students in oral examination.

Course Title	Short Title	Course Code
Industrial Lecture	**IL**	

Course Description:

The gap between industry's needs and the academic community's aspirations appears to be considerably large. There exists a strong feeling, at least in the academic circles, that unless technology driven initiatives find a surer place in the industrial sector in this country, the academia-industry interaction is likely to remain confined to developmental activities with limited exploratory or research-based content As institutes committed primarily to creation and growth of technological knowledge, technical institutes have an important role to play in the industrial sector of the country's economy. This fact by way of encouraging mechanisms to foster interaction between the academia and industry. Typically, academic interest in the multidimensionality of a problem leads to a tendency to explore a variety of options to arrive at a solution. This industrial lecture develops ability of student for expectations of the industrialists from the fresh engineers.

	Total Hours	**Semester Credits**
Lecture	**06**	**2**

General Objectives: The domains in which interaction is possible are:

a. Placement and entrepreneurship development.
b. Industry participation in technology development involving some exploratory work.
c. Academic intervention in solving specific industry problems.
d. Laboratory utilization by industry.
e. Continuing education programme.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Understand need, requirement and expectation of industry from fresh engineers.
2. Understand importance of laboratory practices throughout carrier of engineer. Design and conduct experiments, as well as to analyze and interpret data.
3. Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
4. Function on multidisciplinary teams, communicate effectively.
5. Identify, formulate, and soIVe engineering problems by understanding professional and ethical responsibility.
6. Recognition of the need for, and an ability to engage in life-long learning.
7. Use the techniques, skills, modern engineering tools and software necessary for engineering practice.

Industrial Lecture
(Course Contents)

Semester-VIII **Examination Scheme:**
Teaching Scheme: **(ICA) Internal Continuous Assessment: 50Marks**
Lecture: 1 Hr

1. There is a need to create avenues for a close academia and industry interaction through all the phases of technology development, starting from conceptualization down to commercialization.
2. List of renowned persons from industry shall be prepared by the committee appointed by Head of the department. After approval from the Principal, Minimum five Industrial lectures in alternate week shall be arranged, which shall be delivered by the experts/Officials from Industries/Govt. organizations/ Private Sectors/Public Sectors / R&D Labs covering the various aspects.
3. Topics of Industrial Lectures shall be Technical in nature and should not be the specific contents from the curriculum.
4. Students shall submit the report based on minimum five lectures giving summary of the lecture delivered.
5. The summary should contain brief resume of the expert, brief information of his organization and brief summary of the lecture in bullet point form.

Guide lines for ICA: Assessment of the Industrial Lecture for award of ICA marks shall be done jointly by departmental committee as per attendance in industrial lecture, report submitted by student and overall performance in semester as per the guidelines given in **Table- D**

Table-D

SN	Name of Student	Attendance (05 Marks per Lecture)	Dept of Understanding (03 Marks per Lecture)	Report Writing	Total
		25	15	10	50

Course Title	Short Title	Course Code
Project-II	**P-II**	

Course Description:
The course explores the knowledge of design, experiment and analysis of data. The course develops ability to work on multidisciplinary teams, Identify, formulate, and soIVe engineering problems in view of economic, environmental and societal context.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Laboratory	**4**	**14**	**56**	**6**

Prerequisite Course(s): Knowledge of science, mathematics, computer programming and core subject of engineering.
General Objectives: The objectives of project are to develop ability to work in group. The scope of work is design and conduct experiments, as well as to analyze and interpret data within realistic constrain such as economic, environmental, social, safety and manufacturability. The project work provides plate form for planning, material procurement, preparing specification and execution of work. The project also develop to work on multidisciplinary teams, communicate effectively and Knowledge of contemporary issues.
Course Outcomes:
Upon successful completion of this course the students will be able to:

1. Apply knowledge of mathematics, science, and engineering.
2. Design and conduct experiments, as well as to analyze and interpret data.
3. Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
4. Function on multidisciplinary teams, communicate effectively and Knowledge of contemporary issues.
5. Identify, formulate, and soIVe engineering problems by understanding professional and ethical responsibility.
6. Understand the impact of engineering solutions in a global, economic, environmental, and societal context.
7. Recognition of the need for, and an ability to engage in life-long and self learning.
8. Use the techniques, skills, modern engineering tools and software necessary for engineering practice.

Project-II
(Lab Course Contents)

Semester-VIII **Examination Scheme:**
Teaching Scheme: **(ICA) Internal Continuous Assessment: 75Marks**
Practical: 2 Hrs/Week **(ESE) End Semester Examination OR: 75Marks**

1. Project-I work decided in VII semester shall be continued as Project-II
2. Students should complete implementation of ideas given in synopsis/Abstract, so that project work should be completed before end of semester.
3. Project-II may involVe fabrication, design, experimentation, data analysis within realistic constraints such as economic, environmental, social, ethical, health and safety, manufacturability, and sustainability. The stage also includes testing , possible results and report writing
4. Each student's project group is required to maintain log book for documenting various activities of Project-II and submit group project report at the end of Semester-VIII in the form of Hard bound.
    a. *Title*
    b. *Abstract*
    c. *Introduction*
    d. *Problem identification and project objectives*
    e. *Literature survey*
    f. *Case study/Analysis/Design Methodology*
    g. *Project design and implementation details*
    h. *Result and conclusion*
    i. *Future scope*
    j. *References.*

Guide lines for ICA: ICA shall be based on continuous evaluation of students' performance throughout semester in project-II and report submitted by the students' project group in the form hard bound. Assessment of the project-II for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given in **Table-E.**

Guide lines for ESE:-
In ESE the student may be asked for demonstration and questions on Project. Evaluation will be based on answers given by students in oral examination.

Assessment of Project - II

Name of the Project: ______________________________

Name of the Guide: ______________________________

Table-E

		Assessment by Guide (50 Marks)				**Assessment by Committee (25 Marks)**		
SN	**Name of Student**	**Attendance, Participation and team work**	**Material procurement/ assembling/ Designing/Programming**	**Case study/ Execution**	**Project Report**	**Dept of Understanding**	**Presentation**	**Total**
Marks		**10**	**15**	**15**	**10**	**10**	**15**	**75**

North Maharashtra University, Jalgaon
M.E. (Computer Science and Engineering)
Syllabus with effect from Year 2009-10
First Year Term I

Sr. No.	Subject	Teaching Scheme per Week		Examination Scheme				
		L	P	Paper Hr.	Paper	TW	PR	OR
1	Advanced Software Engineering	3	-	3	100	-	-	-
2	Distributed Systems	3	-	3	100	-	-	-
3	Net-Centric Computing	3	-	3	100	-	-	-
4	Applied Algorithms	3	-	3	100	-	-	-
5	Elective- I	3	-	3	100	-	-	-
6	Laboratory Practice-I	-	6	-	-	100	-	50
7	Seminar-I	-	4	-	-	100	-	-
	Total	15	10		500	200		50
	Grand Total	**25**		**750**				

Elective I

1) Embedded Software Design
2) Digital Image & Video Processing
3) Mathematical Foundations of Computer Science
4) Software Project Management

First Year Term II

Sr. No.	Subject	Teaching Scheme per Week		Examination Scheme				
		L	P	Paper Hr.	Paper	TW	PR	OR
1	Advanced Database Management Systems	3	-	3	100	-	-	-
2	Web Engineering	3	-	3	100	-	-	-
3	Parallel Computing	3	-	3	100	-	-	-
4	Soft Computing	3	-	3	100	-	-	-
5	Elective- II	3	-	3	100	-	-	-
6	Laboratory Practice-II	-	6	-	-	100	-	50
7	Seminar-II	-	4	-	-	100	-	-
	Total	15	10		500	200		50
	Grand Total	**25**		**750**				

Elective II

1) Software Testing And Quality Assurance
2) Cryptography and Network Security
3) Pattern Recognition
4) Mobile Computing

Second Year Term I

Sr. No.	Subject	Teaching Scheme per Week		Examination Scheme				
		L	P	Paper Hr.	Paper	TW	PR	OR
1	Seminar-III	-	4	-	-	50	-	50
2	Project Stage –I	-	18	-	-	100	-	-
	Total	-	22	-	-	150		50
	Grand Total	**22**		**200**				

Second Year Term II

Sr. No.	Subject	Teaching Scheme per Week		Examination Scheme				
		L	P	Paper Hr.	Paper	TW	PR	OR
1	Progress Seminar	-	-	-	-	50	-	-
2	Project Stage –II	-	18	-	-	150	-	100
	Total	-	18	-	-	200	-	100
	Grand Total	**18**		**300**				

Rules and Regulations for M.E. in Computer Science & Engineering

1. The post graduate degree in engineering consisting of 2 years (4 terms) shall be designated as Master of Engineering in Computer Science & Engineering.

2. A candidate may be permitted to register him/her self for the M.E. degree in Computer Science and Engineering under the faculty of engineering & technology of North Maharashtra University Jalgaon ,only if the candidate holds a bachelor's degree in Engineering & technology of North Maharashtra University , Jalgaon or its equivalent in Computer Engineering / Computer Science & Engineering / Computer Technology /Information Technology/ Electronics/ Electronics and Telecommunication /Electrical recognized by AICTE & North Maharashtra University , Jalgaon.

3. The student shall be admitted to First Year Term II if his/her Term I is granted.

4. The student shall be admitted to the Second Year when ever he/she clears all the theory papers of First Year. The student in any case should not be allowed to start project work before passing all the subjects of first year. The student will have to work on his/her project for minimum one year after passing first year subjects. He/she will not be allowed to submit his/her thesis/dissertation before that.

5. Every student will be required to produce a record of laboratory work in the form of journal, duly certified for satisfactory completion of the term work by the concerned teacher & head of the department.

6. A student whose term is not granted on account of less attendance (Minimum 80%) or non-submission of term work is required to repeat the term.

7. Any approved guide will not be allowed guide more than 5 students in a particular batch.

8. Each student is required to present Seminar-I in the First Year Term I on any related state of the art topic of his own choice approved by the department.

9. The term-work & presentation of the Seminar-I will be evaluated by departmental committee consisting of guide and two faculty members of the department appointed by Director/Principal of the college as per the recommendation of the Head of the Department.

10. Each student is required to present Seminar-II in the First Year Term II on any related state of the art topic of his own choice approved by the department.

11. The term-work & presentation of the Seminar-II will be evaluated by departmental committee consisting of guide and two faculty members of the department appointed by Director/Principal of the college as per the recommendation of the Head of the Department.

12. Each student is required to present Seminar-III in the Second Year Term I on special topic. The topic should be on any of the area not included in the regular curriculum. The report should include detailed study of specific concept (i.e. analysis, design & implementation.). This can be a theoretical study or practical implementation approved by the department/guide.

13. Guidelines for the Seminar-III in Second Year Term I:

1. Seminar-III should be conducted at the end of Second Year Term I.
2. The term-work of the Seminar-III will be evaluated by departmental committee consisting of guide and two faculty members of the department appointed by Director/Principal of the college as per the recommendation of the Head of the Department.
3. The Seminar-III presentation will be evaluated by examiners appointed by University, one of which should be the guide.
4. Student must submit the Seminar Report in the form of soft bound copy
5. The marks of Seminar-III should be submitted at the end of Second Year Term I to the University.

14. Guidelines for the Progress Seminar in Second Year Term II:

- Progress Seminar should be conducted in the middle of Second Year Term II.
- The Progress Seminar Term-Work will be evaluated by departmental committee consisting of guide and two faculty members of the department appointed by Director/Principal of the college as per the recommendation of the Head of the Department.
- Student must submit the progress report in the form of soft bound copy.
- The marks of progress seminar should be submitted along with the marks of Project Stage-II.

15. Minimum passing marks for all Theory shall be 40% and for Term work and Oral shall be 50%.

16.He/she has to present/publish atleast one paper in reputed National/International Journal/Conference on his/her Project work before submission of his/her Thesis/Dissertation.

17. The Term Work of Project Stage –II will be assessed jointly by the pair of Internal and External examiner along with oral examination of the same.

18. The class will be awarded on the basis of aggregate marks of all four terms, giving equal weightage to all terms as shown below:

a) Less than 50%	: Fail
b) 50% to less than 60%	: Second Class
a) 60% to less than 70%	: First Class
b) 70% & above	: First Class with Distinction.

19. Each student is required to complete his/her master's degree within **Five** academic years from the date of admission, failing which he/she will be required to take fresh admission in first year.

M.E. COMPUTER SCIENCE & ENGINEERING
FIRST YEAR TERM I

SUBJECT: ADVANCED SOFTWARE ENGINEERING

Lectures: 3 Hrs per week	Theory: 100 Marks

Objective:
After successfully completing the module student should be apply the systematic approach towards the effective software development, also able to demonstrate knowledge of software design, development and processes using software engineering approaches and practices.

Pre-requisites:
Knowledge of Software Engineering.

DETAILED SYLLABUS

1. Introduction to Software Engineering: Software Engineering Processes, Project Management concept, Project Effort estimation, LOC and function point based estimates, Requirement Analysis and Specifications, Formal Requirements, Specifications, Socio-technical Systems, Dependability, Critical Systems Specification, Formal Specification. Analysis Modeling, Elements of Analysis Model.
2. Design Concepts and Principles: Fundamental issues in Software Design, Effective Modular Design, cohesion and coupling. Architectural Design, Distributed Systems Architecture, Application Architectures, Real-time Systems, User Interface Design, Component Level Design, Modeling Language(UML)
3. Software Development Methodologies: Iterative Software Development, Software Reuse, CBSE, Critical Systems Development Software Evolution. Verification and Validation, Software Testing, Software Testing Principles, Alternative Paradigms: Extreme Programming, Agile Software Engineering, Principles behind Agile method, Agile method and Project Management.
4. Object Oriented Software Engineering: Software Process Improvement, Software Economics, Software Quality, Software Metrics, Software Maintenance, Risk management, Requirement Engineering, Object oriented concepts and principles, OO Analysis, OO Design, OO Testing,
5. Advanced Software Engineering Process: Formal Methods, Basic concepts, Mathematical Preliminaries, Clean room Software Engineering, Component Based Software Engineering, Client/Server Software Engineering, Web Engineering, Reengineering

BOOKS

Text Books:

1. K.K Aggarwal & Yogesh Singh,” Software Engineering”, 3rd Edition, New Age International, 2007

References:
1. Ian Somerville,"Software Engineering", 8th Edition, Addison-Wesley,2006, 2. Roger S Pressman,"Software Engineering: A Practitioner's Approach" 6th Edition, McGraw Hill,2005. 3. Fenton and Pfleeger "Software Metrics:- A Rigorous and Practical Approach" , 2nd Edition , Tomson Learning 4. Grady Booch, Rumbaugh, Jacoboson,"Unified Modeling Language User Guide", Addison Wesley.

M.E. COMPUTER SCIENCE & ENGINEERING
FIRST YEAR TERM I

SUBJECT: Distributed Systems

Lectures: 3 Hrs per week	**Theory: 100 Marks**

Objective:
This course aims to build concepts regarding the fundamental principles of distributed systems. The design issues and distributed operating system concepts are covered.

Pre-requisites: Operating Systems and Computer Networks

DETAILED SYLLABUS

1. INTRODUCTION: Definition of a Distributed system, Goal, Types of distributed system

2 .ARCHITECTURES : Architectural styles, System Architectures, Architectures versus Middleware, Self management in distributed systems

3. PROCESSES: Threads, Virtualization, Clients, Servers, Code migration.

4 .COMMUNICATION: Fundamentals, Remote Procedure Call, Message Oriented Communication, Stream oriented communication, Multicast communication.

5. NAMING: Names, Identifiers and Addresses, Flat, Naming, Structured Naming, Attribute based Naming, LDAP

6. SYNCHRONIZATION: Clock Synchronization, Logical Clocks, Mutual Exclusion Global Positioning of nodes, Election Algorithms.

7. CONSISTENCY AND REPLICATION: Introductions, Data Centric Consistency Models, Client Centric Consistency Models, Replica Management, Consistency Protocols.

8. FAULT TOLERANCE: Introduction to fault tolerance, Process resilience, Reliable Client Server Communication, Reliable group, Recovery

9. DISTRIBUTED FILE SYSTEMS: Architecture, Process Communication, Naming, Synchronization, Consistency and Replication, Fault tolerance, Security.

10 DISTRIBUTED COORDINATION-BASED SYSTEMS: Introduction to coordination models- Architectures, Processes communication, Synchronization, Consistency and Replication, Fault tolerance, Security.

BOOKS

Text Books:

1. Andrew S. Tanenbaum, Maarten Van Steen, “Distributed System: Principals and Paradigms”, 2/E, PHI.

References:

1. George Coulouris, Jean Dollimore and Tim Kindberg,"Distributed Systems Concepts and Design", Fourth Edition, Pearson Education, 2005**.**
2. Pradeep K. Sinha, "Distributed Operating Systems Concepts and Design" , PHI.
3. Galli D.L., "Distributed Operating Systems: Concepts and Practice", Prentice-Hall,2000

M.E. COMPUTER SCIENCE & ENGINEERING
FIRST YEAR TERM I

SUBJECT: NET-CENTRIC COMPUTING

Lectures: 3 Hrs per week	**Theory: 100 Marks**

Objective:
After successfully completing the module student should be :
Familiar with different network technologies, Different Network performance, Modeling and estimation measures, Function and responsibilities of Network Administration, Different Network Design Techniques, Knowledge of High Speed Network, Issues regarding Network Security, Knowledge of IP Telephony, Storage Network and Compression Techniques.

Pre-requisites:
Knowledge of Data Communication and Computer Networks.

DETAILED SYLLABUS

1. Network Technology :
   Introduction, Media Issues, Data Link Protocols, The OSI Model, Networking topologies, Types of Networks, protocols capabilities, NetBIOS, IPX,TCP/IP,CSMA/CD, token passing, frame relay, networking devices, Repeaters, Bridges, Routers, switches, gateways, Network design issues, Data in support of Network Design, Network design tools, protocols and architecture.
2. Network Performance, Modeling and Estimation :
   Issues related with optimizing network performance, probability, stochastic processes, modeling and performance evaluation. Queuing theory, queuing models, estimating model parameters, throughput utilization, modeling network as graph external and internal representation, complexity issues, network traffic controls.
3. Network Administration :
   Function and responsibilities, network issues:-planning, implementation, fault diagnosis and recovery.
4. Network Design :
   Problem definition, multipoint line layout heuristics, CMST algorithms, ESAU-William's algorithm, Sharma's algorithm, unified algorithm, Bin packing algorithm, Terminal assignments and concentrator location.
5. High Speed Networks :
   Need, characteristics, challenges, applications, frame relay, ATM, ISDN, High speed LANs: Ethernet, fiber channel, DQDB, SMDS, B_ISDN, STM, DSL, and DWDM, Architecture Transport, Switching and Routing in optical domain, optical network management, Internetworking.
6. Network security :
   Basic cryptographic techniques, security in OSI architecture, internet and networked computing, Kerberos, firewalls, proxy, etc. Security applications in commerce and banking.
7. IP Telephony :
   VOIP system architecture, protocol hierarchy, structure of a voice endpoint,

Protocols for the transport of voice media over IP networks, Providing IP quality of service for voice, signaling protocols for VOIP,PSTN gateways, VOIP applications.

8. Storage Networks :
   Introduction, challenges, SCSI protocols and architecture: RAID, Backup and mirroring, Fiber channel attached storage. Network attached storage including NFS, CIFS, and DAFS, Management of network storage architectures. New storage protocols, architectures and enabling technologies.
9. Compression :
   Overview of Information Theory, Lossless Compression: Run-Length Encoding, Facsimile compression, String Matching algorithms. Lossy compression: DCT, Wavelet compression.

BOOKS

References:

1. Stallings. W.-"High Speed Networks and Internets: Performance and Quality of service",Pretice Hall 2002
2. Kershenbaum A.-"Telecommunications Network Design Algorithms" Tata McGraw Hill.
3. Ramaswami R. ,Shivrajan K-"Optical Networks", Morgan Kaufmann.
4. Douskalis B.-"IP Telephony: The Integration of Robust VOIP service",Perason Education Asia.
5. Douglas E.Comer-"Computer NetWorks and Internet", Pearson Education Asia.
6. Stallings W.-"High Speed Networks :TCP/IP and ATM Design principles", Prentice Hall,1998.
7. Andrew Tanenbaum- "Computer Network", PHI.

M.E. COMPUTER SCIENCE & ENGINEERING
FIRST YEAR TERM I

SUBJECT: APPLIED ALGORITHMS

Lectures: 3 Hrs per week	Theory: 100 Marks

Objective:
Algorithm design and analysis is a fundamental and important part of computer science. This course introduces students to advanced techniques for the design and analysis of algorithms, and explores a variety of applications.

Pre-requisites:
Knowledge of Algorithms, Discrete structure and graph theory.

DETAILED SYLLABUS

1. **Introduction**: The role of algorithms in computing, analyzing algorithms, designing algorithms, growth of functions- asymptotic notation,standard notations and common functions, recurrences- the substitution method, the recursion tree method, the master method.
2. **Advanced data structures** Red - black trees- properties of red-black trees, rotations, insertion, deletion, B-trees-definition of B-Tree, basic operations on B-Tree, deleting a key from B-Tree, Binomial heaps- binolial trees and binomial heaps, operations on binomial heaps, Fibonacci heaps- structure of Fibonacci heaps, mergeable heap operations, decreasing a key and deleting a node, bounding the maximum degree.
3. **Advanced Design and Analysis Techniques** Dynamic Programming- assembly line scheduling, matrix chain multiplication, elements of dynamic programming, longest common subsequence, optimal binary search trees, Greedy Algorithms- an activity selection problem, elements of greedy strategy, Huffman codes, Amortized Analysis- aggregate analysis, the accounting method, the potential method.
4. **Graph algorithms** Minimum Spanning Trees- growing a minimum spanning tree, the algorithms of Kruskal and Prim, Single-source shortest paths- the Bellman-Ford algorithm, Single-source shortest path in directed acyclic graphs, Dijkstra's algorithm, all pair shortest paths- shortest path and matrix multiplication, the Floyd-Warshall algorithm, Johnson's algorithm for sparse graphs.
5. **Sorting networks** Comparision networks, the zero-one principle, a bitonic sorting networks, a merging network, a sorting network

BOOKS

Text Books:

1. Corman, Leiserson, Rivest, Stein,"Introduction To Algorithms", PHI, 2nd Edition.
2. Horowitz, Sahni, Rajasekaran,"Fundamentals of Computer Algorithms", Universities Press, 2nd Edition.

References:

1. Aho,"Design and Analysis of Algorithms", Pearson, LPE
2. A V Aho, J. D. Ullman, "Design and analysis of algorithms", Pearson LPE.
3. Bressard, Bratly, "Fundamentals of Algorithms", Pearson LPE/PHI

M.E. COMPUTER SCIENCE & ENGINEERING FIRST YEAR TERM I	
SUBJECT: EMBEDDED SOFTWARE DESIGN (ELECTIVE-I)	
Lectures: 3 Hrs per week	**Theory: 100 Marks**

Objective:

After successfully completing the module student should be :

Capable of actively participating or successfully managing a embedded software development project by applying design life cycle concepts, able to demonstrate knowledge of real time constraint with concepts of RTOS as well as porting of any RTOS

Pre-requisites:

Knowledge of Microprocessors and Microcontrollers and their interfacing

DETAILED SYLLABUS

1. Embedded Design Life Cycle: Introduction Product Specification ,Hardware/Software partitioning , Iteration and Implementation, Detailed hardware and software Design, Hardware/Software Integration ,Product Testing and Release, Maintaining and upgrading existing products.
2. Selection Process & Development Environment: RTOS availability, Tool Chain availability, The Execution Environment, On chip Peripherals ,Debugging & Testing : BDM, JTAG, NEXUS & ICE
3. Advanced Embedded Processors: ARM Embedded Systems, ARM Processor Fundamentals, Introduction to the ARM ,Instruction Set, Introduction to the Thumb Instruction Set ,Efficient C Programming Writing and Optimizing ARM Assembly Code, Digital Signal Processing, Exception and Interrupt Handling, Firmware
4. Writing Software for Embedded Systems: The Compilation Process, Native Vs Cross-Compilers, and Runtime Libraries, Writing a Library, Using Alternative Libraries, using a standard library, porting Kernels extensions for embedded systems, Downloading, Emulation and Debugging techniques.
5. RTOS - µC/OS-II: RTOS Services in Contrast to Traditional O.S. Sample Code, Real-Time Systems Concepts, Kernel Structure, Task Management, Time Management, Inter task Communication and Synchronization, , Memory Management, Porting µC/OS -II
6. Understanding Linux Kernel:_Introduction, Memory Addressing , Processes , Interrupts and Exceptions, Timing Measurements, Memory Management, Process Address Space, System Calls ,Signals, Process Scheduling, Kernel Synchronization, The Virtual File system, Managing I/O Devices , Disk Caches , Accessing Regular Files, Swapping: Methods for Freeing Memory, The Ext2 Files system, Process Communication , Program Execution, Porting of Linux Kernel
7. Understanding Windows Embedded CE Kernel: Introduction to Windows Embedded CE Kernel , Boot process, Memory Management, Files Database and Registry, Process and Threads, Communications , Porting of Linux Kernel

BOOKS
Text Books:
1. Embedded Systems Design – Introduction to Processes, Tools, Techniques, Arnold S Burger, CMP books 2. Embedded Systems Design by Steave Heath, Newnes. 3. “ARM Systems Developers Guide Designing and Optimizing System Software” By Andrew N Sloss, Dominic Symes & Cheris Wright ELSEVIER Publication. 4. Understanding the Linux Kernel Daniel P. Bovet Marco Cesati Publisher: O'Reilly First Edition October 2000 ISBN: 0-596-00002-2, 702 pages 5. Building Embedded Linux Systems by Karim Yaghmour 6. Inside Microsoft Windows CE By John Murray
References:
1. ARM System on chip architecture by Steve Furbur 2. μC/OS-II by Jean Labrossewww.uCOS-II.com 3. Programming Microsoft Windows Embedded CE

M.E. COMPUTER SCIENCE & ENGINEERING
FIRST YEAR TERM I

SUBJECT: DIGITAL IMAGE and VIDEO PROCESSING (ELECTIVE-I)

Lectures: 3 Hrs per week	**Theory: 100 Marks**

Objective: Digital Image Processing is a rapidly evolving field with growing applications in science and engineering. Image processing holds the possibility of developing the ultimate machine that could perform the visual functions of all living beings. There is an abundance of image processing applications that can serve mankind with the available and anticipated technology in the near future.

Pre-requisites: Digital Signal Processing, & Computer Graphics

DETAILED SYLLABUS

1. **Digital Image Processing Systems:** Introduction, Structure of human eye, Image formation in the human eye, Brightness adaptation and discrimination, Image sensing and acquisition, Storage, Processing, Communication, Display. Image sampling and quantization, Basic relationships between pixels
2. **Image Transforms (Implementation):** Introduction to Fourier transform, DFT and 2-D DFT, Properties of 2-D DFT, FFT, IFFT, Walsh transform, Hadamard transform, Discrete cosine transform, Slant transform, Optimum transform: Karhunen - Loeve (Hotelling) transform.
3. **Image Enhancement in the Spatial Domain:** Gray level transformations, Histogram processing, Arithmetic and logic operations, Spatial filtering: Introduction, Smoothing and sharpening filters
4. **Image Enhancement in the Frequency Domain:** Frequency domain filters: Smoothing and Sharpening filters, Homomorphic filtering
5. **Wavelets and Multiresolution Processing:** Image pyramids, Subband coding, Haar transform, Series expansion, Scaling functions, Wavelet functions, Discrete wavelet transforms in one dimensions, Fast wavelet transform, Wavelet transforms in two dimensions
6. **Image Data Compression:** Fundamentals, Redundancies: Coding, Interpixel, Psycho-visual, Fidelity criteria, Image compression models, Error free compression, Lossy compression, Image compression standards: Binary image and Continuous tone still image compression standards, Video compression standards.
7. **Morphological Image Processing:** Introduction, Dilation, Erosion, Opening, Closing, Hit-or-Miss transformation, Morphological algorithm operations on binary images, Morphological algorithm operations on gray-scale images
8. **Image Segmentation:** Detection of discontinuities, Edge linking and Boundary detection, Thresholding, Region based segmentation
9. **Image Representation and Description:** Representation schemes, Boundary descriptors, Regional descriptors
10. **Introduction to Video Processing:** Spatio-temporal sampling, inter frame and intraframe coding, motion estimation techniques, video compression standards.

BOOKS
Text Books:
1. R.C.Gonsales R.E.Woods**, "**Digital Image Processing", Second Edition, Pearson Education 2. Anil K.Jain, "Fundamentals of Image Processing", PHI 3. K. R rao and J.J. Hawang, "Techniques and Standards for Video and Audio Coding", Prentice Hall PTR
References:
1. William Pratt, "Digital Image Processing", John Wiley 2. Milan Sonka,Vaclav Hlavac, Roger Boyle, "Image Processing, Analysis, and Machine Vision" Thomson Learning 3. N Ahmed & K.R. Rao, "Orthogonal Transforms for Digital Signal Processing" Springer 4. B. Chanda, D. Dutta Majumder, "Digital Image Processing and Analysis", PHI.

M.E. COMPUTER SCIENCE & ENGINEERING
FIRST YEAR TERM I

SUBJECT: MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE (ELECTIVE-I)

Lectures: 3 Hrs per week	**Theory: 100 Marks**

Objective:
The purpose of this course is to develop mathematical foundations for computer science and computer engineering. In addition, applications of mathematical principles to computer science and engineering are presented.

Pre-requisites:
Knowledge of Theory of Computer Science, Discrete Structure and Graph Theory.

DETAILED SYLLABUS

1. **Probability and Information Theory.**
   Introduction. Basic Concept of Probability. Properties. Basic Calculation. Random Variables and their Probability Distributions. Birthday Paradox. Information Theory. Redundancy in Natural Languages.
2. **Computational Complexity.**
   Introduction. Turing Machines. Deterministic Polynomial Time. Probabilistic Polynomial Time. Non-deterministic Polynomial Time. Non-Polynomial Bounds. Polynomial-time Indistinguishability.
3. **Algebraic Foundations.**
   Introduction. Groups. Rings and Fields. The Structure of Finite Fields. Group Constructed Using Points on an Elliptic Curve.
4. **Number Theory.**
   Introduction. Congruences and Residue Classes. Euler's Phi Function. The Theorems of Fermat, Euler and Lagrange. Quadratic Residues. Square Roots Modulo Integer. Blum Integers.
5. **Fuzzy Logic**
   Operations of fuzzy sets, fuzzy arithmetic & relations, fuzzy relations equations, MATLAB introduction, programming in MATLAB scripts, functions and their Applications
   Case study: Development of fruit sorting system using fuzzy logic in MATLAB

BOOKS

Text Books:

1. Modern Cryptography: Theory and Practice by Wenbo Mao, Low Price Edition, Pearson Education

References:

1. Fuzzy logic in engineering by T. J. Ross, Willey Publications
2. Fuzzy sets theory and its applications, H.J. Zimmermann, Kluwer Academic Publications, 4th edition.
3. Elements of Discrete Mathematics, C.L.Liu, TMH, 2nd edition

M.E. COMPUTER SCIENCE & ENGINEERING
FIRST YEAR TERM I

SUBJECT: SOFTWARE PROJECT MANAGEMENT (ELECTIVE-I)

Lectures: 3 Hrs per week	**Theory: 100 Marks**

Objective:
After successfully completing the module student should be :
Capable of actively participating or successfully managing a software development project by applying project management concepts, able to demonstrate knowledge of project management terms and techniques

Pre-requisites:
Knowledge of Software Engineering.

DETAILED SYLLABUS

1. Introduction to Project Management: Importance of software project management, stages and stakeholders of a software project, elements of software project, Importance of software project management, Stages of Project, The Stakeholder of Project, Project Management Framework, Software Tools for Project Management.
2. Project Planning: Integration Management, Scope Management, Stepwise Project Planning, Use of Software (Microsoft Project) to Assist in Project Planning Activities.
3. Project Scheduling: Time Management, Project Network Diagrams, Use of Software (Microsoft Project) to Assist in Project Scheduling.
4. Project Cost Management: Importance and Principles of Project Cost Management, Resource Planning, Cost Estimating, Cost Control, Use of Software (Microsoft Project) to assist in Cost Management.
5. Project Quality Management: Quality of Information Technology Projects, Stages of Software Quality Management, Quality Standards, Tools and Techniques For Quality Control.
6. Project Human Resources Management: Human Resources Management, Keys to Managing People, Organizational Planning, Issues in Project Staff Acquisition and Team Development, Using Software to Assist in Human Resource Management.
7. Project Communication Management: Communications Planning, Information Distribution, Performance Reporting, Administrative Closure, Suggestions for Improving Project Communications, Using Software to Assist in Project Communications.
8. Project Risk Management: The Importance of Project Risk Management, Common Sources of Risk in IT projects, Risk Identification, Risk Quantification, Risk Response Development and Control, Using Software to Assist in Project Risk Management.
9. Project Procurement Management: Importance of Project Procurement Management, Procurement Planning, Solicitation, Source Selection, Contract Administration, Contract Close-out.

10. Project Management Process Groups: Introduction to Project Management Process Groups, Project Initiation, Project Planning, Project Executing, Project Controlling and Configuration Management, Project Closing.
BOOKS
Text Books:
1.Kathy Schwalbe, "Information Technology Project Management", International Student Edition, THOMSON Course Technology 2.Bob Hughes and Mike Cotterell, "Software Project Management" Third Ed., Tata McGraw-Hill 3.Elaine Marmel, "Microsoft Office Project 2003 Bible", Wiley Publishing Inc.
References:
1.Basics of Software Project Management, NIIT, Prentice-Hall India 2.Pankaj Jalote, "Software Project Management in Practice", Pearson Education 3.S.A. Kelkar, "Software Project Management", A Concise Study, Revised Edition,PHI

M.E. COMPUTER SCIENCE & ENGINEERING FIRST YEAR TERM I	
SUBJECT: Laboratory Practice-I	
Practical: 6 Hrs per week	**Term Work: 100 Marks** **Oral: 50 marks**
DETAILED SYLLABUS	
Experiments/Assignments based on 1. Advanced Software Engineering 2. Net-Centric Computing 3. Elective- I The concerned subject in-charge should frame minimum of six laboratory assignments, two from each subject.	

M.E. COMPUTER SCIENCE & ENGINEERING **FIRST YEAR TERM I**	
SUBJECT: Seminar-I	
Practical: 4 Hrs per week	**Term Work: 100 Marks**
DETAILED SYLLABUS	
Seminar on related state of the art topic of student's own choice approved by the department.	
TERM WORK	
1.The term-work & presentation of the Seminar-I will be evaluated by departmental committee consisting of guide and two faculty members of the department appointed by Director/Principal of the college as per the recommendation of the Head of the Department.	

M.E. COMPUTER SCIENCE & ENGINEERING
FIRST YEAR TERM II

SUBJECT: ADVANCED DATABASE MANAGEMENT SYSTEMS

Lectures: 3 Hrs per week	**Theory: 100 Marks**

Objective: The course gives an overview of motivation and background of the new developments, and is intended as an introduction to the most important advances with respect to the classical relational database systems.

Pre-requisites:
Knowledge of Database Management System, Operating System.

DETAILED SYLLABUS

1. **The Extended Entity Relationship Model and Object Model**
(a) The ER model revisited
(b) Motivation for complex data types
(c) User defined abstract data types and structured types
(d) Subclasses
(e) Superclasses
(f) Inheritance
(g) Specialization and generalization
(h) Relationship types of degree higher than two

2. **Object–Oriented Databases**
(a) Overview of object–oriented concepts
(b) Object identity
(c) Object structure and type constructors
(d) Encapsulation of operations
(e) Methods and persistence
(f) Type hierarchies and inheritance
(g) Type extents and persistent programming languages
(h) OODBMS architecture and storage issues
(i) Transactions and concurrency control
(j) Examples of ODBMS

3. **Object Relational and Extended Relational Databases**
(a) Database design for an ORDBMS
(b) Nested relations and collections
(c) Storage and access methods
(d) Query processing and optimization
(e) An overview of SQL3
(f) Implementation issues for extended type
(g) Systems comparison of RDBMS
(h) OODBMS
(i) ORDBMS

4. **Paralled and Distributed Databases and Client–Server Architecture**
(a) Architectures for parallel databases
(b) Parallel query evaluation
(c) Parallelizing individual operations
(d) Sorting Joins
(e) Distributed database concepts
(f) Data fragmentation
(g) Replication and allocation techniques for distributed database design
(h) Query processing in distributed databases
(i) Concurrency control and recovery in distributed databases
(j) An overview of client–server architecture

5**. Enhanced Data Models for Advanced Applications**
(a) Active database concepts
(b) Temporal database concepts
(c) Spatial databases: concept and architecture
(d) Deductive databases and query processing
(e) Mobile databases
(f) Geographic information systems

BOOKS

Text Books:

1.Elmsari and Navathe, Fundamentals of Database Systems
2.Ramakrishnan and Gehrke, Database Management Systems.

References:

1. Korth, Silberschatz, Sudarshan, Database System Concepts
2. Rob and Coronel, Database Systems: Design, Implementation and Management
3. Date and Longman, Introduction to Database Systems

M.E. COMPUTER SCIENCE & ENGINEERING
FIRST YEAR TERM II

SUBJECT: WEB ENGINEERING

Lectures: 3 Hrs per week	**Theory: 100 Marks**

Objective:
Provides an introduction to the discipline of Web Engineering. This course aims to introduce the methods and techniques used in Web-based system development. In contrast to traditional Software Engineering efforts, Web Engineering methods and techniques incorporate unique aspects of the problem domain such as: document oriented delivery, fine-grained lifecycles, user-centric development, client-server legacy system integration and diverse end user skill levels.

Pre-requisites:
Knowledge of both Internet communication concepts and an introductory programming knowledge (Java & Javascript).

DETAILED SYLLABUS

1. **An Introduction to Web Engineering:** Categories of Web Applications, Characteristics of Web
2. **Requirements Engineering for Web Applications:** Requirements, Engineering Activities, RE Specifics in Web Engineering, Principles for RE of Web, Adapting RE Methods to Web Application Development, Requirement Types.
3. **Modeling Web Applications:** Modeling Specifics in Web Engineering, Levels, Aspects, Phases,
4. Customization, Modeling Requirements, Content Modeling, Hypertext Modeling, Presentation Modeling, Customization Modeling, Methods and Tools.
5. **Web Application Architectures:** Fundamentals, Specifics of Web Application Architectures, Components of a Generic Web Application Architecture, Layered Architectures, Data-aspect Architectures.
6. **Technology-aware Web Application Design:** Web Design from an Evolutionary Perspective, Presentation Design, Interaction Design, Functional Design, Context-aware Applications, Device-independent Applications, Reusability.
7. **Technologies for Web Applications:** Client/Server Communication on the Web, Client-side Technologies, Document-specific Technologies, Server-side Technologies.
8. **Testing Web Applications:** Fundamentals, Test Specifics in Web Engineering, Test Approaches, Test Scheme, Test Methods and Techniques, Test Automation.
9. **Operation and Maintenance of Web Applications:** Challenges Following the Launch of a Web Application, Promoting a Web Application, Content Management, Usage Analysis, From Software Project Management to Web Project Management.
10. **Web Project Management:** Challenges in Web Project Management, Managing Web Teams, Managing the Development Process of a Web Application.

11. **The Web Application Development Process:** Requirements for a Web Application Development Process, Analysis of the Rational Unified Process, Analysis of Extreme Programming. 12. **Usability of Web Applications:** Design Guidelines, Web Usability Engineering Methods, Web Usability Engineering Trends. 13. **Performance of Web Applications:** System Definition and Indicators, Characterizing the Workload, Representing and Interpreting Results, Performance Optimization Methods. 14. **Security for Web Applications:** Aspects of Security, Encryption, Digital Signatures and Certificates, Secure Client/Server-Interaction, Client Security Issues, Service Provider Security Issues. 15. **The Semantic Web – The Network of Meanings in the Network of Documents:** Fundamentals of the Semantic Web, Technological Concepts, Specifics of Semantic Web Applications.
BOOKS
Text Books:
1. Gerti Kappel, Birgit Pr ¨ oll, Siegfried Reich, Werner Retschitzegger, "Web Engineering: The Discipline of Systematic Development of Web Applications", John Wiley 2. Pressman, Roger S. and Lowe, David, "Web Engineering: A Practioner's Approach",McGraw-Hill Higher Education
References:
1. Mishra, "Web Engineering And Applications", Macmillan Publishers India 2. Emilia Mendes, and Nile Mosley, "Web Engineering", Springer

M.E. COMPUTER SCIENCE & ENGINEERING
FIRST YEAR TERM II

SUBJECT: Parallel Computing

Lectures: 3 Hrs per week	**Theory: 100 Marks**

Objective:

Upon completion of this course students will be able to understand and employ the fundamental concepts and mechanisms which form the basis of the design of parallel computation models and algorithms, recognize problems and limitations to parallel systems, as well as possible solutions

Pre-requisites:

Computer architecture, Data structures.

DETAILED SYLLABUS

1.Introduction:
Need, Models of computation, SISD, MISD,SIMD-Shared Memory SIMD, Interconnection network SIMD, MIMD, Programming MIMD, Special Purpose Architecture, Analysis of algorithm, Running time, No of processors, Cost, Other Measures-Area, Length, Period, Expressing Algorithm.

2.Parallel processing:
parallel computer structure, designing of parallel algorithms, analyzing algorithms, general principles of parallel computing.

3. Parallel sorting algorithms
Batcher's bitonic sort, Bitonic sort using the perfect Shuffle, parallel bubble sort, Odd- even transpose sort, Tree sort.

4. Quick Sort:
Parallel Quick sort for CRCW PRAM, Parallel formulation for practical architectures,Shared Address space parallel formulation, message passing parallel formulation, pivot selection.

5. Sorting:
Sorting on the CRCW, CRFW, EREW models, searching a sorted sequence, CREW,CRCW & EREW searching, searching on a random sequence EREW, ERCW, CREW & CRCW searching on SIMD computers, searching on a Tree, mesh, A Network for merging, merging on the CRFW, ERFW models

6. Computing Fourier Transforms:
Computing the DFT in parallel, a parallel FFT algorithm.

BOOKS

References:

1. Design & Analysis of Parallel Algorithm by Salim & Akil, PHI.
2. Design Efficient Algorithm for Parallel Computers by Michel J. Quinn, TMH.

M.E. COMPUTER SCIENCE & ENGINEERING
FIRST YEAR TERM II

SUBJECT: SOFT COMPUTING

Lectures: 3 Hrs per week	**Theory: 100 Marks**

Objective:

By the end of the course a student is expected to become able to apply Genetic Algorithms, Fuzzy Logic and Artificial Neural Networks as computational tools to solve a variety of problems in their area of interest ranging from Optimization problems to Pattern recognition and control tasks.

Pre-requisites:

The prerequisite for this course is a basic understanding of problem solving, design and analysis of algorithms and computer programming. A prior course in Artificial Intelligence will be an advantage.

DETAILED SYLLABUS

1. Introduction to soft computing, Biological Neuron, Artificial Neuron, Characteristics of Neural Network, Neural Network Architectures, Learning in Neural Networks, Various learning Methods and Learning Rules, Single layer Perceptron, training and classification, Linear Separable classification, Applications of Neural Networks for Pattern Recognition, Classification and Clustering.
2. Introduction to Multilayer Perceptron, various activation functions, Delta and Generalized Delta Learning rule, Error Back Propagation training and algorithm, Counter Propagation Network, Boltzman Machine.
3. Recurrent Network, configuration, stability, Associative Memory: Concepts, performance analysis, BAM, ART.
4. Self-organizing Networks: Unsupervised Learning, Self-organized Map.
5. Introduction to fuzzy sets and fuzzy logic systems, Fuzzy set definitions, operations, Fuzzy rules, Fuzzy reasoning. Fuzzy inference systems, Fuzzy models.
6. Introduction to Genetic Algorithms, Biological Inspiration, The Genetic Algorithm, Genetic Operators, Genetic Algorithm through example, Sample problems, Genetic Algorithm Implementation, Tweaking the Parameters and Process, Various Problems with Genetic Algorithm.
7. Applications of Neural Network, Fuzzy Logic, Genetic Algorithms: Signal Processing, Image Processing, Pattern Recognitions, communication systems, Biological Sequence Alignment and Drug Design, Robotics and Sensors, Information Retrieval Systems, Share Market Analysis, Natural Language Processing.

BOOKS

Text Books:

1. J.M.Zurda, "Introduction to Artificial Neural Networks", Jaico Publishing House.
2. D. E. Goldberg, "Genetic Algorithms in Search and Optimization, and Machine Learning", Addison-Wesley, 1989.

3. Jang, Sun, & Mizutani, "Neuro-Fuzzy and Soft Computing", PHI.
4. M. Mitchell, "An Introduction to Genetic Algorithms", Prentice-Hall, 1998.

References:

1. S. Haykin, "Neural Networks", Pearson Education, 2nd Ed., 2001.
2. Klir & Yuan, "Fuzzy Sets and Fuzzy Logic", PHI, 1997.
3. Chin-Teng Lin & C. S. George Lee, "Neural Fuzzy Systems", Prentice Hall PTR.
4. S. Rajasekaran & G. A. V. Pai, "Neural Networks, Fuzzy logic, and Genetic Algorithms", PHI.
5. V. Kecman, "Learning and Soft Computing", MIT Press, 2001.
6. S. N. Sivanandam & S. N. Deepa, Principles of Soft Computing, Wiley - India, 2007
7. D. E. Goldberg, Genetic Algorithms in Search, Optimization, and Machine Learning, Addison-Wesley, 1989.

M.E. COMPUTER SCIENCE & ENGINEERING
FIRST YEAR TERM II

SUBJECT: SOFTWARE TESTING AND QUALITY ASSURANCE (ELECTIVE-II)

Lectures: 3 Hrs per week	Theory: 100 Marks

Objective:
After successfully completing the module student should be apply the testing fundamentals and testing skill to validate and verify the software system, also able to demonstrate knowledge of testing strategies by applying the different testing tools.

Pre-requisites:
Knowledge of Software Engineering.

DETAILED SYLLABUS

1. Software Testing Background: Infamous Software Error Case Studies, What Is a Bug? Why Do Bugs Occur? The Cost of Bugs, What Exactly Does a Software Tester Do? What Makes a Good Software Tester? The Software Development Process, Product Components, Software Project Staff, Software Development Lifecycle, Models, The Realities of Software Testing, Testing Axioms, Software Testing Terms and Definitions.
2. Testing Fundamentals : Examining the Specification, Performing a High-Level Review of the Specification, Low-Level Specification, Test Techniques, Black-Box Testing, Test-to-Pass and Test-to-Fail, Equivalence Partitioning, Data Testing, State Testing, Other Black-Box Test Techniques, Examining the Code, Static White-Box Testing: Examining the Design and Code, Formal Reviews, Coding Standards and Guidelines, Generic Code Review, Checklist, Testing the Software with X-Ray Glasses, Dynamic White-Box Testing, Dynamic White-Box Testing Versus Debugging, Testing the Pieces, Data Coverage, Code Coverage
3. Applying Testing Skills: Configuration Testing, An Overview of Configuration Testing, Approaching the Task, Obtaining the Hardware, Identifying Hardware Standards, Configuration Testing Other Hardware, Compatibility Testing, Compatibility Testing Overview, Platform and Application Versions, Standards and Guidelines, Data Sharing Compatibility, Foreign-Language Testing, Making the Words and Pictures Make Sense, Translation Issues, Localization Issues, Configuration and Compatibility Issues, How Much Should You Test? Usability Testing, User Interface Testing, ,What Makes a Good UI?, Testing for the Disabled: Accessibility Testing,
4. Testing the Documentation: Types of Software Documentation, The Importance of Documentation Testing, What to Look for When Reviewing Documentation, The Realities of Documentation Testing, Testing for Software Security, War Games the Movie, Understanding the Motivation, Threat Modeling, Is Software Security a Feature? Is Security Vulnerability a Bug? Understanding the Buffer Overrun, Using Safe String Functions, Computer Forensics, Website Testing, Web Page Fundamentals, Black-Box Testing, Gray-Box Testing, White-Box Testing, Configuration and Compatibility Testing, Usability Testing, Introducing Automation.

5. Supplementing Testing: Automated Testing and Test Tools ,The Benefits of Automation and Tools, Test Tools, Software Test Automation, Random Testing, Realities of Using Test Tools and Automation, Bug Bashes and Beta Testing, Having Other People Test Your Software, Test Sharing, Beta Testing, Outsourcing Your Testing
6. Working with Test Documentation: Planning Your Test Effort, The Goal of Test Planning, Test Planning, Writing and Tracking Test Cases, The Goals of Test Case Planning, Test Case Planning Overview, Test Case Organization and Tracking, Reporting What You Find, Getting Your Bugs Fixed, Isolating and Reproducing Bugs, Not All Bugs Are Created Equal, A Bug's Life Cycle, Bug-Tracking Systems , Measuring Your Success, Using the Information in the Bug Tracking Database
7. The Future: Software Quality Assurance, Quality Is Free, Testing and Quality Assurance in the Workplace, Test Management and Organizational Structures, Capability Maturity Model (CMM),ISO 9000, Software Quality and Software Metrics.

BOOKS

References:

1.Ron Patton, "Software Testing", Pearson publication.
2.Roger S Pressman, "Software Engineering: A Practitioner's Approach" 6th Edition, McGraw Hill,2005.
3.Marine Hutcheson, "Software Testing Fundamentals: Methods and Metrics", John Wiley Publication,2003.

M.E. COMPUTER SCIENCE & ENGINEERING
FIRST YEAR TERM II

SUBJECT: CRYPTOGRAPHY AND NETWORK SECURITY
(ELECTIVE-II)

Lectures: 3 Hrs per week	**Theory: 100 Marks**

Objective:
The course introduces the principles of number theory and the practice of network security and cryptographic algorithms. At the end of the course the student will understand: Data Encryption Standard and algorithms, IP and Web Security, Protocols for secure electronic commerce, Concepts of Digital Watermarking and Steganography.

Pre-requisites:
Probability theory and Discrete Mathematics

DETAILED SYLLABUS

1. Foundations of Cryptography and Security Ciphers and Secret Messages, Security Attacks and Services
2. Mathematical Tools for Cryptography Substitutions and Permutations, Modular Arithmetic, Euclid!s Algorithm, Finite Fields, Polynomial Arithmetic, Discrete Logarithms
3. Conventional Symmetric Encryption Algorithms Theory of Block Cipher Design Feistel Cipher Network Structures, DES and Triple DES, Modes of Operation (ECB,CBC, OFB,CFB), Strength (or Not) of DES
4. Modern Symmetric Encryption Algorithms IDEA, CAST, Blowfish, Twofish, RC2, RC5, Rijndael (AES) Key Distribution
5. Stream Ciphers and Pseudo Random Numbers, Pseudo random sequences, Linear Congruential Generators, Cryptographic Generators, Design of Stream Cipher, One Time Pad
6. Public Key Cryptography, Prime Numbers and Testing for Primality, Factoring Large Numbers, RSA, Diffie-Hellman, ElGamal, Key Exchange Algorithms, Public-Key Cryptography Standards
7. Hashes and Message Digests Message Authentication, MD5, SHA, RIPEMD, HMAC
8. Digital Signatures, Certificates, User Authentication, Digital Signature Standard (DSS and DSA), Security Handshake Pitfalls, Elliptic Curve Cryptosystems
9. Authentication of Systems Kerberos V4 and V5, X.509 Authentication Service
10. Electronic Mail Security Pretty Good Privacy (PGP), S/MIME, X.400
11. 12 3/28 IP and Web Security Protocols IPSec and Virtual Private Networks, Secure Sockets and Transport Layer (SSL and TLS)
12. Electronic Commerce Security, Electronic Payment Systems, Secure Electronic Transaction (SET), CyberCash, iKey Protocols, Ecash (DigiCash)
13. Intrusion detection – password management – Viruses and related Threats – Virus Counter measures – Firewall Design Principles – Trusted Systems
14. Digital Watermarking and Steganography, Biometrics for security- signature verification, figure print recognition, voice recognition, Iris recognition system.

BOOKS
Text Books:
1. William Stalling, “Cryptography and Network Security, Principles and Practice”, Pearson/PHI Publication 2. B A Forouzan, “Cryptography and Network Security”, TMH
References:
1. Bruce Schneier, “Applied Cryptography”, John Wiley & Sons Inc 2. Charles B. Pfleeger, Shari Lawrence Pfleeger, “Security in Computing”, Pearson Education 3. D Denning, “Cryptography and Data Security”, Addision-Welesly

M.E. COMPUTER SCIENCE & ENGINEERING
FIRST YEAR TERM II

SUBJECT: PATTERN RECOGNITION
(ELECTIVE-II)

Lectures: 3 Hrs per week	**Theory: 100 Marks**

Objective: This course teaches the fundamentals of techniques for classifying multi-dimensional data, to be utilized for problem-solving in a wide variety of applications, such as engineering system design, manufacturing, technical and medical diagnostics, image processing, economics, and psychology.

Pre-requisite: Linear Algebra, Probability and Statistics

DETAILED SYLLABUS

1. **Introduction:** Machine perception, Pattern recognition systems, Design cycle, Learning and Adaptation
2. **Bayesian Decision Theory:** Bayesian decision theory: Continuous features, Minimum-error rate classification, classification, Classifiers, Discriminant functions and Decision surfaces, Normal density, Discriminant functions for normal density, Bayes Decision theory: discrete features
3. **Maximum-Likelihood and Bayesian Parameter Estimation:** Maximum likelihood estimation, Bayesian estimation, Bayesian parameter estimation: Gaussian caseand General theory, Prolems of dimentionality, Hidden Markov Model
4. **Nonparametric Techniques:** Density estimation, Parzen windows, k_n-Nearest-Neighbor estimation, Nearest-Neighbor rule, Matrics and Nearest-Neighbor classification
5. **Linear Discriminants Functions:** Linear discriminant functions and decision surfaces, Generalised linear discriminant functions, 2-Category linearly separable case, Minimising the Perceptron criterion function, Relaxation procedure, Non-separable behavior, Minimum squared error procedure, Ho-Kashyap procedures, Multicategory generalizations
6. **Nonmetric Methods:** Decision tree, CART, ID3, C4.5, Gramatical methods, Gramatical interfaces
7. **Algorithm Independent Machine Learning:** Lack of inherent superiority of any classifier, Bias and Variance, Resampling for estimating statistic, Resampling for classifier design, Estimating and comparing classifiers, Combining classifiers
8. **Unsupervised Learning and Clustering:** Mixture densities and Identifiability, Maximum-Likelihood estimations, Application to normal mixtures, Unsupervised Bayesian learning, Data description and clustering criterion function for clustering, Hierarchical clustering
9. **Applications of Pattern Recognition**

BOOKS

Text Books:

1. Duda, Hart, and Stock, "*Pattern Classification*", John Wiley and Sons.
2. Gose, Johnsonbaugh and Jost, "*Pattern Recognition and Image analysis*", PHI

M.E. COMPUTER SCIENCE & ENGINEERING
FIRST YEAR TERM II

SUBJECT: Mobile Computing
(ELECTIVE-II)

Lectures: Hrs per week	**Theory: 100 Marks**

Objective:
After successful completion of the course student should get knowledge about: Mobile Computing Architecture, mobile technologies: GSM, Bluetooth, GPRS, CDMA and should be capable to develop mobile computing applications.

Pre-requisites:
Knowledge of Computer Networks.

DETAILED SYLLABUS

1. Introduction: Mobile Computing, Dialogue Control, Networks, Middleware and Gateways, Application and Services, Developing Mobile Computing Applications, Security in Mobile Computing.
2. Mobile Computing Architecture: Internet – The Ubiquitous Network, Architecture for Mobile Computing, Three-Tier Architecture, Design considerations for Mobile Computing, Mobile Computing through Internet, Making Existing Applications Mobile-Enabled.
3. Emerging Technologies: Introduction, Bluetooth, Radio Frequency Identification, Wireless Broadband, Mobile IP, IPV6, Java card.
4. Mobile Transport Layer: Traditional TCP - Congestion Control, Slow Start, Fast Retransmit/Fast Recovery, Implications on Mobility, Classical TCP Improvements - Indirect TCP, Snooping TCP, Mobile TCP, Fast Retransmit/Fast Recovery, Transmission/Time-Out Freezing, Selective Retransmission, Transaction Oriented TCP.
5. Support for Mobility: File Systems – Consistency, Coda, Little work, Ficus, Mio-NFS, Rover, World Wide Web - Hypertext Transfer Protocol, Hypertext Markup Language, Some Approaches that Might Help Wireless Access, System Architectures, Wireless Application Protocol - Architecture, Wireless Datagram Protocol, Wireless Transport Layer Security, Wireless Transaction Protocol, Wireless Session Protocol, Wireless Application Environment, Wireless Markup Language, WML script, Wireless Telephony Application, Push Architecture, Push/Pull Services.
6. Global System for Mobile Communications (GSM): Global System for Mobile Communications, GSM Architecture, GSM Entities, Call Routing in GSM, PLMN Interfaces, GSM Addresses and Identifiers, Network Aspects in GSM, GSM Frequency Allocation, Authentication and Security.
7. General Packet Radio Service (GPRS): Introduction, GPRS and Packet Data Network, GPRS Network Architecture, GPRS Network Operations, Data Services in GPRS, Applications for GPRS, Limitations of GPRS, Billing and Charging in GPRS.
8. CDMA and 3G: Introduction, Spread-Spectrum Technology, Is-95, CDMA versus GSM, Wireless Data, Third Generation Networks, Applications on 3G.
9. Security Issues in Mobile Computing: Introduction, Information

Security, Security Techniques and Algorithms, Security Protocols, Public Key Infrastructure, Trust, Security Models, Security Frameworks for Mobile Environment.
BOOKS
Text Books:
1. Talukder Asoke K. and Yavagal Roopa R ," Mobile Computing (Technology, Applications and Service Creation) ",Tata Mcgraw-Hill. 2. Jochen Schiller, Addison-Wesley, "Mobile Communications ",2nd Edition.

M.E. COMPUTER SCIENCE & ENGINEERING
FIRST YEAR TERM II

SUBJECT: LABORATORY PRACTICE-II

Practical: 6 Hrs per week	**Term Work: 100 Marks** **Oral: 50 marks**

DETAILED SYLLABUS

Experiments/Assignments based on
1. Advanced Database Management Systems
2. Soft Computing
3. Elective- II

The concerned subject in-charge should frame minimum of six laboratory assignments, two from each subject.

M.E. COMPUTER SCIENCE & ENGINEERING **FIRST YEAR TERM II**	
SUBJECT: SEMINAR-II	
Practical: 4 Hrs per week	**Term Work: 100 Marks**
DETAILED SYLLABUS	
Seminar on related state of the art topic of student's own choice approved by the department.	
TERM WORK	
1. The term-work & presentation of the Seminar-II will be evaluated by departmental committee consisting of guide and two faculty members of the department appointed by Director/Principal of the college as per the recommendation of the Head of the Department.	

M.E. COMPUTER SCIENCE & ENGINEERING SECOND YEAR TERM I	
SUBJECT: SEMINAR-III	
Practical: 4 Hrs per week	**Term Work: 50 Marks** **Oral: 50 Marks**
DETAILED SYLLABUS	
Seminar on special topic. The topic should be on any of the area not included in the regular curriculum. The report should include detailed study of specific concept (i.e. analysis, design & implementation.). This can be a theoretical study or practical implementation approved by the department/guide.	
TERM WORK	
1. Seminar-III should be conducted at the end of Second Year Term I. 2. The term-work of the Seminar-III will be evaluated by departmental committee consisting of guide and two faculty members of the department appointed by Director/Principal of the college as per the recommendation of the Head of the Department. 3. The Seminar-III presentation will be evaluated by examiners appointed by University, one of which should be the guide. 4. Student must submit the Seminar Report in the form of soft bound copy 5. The marks of seminar-III should be submitted at the end of Second Year Term I to the University.	

M.E. COMPUTER SCIENCE & ENGINEERING SECOND YEAR TERM I	
SUBJECT: PROJECT STAGE-I	
Practical: 18 Hrs per week	**Term Work: 100 Marks**
DETAILED SYLLABUS	
Project will consist of a system Development in Software/Hardware. Project Work should be carried out using Software Engineering principles and practices.	
TERM WORK	
The term-work of the Project Stage-I will be evaluated by departmental committee consisting of guide and two faculty members of the department appointed by Director/Principal of the college as per the recommendation of the Head of the Department.	

M.E. COMPUTER SCIENCE & ENGINEERING **SECOND YEAR TERM II**	
SUBJECT: PROGRESS SEMINAR	
	Term Work: 50 Marks

1. Progress Seminar should be conducted in the middle of Second Year Term II.
2. The Progress Seminar Term-Work will be evaluated by departmental committee consisting of guide and two faculty members of the department appointed by Director/Principal of the college as per the recommendation of the Head of the Department.
3. Student must submit the progress report in the form of soft bound copy.
4. The marks of progress seminar should be submitted along with the marks of Project Stage-II.

M.E. COMPUTER SCIENCE & ENGINEERING **SECOND YEAR TERM II**	
SUBJECT: PROJECT STAGE-II	
Practical: 18 Hrs per week	**Term Work: 150 Marks** **Oral:100 Marks**
DETAILED SYLLABUS	
This is continuation of Project Stage-I. The complete System Development in software/hardware carried out using Software Engineering principles and practices is expected. It should be a working system either software or hardware or combination of both. He/she has to present/publish atleast one paper in reputed National/International Journal/Conference on his/her Project work before submission of his/her Thesis/Dissertation.	
TERM WORK	
1. The Term Work of Project Stage –II will be assessed jointly by the pair of Internal (Guide) and External examiner along with oral examination of the same.	

North Maharashtra University, Jalgaon

M. E. (Electrical Power System)

Examination Scheme & Structure with Effect from Year 2012-13

FIRST YEAR TERM – I

Sr. No.	Subject	Teaching Scheme per week		Examination Scheme				
		L	P	Paper Hrs.	Paper	TW	PR	OR
1	Power System Optimization Techniques	3	--	3	100	--	--	--
2	Microprocessor and Microcontroller	3	--	3	100	--	--	--
3	Power System Planning & Reliability	3	--	3	100	--	--	--
4	Power System Dynamics	3	--	3	100	--	--	--
5	Elective – I	3	--	3	100	--	--	--
6	Laboratory Practice – I	--	6	--	--	100	--	50
7	Seminar – I	--	4	--	--	100	--	--
	Total	**15**	**10**	**--**	**500**	**200**	**--**	**50**
	Grand Total	**25**		**750**				

Elective – I

1. FACTs & Power Quality
2. Artificial Intelligence and its Applications in Power Systems
3. Renewable Energy Sources
4. Power Sector Economics, Management and Restructuring

FIRST YEAR TERM – II

Sr. No.	Subject	Teaching Scheme per week		Examination Scheme				
		L	P	Paper Hrs.	Paper	TW	PR	OR
1	Computer Methods Power System Analysis	3	--	3	100	--	--	--
2	Digital Signal Processing	3	--	3	100	--	--	--
3	Power System Modeling & Control	3	--	3	100	--	--	--
4	High Voltage Power Transmission	3	--	3	100	--	--	--
5	Elective – II	3	--	3	100	--	--	--
6	Laboratory Practice – II	--	6	--	--	100	--	50
7	Seminar – II	--	4	--	--	100	--	--
	Total	**15**	**10**	**--**	**500**	**200**	**--**	**50**
	Grand Total	**25**		**750**				

Elective – II

1. Advanced Power System Protection
2. Power Electronics Applications in Power Systems
3. EHV Transmission Systems
4. Power System Design

North Maharashtra University, Jalgaon

M. E. (Electrical Power System)

Examination Scheme & Structure with Effect from Year 2012-13

SECOND YEAR TERM – I

Sr. No.	Subject	Teaching Scheme per week		Examination Scheme				
		L	**P**	**Paper Hrs.**	**Paper**	**TW**	**PR**	**OR**
1	Seminar –III	--	4	--	--	50	--	50
2	Project Stage – I	--	18	--	--	100	--	--
	Total	**--**	**22**	**--**	**--**	**150**	**--**	**50**
	Grand Total	**22**		**200**				

SECOND YEAR TERM – II

Sr. No.	Subject	Teaching Scheme per week		Examination Scheme				
		L	**P**	**Paper Hrs.**	**Paper**	**TW**	**PR**	**OR**
1	Progress Seminar	--	--	--	--	50	--	--
2	Project Stage – II	--	18	--	--	150	--	100
	Total	**--**	**18**	**--**	**--**	**200**	**--**	**100**
	Grand Total	**18**		**300**				

SEMESTER-I

1. Power System Optimization Techniques

Teaching Scheme:
Lectures: 3 Hrs. /Week

Examination Scheme:
Theory Paper: 100 Marks
Duration: 3 hours

1) Introduction to optimization and classical optimization techniques, Linear Programming: Standard form, geometry of LPP, Simplex Method P.F. solving LPP, revised simplex method, duality, decomposition principle, and transportation problem.

2) Non-Linear Programming (NLP): One dimensional methods, Elimination methods, Interpolation methods Unconstrained optimization techniques-Direct search and Descent methods, constrained optimization techniques, direct and indirect methods.

3) Dynamic Programming: Multistage decision processes, concept of sub-optimization and principle of optimality, conversion of final value problem into an initial value problem. CPM and PERT

4) Genetic Algorithm: Introduction to genetic Algorithm, working principle, coding of variables, fitness function. GA operators; Similarities and differences between GAs and traditional methods; Unconstrained and constrained optimization.

5) Applications to Power system: Economic Load Dispatch in thermal and Hudro-thermal system using GA and classical optimization techniques, Unit commitment problem, reactive power optimization. Optimal power flow, LPP and NLP techniques to optimal flow problems.

Reference books:

a. “Optimization - Theory and Applications”, By S.S.Rao, Wiley-Eastern Limited
b. “Introduction of Linear and Non-Linear Programming”, By David G. Luenberger, Wesley Publishing Company
c. “Computational methods in Optimization “,By Polak, Academic Press
d. “Optimization Theory with Applications” By Pierre D.A., Wiley Publications
e. “Operations Research” By D. S. Hira & P. K. Gupta , S Chand Publications

2. Microprocessor and Microcontroller

Teaching Scheme:	***Examination Scheme:***
Lectures: 3 Hrs. /Week	*Theory Paper: 100 Marks*
	Duration: 3 hours

1) Overview of 8086 : Architecture, instruction including I/O instructions, Addressing modes, interrupt structure, ISR minimum and maximum mode, Assembly Language Programmes on 16-bit multiplication, 16-bit by 8-bit division, bubble sort, palindrome. **Hardware and Software debugging aids**: 1 Pass and 2 Pass assemblers, cross assemblers, circuit emulators, simulators, linkers, loaders, compiler, cross compiler, Types of interfacing devices-→Latches(74373), Buffers(74244/245).

2) **8051 Architecture**: 8051 Microcontroller Hardware, Input/output. Pins, ports, and circuits, External Memory, Counter and Timers, Serial Data input/ output, Interrupts **Assembly language programming concepts :** The mechanics of programming, The assembly language programming process, PAL instructions, Programming tools and techniques, Programming the 8051 **Moving Data :** Addressing modes, external data moves, code memory read only data moves, push and pop -op codes, data exchanges

3) **Logical Operations :** Byte level logical operations, bit level logical operations, rotate and swap operations **Arithmetic Operations :** Flags, incrementing and decrementing, addition, subtraction, multiplication and division, decimal arithmetic **Jumps and Call Instructions :** The jump and call program range, jumps, calls and subroutines, interrupts and returns

4) **8051 Microcontroller Design :** Microcontroller specification, microcontroller design, testing the design, timing subroutines, look up tables for the 8051, serial data transmission

5) **Applications:** Keyboard, displays→LED & LCD, pulse measurement, D/A and A/D conversion, multiple interrupts **Serial Data Communication:** Network Configuration, 8051 Data Communication.

Reference books:

a. "The 8051 Micro Controller : Architecture, Programming," By Kenneth J.Ayala, Penram International, Mumbai.
b. Intel Embeded Micro Controller Data Book, Intel Corporation.
c. "Microprocessor and Digital Systems" By D.V.Hall, ELBS Publication, London.
d. "Advance Microprocessors and Micro Controllers" By B.P.Singh,, New Age International, New Delhi.
e. "Microprocessors and Interfacing" By D.V.Hall, Tata McGraw Hill Publication, New Delhi.
f. "Microcomputer Systems: the 8086/8088 Family, Architecture, Programming and Design" By Y.C.Liu, Gibson, Prentice Hall of India Publications, New Delhi.
g. "Introduction to Microprocessor, Software, Hardware and Programming" By Lance A. Leventhal,
h. "Microprocessor Architecture, Programming and Applications with the 8085" By Ramesh S.Gaonkar, Penram International, Mumbai.
i. "8051 microcontroller and embedded system" By Muhammad Ali Mazidi, Janice Mazidi, Rollin McKinlay, Pearson Second Edition

3. ***Power System Planning & Reliability***

Teaching Scheme:
Lectures: 3 Hrs. /Week

Examination Scheme:
Theory Paper: 100 Marks
Duration: 3 hours

1) **Load Forecasting :** Introduction, Factors affecting Load Forecasting, Load Research, Load Growth Characteristics, Classification of Load and Its Characteristics, Load Forecasting Methods - (i) Extrapolation (ii) Co-Relation Techniques, Energy Forecasting, Peak Load Forecasting, Reactive Load Forecasting, Non-Weather sensitive load Forecasting, Weather sensitive load Forecasting, Annual Forecasting, Monthly Forecasting, Total Forecasting.

2) **System Planning :** Introduction, Objectives & Factors affecting to System Planning , Short Term Planning, Medium Term Planning, Long Term Planning, Reactive Power Planning.
   Reliability : Reliability, Failure, Concepts of Probability, Evaluation Techniques (i) Markov Process (ii) Recursive Technique, Stochastic Prediction of Frequency and Duration of Long & Short Interruption, Adequacy of Reliability, Reliability Cost.

3) **Generation Planning and Reliability :** Objectives & Factors affecting Generation Planning, Generation Sources, Integrated Resource Planning, Generation System Model, Loss of Load (Calculation and Approaches), Outage Rate, Capacity Expansion, Scheduled Outage, Loss of Energy, Evaluation Methods. Interconnected System, Factors Affecting Interconnection under Emergency Assistance.

4) **Transmission Planning and Reliability:** Introduction, Objectives of Transmission Planning, Network Reconfiguration, System and Load Point Indices, Data required for Composite System Reliability.

5) **Distribution Planning and Reliability:** Radial Networks – Introduction, Network Reconfiguration, Evaluation Techniques, Interruption Indices, Effects of Lateral Distribution Protection, Effects of Disconnects, Effects of Protection Failure, Effects of Transferring Loads, Distribution Reliability Indices. Parallel & Meshed Networks - Introduction, Basic Evaluation Techniques, Bus Bar Failure, Scheduled Maintenance, Temporary and Transient Failure, Weather Effects, Breaker Failure

Reference Books :

a. “Modern Power System Planning” By X. Wang & J.R. McDonald, McGraw Hill
b. “Electrical Power Distribution Engineering” By T. Gönen, McGraw Hill Book Company
c. “Generation of Electrical Energy” By B.R. Gupta, S. Chand Publications
d. “Electrical Power Distribution” By A.S. Pabla, Tata McGraw Hill Publishing Company Ltd.
e. “Electricity Economics & Planning” By T.W.Berrie, Peter Peregrinus Ltd., London.
f. “Power System Planning” By R.N. Sulivan , McGraw Hill

4. ***Power System Dynamics***

Teaching Scheme:
Lectures: 3 Hrs. /Week

Examination Scheme:
Theory Paper: 100 Marks
Duration: 3 hours

1) Requirement of reliable power system, Basic concepts of stability, Reliable electrical power service, Stability of Synchronous machines, Tie line oscillations, Method of simulation.

2) Synchronous Machines: Review of synchronous machine equations, parameters, Equations in a-b-c phase co-ordinates and Park's co-ordinates, Representation of external system, Low and High order state models, Choice of state variables. Initial state equivalent circuit, Phasor diagram p.u. reactance. System Response to Large Disturbances: System of one machine against infinite bus, Classical Model, Mechanical and electrical torques, Critical clearing angle and time, Automatic reclosing, Pre calculated Swing curves and their use.

3) System Response to Small Disturbances: Two machine system with negligible losses, Clarke diagram for two machine series reactance system, Extension of Clarke diagram to cover any reactance network, Equation for steady State Stability limit, Two-Machine system with losses, Effect of inertia. Effect of governor, action, Conservative criterion for stability, Effect of saliency, saturation and short circuit ratio on steady state power limits.

4) Regulated Synchronous Machines: Demagnetizing effect of armature reaction and effect of small speed changes, Modes of oscillations of unregulated multimachine system. Voltage regulator and governor with delay Distribution of power impacts.

5) Effect of Excitation on Stability: Effect of excitation on generator power limits, transients and dynamic stability, Examination of dynamic stability by Routh's criterion, Root locus analysis of a regulated machine connected to an infinite bus. Approximate System representation, Supplementary Stabilizing Signals, Linear analysis of stabilized generator.

Reference Books :

a. "Synchronous Machines" By C.Concordia, John Wiley & Sons.
b. "Power System Stability" By E.W.Kimbark, Dover Publication, Vol.-3
c. "Power System Control & Stability" By Anderson, Galgotia Publ.
d. "Power System Stability" By S.B. Crary, John Wiley & Sons.
e. "Modern Power System Analysis" By Nagrath I. J. & Kothari D. P.,Tata McGraw Hill Publication New Delhi

ELECTIVE-I

i. <u>FACTs & Power Quality</u>

Teaching Scheme:
Lectures: 3 Hrs. /Week

Examination Scheme:
Theory Paper: 100 Marks
Duration: 3 hours

1) Steady state and dynamic problems in AC systems, Flexible AC transmission systems (FACTS), principles of series shunt compensation.

2) Description of static var compensation (SVC), thyristor controlled series compensation (TCSC) static phase shitters (SPS), static condenser (STATCON), static synchronous series compensator (SSSC) and unified power flow controller (UPFC), modeling and analysis of FACTS controllers, control strategies to improve system stability.

3) Power quality problems in distribution systems, Harmonics, Harmonics creating loads, modeling.

4) Harmonic propagation, series and parallel resonance, harmonic power flow, mitigation of harmonics, filters, passive filters, active filters, shunt and series hybrid filters, voltage sag and swells.

5) Voltage flicker, mitigation of power quality problems using power electronics conditioners, IEEE standards.

<u>Reference Books :</u>

a. "Understanding FACTS" By Hingorani & Gyugui, IEEE press.
b. "FACTS Controllers in Transmission & Distribution" By K. R. Padiyar. New Age Publication.
c. "Power Quality" By G.T.Heydt , Stars in a Circle Publication, Indiana, 1991.
d. "Static Reactive Power Compensation" By E.J.E.Miller John Wiley & Sons, New York, 1982.
e. Recent Publications on Power Systems and Power Delivery.

ii. Artificial Intelligence and its Applications in Power Systems

Teaching Scheme:
Lectures: 3 Hrs. /Week

Examination Scheme:
Theory Paper: 100 Marks
Duration: 3 hours

1) **Introduction to Artificial Intelligence:** Introduction, Fuzzy systems, Artificial Neural Network (ANN), Expert Systems, Genetic Algorithm, Evolutionary Programming. Biological neurons: Function of single biological neuron, function of artificial neuron, Basic terminology related to artificial neuron. Characteristics of ANN, Typical applications of ANN such as classification, pattern recognition, forecasting Properties, strength of NN.

2) **Different Architectures of ANN and Learning Processes :** Different architectures of Neural Network, types of activation function, concept of Learning with a Teacher, Learning without a Teacher, Learning Tasks (Any two learning methods and applications)

3) **Single Layer Network and Multi-layer Network :** Single Layer Perception: architecture – training algorithm, Least – Mean square algorithm, learning curves, Learning Rate, Annealing techniques. Feed forward Neural Network(MLP) , Back propagation algorithm. Limitation of Back propagation algorithm. Concept of learning rate, momentum coefficient, Generalization capacity

4) **Fuzzy Mathematics :** Basic concept of Fuzzy Logic, Fuzzy set – Basic definition – Mambership function, Operations of fuzzy sets.

5) **Fuzzy Theory :** Fuzzy relations - Fuzzy graphs - Fuzzy analysis – Propositional logic, predictive logic, Fuzzy set theory.
   AI Applications in Power Systems : Application of ANN and Fuzzy logic in Power System Planning, Operation and control – load forecasting, Unit Commitment, Load Dispatch and Protection.

Reference Books:

a. "Neural Networks, Fuzzy Logic & Genetic Algorithms Synthesis & Applications" By S. Rajsekaram, G. A. Vijayalaxmi Pai, Practice Hall India
b. "Introduction to Neural Network Using MATLAB 6.0" By S. N. Sivanandam, S. Sumathi, S. N. Deepa, , Tata McGraw Hill
c. "'Fuzzy Sets, Uncertainty and Information" By George Klir & Tina. A. Folger, Prentice Hall of India Pvt. Ltd
d. "Artificial Intelligence" By G. F. Luger and W. A. Stubblefield, Redwood City, CA: Benjamin Cummings, 1993.
e. "Fundamentals of Artificial Neural Network" By Mohamed H. Hassoun, Practice Hall India.
f. "Introduction to Artificial Intelligence" By Eugene Charniat, Drew McDermott, Pearson Education.
g. "An Introduction to Neural Networks" By James A. Anderson, Practice Hall India Publication.

iii. Renewable Energy Sources

Teaching Scheme: *Lectures: 3 Hrs. /Week*

Examination Scheme: *Theory Paper: 100 Marks* *Duration: 3 hours*

1) **Energy Scenario:** Classification of Energy Sources, Energy resources (Conventional and nonconventional), Energy needs of India, and energy consumption patterns. Worldwide Potentials of these sources. Energy efficiency and energy security. Energy and its environmental impacts. Global environmental concern, Kyoto Protocol, Concept of Clean Development Mechanism (CDM) and Prototype Carbon Funds (PCF). Factors favoring and against renewable energy sources.

2) **Solar Energy:** Solar thermal Systems: Types of collectors, Collection systems, efficiency calculations, applications. Photo voltaic (PV) technology: Present status, - solar cells , cell technologies, characteristics of PV systems, equivalent circuit, array design , building integrated PV system, its components , sizing and economics. Peak power operation. Standalone and grid interactive systems.

3) **Wind Energy:** Wind Energy : wind speed and power relation, power extracted from wind, wind distribution and wind speed predictions. Wind power systems: system components, Types of Turbine, Turbine rating Choice of generators, turbine rating, electrical load matching, Variable speed operation, maximum power operation, control systems, system design features, stand alone and grid connected operation.

4) **Other energy sources:** Biomass – various resources, energy contents, technological advancements, conversion of biomass in other form of energy – solid, liquid and gases. Gasifires Biomass fired boilers, Co firing, Generation from municipal solid waste, Issues in harnessing these sources. Hydro energy – feasibility of small, mini and micro hydel plants scheme layout economics. Tidal and wave energy, Geothermal and Ocean-thermal energy conversion (OTEC) systems – schemes, feasibility and viability.

5) **Energy storage and hybrid system configurations:** Energy storage: Battery – types, equivalent circuit, performance characteristics, battery design, charging and charge regulators. Battery management. Fly wheel energy relations, components, benefits over battery. Fuel Cell energy storage systems. Ultra Capacitors.
   Grid Integration : Stand alone systems, Hybrid systems – hybrid with diesel, with fuel cell, solar wind, wind –hydro systems, mode controller, load sharing, system sizing. Hybrid system economics. Grid integration with the system: Interface requirements, Stable operation, Transient-safety, Operating limits of voltage, frequency, stability margin, energy storage, and load scheduling. Effect on power quality - harmonic distortion, voltage transients and sags.

Reference Books :

a. “Wind and solar systems” By Mukund Patel, CRC Press.
b. “Solar Photovoltaics for terrestrials” By Tapan Bhattacharya.
c. “Wind Energy Technology” By Njenkins, John Wiley & Sons,
d. “Non Conventional Energy Resources” by D.S. Chauhan and S.K.Srivastava,.
e. “Solar Energy” By S.P. Sukhatme, Tata McGraw Hill.
f. “Solar Energy” By S. Bandopadhay, Universal Publishing.

***iv.* Power Sector Economics, Management and Restructuring**

Teaching Scheme:
Lectures: 3 Hrs. /Week

Examination Scheme:
Theory Paper: 100 Marks
Duration: 3 hours

1) **Power Sector in India**
   Introduction to various institutions in Indian Power sector such as CEA, Planning Commissions, PFC, Ministry of Power, state and central governments, REC, utilities and their roles. Critical issues / challenges before the Indian power sector, Salient features of Electricity act 2003, Various national policies and guidelines under this act.
2) **Power sector economics and regulation**
   Typical cost components and cost structure of the power sector, Different methods of comparing investment options, Concept of life cycle cost , annual rate of return , methods of calculations of Internal Rate of Return(IRR) and Net Present Value(NPV) of project, Short term and long term marginal costs, Different financing options for the power sector. Different stakeholders in the power sector, Role of regulation and evolution of regulatory commission in India, types and methods of economic regulation, regulatory process in India.
3) **Power Tariff**
   Different tariff principles (marginal cost, cost to serve, average cost), Consumer tariff structures and considerations, different consumer categories, telescopic tariff, fixed and variable charges, time of day, interruptible tariff, different tariff based penalties and incentives etc., Subsidy and cross subsidy, life line tariff, Comparison of different tariff structures for different load patterns. Government policies in force from time to time. Effect of renewable energy and captive power generation on tariff. Determination of tariff for renewable energy.
4) **Power sector restructuring and market reform**
   Different industry structures and ownership and management models for generation, transmission and distribution. Competition in the electricity sector- conditions, barriers, different types, benefits and challenges Latest reforms and amendments. Different market and trading models / arrangements, open access, key market entities- ISO, Genco, Transco, Disco, Retailco, Power market types, Energy market, Ancillary service market, transmission market, Forward and real time markets, market power.
5) **Electricity Markets Pricing and Non-price issues**
   Electricity price basics, Market Clearing price (MCP), Zonal and locational MCPs. Dynamic, spot pricing and real time pricing, Dispatch based pricing, Power flows and prices. Optimal power flow Spot prices for real and reactive power. Unconstrained real spot prices, constrains and real spot prices. Non price issues in electricity restructuring (quality of supply and service, standards of performance by utility, environmental and social considerations) Global experience with electricity reforms in different countries.

Reference Books :

a. “Know Your Power”, A citizens Primer On the Electricity Sector, Prayas Energy Group, Pune
b. Sally Hunt, “Making Competition Work in Electricity”, 2002, John Wiley Inc
c. Electric Utility Planning and Regulation, Edward Kahn, American Council for Energy Efficient Economy

LABORATORY PRACTICE-I

Teaching Scheme:
Practical: 6 Hrs. /Week

Examination Scheme:
Term Work: 100 Marks
Oral: 50 Marks

Term work shall consist of record of minimum eight experiments using Engineering Computation Software such as MATLAB, SCILAB, PSCAD, ETAP, with moderate to high complexity /assignments based on syllabus of subjects from Semester-I

SEMINAR-I

Teaching Scheme: ***Examination Scheme:***
Practical: 4 Hrs. /Week *Term Work: 100 Marks*

Each student is required to deliver a seminar in first semester on the topic of his/her own choice. The topic of the seminar should be out of the syllabus and relevant to the latest trends in Electrical Power Systems.

The topic will be decided by the student, Guide and Head of department. Each student will make seminar presentation with audio/video aids, for the duration of 45 minutes and seminar work shall be in format of report to be submitted by the student at the end of semester.

The report copies must be duly signed by Guide and Head of department. (One copy for institute, one copy for guide and one copy for candidates for certification). The student is expected to submit the seminar report in standard format. Attendance of all students for all seminars is compulsory.

SEMESTER-II

1. ***COMPUTER METHODS IN POWER SYSTEM ANALYSIS***

Teaching Scheme:	***Examination Scheme:***
Lectures: 3 Hrs. /Week	*Theory Paper: 100 Marks*
	Duration: 3 hours

1) Representation of power systems for computerized analysis: Mathematical models of synchronous generator for steady state and transient analysis, Transformer with tap changer, transmission line, phase shifter and loads.

2) Topology of Electric Power System-Network Graphs, Incidence matrices, fundamental loop and cutset matrices, primitive impedance and admittance matrices, equilibrium equations of networks. Singular and nonsingular transformation of network matrices.

3) Formation of bus impedance and admittance matrices by algorithm - Modification of bus impedance and admittance matrix to account for change in networks. Derivation of loop impedance matrix. Three phase network elements-transformation matrix - incidence and network matrices for three phase network. Algorithm for formulation of three - phase bus impedance matrix.

4) Short Circuit Studies: Three phase network, Symmetrical components. Thevenin's theorem and short circuit analysis of multi node power systems using bus impedance matrix. Short circuit calculations for balanced and unbalanced short circuits bus impedance and loop impedance matrices, Stability studies- Solution of state equation by modified Eular method and solution of network equations by Gauss-Seidal interactive method

5) Load flow studies : Slack bus, load buses, voltage control buses, Load flow equations, Power flow model using bus admittance matrix, Power flow solution through Gauss-Seidal and N-R methods - sensitivity analysis, Second order N-R method, fast decoupled load flow method - Sparsity of matrix. Multi area power flow analysis with the line control.

Reference Books :

a. "Computer Methods in Power System Analysis" By G.W. Stagg, A.H.Elabiad, McGraw Hill Book Co.
b. "Computer Techniques in Power System Analysis" By M.A. Pai, Tata McGraw Hill Publication.
c. "Electric Energy System Theory" By O.I.Elgard, Tata McGraw Hill Publication.
d. "Computer Aided Power System Operation and Analysis" By R.N.Dhar, Tata McGraw Hill Publication.
e. "Modern Power System Analysis" By I.J.Nagrath, D.E.Kothar, Tata McGraw Hill, New Delhi.

2. ***Digital Signal Processing***

Teaching Scheme: *Lectures: 3 Hrs. /Week*

Examination Scheme: *Theory Paper: 100 Marks* *Duration: 3 hours*

1) Characterization & Classification of Digital Signals. Digital Signal Processing of continuous signals. Discrete time signals - sequences, representation of signals on orthogonal basis, sampling, aliasing, quantization & reconstruction of signals.

2) Discrete systems-attributes, z-transform, analysis of LTI system. Frequency analysis, inverse systems, Discrete Fourier transforms, Fast Fourier implementation of discrete time system.

3) Digital filters - structures, sampling, recursive, non-recursive A to D & D to A conversion. FIR, IIR & lattice filter structures, Design of FIR digital filters. Window method, Park-McCellan's method. Design of IIR digital filters. Butterworth, Chebyshev.

4) Elliptic approximations, low-pass, band-pass, band-stop & high-pass filters. Effect of finite register length in FIR filter design. Multirate signal processing-motivation-application, decimation & interpolation, sample rate conversion, polyphase implementation of sampling rate conversion, Filter bank theory-DFT filter banks, Adaptive filtering theory.

5) DSP Processors and Applications - DSP Microprocessor architectures, fixed point, floating point precision, algorithm design, mathematical, structural and numerical constraints, DSP programming, filtering, data conversion; communication applications. Real time processing considerations including interrupts.

Reference Books :

a. "Digital Signal Processing Principles, Algorithm and Applications" By J.G.Proakis and D.G.Manolakis '' Prentice Hall 1997
b. "Discrete Time Signal Processing" By A.V.Oppenheim, R.W.Schafer, John Wiley.
c. "Introduction to Digital Signal Processing" By J.R. Johnson,Prentice Hall 1992
d. "Digital Signal Processing" By D.J.Defatta, J.G.Dulas. Hodgekiss, J. Wiley and Sons Singapore, 1988
e. "Theory & Applications of Digital Signal Processing" By L.R.Rabiner & B. Gold , Prentice Hall, 1992
f. "Digital Signal Processing:A Practical Approch" By Emmanuel Ifeachor, Prof. Barrie Jervis, Prentice Hall

3. Power System Modeling & Control

Teaching Scheme:
Lectures: 3 Hrs. /Week

Examination Scheme:
Theory Paper: 100 Marks
Duration: 3 hours

1) Transient response and concept of stability in Electrical Power System. Modelling of Power System. Control of voltage, frequency and tie-line power flows, Q-V and P-f control loops, mechanism of real and reactive power control.

2) Mathematical model of speed governing system. Turbine governor as affecting the power system dynamics. Transient and steady state response in the interconnected power systems. Excitation systems. Transformation model of exciter system. Analysis using block diagrams.

3) Power systems stabilizers. Dynamic stability (small disturbances), effect of excitation control and turbine dynamics, characteristic equation, method of analysis of the stability of power system. Multi machine systems, Flux decay effects. Multi machine systems with constant impedance loads, matrix representation of a passive network in the transient state, converting to a common reference frame. Converting machine co-ordinates to system reference, relation between machine current and voltages, system order, machine represented by classical methods.

4) Net interchange tie-line bias control. Optimal, sub-optimal and decentralized controllers. Discrete mode AGC. Time - error and inadvertent interchange correction techniques. On-line computer control. Distributed digital control.

5) Data acquisition systems. Emergency control, preventive control, system, System wide optimization, SCADA. Self excited electro-mechanical oscillations in power system and the means for control.

Reference Books :

a. “Transient Processes in Electrical Power System” By V.Venlkov ,Mir Publication, Moscow.
b. “Electric Energy Systems Theory” By Olle I.Elgard , Tata McGraw Hill Pub. Co., New Delhi.
c. “Power System Control and Stability” By Anderson P.M. & Foaud A.A., Galgotia Pub.
d. “Modern Power System Analysis” By Nagrath I.J., Kothari D.P. , Tata McGraw Hill Pub. Co., New Delhi.

4. ***High Voltage Power Transmission***

Teaching Scheme:	***Examination Scheme:***
Lectures: 3 Hrs. /Week	*Theory Paper: 100 Marks*
	Duration: 3 hours

HIGH VOLTAGE AC TRANSMISSION

1) **Engineering Aspects of EHV AC Transmission System:** Principles, configuration, special features of high voltage AC lines, power transfer ability, reactive power compensation, audible noise, corona bundle conductors, electric field, right of way, clearances in a tower, phase to phase, phase to ground, phase to tower, factors to be considered, location of ground wire, angle of protection, tower configuration. Principles of radio interference, origin of radio interference, method of propagation, factors to be considered in line design.

2) **Power System Transients:** Introduction, circuit closing transients, sudden symmetrical short circuit of alternator, recovery transients due to removal of short circuit, traveling waves on transmission lines, wave equation, surge impedance and wave velocity, specifications of traveling waves, reflection and refraction of waves, typical cases of line terminations , equivalent circuit for traveling wave studies, forked lines, reactive termination, successive reflections, Bewley lattice diagram, attenuation and distortion, arcing grounds, capacitance switching, current chopping, lightning phenomenon, over voltages due to lightning, line design based on direct strokes, protection of systems against surges, statistical aspects of insulation co-ordination.

HIGH VOLTAGE DC TRANSMISSION

3) **General Background :** EHV AC versus HVDC Transmission, power flow through HVDC link, equation for HVDC power flow, effect of delay angle and angle of advance, bridge connections, waveform of six pulse and twelve pulse bridge converter, commutation, phase control, angle of extinction, control of DC voltage, connections of three phase six pulse and twelve pulse converter bridges, voltage and current waveforms.

4) Bipolar HVDC terminal, converter transformer connections, switching arrangements in DC yard for earth return to metallic return, HVDC switching system, switching arrangements in a bipolar HVDC terminal, sequence of switching operations, HVDC circuit breakers, DC current interruption, commutation principle, probable types and applications of HVDC circuit breakers, multi-terminal HVDC systems, parallel tapping, reversal of power, configurations and types of multi-terminal HVDC systems, commercial multi terminal systems.

5) Faults and abnormal condition in bipolar, two terminal HVDC system, pole-wise segregation, protective zones, clearing of DC line faults and reenergizing, protection .of converters, transformer, converter valves, DC yards, integration of protection and controls, hierarchical levels of control, block diagram, schematic diagram, current control, power control, DC voltage control, commutation channel, master control, station control, lead station, trail station, pole control, equidistant firing control, synchronous HVDC link, asynchronous HVDC Link.

Reference Books:

a. “An Introduction to High Voltage Engineering” By Subir Ray, Prentice Hall of India Private Limited, New Delhi – 110 001.
b. “HVDC Transmission” By Adamson C., Hingorani N.G., IEEE Press
c. “Power Transmission” By DC Uhimann E.
d. “HVAC and HVDC Transmission, Engineering and practice” By S. Rao, Khanna Publisher, Delhi.
e. “Electric Power Systems” By B.M. Weddy and B.J.Cory, John Wiely and Sons, Fourth edition (2002)
f. “Power System Analysis and Design” By J.Duncan Glover, Mulukutla S.Sarma, Thomson Brooks/cole /Third Edition (2003)
g. “Power System Analysis and Design” By B.R. Gupta, S.Chand and Company (2004)

ELECTIVE-II

i. Advanced Power System Protection

Teaching Scheme:
Lectures: 3 Hrs. /Week

Examination Scheme:
Theory Paper: 100 Marks
Duration: 3 hours

1) Review of principles of power system equipments protection, configuration of various solid state protection scheme, evolution of digital relays from electromechanical relays,

2) performance & operational characteristics of digital protection, Basic elements of digital filtering, analog multiplexers, conversions of system: the sampling theorem, signal aliasing error, sample & hold circuit, multiplexers, analog to digital conversion, digital filtering concepts, A digital relay. Hardware & Software.

3) Mathematical background to protectional algorithm, first derivative (Mann & Morrison) algorithm, Fourier algorithm- full cycle window algorithm, fractional cycle window algorithm,

4) Walsh function based algorithm, least square based algorithm, differential equation based algorithm, travelling wave based technique.

5) Digital differential protection of transformer, digital line differential protection, recent advances in digital protection of power system.

Reference Books:

a. "Digital Protection for Power System" By A.T.Johns and S.K.Salman, Peter, Published by Peter Peregrinus Ltd. on behalf of the IEE, London, U.K.
b. "Power System Protection and Switchgear" By Badri Ram and D.N.Vishvakarma, Tata McGraw Hill, New Delhi.
c. "Transmission Network Protection" By Theory and Practice, Y.G.Paithankar, Marcel Dekker, New York, U.S.A.
d. "Fundamentals of Power System Protection" By Y.G.Paithankar and S.R. Bhide, Prentice Hall of India, New Delhi.

ii. Power Electronics Applications in Power Systems

Teaching Scheme:
Lectures: 3 Hrs. /Week

Examination Scheme:
Theory Paper: 100 Marks
Duration: 3 hours

1) **Power Electronic Controllers**: Basics, challenges and needs, static power converter structures, AC controller based structures, D.C. link converter topologies, converter output and harmonic control, power converter control issues.

2) **Shunt Compensation**: SVC and STATCOM: Operation and control of SVC, STATCOM configuration, control & applications.
Series Compensation: Principle of operation, application of TCSC for damping of electromechanical oscillations, application of TCSC for mitigation of sub-synchronous resonance, TCSC layout and protection, static synchronous series compensator (SSSC).

3) **Unified Power Flow Controller:** Steady state operation, control and characteristics, introduction to transient performance, power flow studies in UPFC embedded systems, Operational constraints on UPFC.

4) **Other FACTS Controllers:** Circuit, model and operating features of Dynamic Voltage Regulator(DVR), Thyristor Controlled Braking Resistors (TCBR), Thyristor Controlled Phase Angle Regulator(TCPAR), comparison of all FACTS controllers.

5) **Control Strategies and co-ordination :** Conventional control, Hysterisis control, Artificial Neural Network, fuzzy logic controls, comparison between different control schemes, co-ordination between different FACTS controllers.

Reference Books:

a. "Flexible A.C. Transmission Systems (FACTS)" By Yong Hua Song and Johns (IEE Power and Energy Series 30)
b. "Thyristor based FACTS controllers" By Mathur & Verma (IEEE Press, New York)
c. "Sub-synchronous Resonance" By K.R. Padiyar, B.S. Publications, Hyderabad.
d. "FACT's Controllers in Transmission & Distribution" by K.R. Padiyar New Age Publishers ,Delhi, May 2007

iii. EHV Transmission Systems

Teaching Scheme:
Lectures: 3 Hrs. /Week

Examination Scheme:
Theory Paper: 100 Marks
Duration: 3 hours

1) Basic Aspects of A.C. Power Transmission, Power-Handling Capacity and Line Loss, Surface Voltage Gradient on Conductors, Electrostatic Field of EHV Lines. Measurement of Electrostatic Fields. Electromagnetic Interference. Traveling Waves and Standing Waves, Line Energization with Trapped - Charge Voltage. Reflection and Refraction of Traveling Waves. Transient Response of Systems with Series and Shunt Lumped Parameters. Principles of Traveling-Wave Protection

2) Lightning & Lightning Protection, Insulation Coordination Based on Lightning

3) Over Voltages in EHV Systems Caused by Switching Operations, Origin of Over Voltages and their Types, Over Voltages Caused by Interruption of Inductive and Capacitive Currents, Ferro-Resonance Over Voltages, Calculation of Switching Surges, Power Frequency Voltage Control and Over Voltages, Power Circle Diagram.

4) Reactive Power Flow and Voltage Stability in Power Systems. Steady - State Static Real Power and Reactive Power Stability, Transient Stability, Dynamic Stability. Basic Principles of System Voltage Control. Effect of Transformer Tap Changing in the Post- Disturbance Period, Effect of Generator Excitation Adjustment, Voltage Collapse in EHV Lines, Reactive Power Requirement for Control of Voltage in Long Lines. Voltage Stability.

5) Power Transfer at Voltage Stability Limit of EHV Lines, Magnitude of Receiving End Voltage at Voltage Stability Limit. Magnitude of Receiving End Voltage During Maximum Power Transfer. Magnitude of Maximum Power Angle at Voltage Stability Limit. Optimal Reactive Power at Voltage Stability Limit.

Reference Books:

a. “Performance, operation & control of EHV power transmission system”
A. Chakrabarti, D.P. Kothari, A.K. Mukhopadhyay, wheeler publications
b. ”Extra high-voltage A.C. transmission Engineering” By Rakash Das Begamudre, New Age International Pvt. Ltd.
c. “EHVAC & HVDC Transmission Engineering & Practice” By S. Rao, Khanna Publications

iv. Power System Design

Teaching Scheme:
Lectures: 3 Hrs. /Week

Examination Scheme:
Theory Paper: 100 Marks
Duration: 3 hours

1) Power System Components, Location of Main Generating Stations and Substations, Interconnections, Load Dispatch Centers

2) Design of Transmission Lines, Selection of Voltage, Conductor Size, Span, Number of Circuits, Conductor Configurations, Insulation Design, Mechanical Design of Transmission Line, Towers, Sag- Tension Calculations

3) Design of EHV Transmission Line Based Upon Steady State Limits and Transient Over Voltage, Design Factors Under Steady States, Design of 400kV, 1000MW Medium and Long Transmission Line Without and with Series Capacitance Compensation and Shunt Reactors at Both Ends, 750KVLong Transmission Line with Only Shunt Reactors. Extra High Voltage Cable Transmission, Design Basis of Cable Insulation, Search Performance of Cable Systems, Laying of Power Cables

4) Vigorous Solution of Long Transmission Line, Interpretation of Long Line Equations, Ferranti Effect, Tuned Power Lines, Equivalent Circuit of Long Line, Power Flow Thorough Transmission Line and Methods of Voltage Control

5) Power System Earthing, Earth Resistance, Tolerable and Actual Step and Touch Voltages, Design of Earthing Grid, Concrete Encased Electrodes, Tower Footing Resistance, Impulse Behavior of Earthing System

Reference Books:

a. “Electrical Power System Design” By M.V. Deshpande, Tata McGraw Hill
b. “Power System Analysis and Design” By B.R.Gupta, Wheeler Publishing co.
c. “Power System Engineering” By I.J.Nagrath & D. P. Kothari, Tata Mc Graw Hill
d. “Extra high-voltage A.C. transmission Engineering” By Rakosh Das Begamudre, New Age International Pvt. Ltd.
e. “EHV AC & HVDC Transmission Engineering & Protection” By S.S.Rao, Khanna Publishers

LABORATORY PRACTICE-II

Teaching Scheme:	***Examination Scheme:***
Practical: 6 Hrs. /Week	*Term Work: 100 Marks*
	Oral: 50 Marks

Term work shall consist of record of minimum eight experiments using Engineering Computation Software such as MATLAB, SCILAB, PSCAD, ETAP, with moderate to high complexity /assignments based on syllabus of subjects from Semester-II

SEMINAR-II

Teaching Scheme: *Practical: 4 Hrs. /Week*

Examination Scheme: *Term Work: 100 Marks*

Each student is required to deliver a seminar in second semester on the topic of his/her own choice. The topic of the seminar should be out of the syllabus and relevant to the latest trends in Electrical Power Systems.

The topic will be decided by the student, Guide and Head of department. Each student will make seminar presentation with audio/video aids, for the duration of 45 minutes and seminar work shall be in format of report to be submitted by the student at the end of semester.

The report copies must be duly signed by Guide and Head of department. (One copy for institute, one copy for guide and one copy for candidates for certification). The student is expected to submit the seminar report in standard format. Attendance of all students for all seminars is compulsory.

SEMESTER-III

SEMINAR-III

Teaching Scheme:
Practical: 4 Hrs. /Week

Examination Scheme:
Term Work: 50 Marks
Oral: 50 Marks

Each student will select a topic in the area of electrical engineering, related to M. E. Project Stage-I.

The topic will be decided by the student, guide and Head of department. Each student will make seminar presentation with audio/video aids, for the duration of 45 minutes and seminar work shall be in format of report to be submitted by the students at the end of semester.

The report copies must be duly signed by guide and Head of department. (One copy for institute, one copy for guide and one copy for candidates for certification). The student is expected to submit the seminar report in standard format. Attendance of all students for all seminars is compulsory.

PROJECT STAGE-I

Teaching Scheme: | ***Examination Scheme:***
Practical: 18 Hrs. /Week | *Term Work: 100 Marks*

Project Stage – I is the integral part of the dissertation project. The project should be based on the knowledge acquired by the student during the coursework and should contribute to the needs of the society.

The project aims to provide an opportunity of designing and preparing complete system or subsystems in an area where the student like to acquire specialized skills. The student should present the progress of the project. It will consist of problem statement, literature survey; project overview and scheme of implementation (block diagram, algorithm, program, PERT chart, etc.)

The term work should be continuously evaluated as per the norms/guidelines.

SEMESTER-IV

PROGRESS SEMINAR

Examination Scheme:
Term Work: 50 Marks

Each student will select a topic in the area of electrical engineering, related to M. E. Project Stage-II.

The topic will be decided by the student, guide and Head of department. Each student will make seminar presentation with audio/video aids, for the duration of 45 minutes and seminar work shall be in format of report to be submitted by the students at the end of semester.

The report copies must be duly signed by guide and Head of department. (One copy for institute, one copy for guide and one copy for candidates for certification). The student is expected to submit the seminar report in standard format. Attendance of all students for all seminars is compulsory.

PROJECT STAGE-II

Teaching Scheme:
Practical: 18 Hrs. /Week

Examination Scheme:
Term Work: 150 Marks
Oral: 100 Marks

The project work will start in second year (Continue to project stage-I).

The term work should be continuously evaluated as per the norms/guidelines.

The project work (dissertation) should be presented in a standard format.
The oral examination shall be conducted with the help of approved external examiner, appointed by university.

North Maharashtra University, Jalgaon

FACULTY OF COMMERCE & MANAGEMENT

Syllabus of Master in Business Administration (MBA-II)

W.E.From 2015-16

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North Maharashtra University, Jalgaon

(NACC Accredited 'B' Grade University)

FACULTY OF COMMERCE & MANAGEMENT

PROPOSED STRUCTURE OF MASTER IN BUSINESS ADMINISTRATION (M.B.A.)

Semester-I and II w.e.f. July 2014			
Paper	**Semester-I**	**Paper**	**Semester-II**
101	Management Science	201	Business Research Methods
102	Corporate Communication Skills	202	Information Technology For Managers
103	Managerial Economics	203	Global Economics Scenario
104	Human Resource Management	204	Marketing Management
105	Business Accounting	205	Management Accounting
106	Organizational Behavior -I	206	Organizational Behavior– II
107	Corporate Social Responsibility	207	Financial Management
108	Quantitative Techniques	208	Operations Management

Semester-III and IV w.e.f . July 2015			
Paper	**Semester-III**	**Paper**	**Semester-IV**
301	Strategic Management	401	Current Business Scenario
302	Management Information System & ERP	402	e-Commerce & Excellence Management
303	Legal Aspects Of Business	403	Indian Commercial Laws
304	Specialization-I	404	Entrepreneurship & Project Management
305	Specialization-II	405	Specialization-V
306	Specialization-III	406	Specialization-VI
307	Specialization-IV	407	Specialization-VII
308	Field Work/ Survey Report	408	Project Report & Viva-Voce

Specialization (Any One)	
A	Financial Management
B	Marketing Management
C	Human Resource Management
D	Operations & Materials Management
E	International Business Management
F	Agro Business Management
G	Information Technology & Systems Management
H	Retail Management
I	Hospitality Management

North Maharashtra University, Jalgaon

(NACC Accredited 'B' Grade University)

FACULTY OF COMMERCE & MANAGEMENT

STRUCTURE OF MASTER IN BUSINESS ADMINISTRATION (M.B.A.)

Semester-I and II									
Paper	Semester-I	Maximum marks			Paper	Semester-II	Maximum marks		
		Int.	Ext.	Total			Int.	Ext.	Total
101	Management Science	40	60	100	201	Business Research Methods	40	60	100
102	Corporate Communication Skills	40	60	100	202	Information Technology For Managers	40	60	100
103	Managerial Economics	40	60	100	203	Global Economics Scenario	40	60	100
104	Human Resource Management	40	60	100	204	Marketing Management	40	60	100
105	Business Accounting	40	60	100	205	Management Accounting	40	60	100
106	Organizational Behavior -I	40	60	100	206	Organizational Behavior – II	40	60	100
107	Corporate Social Responsibility	40	60	100	207	Financial Management	40	60	100
108	Quantitative Techniques	40	60	100	208	Operations Management	40	60	100
Total Maximum Marks		320	480	800	Total Maximum Marks		320	480	800

Semester-III and IV									
Paper	Semester-III	Maximum marks			Paper	Semester-IV	Maximum marks		
		Int.	Ext.	Total			Int.	Ext.	Total
301	Strategic Management	40	60	100	401	Current Business Scenario	40	60	100
302	Management Information System & ERP	40	60	100	402	e-Commerce & Excellence Management	40	60	100
303	Legal Aspects Of Business	40	60	100	403	Indian Commercial Laws	40	60	100
304	Specialization-I	40	60	100	404	Entrepreneurship & Project Management	40	60	100
305	Specialization-II	40	60	100	405	Specialization-V	40	60	100
306	Specialization-III	40	60	100	406	Specialization-VI	40	60	100
307	Specialization-IV	40	60	100	407	Specialization-VII	40	60	100
308	Field Work/ Survey Report	40	60	100	408	Project Report & Viva-Voce	40	60	100
Total Maximum Marks		320	480	800	Total Maximum Marks		320	480	800

North Maharashtra University, Jalgaon

(NACC Accredited 'B' Grade University)

FACULTY OF COMMERCE & MANAGEMENT

STRUCTURE OF MASTER IN BUSINESS ADMINISTRATION (M.B.A.)

W.E.FROM JULY 2014

1. TITLE OF THE DEGREE

This degree shall be titled as Master in Business Administration (MBA) with the mention of Specialization in the bracket as "MBA (Specialization)". This new curricula shall be effective from July 2014.

2. DURATION

The regular Full Time Course shall be of 2 Years duration; comprising of 4 Semesters through Theory papers, Practical, Project report, Field work, Viva-voce, and such other Continuous Evaluation Systems as may be prescribed, in this respect, from time to time.

3. ELIGIBILITY FOR ADMISSION

As per admission rule framed by the Directorate of Technical Education, Government of Maharashtra.

4. PATTERN

3.1. The suggested curriculum comprises 32 papers. Similarly, the student has to opt for one specialization as specialization comprising 8 papers, of which for 1 paper the student has to undergo Summer Internship Project for minimum period of 7 weeks and 1 paper on field work/Survey Report.

3.2. Each semester will have 8 papers of 100 marks each, thus comprising 3200 marks for the Degree.

3.3. The external assessment shall be based on external written examination to be conducted by the university at the end of the each semester.

3.4. The student shall not be allowed to appear for the semester examination unless the Head/Director of the Department/Institution certifies completion of internal work, regularity, practical etc. The institution / Department shall submit alongwith this certificate Internal marks to the COE of the University.

3.5. CGPA system as devised by the University shall be applicable.

3.6. Continuous evaluation of the students shall comprise the 60+40 pattern; where every paper of 100 marks, shall be divided as External evaluation of 60 marks and Internal continuous assessment of 40 marks.

3.7. Continuous Internal assessment may comprises-

3.5.1. Two Class tests of 10 Marks each – Total 20 Marks

3.5.2. 20 Marks for Classroom Paper Presentation, Research Paper Presentations at State Seminars, Research Paper Presentations at National Seminars, Publications in Journals, Practical (Computer related courses), Presentations of Case Study, Group Discussions, Book Review, Survey, Working Assignment, Active participation in Event Management, Industrial Visit, Placement Activities, Institutional Branding Activities, Visit to National/International Business Exhibitionist in related subjects (at Least Two activity have to be completed by the student per semester per paper to be supervised and guided by the concerned subject teacher).

5. PASSING STANDARDS

5.1. In order to pass the examination the candidate has to obtain 50% marks in aggregate & at least 40% marks for each head separately, that is 24 marks out of 60 (External) & 16 marks out of 40 marks (Internal) for all courses.

5.2. The student shall be allowed to keep the terms of the next year as per the University rules.

6. GUIDELINES FOR TEACHING

6.1. There shall be at least 48 lecture hours per semester per course. The duration of the lectures shall be 60 minutes each. There shall be at least 14-16 weeks of teaching before commencement of examination of respective semester.

6.2. There shall be 4 lectures of 60 min duration / week / paper.

6.3. The semester workload is balanced with 8 full papers of 100 marks each / semester. Thus 384 lectures hours are considered for teaching sessions out of which and 48 lecture / sessions shall be used for continuous assessment.

6.4. Self-study shall be natural requirement beside the time table. The Faculty will have to exert a little extra for cultivating reading habits amongst the students.

6.5. The teaching method shall comprise a mix of Lectures, Seminars, Group discussions, Brain storming, Game playing, working assignment, Interactions with Executives etc. so as to prepare the students to face the global challenges as business executive for this Audio-visual aids and Practical field work should be a major source of acquiring knowledge.

6.6. Case study method preferably shall be used wherever possible for the better understanding of the students.

6.7. Each institute shall issue annual souvenir as well as a placement brochure separately to each student and a copy of the same shall be submitted to the university before the end of the year.

7. GUIDELINES FOR FIELD WORK/ SURVEY REPORT

7.1. Each student shall have to undergo a field work/ Survey Assignment while 3rd Semester.

7.2. In the Third semester examination student were to do “field work/ Survey Assignment”; compulsorily based on social problems as mentioned in clause 7.4 below. Group of 2 students is allowed in this. The topic should be decided with consultation and guidance of internal teacher of the Institute having enough knowledge of survey. The field work should be necessarily Research oriented, Innovative and Problem solving.

7.3. The departments / institute shall submit the detailed list of candidate with field work/ Survey Assignment Title, name of the internal guide on or before 31st October of the second year.

7.4. The themes for field work should be related (Not Restricted) to Social issues such as -Education, Sanitation, Health, Village/Cottage Industry, Watershed Management, Problems Of Slum Area, Tribal Upliftment, Rehabilitation, Superstitious (Andhashraddha), NGO, Study of Government Welfare Schemes, and as per necessity of the yearly social situation in that area, etc.

7.5. The student has to write a report based on the actual Field work, get it certified by the concerned Guide/teacher (With Minimum 2 years of teaching Experience) that the field work/ Survey Assignment has been satisfactorily completed and submit one typed copy of the same to the Head / Director of the institute.

7.6. Field work/ Survey Assignment shall be strictly based on primary data. The Sample Size shall be minimum 100.

7.7. Student is expected to formulate at least one hypothesis and use SPSS/PASW or similar software for data analysis and Hypothesis Testing.

7.8. field work/ Survey Assignment details should be displayed on institutes websites

7.9. field work/ Survey Assignment external viva shall be conducted at the end of Semester III

7.10. Viva Voce for one student shall be of minimum 12-15 minutes. The Student has to prepare PowerPoint presentation based on field work/ Survey Assignment to be presented at the time of Viva voce.

7.11. The field work/ Survey Assignment will carry maximum 100 marks, of which internal teacher shall award marks out of maximum 40 marks on the basis of work done by the student. Remaining marks shall be awarded out of maximum 60 marks by examining the student through compulsory PowerPoint presentations followed by Viva-voce, by the panel of the examiners comprises one internal & one External examiner to be appointed by the University. Maximum 30 projects per day will be evaluated by per panel.

7.12. No students will be permitted to appear for Viva-voce and Semester III examinations, unless and until (s) he submits the field work/ Survey Assignment before the stipulated time.

8. GUIDELINES FOR PRACTICAL TRAINING AND SUMMER INTERNSHIP PROJECT

8.1. Each student shall have to undergo a practical training for a period of not less than 7 weeks during vacation falling after the end of either IInd Semester.

8.2. In the Fourth semester viva-voce examination student were to study “Project Work” individually on the basis of Specialization. No group work is allowed in this. The topic should be decided with consultation and guidance of internal teacher of the Institute at the end of the first year, so that the student can take up the training during the vacations. The Project should be necessarily Research oriented, Innovative and Problem solving.

8.3. The departments / institute shall submit the detailed list of candidate with Project Titles, name of the organization, internal guide & functional elective to the university on or before 31st January of the second year.

8.4. No teacher shall be entrusted with more than 15 students for guidance and supervision, in case if more students opt for specific specialization then, Director/Principal of the Institute/College shall certify such project work.

8.5. The student has to write a report based on the actual training undergone during the vacations at the specific selected business enterprise, get it certified by the concerned teacher and head of the department that the

Project report has been satisfactorily completed and submit Two typed copies of the same to the Head / Director of the institute.

8.6. It is responsibility of Director/Principal of concerned Institute to check the authenticity of Project.

8.7. Student may use SPSS software if required.

8.8. One of the reports submitted by the student shall be forwarded to the University by the Institute before 1st March.

8.9. The student shall submit Synopsis of Project duly signed by Project guide to concerned head. The Head has to forward the Synopsis by e-mail only to external supervisor appointed by University, if possible.

8.10. Project details should be displayed on institutes websites

8.11. Project viva shall be conducted at the end of Semester IV

8.12. Viva Voce for one student shall be of minimum 10-15 minutes. The Student has to prepare PowerPoint presentation based on Project work to be presented at the time of Viva voce.

8.13. 10 % of the projects May be given by institute to the students for summer training as basic research projects to be supervised under faculty having enough exposure & knowledge of research.

8.14. The project work will carry maximum 100 marks, of which internal teacher shall award marks out of maximum 40 marks on the basis of project work done by the student as a continuous assessment. Remaining marks shall be awarded out of maximum 60 marks by examining the student during Viva-voce, by the panel of the external examiners to be appointed by the University.

8.15. No students will be permitted to appear for Viva-voce and Semester IV examinations, unless and until (s) he submits the project report before the stipulated time.

9. ADDITIONAL MAJOR SPECIALIZATION

8.1. The student who has passed MBA of this University with a specific specialization may be allowed to appear for MBA examination again, with other specialization by keeping term for the IIIrd and IVth semester for the so opted 8 papers of additional specialization. He has to appear for 8 papers including Project report of the additional specialization so opted.

8.2. He shall be given exemption for all other papers.

8.3. The student has to pay only Tuition fees for one year as may be prescribed from time to time for this purpose.

8.4. The student is not entitled to receive separate Degree Certificate or Class for this additional specialization.

10. STRUCTURE OF THE QUESTION PAPER

9.1. Each question paper shall be of 60 marks and of 3 hours duration.

9.2. **For Theory papers** there will be 2 Sections. In section I a candidate shall be required to answer 3 questions out of 5 questions & in section II (s)he shall be required to answer 2 questions out of 3 questions. All questions shall carry equal marks i.e. 12 marks each.

9.3. **For Composite papers (theory and practical / problems)** there will be 2 sections. In section I (practical/problem) a student shall be required to answer 3 questions out of 5 questions & in section II (Theory) (s)he shall be required to answer 2 questions out of 3 questions. All questions shall carry equal marks i.e. 12 marks each.

9.4. **For papers including case studies(101, 106, 206, 301, 303 & 403**) there shall be 2 Sections. In Section I (Theory) a student shall be required to answer 3 questions out of 5 questions & in Section II (Case studies) 2 case Studies out of 3 case studies to be attempted by the students. All questions shall carry equal marks i.e. 12 marks each.

9.5. **For case studies (Specialization Paper - 406)** out of 5 cases 3 cases should be attempted by the student. Each case shall carry 20 marks.

11. ELIGIBILITY OF THE FACULTY

Strictly As per norms fixed by AICTE / UGC and North Maharashtra University (www.nmu.ac.in)

12. JOB OPPORTUNITIES

In India, a Masters in Business Administration is considered as an attractive career option as after pursuing this degree, the demand of a student in the industry goes up. It is such a degree which makes students ready for a Managerial level role in the chosen field.

- Finance forms a major part of the operations of any company and there are great opportunities lying ahead for students of MBA finance, The prime areas where opportunities occur are **Commercial Banking, Corporate Finance,** Apart from these there are openings as financial planner, credit manager, investor relations officer, insurance advisor, risk management, money management, real estate planner and investment banking.
- Marketing is another common career path for MBA grads. Most large businesses, and many small businesses, utilize marketing professionals. Career options exist in areas of branding, advertising, promotions, and public relations. Some of the job titles include marketing manager, branding specialist, advertising executive, public relations specialist, and marketing analyst.
- HR is another field which is in demand in both public and private sector organizations. One can seek employment in public and private sector industries, banking and financial institutions, corporate houses, and multinational companies.
- Operations and Materials management specialization offers a very good scope to graduate engineers and can seek jobs in areas such as Material controls specialist, Inventory control specialists, Material planner, Loss control specialist, Production departments and quality assessment department.
- The Information Technology field also needs MBA grads to oversee projects, supervise people, and manage information systems. Career options are bright for IT and Systems mgt specialization. Many MBA grads are chosen to work as project managers, information technology managers, and information systems managers.
- Agriculture is the backbone to the Indian economy. This sector occupies 17.5% rate in the national GDP. Every company that is doing business transactions with farmers come under the agribusiness sector. Therefore opportunities for Agro business management students are tremendous; students can join in the warehousing,

retail, seeds companies, fertilizers and pesticides companies, banks and insurance sectors. They can join management experts in the agriculture related industries, policy makers in financial industries. A career in agriculture consultancy, journalism, agri banking, hi-tech farming and agriculture engineering sectors also is a possibility.

- Apart from all these fields, there exists an opportunities in the export field with specialization as International Business Management. This field has got vast scope in the wake of globalization. The world became small as far as business and technology is concerned, this poses lot of challenges for international business opportunities.
- Retail Industry is one of the fastest changing and vibrant industries in the world, and has contributed to the economic growth of many countries. Indian retail sector has been rated as the fifth most attractive, emerging retail market in the world. Retail industry is expected to grow at a compound rate of 30 per cent over the next five years. Some of the opportunities available for students after specializing in retail are Customer Sales Associate, Department Manager, Floor Manager, Category Manager, Store Manager, Retail Operation Manager, Visual Merchandisers Manager, Back-end Operations Logistics, Warehouse Managers, Retail Communication Manager and Retail Marketing Executives.
- Hospitality management specialization students can find work in catering, conference and events management, the entertainment and leisure sector, facilities management, food service management as well as Hospital Management and Tourism industry. Self-employment is an option with experience, business sense and a sound plan.

Finally merely a buzz word, MBA, produces lot of opportunities; it is the responsibility of the student to capture the hand on knowledge to understand the changing needs of the corporate world. One has to make sure that this conceptual knowledge opens up the doors to enter into the “Corporate world” which is normally our aim. This means one can become a successful entrepreneur or a manager depends upon how he/she shapes up with the knowledge…MBA degree is a GATEWAY.

North Maharashtra University, Jalgaon

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FACULTY OF COMMERCE & MANAGEMENT

EQUIVALENCE OF OLD AND NEW COURCES FOR MASTER IN BUSINESS ADMINISTRATION (M.B.A.)

Old Paper	Old courses (w.e.f.- July 2011)	New Paper	New courses (w.e.f.- July 2014)
Semester-I			
101	Management Science	101	Management Science
102	Accounting for Managers	105	Business Accounting
103	Managerial Economics	103	Managerial Economics
104	Information Technology for Managers	202	Information Technology For Managers
105	Introduction To Operations Mgmt.	208	Operations Management
106	Organizational Behavior	106	Organizational Behavior - I
107	Corporate Social Responsibility	107	Corporate Social Responsibility
108	Corporate Communication Skills	102	Corporate Communication Skills
Semester - II			
201	Management Practices	206	Organizational Behavior – II
202	Business Research Methods	201	Business Research Methods
203	Global Economic Scenario	203	Global Economics Scenario
204	Management Information System & ERP	302	Management Information System & ERP
205	Financial Management	207	Financial Management
206	Human Resource Management	104	Human Resource Management
207	Marketing Management	204	Marketing Management
208	Quantitative Techniques	108	Quantitative Techniques
Semester - III			
301	Strategic Management	301	Strategic Management
302	Entrepreneurship & Project Management	404	Entrepreneurship & Project Management
303	Legal Aspects of Business	303	Legal Aspects Of Business
304	Specialization-I (Major)*	304	Specialization-I
305	Specialization-II (Major)*	305	Specialization-II
306	Specialization-III (Major)*	306	Specialization-III
307	Specialization-IV (Major)*	307	Specialization-IV
308	Specialization (Minor-I)**		Three chances to be given of the same paper (308 minor-I)
Semester - IV			
401	e-Commerce & Excellence Management	402	e-Commerce & Excellence Management
402	Family Business Management	401	Current Business Scenario
403	Indian Commercial Laws	403	Indian Commercial Laws
404	Specialization-V (Major)*	405	Specialization-V
405	Specialization-VI (Major)*	406	Specialization-VI
406	Specialization-VII (Major)*	407	Specialization-VII
407	Project Report & Viva-Voce*	408	Project Report & Viva-Voce
408	Specialization (Minor-II)**		Three chances to be given of the same paper (408 minor-II)

North Maharashtra University, Jalgaon

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

301: Strategic Management

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objectives:

- **To equip students with the core concepts, frameworks, and techniques of Strategic management and its applications**

1. **Strategic Management and Establishment of Strategic Intent** **(6)**
    - 1.1 Introduction to Strategic Management- Evolution, Concept, Decision Making Process, Schools of thoughts, Definition, Process, Model to Strategic Management
    - 1.2 Levels of Strategic Management,
    - 1.3 Strategic Intent-Concept of stretch, Leverage and Fit, Strategies Vs Tactics
    - 1.4 Nature, Characteristics, Formulations of -Vision, Mission, and Goals & Objectives, Balance Score Card
2. **Strategy Formulation**
    - **2.1 Environmental Appraisal** **(4)**
        - 2.1.1 Concept
        - 2.1.2 SWOT and PESTLE Analysis
        - 2.1.3 Scenario Building
        - 2.1.4 Environmental Scanning
        - 2.1.5 Appraising Environment
        - 2.1.6 Industry Analysis- Porter five forces analysis
    - **2.2 Organizational Appraisal** **(3)**
        - 2.2.1 Capability factors, Methods and Techniques
        - 2.2.2 Structuring Organisational Appraisal
    - **2.3 Corporate Level Strategies** **(4)**
        - **2.3.1** Types-Introduction to Expansion, Stability, Retrenchment and combination of Strategies
        - 2.3.2 Integration of Strategies
        - 2.3.3 Diversification Strategies- Related and Unrelated
    - **2.4 Business Level Strategies** **(4)**
        - 2.4.1 Introduction
        - 2.4.2 Porter's Generic Business Strategies
        - 2.4.3 Tactics for Business Strategies
        - 2.4.4 Strategies for Different Industry conditions (Industry Life Cycle Analysis)
3. **Strategic Analysis and Choice** **(5)**
    - 3.1 Process of Strategic Choice
    - 3.2 Strategic Analysis- Corporate Portfolio Analysis- BCG Product Portfolio and
    - 3.3 GE Nine Matrix Cell, Competitor Analysis
    - 3.4 Strategic Plan
4. **Strategy Implementation** **(8)**
    - 4.1 Project Implementation
    - 4.2 Procedural Implementation
    - 4.3 Resource Allocation
    - 4.4 Structural Implementation - Interrelationship of Structure and Strategy, Structures for Business and Corporate Strategies
    - 4.5 Behavioural Implementation-Strategic Leadership, Composition Corporate
    - 4.6 Culture, Corporate Politics and use of power
    - 4.7 Functional Implementation- Vertical and Horizontal Fit
    - 4.8 Internal and External Innovation, Implementing internal innovation

5. Strategy Evaluation and Control **(4)**

5.1 Strategic Evaluation- Nature, Importance and Barriers
5.2 Strategic Control and Operational Controls.
5.3 Techniques of Strategic Evaluation and Control

1.2. **Comprehensive Cases on various strategic situations and at least 10 cases based on application of strategic management must be discussed & solved. (10)**

REFERENCE BOOKS

1. Strategic Management and Business Policy-Azar Kazmi, The McGraw Hill
2. Business Policy and Strategic Management : Concepts and Applications- Vipin Gupta, Kamala Gollakota, R. Srinivasan -Prentice Hall India
3. Concepts in Strategic Management and Business Policy- Thomas L. Wheelen, J. David Hunger, Wheelen Thomas L.- Pearson
4. Strategic Management- P.Subba Rao – Himalaya Publishing House.
5. Strategic Management: Concepts and Cases – Upendra Kachru- Excel Books
6. Business Policy and Strategic Management: Text and Cases- Francis Cherunilam- Himalaya Publishing House.
7. Strategic Management- Garth Saloner, Andrea Shepard, Joel Podolny– Willey India
8. Strategic Management – B Hiriyappa – New Age International
9. Strategic Management – V.S.P. Rao , Harikrishna – Excel Books
10. Strategic Management: Concepts: Competitiveness and Globalization- Michael Hitt, R. Duane Ireland, Robert Hoskisson- Cengage Learning

North Maharashtra University, Jalgaon

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

302-Management Information System and ERP

60 + 40 Pattern: External Marks 60 +Internal Marks 40= Maximum Total Marks: 100

Required Lectures: 48 hours

Objectives:

- To explain students why information systems are so important today for business and management
- To evaluate the role of the major types of information systems in a business environment and their relationship to each other
- To assess the impact of the internet and internet technology on business electronic commerce and electronic business
- To identify the major management challenges to building and using information systems and learn how to find appropriate solutions to those challenges

1. Fundamentals of Management Information Systems **(08)**

1.1. Concepts, Classification & Value of Information

1.2. Information System : Open & Closed

1.3. Management Information System

1.3.1. Definition, Concepts & Meaning

1.3.2. Components & Activities

1.3.3. Types – Operation support system & Management support systems

1.3.4. Control systems – Feedback & Feed forward systems

1.3.5. MIS planning process – Steps in planning

1.3.6. MIS design & Development Process – Phases

1.3.7. Components of MIS

2. Process of Management Information System **(08)**

2.1. System Analysis & Design

2.1.1. Introduction & Need for System analysis

2.1.2. System analysis of a new requirement

2.1.3. Structured systems analysis & Design (SSAD)

2.2. Development of MIS

2.2.1. Introduction & Contents of MIS Long range plans

2.2.2. Determining the information Requirement

2.2.3. Management of Quality in the MIS

2.2.4. Factors contributing in the Success & Failure of MIS

3. Application of Management Information System **(12)**

3.1. Business Processes : Primary, Supportive & Administrative

3.2. MIS in functional area

3.2.1. MIS & Manufacturing sector

3.2.1.1. Operational control & Research Systems

3.2.1.2. Inventory Control System

3.2.1.3. Manufacturing system: CIM, Process control & Machine control

3.2.2. Marketing Information System: Marketing Research, Marketing planning, Sales analysis & Marketing control.

3.2.3. Accounting Information system: Financial, Management & Cost accounting system

3.2.4. Human Resource Development System: HRP system, Human Resource Information System

3.3. Service as a distinctive product

3.4. Transaction Processing System

3.5. Concept of Knowledge Based Expert System

3.6. Concept of Artificial Intelligence

3.7. Managerial Challenges of Information Technology : Success or Failure, Developmental & Ethical

4. Support System **(05)**

4.1. Decision Support System (DSS): Concept, Philosophy, Characteristic, Classes, Users of DSS

4.2. Executive Support System (ESS): Introduction, Components & Architecture

4.2.1. Office Information System: Document management & Communication system

5. Enterprise Resource Planning **(08)**

5.1. Concept/System

5.2. Drivers for implementing ERP

5.3. ERP architecture

5.4. ERP Solution Structure: Business operations, Technology & Implementation

5.5. Benefits of ERP

5.6. ERP Selection: Vendor evaluation, Technology evaluation & Solution evaluation

5.7. ERP Implementation: Customization & Precautions

5.8. Problems encountered with ERP

5.9. Service process optimization: Service processes & its benefits

5.10. ERP in the twenty-first century

6. ERP – Technologies & Application **(07)**

6.1. Business Process Re-engineering

- 6.1.1. Meaning, Necessity& Principles
- 6.1.2. Application of re-engineering
- 6.1.3. Three R's – Rethink, Redesign & Retool
- 6.1.4. Reengineering in service industry
- 6.1.5. Quality & re-engineering
- 6.1.6. Benefits & Limitations of re-engineering

6.2. Material Requirement Planning (MRP-I)

6.3. Manufacturing Resource Planning (MRP-II)

6.4 Assignment on ERP implementation in Manufacturing & Service sector.

REFERENCE BOOKS

1. Management Information System by Jawadekar – Tata McGraw Hill
2. Management Information System by Arora – Excel Books
3. Management Information System by Davis & Gordon - Tata McGraw Hill
4. Management Information System by James O'Brian- Tata McGraw Hill
5. Business Process Reengineering by K Sridhar Bhat – Himalaya Publishing House
6. Management Information System by C S V Murthy – Himalaya Publishing House
7. Management Information Systems (3/e) – Goyal - Macmillan
8. Enterprise Resource Planning by Alex Leon - Tata McGraw Hill
9. Enterprise Resource Planning by Ray - Tata McGraw Hill
10. Enterprise Resource Planning (Concept & Practices) by Garg, Venkitrkrishnan– PHI
11. Enterprise Resource Planning by JyotindraZaveri - Himalaya Publishing House
12. Textbook of Enterprise Resource Planning Jaiswal Macmillan

North Maharashtra University, Jalgaon

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

303 Legal Aspect of Business

60 + 40 Pattern: External Marks 60 +Internal Marks 40= Maximum Total Marks: 100

Required Lectures: 48 hours

Objectives: -

- To provide the Basic knowledge about the different types of Contract.
- To increase the Understanding level of Individual about Sales of Goods act.
- To aware about the basic terms in the field of LLP Act 2008.
- To provide the practical aspects in the light of case study.

1. **Law of Contract – "Indian Contract Act, 1872** **(6)**
   - 1.1. Introduction, Meaning, Definitions & Essentials of Contract
   - 1.2. Classification of Contract: - (i) Void, Voidable & Valid Contract (ii) Wagering Agreement, Contingent Contacts & Quasi-contracts
   - 1.3. Discharge of Contract
   - 1.4. Breach of Contract & Remedies
   - 1.5. Specific Contracts: - i) Indemnity & Guarantee ii) Agency iii) Bailment & Pledge

2. **Law of Sale of Goods – "Sale of Goods Act, 1930"** **(9)**
   - 2.1. Contract of Sale of Goods: - i) Its essentials & types of Goods ii) Distinction between 'Sale & Agreement to Sale' Condition & Warranties: - i) Difference between Condition & Warranty ii) Express & Implied conditions & warranties iii) Doctrine of Caveat Emptor
   - 2.2. Transfer of Property: - i) Rules regarding Transfer of Property ii) Transfer of Title & Transfer of Title by Non-owners Performance of Contract of Sale: - Delivery, modes, rules etc.
   - 2.3. Unpaid seller & his rights
   - 2.4. Buyer's right against Seller
   - 2.5. Concept of Auction Sale

3. **Limited Liability Partnership Act 2008** **(7)**
   - 3.1. Meaning & Silent Features of LLP
   - 3.2. Incorporation of LLP
   - 3.3. Extent & Limitations of Liability
   - 3.4. Benefit or Advantages of LLP
   - 3.5. Difference between LLP & Partnership Firm
   - 3.6. Prima facie steps of conversion to LLP
     - 3.6.1.Partnership firm to LLP
     - 3.6.2.Private Limited Company to LLP
   - 3.7. Winding up & Dissolution
     - 3.7.1.Ways of winding up
     - 3.7.2.Circumstances in which LLP may be wound up by Tribunal

4. **Law of Negotiable Instruments – "Negotiable Instrument Act, 1881"** **(4)**
   - 4.1. Introduction, Definition & Characteristics
   - 4.2. Parties to Negotiable Instruments
   - 4.3. Specimen & its Essentials - Promissory Note & Bill of Exchange

4.4. Cheque - Bearer & Crossed, Types of Crossing
4.5. Holder & Holder in due course
4.6. Rights/Privileges of Holder in Due course

5. **Intellectual Property Law – Patent, Copyright & Trade mark** **(12)**
   5.1. **"The Patents Act, 2002" -** i) Application for Patent ii) Grant of Patent iii) Rights of Patentee iv) What inventions are not patentable? v) Revocation of Patents
   5.2. **"Copyright Act, 1957 -** i) Introduction ii) Duration of Copyright protection iii) Registration of Copyright iv) Infringement of Copyright – Exceptions
   5.3. **"The Trade Marks Act, 1999" -** i) Introduction ii) Classification of Goods & Services iii) Procedure for registration of Trade Marks iv) Grounds for refusal of registration

6. **Case studies in Legal Aspects of Business – Typical cases based on the above topics only** **(10)**

REFERENCE BOOKS

1. Legal Aspects of Business by Akhileshwar Pathak – Tata McGraw Hill
2. Legal Aspects of Business by R.R.Ramtirthkar – Himalaya Publishing House
3. Mercantile Law by S.S. Gulshan – Excel Books
4. Mercantile & Commercial Law by Rohini Aggrawal – Taxman Publication

Specialization – A – Financial Management

North Maharashtra University, Jalgaon

(NACC Accredited 'B' Grade University)

FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

304 A -Banking & Investment Management

60 + 40 Pattern: External Marks 60 +Internal Marks 40= Maximum Total Marks: 100

Required Lectures: 48 hours

Objectives:

- To study various operational areas of the bank management.
- To enable students to understand and analyze various investment alternatives

1. Bank Management **(08)**

1.1 Objectives, Evolution, Scope & functional areas of bank management

1.2 Functional areas: Deposit Mobilization, Credit planning & Management, Asset Management, Liability Management, Liquidity Management, Investment Management, Management of legal department, Office Management

1.3 Terms in banking- RTGS, NEFT, Franking Services

2. Credit planning & Management **(10)**

2.1 Objective & Scope

2.2 CRR, SLR, Bank Rate, Repo Rate, Reverse Repo Rate

2.3 Credit Culture

2.3.1 Financial Analysis, Credit rating, Project Appraisal

2.3.2 Consortium lending, loan Syndication

2.4 Priority Sector lending as per the RBI directives

2.5 NPA management-

2.5.1 Meaning, Impact, Process

2.5.2 Recovery mechanism and management

2.5.3Provisioning required as per RBI directives

3. Co-operative Banking **(04)**

3.1 Meaning, Nature and Types

3.2 Governance & reforms in co-operative banking

3.3 State Co-op agriculture & Rural Development banks

4. Investment Avenues **(08)**

4.1 Concept, Objectives, Characteristics, Attributes, Factors favorable for Investment

4.2 Investment Avenues

4.2.1 Non Marketable fixed Income avenues- Bank Deposit, Corporate Fixed Deposit, Provident Fund including PPF, National Saving Certificate

4.2.2 Marketable Avenues- Shares, Debentures, Bonds, Private Equity & Venture Capital

4.2.3 Other Avenues: Units of Mutual fund, Life Insurance, Real Estate, Money Market Instruments.

5. Security Analysis **(09)**

5.1 Concept of Security & Security analysis

5.2 Fundamental Analysis : Economic Analysis, Industry Analysis, Company Analysis

5.3 Technical Analysis: Technical Assumptions

5.4 Technical Vs Fundamental analysis

5.5 Efficient Market Theory

6 Portfolio Analysis & Management **(09)**

6.1 Meaning, Elements & Measurement of Risk, Systematic Risk & Unsystematic risk

6.2 Optimal Portfolio, Selecting the Best portfolio, Markowitz Model of Portfolio Selection
6.3 Portfolio revision: Meaning, Need, Strategies & Constraints
6.4 Performance Evaluation of Portfolios – (Theory only)
6.5 Portfolio Management: Meaning, Phases, Strategies, Asset Allocation, Building Investment Portfolio

REFERENCE BOOKS

1. Introduction to Banking: Vijayaragavan Iyengar – Excel Books
2. Merchant Banking & Financial Services – Dr. K Ravichandran - Himalaya
3. Investment Management by V. A. Avdhani , Himalaya Publishing House
4. Fundamentals of Investment Management - Geoffrey Hirt, Stanley Block –Tata Mcgrew Hill
5. Investment Analysis &Porfolio Management by Ranganathan - Pearson
6. Investment Management: Security analysis and portfolio Management by V. K. Bhalla - S. Chand
7. Investments – Bodie, Kane, Marcus, Mohanty – Tata McGraw Hill
8. Security analysis and portfolio Management by V.A.Avadhani - Himalaya
9. Security analysis and portfolio Management by Rohini Sing – Excel Books

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

305 A – Tax Management

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objectives:

- To understand various provisions of Direct and Indirect Tax Laws and the compliance Procedures.
- To study the compliance procedures under Direct and Indirect Tax Laws .

1. **Income Tax : (34)**
   1.1. Basic concepts: agricultural Income, Assessees, Assessment Year, Income, Person , Gross Total Income, Previous year, Capital and Revenue Receipts, , Capital and Revenue Expenditure, Exempted Incomes, Residential Status.
   1.2. Heads of Income:
      1.2.1. Salary: Allowances, Perquisites, Deductions, Practical Problems
      1.2.2. Income from House Property: let out property, self-occupied properties, deductions, Practical problems
      1.2.3. Income From Business or Profession: Depreciation and other permissible Deductions, Disallowable Expenses, Provisions regarding Tax Audit, Practical Problems
      1.2.4. Capital gains: Capital assets, transfer, cost of acquisition, cost of improvement, exemptions, Practical Problems
      1.2.5. Income from Other Sources: Incomes, Deductions, grossing up, Practical Problems
   1.3. Deductions from Gross Total Income: u/s 80C, 80D, 80 E, 80 G, 80GG
   1.4. Tax Deducted at source , Advance Tax, PAN , TAN , Submission of Returns , e-filing of ITR
2. **Central Excise : (6)**
   2.1. Nature of Excise Duty, Basic concepts-Assessee, Goods and Excisable Goods, Classification of goods , Factory , Manufacture & Production, Deemed Manufacture, Manufacturer, Sale & Purchase, Wholesale Dealer, Central Excise Tariff, valuation of Excisable Goods, Specific Duty Vs. Ad valorem Duty, Maximum Retail sale Price, CENVAT Credit, Registration Procedure
3. **Service Tax: (4)**
   3.1. Features, Exemptions and threshold limits, Gross Value of Services, Registration, Payment, Furnishing of Returns, An Overview of Taxable Services
4. **VAT: (4)**
   4.1. Definitions: Agriculture, Business, Capital Asset, Dealer, Goods, Place of business, Purchase Price, Sale price, Resale, Turnover of Purchase and Turnover of Sale. Incidence of Tax, Registration, Returns, Audit.

REFERENCE BOOKS

1. Students guide to Income Tax , Vinod Singhaniya & Kapil Singhaniya, Taxmann Publications
2. Income Tax law, Mehrotra, Sahitya Bhawan, Agra
3. Direct Taxes, Girish Ahuja and Ravi Gupta, Bharat Publications
4. Direct Taxes, T N Manoharan, Snowwhite Publications.
5. Direct Taxation, Dr Meena Goyal, Biztantra Publications
6. Indirect Taxes, V S Datey, Taxmann Publications
7. Indirect Taxes : V. K. SAREEN and MAYA SHARMA, Kalyani Publishers.
8. Students' Guide to Indirect Taxes : Yogendra Bangar, Vandana Bangar, and Vineet Sodhani – Aadhya Prakashan Pvt Ltd., Jaipur
9. Systematic Approach to Indirect Taxes – Dr Sanjiv Kumar – Bharat Law House Pvt. Ltd., New Delhi.
10. Service Tax : Law, Practice & Procedure – C. Parthasarathy, Sanjiv Agrawal – Snow White Publications Pvt. Ltd., Mumbai
11. Government of India- Income Tax Manual
12. Income Tax Act and Latest Finance Act.

North Maharashtra University, Jalgaon

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

306 A –Strategic Financial Management

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objectives:

- To study the financial resources which can maximize the value of the business.
- To enable students to understand importance of strategies such as Merger, takeover, Joint Venture etc. that enhance the firms competitive strengths.
- To enhance the ability of students as regards the financial decision making in rapidly changing global economic environment.

1. **Capital Structure & Leverages** **(15)**

1.1 Capital Structure

1.1.1 Meaning & Features & Determinants

1.1.2 Approaches to Capital Structure

1.2 Indifference Point

1.2.1 Meaning

1.2.2 Problems on Computation of Indifference Point

1.3 Computation of Cost of Capital

1.3.1 Meaning & Significance

1.3.2 Problems on Weighted Average Cost of Capital

1.3.3 Under & Over Capitalization

1.4 Leverages

1.4.1 Meaning & Types

1.4.2 Problems on Computation of Operating, Financial & Combine Leverages

2. Capital Budgeting Techniques: **(12)**

2.1 Payback period Method

2.2 Rate of return Method

2.3 Net Present Value Method

2.4 Internal rate of Return Method

2.5 Profitability Index

2.6 Replacement Decision

2.7 Lease or Hire- Purchase or Buy Decision

3. Dividend Policy **(5)**

3.1 Determinants of Dividend

3.2 Problems on Dividend Theories: Walter approach, Gorden Growth Model

4. Strategic Financial Management **(4)**

4.1 Strategic Planning: - Meaning

4.2 Strategic Management: - Meaning & Importance

4.3 Strategic Decision Making Framework

4.4 Interface of Financial Policy & Strategic Management

5. Turnaround Management **(8)**

5.1 Corporate Sickness

5.1.1 Definition, Causes & Symptoms of sickness

5.1.2 Prediction of Sickness, Revival of Sick Units.

5.2 Types of Turnaround

5.2.1 Basic Approaches
5.2.2 Phases in Turnaround Management.

5.3 Mergers and Takeover :

5.3.1 Mergers & Acquisitions: Kinds, Motives, Reasons
5.3.2 Major Causes of Mergers & Acquisitions failures
5.3.3 Post-Merger Integration Issue

5.4 Takeovers

5.4.1 Meaning
5.4.2 Kinds of Takeovers
5.4.3 Stages of Hostile Takeover
5.4.4 Defensive Measures

6. Corporate Restructuring **(6)**

6.1 Meaning, Need, Areas, Implication
6.2 Steps in Financial Restructuring
6.3 Joint Ventures & Strategic Alliance
6.4 Leveraged Buyout

REFERENCE BOOKS

1. Strategic financial Management , Ravi M. Kishore, Taxman Publication
2. Strategic Financial Management By Saravanan – Oxford Uni. Press
3. Strategic financial Management, A. N. Sridhar , Shroff Publishers & Distributors Pvt. Ltd
4. Strategic Management' Sharplin McGraw Hill
5. Strategic financial Management , J B Gupta, Taxman Publication
6. Financial Management- I. M. Pandey – Vikas Publication
7. Financial Management by Berk – Pearson Publication
8. Financial Management – Prasanna Chandra

North Maharashtra University, Jalgaon

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

307A Practical Aspects of Business

60 + 40 Pattern: External Marks 60 (Theory) +Internal Marks 40 (Practical) = Maximum Total Marks: 100

Required Lectures: 48 hours (Theory 28 hours, Practical: 20 hours)

Objectives of the course:-

- To enable students to learn how to record accounting operations in Tally Software.
- To establish a connection between theories, concepts & principles of Accounts & Finance with practical business operations.
- To understand the importance of Advanced Excel in business operations in order to perform complex business calculations and preparation of Financial Reports

TALLY

1. Basics of Tally (6)

1.1 Distinction between Computerized Accounting & Manual Accounting

1.2 Introduction to Tally

1.3 Versions & Features of Tally

1.4 Creation of Company Process - (by taking hypothetical information for the Co. to be created)

1.5 Alteration of Company Process - (by taking hypothetical information which is to be altered)

1.6 Deletion of Company - Create a company Temporary Friends Pvt. Ltd. By using hypothetical information and then write process to delete

2. Groups & Vouchers, Stock item in Tally (14)

2.1 Introduction to Gate way of Tally

2.2 Process of Creation of Groups in Tally

2.3 Process of Creation of Ledgers in Tally

2.4 Process of Creation of Vouchers in Tally

Purchase, Sales, Contra Voucher, Receipt, Payment vouchers.

2.5 Process of showing Financial Statements in Tally- Trial Balance, P & L A/c, Balance Sheet

2.6 Procedure to create of Stock items & stock groups in Tally

2.7 VAT Features, Computation of VAT in Tally

Advanced Excel

3. Introduction to Excel & Financial Functions (6)

3.1 Introduction to Excel

3.2 Data Entry- Text, Number, Formulae, Functions (AVERAGE, SUM, PRODUCT, COUNT, MIN, MAX)

3.3 Importance of Financial Functions

3.4 Syntax & benefits of following Financial Functions in Excel -

FV, PV, PMT, PPMT, DB, SLN, IRR, NPV

4. Pivot Table, Charts & Bars, V look up & H Lookups Functions (4)

4.1 Importance of Pivot Table

4.2 Importance of Bars /Pie- Charts

4.3 Importance of V lookup & H Lookup Functions in Excel

Audit

5. Basics of Audit (12)

5.1 Meaning & Significance of Audit

5.2 Difference between Accounting and Auditing, Difference between Auditing and Investigation

5.3 Internal Control, Audit Evidence, Audit Report

5.4 AAS-1 Basic Principles Governing an Audit

5.5 Types of Audit- Statutory Audit, Internal Audit, Balance Sheet Audit, Tax Audit, VAT Audit

5.6 Limitations of auditing

6. Auditing in Computerized Information System (CIS) Environment: (8)

6.1 Meaning of CIS

6.2 Approaches to Computer Auditing- Black Box & White Box

6.3 Characteristics of CIS Environment

6.4 Computer Frauds

Practicals

TALLY

Assignment : 1

Creation, Deletion and alteration of company

A. Create a Company **MBA Friends Pvt. Ltd.** With following details
Enter the hypothetical details e.g. Address, State, PAN No. etc.
Select Accounts with Inventory option, Use 1-4-20XX(Current Financial Year) as the date of commencement of business.

B. Alteration of Company details :-
Alter the Following Details MBA Friends Pvt. Ltd.
Address & contact no. and save the alterations. .(Show Pop-up Menu before Saving changes).

C. Deletion of the Company:-

Create a Company **MBA Temporary Friends Pvt. Ltd.** With following details

Enter the hypothetical details e.g. Address, State, PAN No. etc.

Now, delete the company. (Show Pop-up Menu before deletion)

Select Accounts with Inventory **OR** only Accounts option, Use current financial year as the year of commencement and then **delete the Company**

{Note :- In this practical students are required to take print out before saving the information of Creation , Alteration and Deletion of companies}

Assignment: 2.

Creation of Ledger Accounts, assigning the proper groups and opening Balances of those accounts as on 31 March,2015 in the books MBA Friends Pvt. Ltd. as per the following the information

Sr. No.	Date	Ledger Names (To Be Created)	Groups (To Be Assigned)	Opening Balances (Rs.)
1	1-Apr-201X	Cash A/c	(Already Existing Group.)	5,00,000
2	1-Apr-201X	Mr. X A/c	Sundry Debtors	50,000
3	1-Apr-201X	Mr.Y A/c	Sundry Creditors	20,000
4	1-Apr-201X	Mr.Y A/c	Sundry Creditors	30,000
5	1-Apr-201X	Share Capital Account	Capital A/c	10,00,000
6	1-Apr-201X	SBI Bank A/c	Bank Account	5,20,000
7	1-Apr-201X	Plant & Machinery A/c	Fixed Assets	20,00,000
8	1-Apr-201X	Land & Building A/c	Fixed Assets	30,00,000
9	1-Apr-201X	Furniture & Fixture A/c	Fixed Assets	5,00,000
10	1-Apr-201X	Bank of Maharastra Loan A/c	Loans & Advances	1,00,000

(**Note :** Students are required to take the current financial year for accounting entries)

Assignment: 3 –

Journalize the following (by Using Proper Vouchers in Tally) in the books of **MBA Friends Pvt. Ltd.** along with their appropriate narrations:-

(a) Paid Rs.30,000 as Salary for the month of April on 1st May,20XX
(b) Paid Telephone bill Rs.2,000 through SBI Bank Cheque No. 543210 on 5th May,20XX
(c) Received a cheque Rs. 20,000 from Mr.X (Cheque No.700001) which is deposited in SBI Bank A/c (No.SBIIND123456789) on 8th May,20XX
(d) Purchased Machinery of Rs.50,000 through SBI BANK Cheque No 123456 on 1St June, 20XX
(e) Purchased goods of Rs.1,70,000 from Mr.Y for Cash on 1st Aug,20XX
Create 3 hypothetical stock items; specify rates per unit and total amount.
(f) Sold Goods of Rs.2,00,000 for cash to Mr. X on 10th June,20XX
Take any one stock item from entry (e) above for sale, Specify hypothetical prices.

Note:- In above transactions students need to create Purchase & Sales A/c i.e. Ledgers , other Ledgers are already created in Assignment No. 2.

Assignment: 4

Considering the transactions in Assignment no.1,2,3 above, Show Trial Balance , Trading Accounts & Profit & Loss Accounts and Balance sheet as on 31st March,20XX for MBA Friends Pvt. Ltd.

Split Company Data

Split company data in Tally up to 31st Jan, 20XX and now Make Zip File of the Data up to 30th Jan, 2015 and email it to your tax consultant Mr. Ganesh Maurya on his email Id : ganesh@maurya.com

And

Export of Data in Excel

Export data from Tally containing the Trial Balance, Trading Accounts And Profit & Loss Accounts and Balance sheet as on 31st March, 20XX in Excel Format.

ADVANCED EXCEL

Assignment No: 5

Loan Amortization Schedule

Use PMT function & calculate the monthly payment on a loan with an annual interest rate of 5%, 2-year duration and a present value (amount borrowed) of 20,000.

Name the input cells as:-

Payment Number	Payment	Principal	Interest	Balance

2. Use the PPMT function to calculate the principal part of the payment.

3. Use the IPMT function to calculate the interest part of the payment.

4. Update the balance.

5. It takes 24 months to pay off this loan.

Show how the principal part increases and the interest part decreases with each payment.

Assignment No: 6

Calculation of Depreciation as per accounting principles & as per Income Tax Act,1961

A) As per Accounting Principles

Consider an asset with an initial cost of Rs. 10,000, a salvage value (residual value) of Rs.1000 and a useful life of 10 periods (years).

You are required to calculate -

i) Depreciation using Straight Line Method using above information
ii) Depreciation using Written Down Value Method rate @ 10 % p.a.
iii) Also write interpretation.

B) **As per Income Tax Act,1961**

The following table shows the opening WDV, Addition and sale of Fixed Assets during a particular Financial Year along with rate of Depreciation .You are required to calculate the Total amount of Depreciation as per the Income Tax Act, 1961 ?

Sr.No.	PARTICULARS	W.D.V. AS ON 01.04.20XX	ADDITION DURING THE YEAR BEFORE 30.09.XX	AFTER 30.09.XX	SALE DURING THE YEAR	RATE OF DEPR %
1	Furniture & Fitting	3,00,000	1,00,000	-	50,000	10
2	Buliding	10,00,000	3,00,000		-	10
3	Motor Car	4,00,000	-	-	1,00,000	15
4	Plant & Machinery	20,00,000	-	4,00,000	-	15
	Total Rs.	37,00,000	4,00,000	4,00,000	-	-

Note : -Rate of Depreciation as per Income Tax Rules Depreciation is Charged on block of Assets .

The asset purchased during the year before 30 Sept (put to use for more than 180 days is charged with full rate of depreciation whereas for the asset purchased during the year after 30 Sept (put to use for less than 180 days) is charged with half rate of depreciation.]

Refer Income Tax Act,1961 for more details.

Assignment No: 7 Compound Interest Calculation

1) Assume you put Rs.100 into a bank. How much will your investment be worth after one year at an annual interest rate of 8%?

2) Now this interest will also earn interest (compound interest) next year. How much will your investment be worth after two years at an annual interest rate of 8%?

3) How much will your investment be worth after 5 years?

4) Assume you put Rs. 10,000 into a bank. How much will your investment be worth after 10 years at an annual interest rate of 5% compounded monthly?

5) Assume you put Rs. 10,000 into a bank. How much will your investment be worth after 15 years at an annual interest rate of 4% compounded quarterly?

Assignment: 8 Creation of Income Tax Calculator

Prepare a Income Tax Calculator in Excel to calculate Income Tax on the Net Taxable Income of Following 6 Assessees .

Sr.No.	Name of Assessee	Net Taxable Income (Rs.)
1	Mr. Ganesh	4,25,000
2	Mr. Jayesh	3,10,000
3	Mr.Suresh	7,25,000
4	Mr.Nilesh	6,80,000
5	Mr.Shailesh	11,00,000
6	Mr.Ramesh	15,10,000

Students are required to show in their Print outs.

i) The Applicable Slab and Tax Rates and coding required to calculate the Income Tax (Exclude Education Cess in Calculation)

ii) Final Table Showing Income Tax Calculated for above 6 Assessees.

(**Note :** Student should take Income Tax Slab Rates as per the applicable Assessment Year for the particular Financial year in which they are pursuing this practical)

Assignment: 9 Creation of Pie Chart & Bar Chart (2 Dimension or 3 Dimensional) & Interpretation.

Create Pie Chart & Bar Graphs from the following Particulars for -

i) Sales & Net Profit

Sr.No.	**Particulars**	**2011-12**	**2012-13**	**2013-14**
1	Sales	40,00,000	45,00,000	50,00,000
2	Net Profit	8,00,000	11,25,000	5,00,000

ii) Sales & Sundry Debtors

Sr.No.	**Particulars**	**2011-12**	**2012-13**	**2013-14**
1	Sales	40,00,000	45,00,000	50,00,000
2	Sundry Debtors	2,00,000	5,00,000	6,00,000

Write Interpretation for above Table (i) & (ii)

Assignment: 10 Ratio Analysis

From the following particulars Calculate following Ratios for Given 3 Years Financial Year -

Particulars	2011-12 Rs.	2012-13 Rs.	2013-14 Rs.	Particulars	2011-12 Rs.	2012-13 Rs.	2013-14 Rs.
Sales	10,00,000	12,00,000	15,00,000	Bills Receivable	50,000	60,000	80,000
Net Profit	1,50,000	2,40,000	3,15,000	Cash in Hand	40,000	60,000	70,000
Capital	5,00,000	10,00,000	11,00,000	Cash at Bank	1,10,000	1,50,000	1,80,000
Land & Building	2,00,000	7,00,000	8,00,000	Prepaid Expenses	30,000	40,000	50,000
Plant & Machinery	3,00,000	4,00,000	5,00,000	Sundry Creditors	40,000	60,000	70,000
Sundry Debtors	40,000	50,000	70,000	Bills Payable	20,000	15,000	25,000
Stock	60,000	70,000	80,000	Provision for Taxation	10,000	20,000	40,000

Calculate:

1. Net Profit Ratio
2. Current Ratio
3. Liquid Ratio
4. Debtor Turnover Ratio
5. Fixed Assets Turnover Ratio

Also write interpretation for above Ratios by comparing 3 years Ratios.

References :-

Websites :

1. http://www.tallysolutions.com/
2. http://tallyerp9book.com/

Books :-

1. Tally.ERP 9: Basic Accounts, Invoice, Inventory by Asok K. Nadhani (Author)
2. Tally ERP 9 (English) Paperback – 2014 by Mr. Tarang (Author)
3. Excel With Excel (English) Author: **Rajesh Seshadri**
4. Excel 2010 in Simple Steps Paperback –by **Kogent Learning Solutions Inc.**
5. Auditing **– N. D. Kapoor**
6. Auditing- **G. Shekhar**

Specialization –B – Marketing Management

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

304 B: Product and Brand Management

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objectives

1. To equip the students with the various dimensions of Product and Brand management
2. To develop familiarity and competence with the strategies and tactics involved in building, leveraging and defending strong Products and Brands

1. Introduction **(6)**

1.1. Need for Product Management, Product Line Decision, Product Mix Decision

1.2. Product Manager- Functions and Skills Required

1.3. Marketing Strategies in different Phases of PLC, PLC Extension, Diffusion Model

1.4. Issues of Product Management in India

1.5. Marketing Planning- Concept, The Planning Process, Components of Marketing Plan, Two case Studies based on Marketing Plan

2. Competitive Strategy for Products **(12)**

2.1. Nature, Stages of competition, Forces Driving / Shaping competition, Forms of Competition

2.2. Category Attractive Analysis- Concept, Aggregate Market Factors, Category Factors and Environmental Analysis

2.3. Competitors Analysis- Nature, Sources of Information, Assessing competitor's- Objectives & Marketing Strategies, Differential advantage Analysis

2.4. Customer Analysis

2.5. Market Potential and Sales Forecasting- Methods

3. Developing Product Strategy **(6)**

3.1. Elements of Product Strategies

3.2. Positioning and Differentiation Strategies

3.3. Product Strategy over PLC

3.4. New Product Development- Factors contributing to New Product Development, Factors responsible for failing New Product, Managing New Product Development and Product Innovation- Setting Innovation Objectives, Methods and Steps

4. Concept of Brand **(6)**

4.1. Definition, Nature, Brand and Product, Brand challenges and Opportunities

4.2. Types of Brands, Brand Perspectives

4.3. Brand Evolution-Consumerism Continuum, Brand Levels, Value Hierarchy

4.4. Brand and Product Position, 3 Cs of Positioning and Competitive Positioning-POPs and PODs

4.5. Identifying and Establishing Brand Positioning

4.6. Strategic Brand Management Process

5. Brand Equity **(12)**

5.1. Concept, Customer Based Brand Equity

5.2. Criteria for choosing Brand Element, Options and Tactics for Brand Elements

5.3. Marketing Communication to Build Brand (Criteria for Integrating Marketing communication-IMC)

5.4. Leveraging Secondary Brand Associations to Build Brand Equity

5.4.1. Conceptualising the leveraging Process

5.4.2.Co-Branding, Licensing, Celebrity Endorsement**,**

5.5. Measuring Brand Performance

5.5.1.Qualitative Techniques- Free Association, Projective Technique, Brand personality

5.5.2.Quantitative Techniques-Brand Awareness, Brand identity, Brand Image, Brand Responses, Brand Relationships, Brand Attitude , Brand Loyalty , Brand Switching

5.6. Measuring outcomes of Equity: Models of Brand Equity Aaker Model, Brandz Model, Brand Equity Measurement System, Brand Valuation

6. Brand Extensions and Managing Brand (6)

6.1. Types, Advantage and Disadvantage, New Product and Brand Extensions

6.2. Managing Brand Over a Time-Reinforcing Brand, Revitalising Brand and adjustment to Brand Portfolio

6.3. Global Branding-Advantages and Disadvantages

REFERENCE BOOKS

1. Product Management- Lehmann Donald R ; Winer Russell S, Tata McGraw Hill
2. Brand Management: Text and Cases- Harsh V. Verma- Excel Books
3. Strategic Brand Management: Building, Measuring, and Managing Brand Equity-Kevin Lane Keller, M. G. Parameswaran, Isaac Jacob-Pearson
4. Product Policy and Brand Management-A.K. Chitale and Ravi Gupta, PHI Learning
5. Product Management Text and Cases- Kaushik, Mukerjee-PHI Learning
6. Product and Brand Management-U.C. Mathur, Excel Books
7. Marketing Management- Rajan Saxena (4th Edition), McGraw Hill
8. Marketing Concept and Cases- Michael J. Etzel, Bruce J. Walker, William J. Stanton and Ajay Pandit, Tata McGraw Hill
9. Principles of Marketing- Philip Kotler- PHI Learning
10. Brand Positioning Strategies for Competitive Advantage-Sengupta- Tata McGraw Hill

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

Paper: 305 B – Consumer Behavior and Service Marketing

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objective:

- To highlight the importance of learning about consumer behavior
- To develop understanding of the need to market services differently from general marketing
- To help students in learning different approaches required for effective marketing of services.

1. KNOWLEDGE OF BUYERS **(6)**

1.1. Buyer behavior & Consumer decision making process
1.2. Factors influencing buying behavior & Post purchase behavior
1.3. Consumer Reference Groups
1.4. The family Life Cycle
1.5. Social Class and Consumer Behaviour
1.6. Organizational Buying Vs Consumer Buying

2. INTRODUCTION TO SERVICES **(8)**

2.1. Understanding services phenomena
2.2. Characteristics of services
2.3. Differentiating services from goods
2.4. Role of services in economy
2.5. The service triangle management model
2.6. SERVQUAL
2.7. GAP model of customer satisfaction

3. SERVICES MARKETING MIX (7PS) **(10)**

3.1. Marketing mix in services and traditional 4PS
3.2. Product
3.3. Price
3.4. Promotion
3.5. Place or distribution
3.6. People
3.7. Physical evidence
3.8. Process management

4. CROSS CULTURAL CONSUMER BEHAVIOR: AN INTERNATIONAL PERSPECTIVE **(8)**

4.1. Diffusion and adoption of innovations
4.2. Cross-cultural consumer analysis
4.3. Cross cultural psychographic segmentation
4.4. Developing multinational marketing strategies
4.5. Cultural aspects of emerging international market

5. INTEGRATED SERVICE STRATEGY **(8)**

5.1. Growth strategies for service businesses
5.2. Customer satisfaction measures
5.3. Service profit chain
5.4. Strategy for market leader, challengers, niche market and followers
5.5. Service performance metrics

6. CUSTOMER RELATIONSHIP MANAGEMENT (CRM) **(8)**

6.1. Concept of CRM and CRM issues
6.2. Customer value
6.3. Standardization verses customization
6.4. CRM Objectives
6.5. CRM: Global Perspective
6.6. The scenario of CRM in Indian companies

REFERENCE BOOKS

1. Consumer Behavior, Schiffman G.L and Kanuk L.L, Prentice- Hall
2. Services marketing : ravi Shankar, Excel Book
3. Services marketing C Bhatacharjee, Excel Book
4. Services marketing Govind Apte, Oxford
5. Services marketing: Rajendra Nargundkar, Tata Mc Graw Hill
6. Marketing Management: A south Asian perspective; Philip Kotler, Kevin Lane Keller, Abraham Koshy Mithileshwar Jha, 14 ed, Pearson
7. Marketing Management, Rajan Saxena, Tata McGraw Hill
8. Marketing; Grewal, Ievy, Tata McGraw Hill
9. Services Marketing, Lovelock, Wirtz, Chatterjee; Pearson

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

Paper: 306 B– Sales & Distribution

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objective:

- To impart knowledge about the selling function and highlight the managerial issues involved in sales management.
- To bring out the changes in distribution function and understand current practices

1. **Introduction to sales management** **(10)**
   1.1. Nature and Scope of Sales Management
   1.2. Objectives of Sales management
   1.3. Functions of Sales management
   1.4. Prospecting for customers
   1.5. Modes of sales presentation
   1.6. Designing and delivering of sales presentation
   1.7. Recruiting and selecting Sales Personnel
   1.8. Methods and administering selection procedures
2. **Sales force involvement, evaluation and training** **(10)**
   2.1. Developing Sales Training Programs,
   2.2. Executing and Evaluating sales training programs
   2.3. Motivating Sales Personnel
   2.4. Compensating sales personnel
   2.5. Designing and Administering various Compensation Plans
   2.6. Controlling Sales personnel
   2.7. Managing sales evaluation programs
   2.8. Comparing standards with actual performances of sales personnel;
3. **Sales force management** **(8)**
   3.1. Objective and Types of Quotas
   3.2. Quota setting procedure
   3.3. Administering the quota system
   3.4. Designing Sales Territories
   3.5. Allocating Sales efforts to sales territories
4. **Marketing channels, structure and distribution** **(6)**
   4.1. Functions and Relationships of channels of Distribution
   4.2. Channel Dynamics
   4.3. Channel Planning and organizational Patterns in Marketing Channels
   4.4. Channel Design Process
   4.5. Channel Management Decisions
5. **Channel intermediaries** **(8)**
   5.1. Channel Intermediaries- Role and Types
   5.2. Wholesaling- Types of Wholesalers
   5.3. Wholesaler marketing decisions
   5.4. Retailing- Types of retailers
   5.5. retailer marketing decisions

6. Market logistics **(6)**

6.1. Logistics Objectives,

6.2. Market logistics decisions for Distribution Channels

6.3. Role of Information System in Distribution Channel Management

6.4. Assessing Performance of Marketing Channels.

REFERENCE BOOKS

1. Tanner, J; HoneycuttED; Erffmeyer Robert C.; Sales management: Pearson Education, 2009
2. R.S.N. Pillai :Marketing management, S. Chand
3. Still, R R. & Cundiff; Sales Management, Englewood Cliff, New Jersey, Printice Hall Inc.,
4. Anderson, R. Professional Sales Management. Englewood Cliff, New Jersey, Prentice Hall Inc., 1992.
5. Buskirk, R H and Stanton, W J. Management of Sales Force. Homewood Illonois, Richard D Irwin, 1983.
6. Dalrymple, D J. Sales Management: Concepts and cases. New York, John Wiley, 1989.
7. Johnson, E M etc. Sales Management: Concepts Practices and cases. New York, McGraw Hill, 1986.
8. Stanton, William J etc. Management of Sales Force. Chicago, Irwin,1988.

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

Paper: 307 B: Global Marketing Management

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objectives

- to apply Global marketing theories, frameworks and concepts to managerial decision contexts

1. **Introduction to International Marketing** **(8)**
   1.1. International Market: Meaning, Expansion, Growing Attractiveness
   1.2. International Marketing: Meaning, Need, Significance, Participants, Motives, Problems, Complexities
   1.3. International Orientation & Stages
   1.4. Scope of Marketing Indian Products Abroad
   1.5. International market orientation- EPRG frame work;
   1.6. International Marketing Environment:
      1.6.1. Internal, External, Domestic, Economic, Social, Cultural, Demographic, Technological, Political and Legal
      1.6.2. International Trading Environment
      1.6.3. Trading Blocs
   1.7. International Market Entry Strategies & Modes
2. **International Product Strategy:** **(8)**
   2.1. Levels & Hierarchy of product, Product-line analysis, Product design Strategy
   2.2. Pro duct Life Cycle Management,
   2.3. New Product Development, Product Positioning & Product Adoption , Repositioning Strategies
   2.4. Product planning Matrix, Dimensions of Product Strategies
   2.5. Product planning for global markets;
   2.6. Standardization v/s Product adaptation;
   2.7. Management of international brands: Bran d Drivers
   2.8. Packaging and labelling
3. **International Pricing** **(8)**
   3.1. Role of Pricing, Objectives, Factors affecting Pricing, Pricing decisions
   3.2. Pricing Methods, Pricing Strategies, Cost based pricing, Transfer pricing, Dumping , Export price structure, Skimming Pricing, Penetration Pricing, Price discounts, Discriminating Pricing
   3.3. Price-Market relationship, Price Escalation: cost of exporting, Taxes, tariffs & Administrative costs, Exchange rate
   3.4. Price control: Approaches to lessening price escalation, Leasing in international markets
   3.5. Currencies and foreign Exchange- Money, Foreign Exchange Market, Foreign exchange rate and its system, Evaluation of floating rates
4. **International Promotions** **(8)**

   4.1. Pro motion Decisions: Complexities and issues; International advertising
   4.2. Marketing Environment & Promotional Strategies
   4.3. Role of Export Promotion Organizations, Trade fairs and Exhibitions
   4.4. International Marketing Communication: Major Decisions, Communication Mix, Problems in International Marketing Communication
   4.5. International Personal selling, Sales promotion and public relations.

5. International Distribution **(8)**

5.1. Distribution Channels: Policy, issues, Functions & types of channels;
5.2. International Channel conflict & Channel Decision
5.3. Functional Excellence in Distribution Planning
5.4. International logistics decisions & Management, Developing logistic Strategy

6. Export Management **(8)**

6.1. Managing Export Decisions
6.2. Export Contract: INCO Terms
6.3. Export procedure & Documentation, Certificate of Origin, Modes of payments- LOC, Forfeiting agents, Cross Border Factoring, Bankers Acceptance (BA), Counter Trade
6.4. EXIM policy of India

REFERENCE BOOKS

1. Global Marketing Management by Keegan - Pearson
2. International Marketing: Text & Cases – Francis Cherunilam – Himalaya
3. International Marketing – Cateora, Graham, Salwan – Tata McGraw Hill
4. International Marketing: Text And Cases - Justin Paul & Ramneek Kapoor – Tata Mcgraw Hill
5. International Marketing – Rajgopal – Vikas Publications
6. International Marketing – Rajendra Nargundkar – Excel Books
7. International Marketing – R Shrinivasan – Prantice Hall
8. Global Marketing: Foreign Entry, Local Marketing & Global Mgmt. – Johansson - Tata Mcgraw Hill
9. International Marketing & Export Management By Albaum - Pearson
10. International Marketing - Jain S.C. - CBS Publications, New Delhi
11. International Financial Management- V.K. Bhalla, Anmol Publications
12. International Financial Management- P.G. Apte, Tata McGrahill

Specialization – C – Human Resource Management

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

304 C - Industrial Relations & Labour Welfare

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objectives:

- To Study various Industrial Relations practices in the organisation
- To understand Grievance handling & collective bargaining.
- To study various aspects of labour welfare.

1. Introduction to Industrial Relations **(10)**

1.1. **Industrial Relations –**

1.1.1. Concept, Scope & Objectives of IR, Approaches to IR

1.1.2. Conditions for Congenial IR & Functional Requirement for Sound IR Policy

1.2. **Employee Discipline –**

1.2.1. Concept, Objectives, Need,

1.2.2. Red Hot Stove Rule,

1.2.3. Principles & Approaches to Discipline

1.3. **Trade Unionism-**

1.3.1.Types, role & importance

1.3.2.Growth & Need of & Managerial Trade Unions

2. Industrial Disputes- **(12)**

2.1. **Industrial Disputes**

2.1.1. Concept, Definition,

2.1.2. Causes & Consequences of Industrial Disputes,

2.1.3. Types of Industrial Disputes - Strikes & Lockouts,

2.1.4. Prevention of Industrial Disputes-

2.2. **Industrial Dispute Settlement Machinery-**

2.2.1.**Mediation –**

2.2.1.1. Meaning, Importance,

2.2.1.2. Types and Essentials of Mediation

2.2.2.**Conciliation**-

2.2.2.1. Meaning, Steps for Conciliation Procedure,

2.2.2.2. Role and Qualities of Conciliator,

2.2.2.3. Essentials for Effective Conciliation

2.2.3.**Arbitration –**

2.2.3.1. Concept, Advantages, Disadvantages,

2.2.3.2. Essentials of arbitration

2.2.4.**Adjudication** –

2.2.4.1. Concept, Meaning,

2.2.4.2. Three Tier System of Adjudication – Labor Courts, Industrial Tribunal & National Tribunal

3. Grievance Procedure & Collective Bargaining **(08)**

3.1. **Grievance Procedure-**

3.1.1. Meaning, Nature & Causes,

3.1.2. Steps in Grievance Procedure

3.2. **Collective Bargaining** –

3.2.1. Concept, Objectives, Importance & Need,

3.2.2. Process of Collective Bargaining,

3.2.3. Bargaining Strategies

3.2.4.Collective Bargaining in India & Qualities of Good Negotiator,

4. Introduction to labour welfare **(06)**

4.1. Meaning, Importance & Objectives of Labour Welfare.

4.2. Types of Labour Welfare Services,

4.3. Need and Scope of Labour Welfare in India,

4.4. Labour Welfare Officer- Concept, Qualities and Role

5. Workers' Participation in Management (WPM) & Employee Empowerment- **(08)**

5.1. **Workers' Participation in Management (WPM)** –

5.1.1. Definition, Meaning and Objectives,

5.1.2. Causes of Failure and Forms of WPM,

5.1.3. Essentials for Effective WPM

5.2. **Employee Empowerment—**

5.2.1. Concept, Importance and Need of Employee Empowerment,

5.2.2. Characteristics of Empowered Organization,

5.2.3. Empowerment Process

5.3. **Quality Circles-**

5.3.1.Concept, Objectives and Benefits of Quality Circles,

5.3.2.Organization Structure of Quality Circles

6. India & International Labour Organization **(04)**

6.1. Objectives, Structure of ILO

6.2. Impact of ILO on India Labour

6.3. Recommendations of ILO

REFERENCE BOOKS:

1. Industrial Relations Trade Union & Labour Legislations by PRN Sinha & Shekher – Pearson
2. Dynamics of Industrial Relations by C. B. Mamoria; Himalaya Publishing House
3. Essentials of HRM & IR by P Subba Rao – Himalaya
4. Industrial Relations by Arun Monappa – Tata McGraw Hill
5. Labour Welfare Trade Union & Industrial Relations by Punekar, Deodhar & Sankaran - Himalaya Publications
6. Human Resource Management by K. Ashwathappa – Tata McGraw Hill
7. Industrial Relations in India 2/e – Sen - Macmillan
8. Human Resource Management by S. S. Khanka; S. Chand & Co. Ltd. New Delhi.
9. Industrial Relations of Developing Economy by Bishwanath Ghosh- Himalaya

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

305-C: HUMAN CAPITAL MANAGEMENT AND DEVELOPMENT

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objectives:

- To understand the concept of Human Capital Management
- To study various testing concepts in selection process

1. Human Capital Management (HCM)- (08)

1.1. Concept of Human Capital & Its Origin
1.2. Definition, Aims, Rationale of HCM
1.3. HCM Vs HRM
1.4. Role of HR in HCM
1.5. Human Capital Advantage & Resource based Strategy
1.6. Applications of HCM- HCM & Talent Management, HCM & Strategic HRM, HCM & Knowledge Management

2. Human Resource Development (HRD)- (05)

2.1. Concept, Objectives & Scope of HRD
2.2. Need, Importance of HRD
2.3. HRD Framework

3. Basics of Job Analysis- (05)

3.1. Concept, Importance and Steps
3.2. Collecting Job Analysis Information
3.3. How to write Job Description- Job Identification, Job summary & Relation
3.4. How to write Job Specification for Trained & Untrained Persons, Its Methods

4. Employee Testing & Selection- (12)

4.1. Importance of Careful Selection of Employees
4.2. Testing Concepts-
4.2.1.Reliability and Validity-Way to Validate Test
4.2.2.Types of Tests- Tests of Cognitive Abilities, Tests of Physical Abilities, Personality and Interest Tests, Some other Tests-Honesty (Polygraph) Test, Graphology, Substance Abuse Screening, Test of Intelligence-IQ, Spiritual & Emotional Quotient, , Multiple Intelligences Test
4.3. Interviews-
4.3.1.Concept & Importance of Interviews
4.3.2.Types of Interviews- Structured Vs Unstructured, Exploratory, Directive, Telephonic, Video Conferencing, Stress Interview, Panel Interview, Peer Interview, Group Interview, Behavioral Event Interview (BEI), Situational Interviews
4.3.3.Designing of Effective Process
4.3.4.Best Practices for Effective Interview
4.3.5.Pitfalls of Interview Process
4.3.6.How to measure effectiveness of Selection

5. Developing Effectiveness of HR- (12)

5.1. Potential Appraisal- Concept, objectives and Importance
5.2. Training- Investments in Training, Aspects of Training
5.3. Training Process-
5.3.1.Need Assessment- Organizational Analysis, Task Analysis, Personal Analysis

5.3.2. Designing Training Program- Instructional Objectives, Trainee Readiness & Motivation, Principles of Learning & Teaching, Areas & Principles of Training, Characteristics of Good Instructor

5.3.3. Implementing Training Program- Methods

5.3.4. Evaluating Training Program- Essential Ingredients for Successful Evaluation, Evaluation Techniques- General Observations, HR Factors, Controlled Experimentation, Performance Tests, Cost Value Relationship, Training Metrics, Kirkpatrick Model

5.3.5. Benchmarking of HR Training

6. High potential Employees & Competency Management- (06)

6.1. High Potential Employees-

6.1.1.-Definition, Concept, Categories & Characteristics

6.1.2.-Identification of High Potential Employees

6.1.3.-Retention of High Potential Employees-Motivators, Retention Measures

6.2. Competency Management-

6.2.1. Concept & Types

6.2.2. Competency Framework- Competency Dictionary, Competency Band Matrix, Job/Role Competency Profile, Competency Assessment Tool

*** Note** - 1. The Practical Aspects of concepts in syllabus should also be discussed with students.

2. The formation of HR Policies for any small organization can be carried out from the students as an assignment work

Reference Books:

1. Human Capital Management-Angela Baron & Michael Armstrong, Kogan Page Publishers, 2007
2. Strategic Human capital Management-John Ingham, Butterworth- Heinemann, 2007
3. Human Resource Management, 2/E Gilmore & Williams- Oxford University Press
4. Human Resource Management-Sharon Pande & Swapnalekha Basak, Pearson
5. Essentials of Human Resource Management & Industrial Relations- P Subbaro, Himalya Publications, 2012
6. Managing Human Resource-Bohlander, Snell, Thomson-South Western, 2004
7. Human Resource Management- Gary Dessler & Biju Varkkey, Pearson Prentice Hall, 2009
8. Human Resource Management by Gary Dessler – Pearson
9. Human Resource Management by Snell Bohlander - Cengage
10. Cross Cultural Management by Madhavan Oxford University Press
11. Human Resource Management by Mondy - Pearson

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

306-C: Strategic Human Resource Management

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objectives:

- To study the integration of Strategy alongwith Human Resource Management
- To understand Employee engagement.
- To study HR as Strategic Value addition Function
- To study role of IT in Strategic HRM

1. **Strategic Human Resource Management** **(10)**
   - 1.1. Meaning, Definition of SHRM
   - 1.2. Strategic HR Vs Traditional HR
   - 1.3. Need & Importance of SHRM
   - 1.4. Steps in SHRM
   - 1.5. HR Strategies
     - 1.5.1.Overall HR Strategy
     - 1.5.2.Specific HR Strategy
   - 1.6. Barriers to Strategic HR 4
   - 1.7. Outsourcing & Revamping HR
   - 1.8. Role of HR during
     - 1.8.1.Organizational growth
     - 1.8.2.Retrenchment
     - 1.8.3.Organizational Turnaround
2. **Strategic Job Analysis, Job design & Redesigning of Work System** **(12)**
   - 2.1. Concept, Process & Method & uses of Job Analysis
   - 2.2. Concept of - Job Description, Job Specification & Job Design
   - 2.3. Modern Management Techniques
   - 2.4. Designing work systems
   - 2.5. Redesigning of work Systems
   - 2.6. Organizational Design Process & Emerging issues in Organizational Design
   - 2.7. Factors affecting Design Process
3. **Employee Engagement & Goal Setting** **(08)**
   - 3.1. **Employee Engagement**
     - 3.1.1.Meaning & Importance
     - 3.1.2.Factors influencing engagement
     - 3.1.3.Strategies for enhancing engagement
   - 3.2. **Goal Setting**
     - 3.2.1.Introduction ,
     - 3.2.2.Requirements of Goal setting procedure
     - 3.2.3.Relationship between Vision, Mission and Goal setting
     - 3.2.4.Approaches to Goal setting
     - 3.2.5.Process of Goal setting
     - 3.2.6.Characteristics of Goal setting (SMART)
4. **Global Competitiveness & Strategic HR** **(08)**
   - 4.1. Strategic Procurement: Strategic Recruitment, Strategic Selection

4.2. Strategic Challenges
  4.2.1. Managing Talent Surplus
  4.2.2. Managing Talent Shortage
4.3. Technology Challenges
4.4. Strategic Dimensions of Performance Appraisal
4.5. A Shift from Appraisal to Performance Management
4.6. Economic Value added
4.7. Organisational Appraisal- Balanced Scorecard (BSC)

5. Strategic HR & Information Technology **(06)**

5.1. Technologies Affecting HRM
5.2. Human Resource Innovations
5.3. Conventional HRM to Web Based HRM
5.4. Application Software for HR Practices

6. Developing HR as Strategic Value addition Function **(06)**

6.1. Gaining competitive Advantage through HR
6.2. HR as a Strategic Partner
6.3. The VRIO Framework
6.4. The changing role of HR
6.5. Future Challenges of HR
6.6. Economic Value Added

REFERENCE BOOKS:

1. Strategic Human Resource Management by Jeffrey Mello.- Pearson
2. Strategic Human Resource Management by Truss Et Al   Oxford University Press
3. Strategic Human Resource Management by Rajeesh Viswanathan – Himalaya
4. Strategic Human Resource Management by Armstrong – Kogan Page
5. Strategic Human Resource Management by Rajib Dhar – Excel Books
6. Strategic Human Resource Management by Greer - Pearson
7. Human Resource Strategy by Dreher & Dougherty – Tata Mcgraw Hill
8. Human Resource Management: A South Asian Perspective – Mathis, Jackson & Tripathy - Cengage
9. Managing Human Resources By Fisher- Cengage Learning

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

307C – Labour Laws

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objectives:

- To study various labour laws applicable to Indian industries
- To understand various benefits available under labour laws

1. Factories Act, 1948 **(06)**

1.1. Object & Definitions
1.2. Health Provisions
1.3. Safety Provisions
1.4. Welfare Provisions
1.5. Obligations of Worker & Occupier
1.6. Offences & Penalties

2. Minimum wages Act, 1948 **(04)**

2.1. Object, Applicability & definitions
2.2. fixation of minimum rate of wages
2.3. Procedure for fixing and revising minimum wage,
2.4. Offences & Penalties

3. Payment of wages Act, 1936 **(04)**

3.1. Object, Applicability & definitions
3.2. Time of payment of Wages.
3.3. Deductions from wages.
3.4. Obligations of Employers & Employees.

4. Payment of Bonus Act 1965 **(06)**

4.1. Object, Applicability & definitions
4.2. Calculation of Bonus,
4.3. Time limit for payment
4.4. Employees entitled to Bonus
4.5. Payment of min/max Bonus
4.6. Calculation of allocable surplus,
4.7. Set-on and set-off of allocable surplus

5. Workmen's Compensation Act, 1923. **(04)**

5.1. Object, Scope & definitions
5.2. Amount of Compensation
5.3. Obligations of Workmen & Employer
5.4. Distribution of Compensation
5.5. Occupational diseases
5.6. Penalties

6. Equal Remuneration act, 1976 **(06)**

6.1. Object & definitions
6.2. Duty of employer to pay equal remuneration to men and women workers for same work of a similar nature
6.3. No discrimination to be made while recruiting man & women workers
6.4. Advisory committee
6.5. Authorities for hearing and deciding claims & Complaints
6.6. Duty of employers to maintain registers
6.7. Power of inspectors

7. **Employees state insurance Act, 1948** **(03)**
    7.1. Object, definitions
    7.2. Obligations of Employers & Employees.
    7.3. Contribution
    7.4. Benefits to employees
8. **The employee Provident fund & Miscellaneous provisions Act, 1952** **(05)**
    8.1. Object, Applicability & definitions
    8.2. Employees' Provident Funds Scheme
    8.3. Employees' Family Pension Scheme,
    8.4. Employees' Deposit-linked Insurance Scheme,
    8.5. Determination of moneys due from employers,
    8.6. Special provisions relating to existing provident funds
    8.7. Transfer of accounts
    8.8. Obligations & Rights of employer & employees.
9. **Payment of Gratuity act, 1972** **(05)**
    9.1. Object & Definitions
    9.2. Payment of gratuity: Amount of Gratuity
    9.3. Nominations
    9.4. Compulsory Insurance
    9.5. Forfeiture, exemption
    9.6. Inspectors, Power of inspectors
    9.7. Obligations & Rights of employer & employees.
10. **Maternity Benefit Act, 1961** **(05)**
    10.1. Object, Applicability & definitions
    10.2. Right to payment of maternity benefit
    10.3. Forfeiture of maternity benefit
    10.4. Payment of maternity benefit in case of death of a woman
    10.5. Payment of medical bonus
    10.6. Leave for miscarriage
    10.7. Leave for illness arising out of pregnancy, delivery, premature birth of child, or miscarriage
    10.8. Nursing breaks

REFERENCE BOOKS:

1. Taxmann's Labour Laws – Taxmann publications
2. Industrial and Labour Laws – Saravanavel – Galgotia Publications
3. Elements of Merchantile Law by N.D.Kapoor – Sultan Chand & Sons
4. Industrial Relations, Trade Unions &Labour Legislation by PRN Sinha, InduSinha, SeemaShekhar – Pearson
5. Industrial Jurisprudence and Labour Legislation by A.M.Sharma – Himalaya Publications
6. Labour Laws for managers by B.D.Singh – Excel Books
7. Labour Laws – Bare Acts

Specialization – D – Operations & Materials Management

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

304 D – World Class Manufacturing & Process Management

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 50 hours

Objective:

1) Manufacturing Management **(04)**

a) Manufacturing activity scheduling
b) Manufacturing resource planning
c) Current Trends in Manufacturing in India

2) World Class Manufacturing **(08)**

a) Characteristic of Re-engineered process.
b) Managerial responsibility in globalization :
c) Software in use, Problems of implementation on the system.
d) Optimized Production Technology (OPT),
e) Automation in Design and manufacturing, Role of Robotics etc.
f) State of International Business – Managerial Attitude and Challenges.
g) Environment Pollution – Factors, Effect and Control.

3) Innovative Manufacturing System **(10)**

a) Lean Manufacturing: Concept, Tools & Techniques, Advantages And Disadvantages
b) Flexible Manufacturing System: Different production system of FMS & its Configuration
c) Group Technology: Concept & applications of GT
d) Cellular Manufacturing System: Concept
e) Agile Manufacturing: Concept
f) Computer Integrated Manufacturing (CIM) : Concept

4) Process Management **(10)**

a) Processes: Meaning, Types & Scope
b) Process planning and selection
c) Process design: Scope, Factors affecting and operation design
d) Major process decisions
e) Process analysis and process flow charts
f) Process Improvement: Methods – Kaizen Umbrella, Process Management tools
g) Process Management tools & Techniques: Design of Experiments (DOE), Taguchi Method, Quality Function Deployment (QFD), Single Minute Exchange of Die (SMED), Visual Control (VC)
h) Product Design Concepts: Design for manufacture (DFM), Design for Assembly (DFA), Design for Operations (DFO)

5) Maintenance Management **(06)**

a) Maintenance Function and Strategies
b) Maintenance economics
c) Spare Parts Management: Types of Spares & Inventory Planning for Spare Parts
d) Measurement of Maintenance performance:
   i) Total Productive Maintenance
   ii) Concept of Reliability, Reliability Improvement
   iii) Concept of Maintainability, Maintainability Improvement.

6) Management of Industrial Safety **(06)**

a) Safety Analysis
b) Safety programs and organization
c) Safety and productivity
d) Causes, problems and sources of industrial accidents
e) Theory of accident occurrences
f) Accident prevention and control
g) Investigation and Analysis of accident
h) Duties of plant supervisor and safety inspector
i) Welfare and safety

7) Technology Transfer **(04)**

a) Definition and Classifications
b) Channels of technology Flow
c) International Technology Transfer
d) Intra-firm Technology Transfer

REFERENCE BOOKS:

1. Operations Management by B Mahadevan – Pearson
2. Production and Operations Management by N.G. Nair – Tata McGraw Hill
3. Production & Operations Management by Upendra Kacharu – Excel Books
4. Global Management Solutions-Demystified – Seth, Rastogi – Thomson Press
5. Total Quality Management: Text & Cases – K Shridhara Bhat - Himalaya
6. Production and Materials Management by K. Shridhar Bhat –Himalaya
7. Management of Technology by Tarek Khalil - TMH
8. Production and Operation Management by Kanishka Bedi – Oxford
9. Operation management by Ray wild – Thomson
10. Production and Operation Management by Chunnawala Patel - Himalaya
11. Materials and Purchasing Management by S.A. Chunawala – Himalaya

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

305 D – MANAGEMENT OF TECHNOLOGY

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 50 hours

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1. Introduction to Technology Management: **(06)**

a) Concept and meaning of technology,
b) Evolution and growth of technology,
c) role and significance of management of technology,
d) Impact of technology on society and business,
e) Forms of technology: process technology and product technology.

2. Competitive advantages through new technologies: **(06)**

a) Product development – from scientific breakthrough to marketable product –
b) Role of Government in Technology Development.
c) Linkage between technology, development and competition,
d) Managing research and development (R&D),
e) Managing Intellectual Property.

2) **Technological Forecasting:** **(04)**

a) Exploratory: Intuitive, Extrapolation, Growth Curves,
b) Technology Monitoring, Normative: Relevance Tree, Morphological Analysis, Mission Flow Diagram

3) **Technology Assessment:** **(06)**

a) Technology Choice, Technological Leadership and Follower ship,
b) Technology Acquisition. Meaning of Innovation and creativity,
c) innovation management

4) **Technology strategy**: **(04)**

a) concept, types, key principles, framework for formulating technology strategy,
b) Technology forecasting: techniques and application.

5) **Technology diffusion and absorption**: **(06)**

a) Rate of Diffusion; Innovation Time and Innovation Cost, Speed of Diffusion.
b) Project management in adoption and implementation of new technologies.

6) **Technology Transfer Management**: **(06)**

a) Technology transfer-process;
b) outsourcing strategic issues; joint ventures,
c) Technology sourcing.

7) **Human Aspects in Technology Management:** **(05)**

a) Integration of People and Technology,
b) Organizational and Psychological Factors,
c) Organizational Structure.

8) **Social Issues in Technology Management:** **(05)**

a) Technological Change and Industrial Relations,
b) Technology Assessment and Environmental Impact Analysis.

305 D – MANAGEMENT OF TECHNOLOGY

REFERENCE BOOKS:

1) Management of Technology - Tarek Khalli - McGraw-Hill.
2) Managing Technology and Innovation for Competitive Advantage - V K Narayanan - Pearson Education Asia
3) Strategic Technology Management - Betz. F. - McGraw-Hill.
4) Strategic Management of Technological Innovation - Schilling - McGraw-Hill, 2nd ed.
5) Strategic Management of Technology & Innovation - Burgelman, R.A., M.A. Madique, and S.C. Wheelwright -. Irwin.
6) Handbook Of Technology Management - Gaynor - Mcgraw Hill
7) Managing New Technology Development - Souder, W.C. and C.M. Crawford - McGraw-Hill.
8) Managing Technological Innovation - Twiss, B. -. Pitman.
9) Bringing New technology To Market - Kathleen R Allen - Prentice Hall India
10) Management Of New Technologies For Global Competitiveness — Christian N Madu - Jaico Publishing House

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

306 D –Logistic & Supply Chain Management

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 50 hours

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1) Supply Chain Management **(15)**

a) Concept, Supply Chain Linkage
b) Mapping the supply chain
c) E-Business solution for supply chain
d) Supply chain Flows
e) Cycle View of Supply Chain
f) Process cycle time
g) Supply Chain Relationships: Supplier-Buyer relationship
h) Functional Strategies that impact SCM performance
i) Parameters for SCM Design
j) Information Functionality of Supply Chain
k) Principles of Supply chain Information
l) Information System activity
m) Technology Used in SCM

2) Logistic Management **(06)**

a) Definition, Objective Functions & Scope
b) Customer value chain
c) Logistical competence, competitiveness and competitive advances
d) Logistic for business excellence
e) Logistic solution
f) Role of Logistic in Supply Chain

3) Customer Service And Demand Management **(06)**

a) Relationship between customer and demand management
b) Customer service for competitiveness
c) Customer service phase
d) Service attributes
e) Customer service strategy
f) Value added logistical service

4) Logistic Planning And Strategy **(06)**

a) Hierarchy of planning
b) Relationship between logistic strategy and corporate strategy
c) The strategic logistic plan and audit
d) Logistic mission and objectives
e) Logistic Strategies & Formulation
f) Designing Logistical system

5) Logistic Mix **(15)**

a) Warehousing
   i) Concept & Functions
   ii) Warehouse Options

iii) Warehouse Site Selection & Layout Design
iv) Warehouse Costing
v) Warehousing Strategies
vi) Warehousing in India

b) Material Handling Systems
i) Role of Material Handling
ii) Material Handling Guidelines

c) Material Storage Systems
i) Concept
ii) Storage Principles
iii) Benefits of Storage Design
iv) Storage Methods

d) Transportation
i) Transportation Infrastructure
ii) Freight Management
iii) Factors influencing Freight cost
iv) Transportation Network
v) Route Planning
vi) Containerisation

e) Logistical Packaging
i) Consumer Vs Logistic Packaging
ii) Packaging as Unitisation
iii) Design Considerations
iv) Packaging Materials
v) Returnable Logistic Packaging
vi) Packaging Cost

f) Logistic Information system (LIS)
i) Logistic Information Needs
ii) Designing Logistic Information system
iii) Desired Characteristic of LIS

REFERENCE BOOKS:

1. Logistic Management by V.V.Sople- Pearson
2. Logistic & Supply chain management by K.Shridhara Bhat – Himalaya
3. Exploring the supply chain by Upendra kachru – Excel books
4. Supply Chain Logistics Management - Donald Bowersox , David Closs, M. Bixby Cooper – Tata McGraw Hill
5. Supply chain management by Janat Shah - Pearson
6. Logistical Management by Donald Bowersox , David Closs – Tata McGraw Hill
7. Supply chain management Concept and cases by Rahul V. Altekar - PHI

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

307 D –Operations Research

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 50 hours

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1) **Introduction to Operations Research** **(06)**
   a) Definitions, characteristic & Scope of Operations Research
   b) Role of Operations Research in Managerial D/M
   c) Role of Computers in OR
   d) Limitations of OR
2) **Transportation Model** **(06)**
   a) Formulation of Transportation Problem.
   b) Methods of Finding Initial Solution.
      i) North-West corner rule
      ii) Row Minima Method
      iii) Column Minima Method
      iv) Least Cost Method
      v) Vogel's Approximation Method
3) **Assignment Model** **(06)**
   a) Comparison with Transportation Model
   b) Formulation of Assignment Model
   c) Hungarian or reduced Matrix Method
4) **Theory of Games** **(10)**
   a) Competitive Games
   b) Terminology
   c) Rules for games theory
   d) 2X2 Games, 2X3 Games, 3X3 Games
5) **Sequencing Problem** **(06)**
   a) Processing n jobs through two machines
   b) Processing n jobs through three machines
   c) Processing Two jobs through m machines
6) **Replacement Decisions** **(06)**
   a) Replacement of Item Deteriorates with time
   b) Replacement of Item Whose Maintenance cost Increase with Time and value of Money
7) **Investment Analysis** **(08)**
   a) Break even analysis
   b) Payback Period Method
   c) Average Rate of Return Method
   d) Discounted Cash Flow Method

REFERENCE BOOKS:

1. Operations Research by V.K.Kapoor - Sultan Chand & Sons
2. Operations Research by D.S Heera & P.K.Gupta - S.Chand & Sons
3. Quantitative Techniques in Management by Vohra – Tata McGraw Hill Company
4. Operations Research by Natarajan - Pearson
5. Quantitative Techniques in Management by Jaishankar – Excel Books

Specialization – E – International Business Management

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: IV

Paper: 304 e – International Business

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objective:

- To develop a sound conceptual framework for understanding International business management
- To get in-depth knowledge on Theories of International Trade
- To be able to understand international trade strategies.

1. Introduction to International Business (IB) **(06)**

1.1. Concept of International Business
1.2. International Vs Domestic Business
1.3. Evolution, Development & Factors leading to Growth of IB
1.4. International Orientation
1.5. Globalization of Business Structure

2. Modes of International Business **(06)**

2.1. Determinants of Entry Mode
2.2. country-specific,
2.3. Industry-specific,
2.4. Firm-specific,
2.5. Project-specific
2.6. Entry Mode Selection & Choices
2.7. Trade Related
2.8. Contractual
2.9. Investment Based

3. Theories of International Trade **(06)**

3.1. Mercantilism
3.2. Theory of Absolute cost Advantage
3.3. Comparative cost Advantage Theory
3.4. Comparative cost Advantage Theory with Money
3.5. Country Similarity Theory
3.6. Global Strategic Rivalry Theory
3.7. Factor Proportions Theory
3.8. Product life Cycle Theory
3.9. Porter's National Competitive advantage Theory

4. International Business Environment **(08)**

4.1. Meaning of IB Environment, IB Environmental Factors
4.2. Socio-cultural & Ethical Environment
4.3. Economic Environment
4.4. Political Environment
4.5. Technological Environment

5. International Business Strategies **(12)**

5.1. Strategy: Role & Choices
5.2. Strategy formulation: Approaches, Spectrum, Levels
5.3. Planning, Organization & Control
5.4. International Marketing Strategy
5.5. International Investment & Financing Strategy
5.6. International HRM Strategies

6. **Global Trade & Investment** **(10)**
   6.1. World Trade Organization
      6.1.1. Establishment of WTO
   6.2. Organization Structure of WTO
   6.3. Anti Dumping Measures
   6.4. Dispute settlement Mechanism
   6.5. TRIMS & TRIPS
   6.6. WTO & India
   6.7. Conflict & Negotiations in IB
   6.8. Factors causing Conflict
   6.9. Host Country Vs Transnational Corporations
   6.10. International Negotiations
   6.11. Role of International agencies in Conflict resolution
   6.12. Foreign Direct Investment (FDI)
7. **Concept, Reasons & Trends in FDI**
8. **Costs, Benefits & Determinants in FDI**
9. **Theories of FDI**
   9.1. Industrial Organisation Theory
   9.2. Product Cycle Theory
   9.3. MacDougall-Kemp Hypothesis
   9.4. Location-specific Theory
10. **Foreign Direct Investment In India**

REFERENCE BOOKS:

1) International Business: K. Ashwathappa -Tata McGraw Hill
2) International Business–Hill & Jain –Tata McGraw Hill
3) International Business: concept Env. & Strategies– Vyuptakesh Sharan –Pearson
4) International Business: concept Env. & Strategies –Sumati Varma –Ane Books
5) International Business: Text & Cases –P. Subba Rao –Himalaya
6) International Business–Shajahan-Macmillan
7) International Business –Shyam Shukla–Excel Books
8) International Business Environemt & Management: V.K. Bhalla –Anmol Publications
9) International Business -O.P.Agrawal -Himalaya
10) International Business–Justine Paul–Prantice Hall

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: IV

Paper: 305 E-International Logistics and Supply Chain Management

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objective of the Course:

- To develop a sound conceptual framework for understanding International Logistics Management
- To get in-depth knowledge on Supply Chain Management
- To be able to plan global supply chain.

1. INTRODUCTION: [8]

1.1. International Logistics and Supply chain management: meaning and objectives,
1.2. importance in global economy ,
1.3. Characteristics of global supply chains,:
1.4. Supply chain relationship to business performance, -Key tasks of logistics and supply chain managers,
1.5. Role of Government in controlling international trade and its impact on Logistics and supply chain.

2. SUPPLY CHAIN STRATEGY: [8]

2.1. Supply chain as a competitive advantage,
2.2. Global Supply chain strategy,
2.3. Structuring supply chain capabilities,
2.4. Business matching supply chain design with business strategy.

3. TRANSPORTATION: [8]

3.1. Strategic importance of transport in global logistics,
3.2. logistical objectives of transport,
3.3. International Ocean Transportation,
3.4. International Air Transportation, and International Land Transportation:
  3.4.1.types, characteristics and salient features,
  3.4.2.intermodal transportation in international operations,
  3.4.3.factors influencing mode and carrier selection decision,

4. OUTSOURCING AND LOGISTICS SERVICE PROVIDERS [8]

4.1. Intermediaries and Alliances in Global Logistics,
4.2. Meaning of 3 PL and 4 PL service providers,
4.3. role in Global logistics,
4.4. Types of services, considerations for hiring 3PL and 4 PL service providers.
4.5. Concept and need of outsourcing,
4.6. determinants for outsourcing decisions,
4.7. role of outsourcing in global supply chain management

5. NETWORK DESIGN & INFORMATION TECHNLOGY IN SUPPLY CHAIN [8]

5.1. Decisions in Network design-strategic importance, location of plant, warehouse, Facilities; capacity and number of warehouses:
5.2. Factors influencing network design Decisions,
5.3. Role and Importance of IT in Supply Chain Management,
5.4. IT solutions for Supply Chain Management,
5.5. Supply Chain Information Technology in Practice.

6. PLANNING GLOBAL SUPPLY CHAIN [8]

6.1. Planning the global supply chain,
6.2. Network design for global supply chain management,

6.3. Risk management in the global context,
6.4. Measuring logistics cost and performance.
6.5. Benchmarking the supply chain,
6.6. Performance measurement and evaluation in global supply chains

REFERENCE BOOKS:

1. Douglas Long International Logistics: Global Supply Chain Management Springer- Verlag New York, LLC;2004
2. Logistics Management Ganpathi & Nandi Oxford University Press
3. Philippe-Pierre Dornier, Panos Kouvelis, Michel Fender Global Operations and Logistics: Text and Cases Wiley, John & Sons, Incorporated 1998
4. Alan Branch Global Supply Chain Management in International Logistics Routledge 2007
5. Kent N. Gourdin Global Logistics Management: A Competitive Advantage for the New Millennium Blackwell Publishing 2006
6. Sridhar R. Tayur (Editor), Michael J. Magazine (Editor), RAM Ganeshan (Editor)
7. Quantitative Models for Supply Chain Management Kluwer Academic Publishers 1998)

North Maharashtra University, Jalgaon

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: IV

Paper: 306 E- Export Import Management

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objective of the Course:

- To develop a sound conceptual framework for understanding Export and Import management.
- To get in-depth knowledge in various aspects of Exports and Imports
- To be able to understand procedures of Exports and Imports

1. **PRELIMINARIES FOR EXPORTS AND IMPORTS** (8)
   - 1.1. Meaning of exports and imports
   - 1.2. Effects of Exporting and Importing on Economy
   - 1.3. Classifications of goods for exports
   - 1.4. Strategy and preparations for exports
   - 1.5. Methods of exporting
   - 1.6. Export marketing organizations in India
   - 1.7. Liberalizations of imports
   - 1.8. Negative list for imports
   - 1.9. Special schemes for imports
2. **EXPORT PROCEDURE** (8)
   - 2.1. Registration stage
   - 2.2. Pre-shipment stage, shipment stage and post shipment stage
   - 2.3. Quality control and pre-shipment inspection
   - 2.4. Sales tax exemption
   - 2.5. Procedure for excise clearance
   - 2.6. Shipping and customs formalities
   - 2.7. Realization of export incentives
   - 2.8. Procedure for realization of export proceeds
3. **EXPORT DOCUMENTATIONS** (10)
   - 3.1. Aligned documentation systems (ADS)
   - 3.2. Proforma Invoice, Commercial Invoice
   - 3.3. Packaging list
   - 3.4. Mate's receipt
   - 3.5. Bill of lading
   - 3.6. Certificate of origin
   - 3.7. Shipping bill
   - 3.8. Consular invoice
   - 3.9. Bill of entry
   - 3.10. Airway bill
   - 3.11. GR Form
4. **IMPORT PLANNING** (6)
   - 4.1. Methods of Import Procurement – Global Tendering , Limited Tendering
   - 4.2. Negotiated Procurement
   - 4.3. Long-term Contracting
   - 4.4. Foreign Exchange Regulations Relating to Import
   - 4.5. Import finance – Instruments of financing, Related Procedures, Customs Clearance

5. **EXIM POLICY** (8)
    5.1. Objectives
    5.2. Facilities & Restrictions
    5.3. Significance of Exports & Imports to Nations Progress
    5.4. Export Potential of Services
    5.5. Export Potential of Select Commodities: Textiles, Agricultural Products, Marine Products, Floriculture, Readymade Garments, Engineering Goods, Leather Products, Gems & Jewelry Export Prospects in Various Countries.
6. **INSTITUTIONAL FRAMEWORK FOR FOREIGN TRADE** (8)
    6.1. Special Economic Zone(SEZ)
    6.2. Indian institute of packaging (IIP)
    6.3. Export promotion council(EPC)
    6.4. Export Oriented Units (EOU)
    6.5. Commodity Boards(CBs)
    6.6. Export Credit and Guarantee Corporation (ECGC)
    6.7. Federation of Indian Export Organizations(FIEO)
    6.8. Indian Trade Promotion Organization (ITPO)
    6.9. Indian Institute of Foreign Trade(IIFT)

REFERENCE BOOKS:

- Export Import Procedures and Documentation, Khuspat S Jain, Himalaya Publishing House
- Export Management, S.H. Nagalkar & M.A. Barhate, Sai Jyoti Publication
- Asin Kumar: Export – Import Management, Excel Publications. New Delhi
- Cherian and Parab : Export Marketing, Himalaya Publishing Houses, Delhi.
- Government of India, Handbook of Procedures, Import and Export Promotion, New Delhi
- Rathod, Rathore and Jani : International Marketing, Himalaya Publishing House, Delhi

North Maharashtra University, Jalgaon

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: IV

Paper: 307 E – International Finance and Forex Management

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objective:

- To develop a sound conceptual framework for understanding International Financial management
- To get in-depth knowledge on Forex Management
- To be able to understand international Tax and Monetary system

1. **Financial Management in a Global Context** (8)
    1.1. Nature, Scope, Dimension & Importance of International Finance
    1.2. Why Study International Finance
    1.3. Domestic Vs International Finance
    1.4. Recent changes in Global Financial markets
    1.5. Globalization & international Financial Management
    1.6. Emerging challenges & Responsibilities of finance Manager
2. **Exchange Rate determination & Forecasting** (8)
    2.1. Introduction
    2.2. Exchange Rate and interest rate volatility- A recent Experiencce
    2.3. Nominal, Real and Effective Exchange Rates
    2.4. Some Fundamental Equivalence relationship
    2.5. Structural models of Exchange Rate Determination
    2.6. Exchange Rate Forecasting and Need for it.
    2.7. Exchange Rate of Rupee
3. **International Monetary system** (8)
    3.1. Introduction
    3.2. Exhange rate regimes since 1973
    3.3. Bretton woods system of Exhange Rate
    3.4. International Monetary Fund (IMF)- Solution for financial crisis
    3.5. Economic and Monetary Union (EMU)
    3.6. Asian Development Bank
4. **Balance of Payments** (8)
    4.1. What is Balance of Payments
    4.2. Function Principles and Accounting of Balance of Payments
    4.3. Components of Balance of Payments
    4.4. Meaning of "Deficit" and "Surplus" in Balance of Payments
    4.5. Adjustments and Approaches to Adjustments
    4.6. Why Balance of Payments Statistics are important
    4.7. India's Balance of Payments
5. **Foreign Exchange Market** (8)
    5.1. Introduction
    5.2. Distinctive features
    5.3. Major Participants
    5.4. Spot Market
    5.5. Forward Markets
    5.6. Currency Futures

5.7. Currency Options

6. **International Taxation** (8)

6.1. Bases of International tax System

6.2. Types of Taxes

6.3. Tax havens

6.4. Modes of Doble Taxation Relief

6.5. International Tax Management Strategy

6.6. Indian Tax Scenario

7. **Field Work Suggested:-** Visit industries in your area which are involved in export business and Study the impact of the above factors on their business.

REFERENCE BOOKS:

1) International Finance Management by Thummuluri Siddaiah (IFM) - Pearson
2) International Finance Management by P. G. Apte - Tata McGraw Hill
3) International Finance Management by Vyuptakesh saran – Prentice Hall
4) International Finance by Maurice D. Levi - Routledge
5) International Finance Management by V.A. Avadhani – Himalaya Publishing House
6) International Finance Management by V.K Bhalla - Anmol Publications
7) International Finance Management by O.P.Agrawal and B K chaudhari- Himalaya Publishing House
8) International Finance Management by Cheol S. Eun & Bruce G Resnick , Tale McGraw Hill
9) International finance Marketing by N. R. Machiraju – Himalaya Publication
10) International Finance Management by K. Aswasthapa- Tata McGraw Hill

SPECIALISATION - F -AGRI- BUSINESS MANAGEMENT

MBA Job opportunities:

- Agricultural Manger
- Marketing Analyst
- Accounting manger
- Bioterrorism energy
- Alternative energy consultant
- Sales Manager
- Operation officer
- Credit Analyst
- Business Manger
- Manger-rural
- Manger-Business planning
- Commercial Executive –Crop care
- Investment Analyst –Food and Agriculture
- Sales Representatives
- Relationship Manager-Corporate and Retail Agriculture

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

304 F – Agro Business Management

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objectives:

- The course aims at providing students an exposure to the management practices in Agro Business Management.
- To train students in handling different issues related to Agro Business management.

1. Introduction to ABM **(06)**

1.1 Meaning, definition, history, Importance and scope of agri-business

1.2 Changing dimension of agricultural business

1.3 Agri-business Management-distinctive features, nature and components

1.4 F i v e Years Plans and agri-business, characteristics of plan

2. Advanced Food Processing **(14)**

2.1. Pesent scenario, scope and opportunities

2.2. Infrastructural Development

2.3. Constraints and policy initiatives

2.4. Value addition and waste utilization

2.5. Food plant hygiene

2.6. industry wise segmentation

2.6.1.Processed fruits & vegetables

2.6.2.Milk and milk products

2.6.3.Grain processing

2.6.4.Meat & Poultry processing

2.6.5.Fisheries, Marine Products

2.6.6.Packed/Convenience foods

2.6.7.Beverages

2.6.8.Regulatory measures

3. Agro-Processing Management **(16)**

3.1. Role of agro-processing industries in the Indian economy

3.2. Status and potential of Indian agro-processing industries. Food grains, commercial Crops.

3.3. Policy environment of agro-processing industries-Development, management

3.4. structure and communication.

3.5. Work performance efficiency, public contact and public participation in agro-

3.6. Processing industries

3.6.1.Decision making process and entrepreneurial efficiency

3.6.2.Government policies relating to agro processing unit

3.6.3.Interdependence of agro-processing industries,Problem of agro-processing units,

3.6.4.Guideline for financing of agro-processing industries in India

4. HRM in Agri Business Management **(06)**

4.1. Development of Human Resource in Agricultural Training

4.2. Importance of Human Resource in Agricultural

4.3. H. R. M. development program for Agribusiness

5. Emerging Trends in ABM **(06)**

5.1. Agro Tourism

5.2. Organic Farming

5.3. Contract Farming

5.4. Herbal Farming

REFERENCE BOOKS:

1. Dhondyal, S.P. Farm Management: An Economics Analysis. Friends Publications, 90, Krishnapur, Meerut - 250002
2. Johl, S.S. and T.R. Kapur. Fundamentals of Farm Business Management. Kalyani Publishers, 11 Rajendra Nagar, Ludhiana – 114008,P-475
3. Kahlon, A.S. and Karan Singh. Economics and Farm Management in India: Theory and Practice. Allied Publishers Pvt. Ltd. 15 JN Heredia Marg, Ballard Estate Mumbai-400038
4. Singh I.J. Elements of Farm Management Economics. Affiliated East West Press, Pvt. Ltd. New Delhi.
5. Srivastava, U.K. Vathsala. Agro-processing Strategy for Acceleration and Exports Oxford University Press,YMCA, Library Building, Jai Singh Road, New Delhi – 110001.
6. Rajagopal. Organizing Rural Business Policy Planning and Management. Sage Publication, New Delhi.
7. Pandey, Mukesh and Deepak Tiwari. Rural and Agricultural Marketing International Book Distribution Co. New Delhi.
8. Diwase, Smita. Agri-Business Management. Everest Publishing House, Everest Lane, 536, Shaniwar Peth, Appa Balwant Chowk, Pune – 4110030
9. Siva Rama, K., K. Ramesh and M. Gangadhar. Human Resource Management in AGRICULTURE. Disscovery Publication, New Delhi.
10. Talwar, Prakash, Travel and Tourism Management, Gyan Books Pvt. Ltd., Main Ansari Road, Darya Ganj, New Delhi- 110 002
11. Bagri, S.C. Trends in Tourism Promotion 2003. International Books Distributors, 9/3, Rajpur Road,Dehradun-248 001 Uttarakhand (India)

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

305 F –Management of Agro Industries

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objectives:

- The present course aims at familiarizing the participants with the concepts, tools and techniques of Management of Agro based industries so as to enable them to develop analytical and conceptual skills and the ability to handle the various situations.

1. Animal Production Management (10)

1.1. Scope of livestock in Indian economy
1.2. Livestock census and trend of livestock production
1.3. Terminology used in livestock care, poultry care and management of livestock and poultry i.e. calf, heifer, milking animal, dry animal, pregnant animal, draft animal and breeding bull.
1.4. Stress management. Housing of different livestock and poultry.
1.5. Routine farm management. Preparation of animal for different purposes
1.6. Various breeds of cattle, sheep, goat, buffalo and poultry
1.7. Nutrient requirement of livestock and poultry
1.8. Maintenance of records on livestock dairy and poultry farms
1.9. Animal health cover, structure of udder and letting down of milk, clean and hygienic milk production.
1.10. Reproductive systems of male and female, estrus cycle, pregnancy and parturition. Systems of breeding, artificial insemination

2. Value Addition in Animal Products (10)

2.1. Present status of dairy, poultry, meat, wool and hide industries in WTO regime. Milk composition of different species
2.2. Production, packing, marketing of milk, meat and their products
2.3. Import, export of animal and poultry products
2.4. Price regulation in animal products. Factors influencing price
2.5. Trends in marketing and utilization of animal products
2.6. Importance of hides and bones, quality standards and storage Market standards and regulation of animal products

3. Post – Harvest Technology of Horticultural Crops (12)

3.1. Importance and present status of post-harvest technology in horticultural crops in
3.2. India and Maharashtra. Maturity, harvesting and handling in relation to extended
3.3. shelf-life and storage quality of fruits, vegetables and flowers.
3.4. Methods of pre-cooling, grading, packaging, storage and transport of fruits, vegetables and flowers.
3.5. Importance and scope of fruits and vegetable preservation.
3.6. Selection of site for fruit and vegetable preservation unit. Principles and methods of preservation.
3.7. Preparation of jams, jellies, marmalades, squashes, juices, syrups, preserves, crystallized fruits, chutney, pickle and ketchups
3.8. Spoilage of processed products, Post-harvest management of cut flowers. Control of
3.9. Post-harvest diseases of important fruits and vegetables.

4. Bio-fertilizers and Mushroom Production (08)

4.1. Bio-fertilizers: Introduction, importance and definition
4.2. Type of bio-fertilizers, Economics of bio-fertilizer production
4.3. Mushroom: Introduction, importance and types of mushrooms. Requirements for mushrooms cultivation: different tools, equipment's, substrates and chemicals required for
4.4. commercial cultivation of mushroom.

5. **Technology in Agri-Business** **(08)**

5.1. Information Technology: meaning, role and importance in Agri business and Agriculture marketing.
5.2. Importance of Common Service Centers (CSC), Common issues of CSCs, Expert decision support system in Agriculture.
5.3. Information Technology for Agriculture Marketing.
5.4. Online market information, online market status in India.
5.5. Website on Agriculture marketing and export.
5.6. Role of private companies in online marketing – eChaupal, HLL Shakti, Quality control system.
5.7. Packaging, preservation and storage systems.

REFERENCE BOOKS:

1. Banerjee, G.C. Text Book of Animal Husbandry. Oxford and IBM Publishers, New Delhi.
2. Sashry, N.S.R.C.K. Thomas and R.A. Singh. Farm Animal Management and Poultry Production. NSR, Vikas Publishing House Pvt. Ltd. Delhi.
3. Hand Book of Animal Husbandry, ICAR, New Delhi.
4. Singh, R.A. Poultry Production. Publishers, New Delhi.
5. Maske, O Norton. Commercial Chicken Production. Manuel AVI Publishers, INC West Port.
6. Ling. E.R. Text Book and Dairy Chemistry. Chapman Hall Ltd., London
7. Pantastico, E.R.,B. Post Harvest Technology, Handling, Utilization of Tropical and Sub-tropical Fruits and Vegetables. The AVI Publishing Co., West-Post, Connecticut, USA.
8. Salunke, D.K. and Desai, B.B.Past Harvest Biotechnology of Vegetables. II CRC Press, Boca Raton, Florida.
9. Varma, L.R. and V.K.Joshi. Post Harvest Technology of Fruits and Vegetables, Vol. II. Indus Publishing Company, New Delhi-110027
10. Motsara I.M.R., P. Bhattacharyya and Beena Srivastava, Biofertilizer Technology, Marketing and Usage- A source Book – cum glossary, FDCO, New Delhi.
11. Bahl, N. Handbook on Mushrooms. Oxford and IBH Pub. Co.Pvt, Ltd, New Delhi.
12. Kapoor, J.N. Mushroom Cultivation. Sterling Pub. Co., New Delhi-16.
13. Recciuti, M.Database vendors hawk wares on Internet. Info World, 17-2, Jan 9,10.
14. Shah Jignesh. Commodity Future- Benefits start flowing in The Hindu Survey of Indian Industry.

North Maharashtra University, Jalgaon

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

306 F- Agri-Business Financial Management

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objectives:

To understand the perspective of financing agricultural operations and rural development in India and the current developments in this field.

1. Introduction to Agriculture Economics (08)

1.1. Meaning,-Need, importance, scope, importance of Agricultural in National Economy, Special characteristics of agriculture in Indian economy

1.2. Principles of agriculture finance, financial management for agribusiness.

1.3. Introduction-Accounting concepts,-Farm accounting,-Ratio analysis- Cash budget,Difference between Micro and Macro Economics, Basic terms and concepts used in economics.

1.4. Consumer behaviour and demand, law of diminishing marginal utility, consumer's surplus and application, Production and supply: Nature and factors of production, Short-run and long –run production function.

2. Structure & Dynamics of Indian Agricultural (10)

2.1. Place of Agricultural in National and International economy.

2.2. Pattern of agricultural holdings.

2.3. Agricultural productivity: Trends, causes and consequences of low productivity in India. Measuring efficiency in agricultural production, Economic efficiencies.

2.4. Theory of product choice; selection of optimal product combination.

2.5. Green revolution: Strategy in development of Indian agriculture.

3. Indian Agricultural Policies (16)

3.1. Meaning, types and importance of agricultural policies.

3.2. Evolution of agricultural policy.

3.3. Famine Commission Report.

3.4. Drought Prone area Programme (DPAP)

3.5. Nature and objectives of land reforms, Land Reform Policy.

3.6. National Insurance Policy.

3.7. Tenancy reforms, Crash Scheme for Rural Development.

3.8. National Rural Employment Assurance Programme & other recent Agricultural Development Programs.

4. Financial Management in Agri-Business (14)

4.1. Definition, Importance, Need of Agricultural Finance, Problems of agricultural credit in India, Requisites of good credit system.

4.2. Classification of credit and loan, Institutional agencies in agricultural credit, test of farm Credit proposal, tools of farm financial analysis, agricultural projects.

4.3. Traditional sources of finance for agriculture – issues, Significance of Co-op. Credit, Estimation of Agricultural Finance, Issues Theories of Agricultural Finance - Productive Vs. Consumption Credit Analysis, Kind Loans Vs. Cash Loans, Supervised Credit – Crop Loan – Cooperative credit, agricultural Finance in India.

4.4. Financial Institutions, Central banks - role of NABARD, RBI and developmental banks. Budgetary provision to agri-business, Agricultural subsidies Agricultural taxation, Agricultural finance-Problems and remedies.

Reference Books:

1. Indian Economy- S.K. Misra, V.K. Puri, Himalaya Publishing House.
2. Student Guide to Income Tax- Singhania, Taxman Publication
3. Indian Economy since Independence- Uma Kapila, Academic Foundation.
4. Banking Theory & Practice- Dr. P.K. Shrivastava, Himalaya Publishing House.
5. Direct Taxes- Singhania, Taxman Publication.
6. Beattie BR & Taylor CR. 1985. The Economics of Production. John Wiley & Sons.
7. Doll JP & Frank O. 1978. Production Economics - Theory and Applications.John Wiley & Sons.
8. Gardner BL & Rausser GC. 2001. Handbook of Agricultural Economics. Vol. I Agricultural Production. Elsevier. Heady EO. Economics of Agricultural Production and Resource Use. Prentice-Hall.
9. Sankayan PL. 1983. Introduction to Farm Management. Tata Mc Graw Hill.
10. Agricultural Finance In India – Theories and Practices, VB Jugale, Atlantic Publishers
11. Financing Agricultural industries – Long term loans – Need and estimation – Working Capital loans – Issues in managing Finance For Micro Finance – SHGs Bank linkages ,Insurance – Crop Insurance, Financing Agro exports.
12. Agricultural finance in India – the role of NABARD - Rajkumar K. – New Century Publications(208)

North Maharashtra University, Jalgaon

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

307 F- Agricultural marketing

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objectives:

- To understand and appreciate the concept of marketing strategy formulation and implementation in agricultural marketing.

1. Introduction to Agricultural Marketing (06)

1.1. Scope, concepts & objectives, Role of agricultural marketing
1.2. Differences in Agricultural & consumer marketing
1.3. Problems of Agri. Marketing: Traditional agri. Marketing and present status, suggestion for improvements.
1.4. Present status & problem in various marketing function, role of government in agricultural marketing, Standardization and Grading.

2. Retail Marketing (14)

2.1. Concept, types of retailers, supermarkets, factory outlets, hypermarkets
2.2. Non store retailing. Retailer- marketing decisions. Direct selling, one to one selling, multiple selling, direct marketing and multiple marketing.
2.3. Major types of retail organization, co-operative chain stores, voluntary chain, retailers and consumer cooperatives.
2.4. Packaging and Market Segmentation in Retail Marketing.
2.5. Store Management: Retail location, merchandising, using price to stimulate market sale.
2.6. Branding Strategy: Manufacturer's brand, private label, brand for a sale.
2.7. Trends in retailing, retailing strategies.
2.8. Impact of retailing on economy and society.
2.9. Understanding Supply Chain, Decision phases in Supply Chain, Drivers of Supply Chain Performance.
2.10. The Role of Transportation in a Supply Chain, Factors affecting transportation Decisions, tailored Transportation, Managing Demand in Supply Chain.

3. Promotion of Agri Products (10)

3.1. Basic Concept of Promotion, Fundamental of Advertising.
3.2. Market Analysis for Agri Products segmentation & Targeting
3.3. Concept of Direct marketing, Sales Management, Personal Selling & Salesmanship, Sales Related Marketing Policies.
3.4. Developing and implementing customer Relationships Management: Key concepts in Customer relationships, Customer loyalty, key principles of relationship management, framework for building CRM strategy in agriculture marketing, CRM Implementation.

4. Problems of Agricultural Marketing (10)

4.1. Standardization: Basis of standards, aims of standardization, significance of standardization, demerits of standardization.
4.2. Grading: A marketing function, Importance of grading in agriculture grading in India.
4.3. Study of Market Intelligence and Market Integration: Meaning, definition, types of market integration, market function, AGMARK, price trends, market information. Co-operative agricultural marketing and public agencies involved in agricultural marketing viz. FCI, NAFED, STC, etc.; Functions of price mechanism, Nature and supply of agricultural products, marketable and marketed surplus, Types and reasons for price movements and their effect on agricultural price stabilization and price support police.
4.4. Warehousing: State and Central Warehousing Corporations, objectives, functions, advantages, speculation, future trading and hedging. Hedging: Meaning, chief features of hedging, kinds, purpose, benefits and limitations of Hedging.

5. Trading of Agricultural Marketing **(08)**

5.1. Importance of agricultural commodities in agricultural marketing.
5.2. Marketing of cereals rice, wheat and jawar etc.
5.3. Marketing of pulses-mango, tur, gram, udid etc.
5.4. Average cost of processing wheat into wheat flour, paddy to rice, whole pulses in to split pulses, comparison of different rice milling methods
5.5. Marketing of mango, citrus and grapes etc.
5.6. Improving efficiency in commodity marketing, Role of co-operative and regulated market in commoditn marketing.
5.7. Marketing of commercial crops with special reference to all functions and price analysis
5.8. Commercial commodity Trading- cotton, sugarcane, grapes, banana, mango, cut flowers – roses, gerbera, gladiolus, etc. vegetables – cauliflower, tomato, potato, onion, ladies finger.

Reference Books:

1. Acharya, S.S. and N.L. Agrawal. -Agricultural Marketing in India.- Oxford and IBM Publishing Company Pvt. Ltd., 66 Janpath, New Delhi-110001.
2. Gupta, A.P. - Marketing of Agricultural Produce in India. - Vora and Company Publishers Pvt, Ltd., 3, Round Building, Kalbadevi, Mumbai-400002
3. Mamoria C.B. and R.L. Joshi.- Principles and Practice of Marketing in India. -Kitab Mahal, 15, Thorn hill Road, Allahabad.
4. Philip Kotler.- Marketing Management.- Pearson Education Publishers, New Delhi.
5. Panvar, J.S.Beyond - Consumer Marketing. - Response Books, Sage Publications, New Delhi.
6. Pandey, Mukesh and Deepak Tiwari.- Rural and Agricultural Marketing.- International Book Distribution Co., New Delhi.
7. Swapna Pradhan.- Retail Management – Tata McGraw Hill
8. Acharya, S.S. and N.L. Agrawal. - Agricultural Marketing in India. - Oxford and IBH Publishing Company Pvt., Ltd., 66, Janpath, New Delhi 110001
9. Mamoria, C.B. and R.L. Joshi. - Principles and practice of Marketing in India. - Kitab Mahal,15, Thorn hill Road, Allahbad.
10. Sunil Chopra, Peter Meindl,- Supply Chain Management.- Prentice Hall Publication
11. Panvar, J.S. Beyond - Consumer Marketing. - Response Books Sage Publications, New Delhi.
12. S. A. Chunawala,-Advertising, Sales and Promotion Management- Himalaya Publishing House
13. Customer relationship Management –A strategy approach to marketing by Kaushik Mukerjee , Prentice Hall India.

Specialization – G - Information Technology & Systems Management

Employability Opportunities for MBA in Information Technology & Systems Management Specialization Students

Students who have a desire to take control of technology transformations and gain a thorough understanding of business factors, IT networking, and specialized databases should consider pursuing this Specialization. This specialization can teach students the necessary skills to lead organizations in strategic decision-making regarding systems, database administration, telecommunications, and internet technologies.

MBA in Information Technology & Systems Management offers students the opportunity to study critical business and management skills, database management, and business application of these principles. Courses centre on IS principles, analysis, and design while also focusing on project and change management and networking communications. Most programs are tailored toward developing graduates that are leaders in the IS industry.

MBA students specializing in Information Technology & Systems Management can perform the following broad roles within an organization:

1. **Software Developers:**
   This job name broadly describes those information technology professionals who design computer programs, applications and operating systems.
2. **Information security analyst:**
   These analysts monitor and protect an organization's computer network and systems. According to the BLS, prior experience in a related field is usually a prerequisite, and companies prefer to hire those with an MBA.
3. **Management analyst:**
   In this field, you'll provide feedback on improving an organization's efficiency and profitability.
4. **Systems Analyst:**
   Systems analysts are responsible for the complete life-cycle of a new/modified IT system, from analysing existing arrangements to implementing systems and providing training, Addressing Information systems issues & developing Systems.
5. **IT Entrepreneur:**
   Students are able to start their own Software Project Development firm.
6. **Information Technology Consultant :**
   Information technology consultants provide analysis, advice and solutions for organizations that need to develop or improve their communication, data or software systems. They can also provide training for current employees. Job duties of IT business consultants vary by industry and specialty, but generally include performance assessments of a business' existing systems, strategic planning and implementation of the new system or process.
7. **IT Administrative Officer:**
   This job includes investigating and diagnosing network problems, collecting IT usage stats, making recommendations for improving the company's IT systems and carrying out routine configuration and installation of IT solutions.
8. **Network Administrator**
   To monitor computer networks for security threats or unauthorized users. To identify compromised machines and report on security measures taken to address threats. He also needs to analyze security risks and develop response procedures. Additional duties may include developing and testing software deployment tools, firewalls and intrusion detection systems.
9. **E-commerce Development :**
   Expand their business over internet & become a part of E-Commerce, E-business & E-World.
10. **Database Manager:**

Database Manager works closely with the teams who need to use the data and manage a database administrator or a team of database administrators to help you with the work.

The Job involves modeling and designing databases. This means database Manager spend a lot of time working with users to find out what information they need to use, how frequently, what categories they need to split it by and what would make it easy to use. Once database is built, it needs to test thoroughly by database manager.

11. Cyber Security Analyst

Cyber Security analysts assess and mitigate risk while enhancing system security. They are typically responsible for identifying and patching any security weaknesses they may find and making recommendations for security hardware and software. The Analyst is often tasked with establishing information security policies and procedures, as well as reviewing violations to help prevent future occurrences. Cyber Security analysts have to regulate access to computer files, develop firewalls, perform risk assessments and test data processing systems to verify security measures.

the firm's policies and practices. Lead digital forensic and cybercrime response efforts. Liaise with client representatives.

12. MIS Manager:

An MIS manager who is employed by an organization plans computer-related work for organizations and develops and implements new technologies for more efficient business processes. ; directs the work of technology professionals; analyzes business technology needs; works with top management to discuss and determine technology projects needed for the business; hires, manages and developed technology staff; develops technology policies and procedures within the organization; oversees purchases and maintenance of office computer equipment and peripherals; acts as a technology consultant to business managers; performs gap analysis to determine required changes to core systems of the organization; creates test scenarios; conducts testing efforts; designs and documents combined solutions; and supervises and delegates work to other IT staff members.

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

Paper: 304G: EMERGING TRENDS IN INFORMATION TECHNOLOGY

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objective:

- To gain the basic knowledge of emerging trends in Information technology.
- To understand the changing scenario of business
- To understand the diversifying need of customer & make utilization of same for expanding the scope of business.

1. Overview of an E – Commerce **(8)**

1.1. Definition of ecommerce, Essential of E-commerce, Goals of E- Commerce
1.2. Difference between E-Commerce and Traditional Commerce,
1.3. Limitations and Advantages of E-Commerce, Scope of E-commerce

2. E-Business **(8)**

2.1. Definition-E-business,
2.2. Characteristics of E-business,
2.3. E-business Roles & their Challenges,
2.4. E-business Requirements, Impact of E-business,
2.5. Inhibitors of E-Business,
2.6. Case study of Amazon.com & Flip cart

3. **E-Banking** **(8)**

3.1. Transactions: Inter Banking, Intra Banking, Electronic Payments, Payment
3.1. Gateway, Securities in E-banking -SSL, Digital Signatures
3.2. Services Provided: ATM, Smart Card, Micro payment, E-cash, Electronic Fund Transfer,
3.3. ECS (Electronic Clearing System) e.g. Telephone, Electricity Bills
3.4. Case study based on E-banking services provided by National & International Banks

4. E- Security **(8)**

4.1. Type of cyber-attacks, Intruders-hacking, cracking, freaking,
4.2. Types of Securities, Security Tools,
4.3. Network Security,
4.4. Security Protection & Recovery,
4.5. Cryptography and Digital Certificates.

5. **E – Governance:** **(8)**

5.1. Concept of E-Governance,
5.2. E –Governance Models: (G2B, G2C, C2G, G2G),
5.3. Challenges to E – Governance,
5.4. Strategies and tactics for implementation of E – Governance,
5.5. Case Study of E-Governance services like UAN etc.

6. **E-CRM** **(8)**

6.1. Definition e-CRM, Need of e-CRM,
6.2. Framework of e-CRM, Features of e-CRM,
6.3. Various stages in evolution of e-CRM,
6.4. Six e's of e-CRM, CRM Vs E-CRM,
6.5. Architecture of e-CRM,
6.6. mobile applications
6.7. Case study of Dell & HP for E-CRM

REFERENCE BOOKS:

1. Management Information System: Jawadekar- TMH
2. Management Information System: Laudon & Laudon
3. E – Commerce: Bhaskar - TMH

4. The Essential Guide to Knowledge management: Amrit Tiwana
5. Electronic Commerce: Elias M. Awad, Pearson Education
6. E – Commerce: Milind Oka
7. Fire Wall and Internet Security: William Cheswick, Stevens, Aviel Rubin
8. E-Governance Case Studies – Ashok Agarwal
9. E-commerce – C. S. V. Murthy
10. E-Business: Michael P. Papazoglou, Wiley-India Education
11. E-Commerce: David Whiteley

North Maharashtra University, Jalgaon

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

Paper: 305G: RDBMS USING ORACLE 8i

60 + 40 Pattern: External Marks 60 +Internal Marks (20 Marks Theory+ 20 Marks Practical=40 Marks) = Maximum Total Marks: 100

Required Lectures: 48 hours (30 Hours Theory + 18 Hours Practical)

Objectives:

- To understand the flow of data & how data is organized & manipulated.
- To provide basic understanding for retrieving data according to required format.
- To learn the accessibility of data for different users.

-

1. Introduction **(3)**

1.1. Limitation of File Processing System
1.2. Advantages and limitations of RDBMS
1.3. Applications of RDBMS
1.4. Modelling Techniques
  1.4.1.Different Types of Database Models,
  1.4.2.Relational Model,
  1.4.3.Hierarchical Model,
  1.4.4.Network Model,
  1.4.5.E-R Model

2. Normalization **(3)**

2.1. Normalization Introduction,
2.2. Advantages and disadvantages of Normalization;
2.3. 1NF-2NF-3NF rules with examples;
2.4. Anomalies,
2.5. Denormalization

3. Data Types & SQL Functions- **(4)**

3.1. Numeric - abs(),ceil(),MOD, floor(), Round(), Trunc() etc
3.2. Aggregate –avg(), count(), min(), Max(), Sum() etc.
3.3. Character-char(),ltrim(), rtrim(), Upper(), LCase(), Concat() etc
3.4. Date - sysdate(), Curdate(), Hour(), LastDay(), Month() etc

4. SQL Statements **(12)**

4.1. Type of SQL Statements, Structure of SQL statement(create, alter, delete, update, modify, Insert, select)
4.2. Constraints- Primary key, Unique key, Foreign Key, Alternate Key, NULL, NOT NULL, Check Constraint
4.3. Operator Used-IN, Between, AND, OR, IS NULL, NOT NULL, Join- Natural Join/Equal, Self Join, Left/Right/Both Join, Cross Join
4.4. Queries: Simple queries, Sub queries, Nested Queries,

5. Views & Sequence **(4)**

5.1. Create View, Types of View(Simple, Complex, Updatable, Predicate View),
5.2. Queries based on View & Join
5.3. Sequence- Create, alter, Drop Sequence, Use of Sequence

6. Database Trigger & Stored Procedures **(4)**

6.1. Trigger-Types, Enabling, Disabling, Create, Drop, Predicates- Inserting, Updating, Deleting
6.2. Stored Procedure- Definition, Implementation & Execution

REFERENCE BOOKS:

1. Mastering Database Technologies- Ivan Bayross
2. SQL by Scott Urman
3. Oracle 8- William G. Page Jr. and Nathan Hughes
4. Database System Concepts- Silberschatz,Korth, Sudarshan

Practical List

1) Create Database, table using data types(Create, Modify, Delete, Drop)
2) Write SQL queries to implement Insert, Delete, Update, Alter statement
3) Write SQL queries to apply table level & Column Level Constraints like Primary key, Foreign Key, Unique Key, Check, NULL, NOT NULL, Default
4) Write a SQL queries to use select statement with the use of different Clauses like Where, Group By, Order by, Having, Distinct
5) Write a SQL queries to implement different Functions Numeric, Aggregate, Character & Date
6) Write a SQL to demonstrate different Sub queries & Nested Queries.
7) Write a SQL queries to demonstrate different types of Joins.
8) Write SQL queries to perform different operation on View.

North Maharashtra University, Jalgaon

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

Paper: 306G: OBJECT ORIENTED PROGRAMMING USING C++

60 + 40 Pattern: External Marks 60 +Internal Marks (20 Marks Theory+20 Marks Practical= 40 Marks) =Maximum Total Marks: 100

Required Lectures: 48 hours (30 Hours Theory + 18 Hours Practical)

Objectives:

- To gain the basic knowledge of programming language & build logical thinking.
- To understand the behavior of real life entities through practicality.
- To gain the knowledge or different structure.

1. **Introduction & moving from C to C++** **(6)**
   Difference between Structures oriented & Object oriented programming language, Advantages of C++, Structure of C++ Program, Single & Multi line Comment, Literals- Constant Qualifier, Variables, Data types in C++, Type Conversion, Array, Strings.
2. **Operators & Expression** **(6)**
   Character Set, Operators, Types of Operators (Arithmetic operators, Relational Operator, Logical Operator, Bitwise Operator, and Increment & Decrement Operators), and Operator Precedence & Associativity.
3. **C++ At a Glance** **(4)**
   Introduction, Data Encapsulation & Abstraction-Classes, Inheritance- Base & Derived Class, Polymorphism- Operator & Function Overloading, Friend Function. Control flow statement-If-else, nested if- else, for loop, while loop, do…while loop, Switch statement, goto statement, and break Statement.
4. **C++ Structure & Inheritance** **(6)**
   Difference between Structure & C++ Program, C++ Program Structure, Visibility Mode, Access Specifier scope, Concept-Inheritance, Types- Simple, Multiple, Multilevel, Hybrid Inheritance
5. **Constructor & Destructor** **(4)**
   Introduction, Types of Constructor (Default, Parameterized & Copy Constructor), Constructor Overloading, Destructor
6. **Exception Handling** **(4)**
   Introduction, Basics of Exception Handling, Types of Exception Handling, Exception Handling Mechanism (Try, Throw & Catch).

REFERENCE BOOKS:

1. Object oriented programming with C++ : E. Balagurusamy, 3rd Edition
2. Mastering C++: K. R. Venugopal, Rajkumar, T. Ravishankar.
3. The Complete Reference C++: Herbert Schildt, 4th Edition
4. C++ By Example under C Learning: Steve Donovan
5. Let us C++: S. Jaiswal, Galgotia Publication
6. Let us C++: Yashwant Kanetkar

PRACTICAL LIST

1. Write a C++ program to demonstrate use of operators(Arithmetic, Logical, Relational, Bitwise, Increment & decrement)
2. Write a C++ program to demonstrate use of if…else, nested if else
3. Write a C++ Program to demonstrate use of FOR, While & Do….While Loop.
4. Write a C++ program to demonstrate use of array.
5. Write a C++ Program to demonstrate use of encapsulation.
6. Write a C++ program to demonstrate use of different types of Inheritance.
7. Write a C++ program to demonstrate Function & Operator Overloading.
8. Write a C++ program to demonstrate use of Friend Function.
9. Write a C++ program to demonstrate different types of Constructor & destructor.
10. Write a C++ Program to demonstrate use of exception handling.

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

Paper: 307G: SYSTEM ANALYSIS & DESIGN

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours (50 Hours Theory)

Objective of Course:

- Plan and organize an information systems development project.
- Apply system analysis and design techniques to define and document information system requirements
- Apply systems analysis and design techniques to develop object-oriented models (UML diagrams) of information systems
- Evaluate models of an information system

1. **System Concept:** **(6)**
   - 1.1. Definitions, Types of Systems, Characteristics and elements of System
   - 1.2. Role of Software Engineer/Analysts/Users in the various phases of Systems
   - 1.3. Development Life Cycle
2. **General phases of Systems Development Life Cycle:** **(12)**
   - 2.1. Feasibility Study, Requirements Capture, Detailed Systems Analysis, Systems Design,
   - 2.2. Testing, On-site Implementation and Maintenance, Fact Finding Methods
3. **Different Approaches to Software Development** **(10)**
   - 3.1. Waterfall Model, Spiral Model, Prototyping, RAD, Object Oriented
4. **Process & Data Modeling** – **(6)**
   - 4.1. Data Flow Diagrams; Concept of Object Oriented Modeling
   - 4.2. Data Modeling - Entity Relationship Diagrams
5. **Database Design:** **(8)**
   - 5.1. Normalization Technique for Database Design; De-normalization
6. **System Documentation Techniques:** **(2)**
   - 6.1. System Flow Charts; Functional Decomposition
   - 6.2. Diagrams; Structured Flow Charts (N-S Diagrams)
7. **Logic Representation Techniques**: **(2)**
   - 7.1. Decision Trees;
   - 7.2. Decision Tables;
   - 7.3. Pseudo code and Structured English
8. **Users Interface Design**: **(2)**
   - 8.1. Menu, Screen and Report Layout Designing
   - 8.2. Introduction to Computer Aided Software Engineering (CASE)

REFERENCE BOOKS:

1. Analysis and Design of Information System 2nd Ed. - Senn
2. Software Engineering Practitioner's Approach - Roger Pressman
3. Introduction to Systems Analysis and Design - Hawryszkiwycz
4. Systems Analysis and Design - Elias Awad
5. Introducing Systems Analysis and Design - Lee
6. Systems Analysis and Design - Perry Edwards
7. Software Engineering Concepts – Fairley
8. Software Engineering – K.K.Agrawal

Specialization –H– Retail Management

North Maharashtra University, Jalgaon

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

Paper: 304 H :Introduction to Retail Management

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objectives:

- To understand the scenario of Retailing.
- To get in depth knowledge of Retail and functions of Retailing.
- To be able to understand the recent trends in Retailing.

1. Fundamentals of Retailing **(12)**

1.1. Retailing:

1.1.1.Concepts of Retail, Retailing & Retail Management
1.1.2.Types and functions of Retailers
1.1.3.Characteristics, Role, Importance, functionsand Principlesof Retailing
1.1.4.Evolution of retailing in India- Growth, Reasons for growth,
1.1.5.Emerging trends in retailing - New approaches in Retailing
1.1.6.Indian Vs Global Scenario and careers in retailing
1.1.7.Concept of value chain in retail, Services retailing, ethical issues in retailing.

1.2. Retailing Formats

1.2.1.Store-based (1) By Ownership, (2) On the basis of Merchandise: Food-based & General Merchandise-based
1.2.2.Non Store-based : Traditional & Non-Traditional
1.2.3.Organized vs Un-organized Retailing

2. Retail Location, Design and Layout **(08)**

2.1. Factors affecting retail location decision-Site selection-Location based retail strategies,Store design-Interiors & exteriors.
2.2. Store layout – Types of layouts – Factors affecting store layout – Retailing image mix:(employees, merchandise, fixtures, sound, odor, visual, etc.) Effective Retail Space Management
2.3. Live Exercise –To visit and observe any retail Supermarket from view point of location, store layout, merchandise arrangement and space utilization followed by group discussion in class room.

3. **Managing a Retail Business-** **(06)**

3.1. Human Resource Management in Retailing:
3.2. Significance of Human resources in retail,Gaining competitive advantage through HRM, Designing retail organization structure, Motivating retail employees.
3.3. Retail store operations-Functional areas of retail operations, store operating parameters,strategic resource model in retailing
3.4. Theories of Retail Development: Environmental Theory, Cyclical Theory and Conflict Theory.

4. Merchandise Management **(12)**

4.1. Basics of Retail Merchandising: Meaning, Evolution
4.2. Factors affecting buying functions
4.3. Roles & Responsibilities of Merchandiser & Buyer
4.4. Buying for a single store, chain store &Non store retailers
4.5. Lifestyle merchandising
4.6. Merchandising Planning: Concept and Process of Merchandising Planning
4.7. Developing Sales forecast
4.8. Determining Merchandising requirements
4.9. Merchandising Control & Assortment planning

4.10. Evaluation of Merchandise performance
4.11. Retail pricing: concepts & elements
4.12. Determining price, ii) Retail Pricing policies/ Strategies

5. Private Labels in Retailing **(05)**

5.1. Concept,Importance, evolution of private labeling in retail.
5.2. Role of private labels, current scenario in India
5.3. Factors influencing private labels development, promotion of private labels
5.4. Transition of private labels to store brands
5.5. Theory of retail incubation and propagation

6. Rural retailing &Legislation for Retailing **(05)**

6.1. Concept, opportunities and challenges in rural retailing.
6.2. Regulations and Policies for the rural retailing
6.3. Regulations to promote healthy retail competition, product related regulations.
6.4. Legal compliances in store operations
6.5. Taxation and its impact on retailing
6.6. Live Exercise- Students shall study various rural retail projects like Hariyaali Kisaan Bazaar, Project Shakti, e-choupal, Kisanseva kendra etc. followed by class room presentations.

REFERENCE BOOKS:

1. Retail Management: Swapna Pradhan – Tata Mcgraw Hill
2. Retail Management by Berman& Evans - Pearson
3. Retail Management: Suja Nair, First Edition 2006
4. Retail Management: A global Perspective: Dr. Harjeet Singh – S. Chand & Sons
5. Retail Management by Areef Sheikh &Kaneez Fatima
6. Retail Management by Bajaj, Tuli & Srivastava
7. Retail Management - Functional Principles & Practices by Gibson G.Vedamani, Jaico publishing house
8. Fundamentals of retailing by K.V.S.Madan, Tata Mcgraw Hill Publications

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

Paper: 305 H – Retail Promotion & Consumer Behavior

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objective:

- To know the Retail promotion and advertising strategy.
- To provide essential knowledge of core concepts like market segmentation, customer loyalty, Consumer behavior.
- To prepare students to undertake practical assignments and live projects in various retail stores.

1. <u>Retail Promotion Strategy</u> – **(8)**

1.1. Advertising sales promotion and publicity
1.2. Communication and stages of Models of Communication: what is communication, types of communication, important issues for consideration
1.3. Deciding objective of sales promotion
1.4. determining budget and allocation of budget
1.5. Implement promotional plans and evaluate implementation programs
1.6. Live assignment: visiting D-mart and Big bazaar in the festive season to understand the different retail promotional strategies

2. <u>Advertising, Sales Promotion and Publicity</u> **(12)**

2.1. Developing plans for advertising
2.2. When to advertise, what to advertise, where to advertise and how to advertise
2.3. Sales promotion by vendor originated and retailer originated
2.4. Planning of promotional events & Limitations and benefits of promotional events
2.5. Ways to effective publicity and Dos and don'ts of effective publicity
2.6. Live assignment: analyzing list of advertising as per the products and brands available in the Retail store

3. <u>Retail Promotional Strategy</u>— **(8)**

3.1. Store atmosphere and personal selling
3.2. Display as promotional tool: window display, interior display
3.3. How display affects the sales
3.4. Types of retail selling :Personal selling
3.5. Competencies, common errors of personal selling cause poor performance
3.6. Ideal selling: evaluate sales performance
3.7. Importance of CRM and personal selling

4. **<u>Retailing Strategy</u>** **(4)**

4.1. Store image and target customer
4.2. Sustainable competitive advantage
4.3. Customer loyalty, vendor relation, location and low cost operations

5. **<u>Market segmentation and growth strategy</u>** **(6)**

5.1. Establishing retail mix: components of retail mix

5.2. Market penetration, market expansion and diversification
5.3. Retail mix scales: innovative strategies, coordinate efforts, avoid diffusion

6. **Retail Consumer Behavior** **(10)**
6.1. Major factors influencing buying behavior : cultural, social, personal, psychological
6.2. Purchase decision: basis of purchasing parameters and inducing factors
6.3. Customers buying behavior: complex, dissonance reducing, variety seeking, habitual
6.4. The buying decision process- a model: problem recognition, information search, Post purchase behavior
6.5. Live assignments: collecting data from the students actually filled at retail store for buying behavior and understanding the different factors influencing buying behavior

REFERENCE BOOKS:

1. Retail Management: Arif Shaikh and Kaneez Fatima, Himalaya Publishing
2. Retail Management: Swapna Pradhan – Tata McGraw Hill
3. Consumer Behavior and Text and Cases, Satish K.Batra, Excel Book
4. Consumer Behavior Building Marketing Strategy, Hawkins, Mc.Graw Hill
5. Consumer Behavior, Solomon, Pearson Publication
6. Marketing Management, (Kotler, Koshy, Keller, Jha), Pearson Publication

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

Paper: 306 H –Retail Supply Chain Management

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objective:

- To understand the fundamental of supply chain.
- To get acquainted about Retail logistics.
- To provide knowledge of Retail distribution channels.

1. Fundamentals of Supply Chain **(06)**

1.1. Meaning and importance of Supply Chain
1.2. How Retail Supply Chain is Different from Manufacturing Supply Chain
1.3. Aligning the Supply Chain with Business Strategy.
1.4. Supply Chain Linkages
1.5. Decision phases in supply chain
1.6. Supply chain flows
1.7. Cycle view of supply chain
1.8. Drivers of retail supply chain

2. Retail Distribution Channels- **(08)**

2.1. Participants in the Distribution Channel,Need for distribution Channel and Types of Channels
2.2. Channel relationships-
2.2.1. Retail supplier relationship management- retail sourcing, merchandise procurement, global Sourcing, and sourcing measures.
2.3. Retail customer relationship management- Introduction, customer service, order management,
2.4. Retail loyalty programmes, retail kiosks and Green retailing – what it means to CRM, measures of Retail CRM.
2.5. Direct Store Delivery (DSD), Managing Retail Home Delivery.
2.6. Live Exercise-Students shall visit the office of a manufacturer/marketer of any consumer/industrial
2.7. goods and discuss the distribution channels used by them in order to make their product available to the buyers/ customers.

3. Managing Retail Logistics- **(12)**

3.1. Introduction to retail logistics management – Elements of retail logistics, Retail logistics structure,Importance and Retail logistics trends.
3.2. Retail Transport-Transportation Infrastructure, Freight Management, Freight Costs, Transportation Networks, Route Planning, Containerization.
3.3. Retail Warehousing-Warehousing Functions, Consolidation, Warehouse Site Selection, Size, Layout, Warehouse Costing, Warehousing Strategies, Virtual Warehouses, Cold Chain Infrastructure.
3.4. Retail returns and reverse logistics-challenge of product returns, scope of reverse logistics, system design for reverse logistics, reverse logistics – a competitive tool
3.5. Logistics Outsourcing-
3.6. Drivers of Outsourcing Trend, Benefits of Outsourcing, Third Party & Fourth Logistics, Selection of Service Provider, Value Added Services, Service Contracts.

4. Category and Format Specific Supply Chain Issues- **(08)**

4.1. Food and Grocery Retailing Supply Chain- Food and Grocery Retailing, Food and Grocery Supply Chain Characteristics, Fresh Fruit and Vegetable Supply Chain, Managing the Cold Chain, Dairy Retailing, Technology Requirements for Food and Grocery Retailing

4.2. Apparel and Footwear Retailing Supply Chain-Understanding the Segment, Apparel Retailing Supply Chain, Supply Chain Characteristics, Apparel Retailing in India, Apparel Retail Supply Chain Innovations, Footwear Retailing.

5. Other Category Retailing Supply Chains- (08)

5.1. Consumer Electronics Retailing - Understanding the Segment, Consumer Electronics Retailing Supply Chain Characteristics, Jewelry Retailing, Home Furnishing Retailing,

5.2. Health and Beauty Retailing, Pharma Retailing, retailing of Books and Music, Retailing of Financial Products and Retail Banking, Courier Service Retailing, Service Retailing.

5.3. Live exercise- Students shall visit any retail mall/ outlet from above category products to study its retail supply chain followed by presentation in class room.

6. Information Technology for retail supply chain & logistics- (06)

6.1. Information Needs, Desired Characteristics of Information Systems, Retail Technology Maturity Model

6.2. Bar Coding & RFID- product tracking in transit

6.3. Retail ERP

6.4. Mobile Applications

6.5. Retail Analytics, Point of Sales Solutions

6.6. Green Information technology and other Emerging Retail Technologies

REFERENCE BOOKS:

1. Retail Supply chain Management: Rajesh Ray –Mcgraw Hill education
2. Supply Chain Management in the Retail Industry-Michael H. Hugos, Chris Thomas, Wiley Publications
3. Channel Management and retail marketing by Meenal Dhotre.
4. Supply chain Management by V.V. Sople
5. Supply Chain Management by Rahul V. Altekar

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

307 H: Mall Management

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objectives:

- To understand the current scenario of Shopping Malls with challenges.
- To get in depth knowledge of Mall development.
- To provide knowledge of Mall maintenance, tenant mix etc.

1. <u>Introduction to Shopping Malls</u> **(08)**

1.1. Introduction, Emergence of Organized retail in India,
1.2. Evolution of Shopping Malls
1.3. Malls move out of Indian Metros
1.4. Types of shopping malls
1.5. Factors stimulating growth of shopping malls in India
1.6. Challenges of Mall development in India.

2. <u>Mall Development</u> **(08)**

2.1. Introduction, Planning & design Decisions.
2.2. Site for shopping malls, Mall Design process, Capital sources of malls, Sources of revenues, Strategic decisions in mall financing.

3. <u>Tenant Mix</u> **(10)**

3.1. Introduction, Zoning, Concept of Tenant mix, important terms related to Tenant mix, Five attributes of Tenant mix, Tenant mix modification to flow with times.
3.2. Models of Tenant mix improvement. Future direction of Tenant mix management. Concept of anchor store.

4. <u>Maintenance Management</u> **(06)**

4.1. Areas of maintenance, Housekeeping services, security services, Fire management, parking management, Finance, HR policies, some common Engineering system.

5. <u>Marketing Planning</u> **(08)**

5.1. Marketing planning, Facilitating marketing planning process, Graphical summery of marketing plans. Customer segmentation methodology, 4P's, Marketing communication, Branding methodology. Brand valuation, Market research.

6. <u>Attributes of Mall</u> **(08)**

6.1. Entertainment, Relationship between key constructs and overall satisfaction, important factors related to consumer choice of choosing shopping centers, Dimensions of retailer attributes, shopping centers and food court, Common area kiosks.

REFERENCE BOOKS:

1. Mall Management with case studies (2nd Edition)- Abhijit Das, Taxmann's, New Delhi.
2. Retail Management: Arif Shaikh and Kaneez Fatima, Himalaya Publishing
3. Mall Management- operating in Indian Retail space, Harvinder Sing, Srini R Srinivasan
4. Retail Management: Swapna Pradhan – Tata Mcgraw Hill

Specialization –I– Hospitality Management

Objective of the course:

The syllabus is aimed to organize, integrate, and present information about managing hospitality organizations, which comes from academic studies and by experience. It is designed to meet the needs of hospitality management students in exploration of this exciting, undeveloped area. It should also guide students to implement a guest-focused service strategy in any hospitality or service organization that wants to compete successfully in today's customer-driven market.

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

304 I: Hospitality Management

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objective:

- To study the fundamental aspects of hospitality management
- To study Hospitality business models, Practices, Strategies
- To study Front Office Division, services & communication.

1. Nature and Scope of Hospitality Business **06**

1.1. A generic view of Hospitality and Tourism business, Various characteristic of Hospitality industry
1.2. Corporate culture, Philosophy and Mission statement of the business.
1.3. Service – a focal point, Various ways to improve service, TQM approach in service

2. Hospitality business models, Practices, Strategies **08**

2.1. Careers in hospitality – Career goals, Professionalism, Etiquettes, Self-assessment and Personal philosophy
2.2. Hospitality industry in India
2.2.1. Emerging trends in hospitality industry
2.2.2. Career options in hospitality industry
2.2.3. Eco friendly practices in hospitality industry
2.3. Customer care in hospitality industry
2.4. Social Responsibility – Ethical dilemmas
2.5. Careers in allied industry

3. Hotel industry – **08**

3.1. Classification of hotels, Hotel integration, Hotel chain
3.2. Organizational Structure of Hotel
3.2.1. Departments in hotel and their functions
3.2.2. Organizational charts in hotels
3.2.3. Facilities provided in hotels
3.3. Classification of hotels
3.3.1. Types of rooms
3.3.2. Room Rates
3.3.3. Classification of hotels
3.4. Registration & Gradation of Hotels

4. Recreation management **06**

4.1. Recreation – Leissure and for Wellness
4.2. Types of Recreation – Sponsored, Non-sponsored, Commercial and Non-commercial recreation
4.3. Gaming, Entertainment – Size and Scope, Trends in Gaming industry
4.4. Meeting, Incentive Travel, Conventions and Exhibitions (MICE) – Overall perspective of MICE w.r.t trends

5. **Introduction to Front Office** 14

5.1. Front Office Division

5.1.1.Front Office department and its functions

5.1.2.Sections and layout of Front Office

5.1.3.The organization structure of rooms division

5.1.4.Organizational chart of front office department (small, medium and large hotels)

5.1.5.Duties and responsibilities of various staff

5.1.6.Attributes of front office personnel

5.1.7.Co-ordination of front office with other departments of the hotel

5.1.8.The Guest Cycle

5.1.9.Property Management Systems

5.2. Front Office Services

5.2.1.Equipments used (Manual and Automated)

5.2.2.Role of Front Office in

5.2.3.key control and key handling procedures

5.2.4.mail and message handling

5.2.5.paging and luggage handling

5.2.6.bell desk and concierge

5.2.7.Rules of the house

5.2.8.Black list

5.3. Front Office Communications & Other Attributes

5.3.1.Communication Fundamentals

5.3.2.Telephone etiquettes – restaurant and hotel English

5.3.3.Professional Attributes - Attitude towards your job,

5.3.4.Personal Hygiene

5.3.5.Uniforms

5.3.6.Care for your own health & safety

5.3.7.Important terminology used in hotels

6. **Global Perspective of Hospitality Economy and a futuristic view** 06

6.1. Tourism – International Organization, Domestic organizations, Long term prospect of tourism industry: Vision 2020

6.2. The economic impact of tourism and its multiplier effect

6.3. Social and cultural impact of tourism, Sustainable Tourism, Ecotourism etc.

References

1. Introduction to Hospitality Management by John R. Walker – Pearson
2. Hotel front office management by James A. Bardi.—3rd ed. - John Wiley & Sons
3. Hospitality Management By Prof. Jagmohan Negi, Gaurav Manohe – University science Press New Delhi
4. Hotel Front Office: Operations and Management by Jatashankar R. Tewari, Oxford
5. Hospitality Marketing Management by Robert D. Reid (Author), David C. Bojanic (Author) John Wiley & Sons

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

305 I: Hospitality Marketing Management

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objective:

- To study Marketing Mix and Marketing Strategies for Hospitality sector.
- To study Marketing and positioning of hospitality services.
- To understand License & Permits required for Hotels

1. Marketing for Hospitality and Tourism: **06**

1.1. Service Characteristics,
1.2. Segmentation,
1.3. Targeting and Positioning of Hospitality Industry,
1.4. Environmental influence on Hospitality
1.5. Marketing Mix and Marketing Strategies for Hospitality and Tourism.

2. Marketing of Hospitality Services **10**

2.1. Concepts & Issues : Marketing of Hospitality and Tourism
2.2. Services – Management and Marketing of Tourism in India-
2.3. Hospitality Marketing : A Special Case in Services Marketing.
2.4. Future trends in Hospitality Industry –
2.5. Usage of CRS in Hotel Industry,
2.6. operational usage through chain of hotels.
2.7. Role of Associations in hospitality management- Functions and operations.

3. Positioning of services – **08**

3.1. Designing service delivery System,
3.2. Service Channel –
3.3. Pricing of services, methods –
3.4. Service marketing triangle –
3.5. Integrated Service marketing communication.
3.6. Service Marketing Strategies for health –
3.7. Hospitality – Tourism – Financial – Logistics - Educational – Entertainment & public utility Information technique Services

4. **Distribution Channel** **10**

4.1. Introduction
4.2. Functions of distribution channel
4.3. Number of channel levels
4.4. Distribution Channel in Hospitality

4.4.1. Travel Agents
4.4.2. Tour Operators
4.4.3. Specialists
4.4.4. Hotel Representatives
4.4.5. National, State and Local Tourist Agencies
4.4.6. Global Distribution System
4.4.7. Consortia and Reservation Systems
4.4.8. Concierge
4.4.9. Internet-Online travel companies,
4.4.10. Individual hotel website, mobile phones

5. Laws & Guidelines: 06

5.1. Recognition of Travel Agency,
5.2. Tour Operator and Travel Guide
5.3. License & Permits required for Hotels: National & International Organization: IATA, PATA, ICAO, WTO, UFTAA, FHRAI, TAAI.

6. Brand Building & Promotional activity for development of Hospitality Sector 08

6.1. Branding of location (Adventure, heritage, cultural etc)
6.2. Branding of service operators
6.3. Branding at state & National Level
6.4. Promotional tools and techniques used for brand building
6.5. Digital marketing avenues for hospitality sector

References

1. Hospitality Marketing Management, Fifth Edition by Robert D. Reid and David C. Bojanic - Willey
2. Hospitality Marketing By David Bowie, Francis Buttle - Elsevier
3. Stephen Ball, Jones Peter, Kirk David and Lockwood Andrew - Hospitality Operations: A System Approach (Cengage Learning, 1st Ed.)
4. Marketing for Hospitality and Tourism - Kotler Philip, Bowen John and Makens James - (Pearson Education, 3rd Ed.)
5. Services Marketing, Chiristropher H.Lovelock and Jochen Wirtz, Pearson Education, New Delhi, 7th edition, 2011.

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

306 I: Travel and Tourism Management:

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objective:

- To study travel & tourism management w.r.to India
- To study different types of tourism & its future prospects vis a vis India
- To evaluate the components of demand and supply of tourism services.

1. **Introduction** **08**
   1.1. Introduction to travel and tourism
   1.2. Development of tourism through ages (History)
   1.3. Future prospects
   1.4. Impact of tourism
   1.5. Indian and Global perspective of tourism
2. **Types** **10**
   2.1. Types of tourism
   2.2. Ecotourism
   2.3. Heritage Tourism
   2.4. Religious tourism
   2.5. Agrotourism
   2.6. Adventure tourism
   2.7. Wildlife tourism
   2.8. Sports tourism
   2.9. Medical tourism
   2.10. Cultural tourism
   2.11. Emerging new areas
3. **Organisational Support** **10**
   3.1. Tourism Organisations
   3.2. Promoters of tourism
4. **Tourist Transport** **08**
   4.1. Transportation: Different Modes
   4.2. Domestic travelling
   4.3. International Travelling
5. **Sustainability and Monitoring** **06**
   5.1. Sustainability: Importance and problems
   5.2. Monitoring : Need and Techniques
6. **Demand and Supply** **06**
   6.1. Basic Tourism Supply Components
   6.2. Measurement of Tourism Demand

Reference Books

1. Tourism: Operations and Management, 1/e, by Sunetra Roday, Archana Biwal, & Vandana Joshi - Oxford
2. Tourism: Principals and Practices, Oxford,1/e, Sampad Kumar Swain & Jitendra Mohan Mishra
3. Tourism in Global Perspective, Global Vision Publishing House, Dr Sukanta Sarkar
4. Sustainable Tourism, Global Vision Publishing House, S. R. Chauhan
5. Monitoring Tourism, Sonali Publications, Romila Chawla
6. Tourism Marketing by Manjula Chaudhary - Oxford

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

307 I: Human Resource Management in Hospitality Industry

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objective:

- To study Human resource activities in Hospitality sector
- To study the different HR function required in hospitality industry
- To study retention policies in hospitality industry.

1. HR & Hospitality Industry (An Overview)- **06**

1.1. Concept of Hospitality
1.2. HR Activities/Functions in Organizations
1.3. Diversity in Hospitality Workers
1.4. Views of HRM in Hospitality

2. Employee Recruitment & Selection- **08**

2.1. Recruitment-

2.1.1. Labor Market-Primary & secondary
2.1.2. Sources of Recruitment-Internal & External
2.1.3. Recruitment Process
2.1.4. Future of Recruiting in Hospitality Industry

2.2. Selection-

2.2.1. Concept of Selection
2.2.2. Process & Factors affecting Selection Efforts

3. Delivering & Evaluating Training- **06**

3.1. Concept of Training
3.2. Methods-Individual-On job and Off Job
3.3. Group Training-Concept, Preparing Group for Training and Methods
3.4. Evaluation of Training Programs

4. Performance Management & Appraisal- **08**

4.1. Performance Appraisal-Concept and Overview
4.2. Performance Management- Concept
4.3. Common Methods of Appraisal
4.4. Other Methods of Appraisal
4.5. Behavior Improvement Tactics

5. Reward & Compensation Strategies in Hospitality Industry- 08

5.1. Employee's & Employer's View of Pay

5.2. Remuneration in Hospitality Industries

5.3. Practice if Tipping

5.4. Financial(Direct & Indirect) Compensation

5.5. Non-Financial Compensation

5.6. Retaining manpower in hospitality

6. Employee Relation, Welfare, Health & Safety- 12

6.1. Employee Relation-

6.1.1. Employee or Industrial Relations

6.1.2. Trade Unions

6.2. Welfare, Health & Safety Issues-

6.2.1. Absence Management

6.2.2. AIDS/HIV

6.2.3. Drug Misuse-Alcohol & Smoking

6.2.4. Sexual Harassment

6.2.5. Stress

6.2.6. Work time

6.2.7. Workplace Violence

Reference Books

1. HRM in Hospitality Industry-David Hayes, Jack D. Ninemeier-John Wiley & Sons
2. HRM for the Hospitality & Tourism Industries-Denis Nickson- Butterworth's
3. HRM in Hospitality Industry-M J Boella, Nelson Thornes Ltd.
4. Human Resource Management in Hospitality by Malay Biswas - Oxford
5. Human Resource Management, P S Rao, Himalaya

SEMESTER IV

North Maharashtra University, Jalgaon

(NACC Accredited 'B' Grade University)

FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: IV

Paper: 401: Current Business Scenario

60 + 40 Pattern: External Marks 60 +Internal Marks 40= Maximum Total Marks: 100

Required Lectures: 48 hours

Objective :

To equip the students with the Current Indian Business Scenario and decision making.

1. **Business Environment** **(6)**
   - 1.1. Meaning and Definition, Scope of Environment
   - 1.2. Environmental Factors, Characteristic of Business environment, Indian Perspective
   - 1.3. Environmental Risk Overview, Methods of Assessing Environmental Risk, Managing Environmental Risk
   - 1.4. Market Opportunities
   - 1.5. Distribution of Indian Household by Income
2. **Economic Overview** **(12)**
   - 2.1. Emergence of Planning, five year plan challenges
   - 2.2. The Planning Commission of India, The National Development Council and Niti Aayog
   - 2.3. Highlights of Five Year Plan -2012-2017, infrastructure and Indian planning
   - 2.4. Policies of Indian Government
     - – New Industrial Policy-Historical Background, Meaning and Objectives, Recent Industrial Policy- MSME Sector
     - – Indian Industrial Licensing- Objectives, Policy
   - 2.5. The Indian Financial System- Structure and Functions, Markets-Money, Capital and Bill
   - 2.6. Industrial Structure: Classification of Industry, Industrial Structure of India, Ownership sectors, Major Industries
   - 2.7. Privatisation and Disinvestment of PSUs - Concept, Meaning, Objectives and government performance in last decade
3. **Problems of Growth in India** **(10)**
   - 3.1. Poverty- Concept, Factors Responsible, People Living Under Poverty Line, Measure to reduce Poverty Line
   - 3.2. Unemployment- Concept, Factors Responsible, Types, Government Policy Measures to Reduce Unemployment
   - 3.3. Inflation-Meaning, Overview, Measures, Effects of Inflation, Global Inflation and India
   - 3.4. Human Development-Concept, Importance, Gender Situation
   - 3.5. Rural Development- Concept, Importance, Important features of Rural Economy and Society, Challenges
   - 3.6. Other- Parallel Economy, Regional Imbalance, Social Injustice
4. **Management Systems (MS)- Certification Schemes** **(6)**
   - 4.1. Overview of Bureau of Indian Standards
   - 4.2. Quality Management System (IS/ISO 9001)
   - 4.3. Environmental Management System (IS/ISO 14001)
   - 4.4. Hazards Analysis and Critical Control Point (IS 15000)
   - 4.5. Occupational Health and Safety Management System (IS 18001)
   - 4.6. Food Safety Management System (IS/ISO 22000)

4.7. Quality Management Systems - Requirements for service quality by public service organizations (IS 15700)
4.8. Energy Management System (IS/ISO 50001)
4.9. Six Sigma Certification

5. Global Competitiveness (6)

5.1. Global Entry Strategies
5.2. Technology and Global Competition, Globalization and Human Resource Development, Globalization with Social Responsibility; Negotiating an International Business, Issues in Asset Protection; Multilateral Settlements

6. Indian Rural Market (8)

6.1. Understanding Indian Rural Economy- Introduction, Rural Urban Disparities, Diagnosis of Failure, Rural Face of reforms, Towards Cyber India.
6.2. Rural Banking System- Rural Indebtedness and Rural Credit, The co-operative Banks, Commercial Banks-Functions, Problems
6.3. Agriculture and Indian Economy
6.4. Various Employment Generation Schemes.

- **Comprehensive Cases on various business environments can be discussed and solved. (No Case Study in University Examinations)**

REFERENCE BOOKS

1. Business Environment, 2/E- Saleem Shaikh-Pearson
2. Business Environment – Paleri – Cengage Learning
3. Fundamentals of Business Environment by Shukla – Taxmann
4. Economic Environment of Business - By Pailwar-PHI
5. Economic Environment of Business-V. K. Puri , S. K. Misra-Himalayan Books
6. Business Environment- A.C. Fernando-Pearson
7. The International Business Environment – Janet Morrison- ANE Books Chennai
8. International Business Text and cases by Francis Cherunilam- PHI
9. International Business – By Rakesh Mohan Joshi-Oxford University Press
10. http://www.bis.org.in/index.asp
11. Cases in the Environment of Business international Perspective, David W Conklin, A South Asian Reprint, Sage India
12. Rural Development-Dr. I. Satya Sundaram, Himalaya Publishing House
13. Rural Marketing Indian Perspective- Awadesh Kumar Singh, Satya Prakash Pandey, New Age International Publication
14. Rural Marketing: Text and Cases- By C. S. G. Krishnamacharyulu- Pearson Education India

North Maharashtra University, Jalgaon

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: IV

402 – E-commerce and Excellence Management

60 + 40 Pattern: External Marks 60 +Internal Marks 40= Maximum Total Marks: 100

Required Lectures: 48 hours

Objective:

- To get in-depth knowledge about various e-commerce terminology
- To understand business excellence

1. **Introduction to E-Commerce**
   - 1.1. History, E-Commerce Concepts, Definitions, Features of Electronic Commerce, Traditional vs. e-commerce transactions.
   - 1.2. Electronic Commerce Framework, Benefits &Impact, Factors affecting Electronic Commerce, Challenges of e-commerce.
   - 1.3. Classification of e-commerce: B2B, B2C, C2C, B2G, B2E.
   - 1.4. The E-Commerce Domain and Applications
     - 1.4.1.e-Customer Relationship Management
     - 1.4.2.Enterprise Resource Planning
     - 1.4.3.e-Supply Chain Management
     - 1.4.4.E-Procurement
     - 1.4.5.E-Banking
     - 1.4.6.Knowledge Management.
     - 1.4.7.Call Center & BPO's etc.
2. **E-commerce Models**
   - 2.1. Native Content Based Models
   - 2.2. Native Transaction Models
   - 2.3. Transplanted Content based Models
   - 2.4. Transplanted Transaction based Models
3. **E-Commerce Infrastructure**
   - 3.1. Meaning and concept of Cluster servers, Virtualization techniques.
   - 3.2. Introduction to Cloud Computing, Hadoop and Google Apps Engine.
   - 3.3. Network Infrastructure
     - 3.3.1.LAN, MAN, WAN, VPN
     - 3.3.2.TCP/IP Reference Model
     - 3.3.3.Domain Name Systems
4. **Security, Encryption and Law**
   - 4.1. Concept of Firewalls, types, need and benefit.
   - 4.2. Computer Crime, types of crime and Computer security classification, E-Commerce threats, Security of Clients and sever, Importance of Security.
   - 4.3. Cryptography (Digital Signature): Public Key & Private Key.
   - 4.4. Electronic Mail Security.
   - 4.5. Cyber law
     - 4.5.1.Cyber laws aims and salient provisions.
     - 4.5.2.Copyright and intellectual Property concept relating to e-commerce.
     - 4.5.3.Cyber laws in India and their limitations.
5. **EPS and EDI**
   - 5.1. **Electronic Payment Systems:**
     - 5.1.1.Online Electronic Payment Systems,
     - 5.1.2.Prepaid and Post Paid Electronic Payment Systems.

5.1.3. E-Cash, e-cheque, credit cards, debit cards, smart cards; E-Banking.
5.1.4. Inter-organizational commerce & intra—organizational commerce.

5.2. **Electronic data interchange**

5.2.1. Concept and Meaning of EDI and Paperless trading,
5.2.2. EDI architecture, EDI standards and components.
5.2.3. Internet based EDI, Web enabled EDI.

6. Business Excellence

6.1. Concept and Definition of business Excellence.
6.2. Business Excellence Models
6.2.1. EFQM
6.2.2. *Ericsson Business Excellence Model*
6.3. Excellence Maturity Model
6.4. Measuring Business Excellence.
6.5. Comparison of the Baldrige and EFQM
6.6. Quality awards & Excellence.
6.7. Overview & Development of Self-Assessment Process.
6.8. Achieving organizational Excellence.

REFERENCE BOOKS

1. Business on the Net : What's and How's of E-Commerce - Kamlesh N Agarwala - Macmillan Publishers India
2. E-commerce - C.S.V. Murthy – Himalaya Publications.
3. E-commerce: Framework, Technologies & Applications 3rd Edn – Bharat Bhaskar – Tata McGraw Hill
4. Electronic Commerce–Awad - Pearson
5. Electronic Commerce: a Managers Guide – Ravi Kalakota - pearson
6. E-Commerce -Greenstein and Feinman – Tata McGraw Hill
7. Assessing Business Excellence – L.J.Porter& S.J Tanner – ElsevierButterworth Heinemann
8. E-Commerce: The Cutting Edge of Business -Bajaj & Nag – TMH
9. Measuring Business Excellence - by Gopal K. Kanji – Routledge
10. E-Commerce – Mishra - Macmillan

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: IV

403: Indian Commercial Law

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

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Objectives:

- To provide the Basic knowledge about the Company.
- To increase the Understanding level of Individual about rights as a Consumer.
- To aware about the basic terms in the field of Information Technology.
- To provide the practical aspects in the light of case study.

1. The Consumer protection Act, 1986 (7)

1.1. Who is consumer
1.2. who can make a complaint
1.3. Unfair Trade practices
1.4. Restrictive Trade Practices
1.5. Medical services and the consumer protection Act,1986
1.6. Consumer Protection Councils
1.7. Consumer Dispute Redressal Agencies

2. The Company Law – Companies Act 2013

2.1. Definition, characteristics , & types of company
2.2. Setting up of a company
 2.2.1.Incorporation of company
 2.2.2.Prospectus & public offer
 2.2.3.share capital , debentures
2.3. Management & Administration
 2.3.1.Directors: - Types, Duties & Liability, Responsibilities
 2.3.2.Corporate Social Responsibility
2.4. MOA & AOA: - Meaning & Content
2.5. Winding up of the company & its types

3. Cyber laws – Information Technology Act 2000

3.1. Objectives & scheme of the IT Act 2000
3.2. Digital signature – i) meaning ii) Authentication of electronic records – Asymmetric Crypto system , Electronic records , Key pair , Private key , Public Key
3.3. Electronic Governance –
 3.3.1.Legal recognition of electronic records & digital signature
 3.3.2.Use of electronic records & digital signature in Government & its signature
 3.3.3.Retention of Electronic Records
 3.3.4.Powers to make rules by central government in respect of digital signature
 3.3.5.Definitions of – Information , electronic form , Computer , Computer network , Computer resources , Computer system , Data & functions.
 3.3.6.meaning of certifying authority under the act

4. Right to Information Act 2005

4.1. Important theme w.r.t. Citizen, information & public authority
4.2. Enforcement and Penalty under act
4.3. Right of Third Party

5. Arbitration

5.1. What is Arbitration

5.2. Arbitration Agreement
5.3. Appointment of Arbitrator
5.4. Arbitration Proceedings
5.5. Arbitral Tribunal
5.6. Arbitral Award
5.7. New York convention Awards
5.8. Geneva Convention Awards

6. Case studies in Indian commercial laws – Typical case based on above topics only

REFERENCE BOOKS

1. Mercantile & Commercial Laws by RohiniAggrawal – Taxman Publication
2. Legal Aspects of Business by Akhileshwar Pathak – Tata McGraw Hill
3. Legal Aspects of Business by R.R.Ramtirthkar – Himalaya Publishing House
4. Mercantile Law by S.S.Gulshan – Excell Books
5. Elements of Merchantile Laws by N.D. Kapoor – Sultan Chand & Sons
6. Business law – Bulchandani - Himalaya

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FACULTY OF COMMERCE & MANAGEMENT
New Syllabus: M.B.A.
SEMESTER: IV

404: Entrepreneurship & Project Management

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100
Required Lectures: 48 hours

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1. **Entrepreneur and Entrepreneurship** **(04)**
    - 1.1. Entrepreneur - Concept, Functions, Types, Characteristics, Qualities and Role – Ideal Entrepreneur
    - 1.2. Entrepreneur vis-à-vis Professional Manager, Intrapreneur, Copreneur
    - 1.3. Distinction between wage employment, self employment & Entrepreneurship
    - 1.4. Entrepreneurial Competencies
    - 1.5. Entrepreneur and Entrepreneurship – Factors, Barriers & Problems and Process of Entrepreneurship

2. **Entrepreneurship Development** **(10)**
    - 2.1. Entrepreneurship Development: Concepts, Factors affecting, Development Cycle and Strategy
    - 2.2. Entrepreneurship Development Program (EDP): Concepts, Objective, Contents, issues, Phases, Evaluation. Institutions conducting EDP's in India
    - 2.3. Entrepreneurship Development Training: Importance, Objective, Methods
    - 2.4. Role of Institutions in Entrepreneurship Development - District Industrial Centre (DIC), Small Industries Services Institute (SISI), Entrepreneurship Development Institute of India (EDII), National Institute of Entrepreneurship and Small Business Units Development (NIESBUD), National Entrepreneurship Development Board **(**NEDB)
    - 2.5. Role of Central and State Government in Entrepreneurship Development

3. **Emerging areas in Entrepreneurship** **(08)**
    - 3.1. Women Entrepreneurship: Types, Challenges, Opportunities, Achievements, Problems, Remedial Measures & supporting Institutions and Role Models of Woman Entrepreneurs in India, Self Help Groups,
    - 3.2. Rural Entrepreneurship: meaning, need, Problems, Development, Role of NGO's, Entrepreneurship in agriculture, TRYSEM.
    - 3.3. Social Entrepreneurship: Genesis & Characteristic
    - 3.4. E- Entrepreneurship: Concept, Purpose and Essence.
4. **Family Business Management** **(08)**
    - 4.1. Importance of Family Business
    - 4.2. Types of Family business
    - 4.3. History of family businesses
    - 4.4. Responsibilities and Rights of Family Shareholders of a Family Business
    - 4.5. Succession in Family Business
    - 4.6. Pitfalls of the Family Business
    - 4.7. Improving Family Business Performance
    - 4.8. How to Overcome Nepotism in Family Businesses
    - 4.9. Management Development Plan in Family Business
    - 4.10. How to save the Family Business
    - 4.11. Seasonal Nature of the Family Business
5. **Project** **(08)**
    - 5.1. Project : Concept, Classification, Identification, Project Design, Project Appraisal, Project Planning,
    - 5.2. Formulation of Project Report - Cost Benefit Analysis, Technical Feasibility, Financial Feasibility, Managerial Feasibility, and Market Survey.
    - 5.3. Financing of the Project – Sources of Finance
    - 5.4. Role of Financial Institutions – Commercial Banks, IDBI, ICICI, SIDBI, SFC's, IFCI, NABARD, Venture Capital.

6. **Project Management** **(10)**
    6.1. Project Management Life Cycle: Project Initiation, Planning, Execution, Closure
    6.2. Project Monitoring and Control – Parameters, Process
    6.3. Monitoring and Control of group of Projects
    6.4. Computer based Project Management
    6.5. Integrated Project Management – Management of Project Finances, Materials – Production – Marketing – Personnel Management.
    6.6. Project Audit

*** Out of 40 internal marks the student has to prepare & submit a business plan for 10 marks. The students may refer & take help from local DIC or Banks.**

REFERENCE BOOKS

References for Entrepreneurship :

1. Dynamics of Entrepreneurship Development and Management – Vasant Desai, Himalaya
2. Entrepreneurship Development small business Enterprises – Poornima Charantimath - Pearson
3. Entrepreneurship, Robert D. Hisrich, Michal P. Peters, Tata McGraw-Hill Edition
4. Entrepreneurship by lall and Sahai, Excel Books
5. Entrepreneurship Development and Project Management by Neeta Baporikar, Hiimalaya
6. Entrepreneurship Development in India by Gupta, Srinivasan – Sultan Chand & Sons
7. Entrepreneurship Management by Aruna Kaulgud - Thomson
8. Entrepreneurship Development by S.S. Khanka – S. Chand
9. Patterns of Entrepreneurship by Jack M. Kaplan, Willey Publications
10. Entrepreneurship Development by Cynthia L. Greene, Cenage Learning

Project Management

1. Project Management by Gray, Larson – Tata McGraw Hill
2. Project Management by Vasant Desai- Himalaya
3. Project Management by Maylor - Pearson
4. Projects - Prasanna Chandra – CFM TMH Professional Series -Tata McGraw Hill
5. Project Management : Managerial Approach by Jack R. Mereditts and Samuel J. Mantel Jr., Willey Publications
6. Contemporary Project Management by Timothy J. Kloppenborg, Cenage Learning
7. Project Management and Control by Narendra Singh, Himalaya Publishing House
8. Project Management by Panneerselvam, Senthilkumar – PHI
9. Project Management by Nagarajan – New Age International

Specialization –A – Financial Management

North Maharashtra University, Jalgaon

(NACC Accredited 'B' Grade University)

FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: IV

405 A –Financial Derivatives

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objectives:

- To understand the concept of derivatives, various derivative instruments and the techniques of hedging the risks.

1. Introduction to Financial Derivatives **(08)**

1.1 Financial Derivatives: Meaning, need, Features, Types, Uses, Critiques
1.2 Derivative markets – participants & functions
1.3 Growth of Financial Derivatives in India
1.4 The regulatory framework of Derivatives trading in India

2 Futures & Forwards **(12)**

2.1 Financial Futures: Contracts& Types
2.2 Future Market: Functions & Operators
2.3 Forward contracts: Concept, Features & Classifications
2.4 Future Vs Forwards
2.5 Pricing of Future and Forwards
2.6 Hedging strategies – hedging with Stock Index Futures, types of members & margining System in India
2.7 Futures trading on BSE & NSE

3 Options Market& Pricing **(12)**

3.1 Options: Meaning, Need, Terminology, Valuation
3.2 Options v/s Futures
3.3 Types of Options contracts – Call & Put options, Covered & Uncovered options
3.4 Trading Strategies involving Options – basic Option Positions – margins – Options on stock indices
3.5 Option markets in India on BSE & NSE
3.6 Intrinsic value & Time value, Pricing at Expiration
3.7 Factors affecting Options pricing, Put-Call Parity Pricing Relationship
3.8 Pricing models – Introduction to Binomial Pricing model, Black Scholes Option Pricing model

4 Swaps **(06)**

4.1 Swaps: Concepts, Nature, Evolution, Features &Structure of Swaps
4.2 Types – Interest-rate Swaps, Currency Swaps, Commodity Swaps, Equity Swaps
4.3 Swap variant, Swap Dealer Role
4.4 Economic Functions of Swap transactions.

5 Hedging &Credit Derivatives **(10)**

5.1 Concept
5.2 Fixed Hedging with options - concepts
5.3 Naked & covered Positions
5.4 Strategies
5.5 Hedging option Portfolio
5.6 Credit Derivatives: Concept, feature, growth, Benefits & Credit derivatives in India

REFERENCE BOOKS:

1. Financial Derivatives: Theory concepts & problems – S.L.Gupta – Prantice Hall India
2. Derivatives And Risk Management, 2/E Srivastava Oxford University Press
3. Options, Futures & Other Derivatives - Hull C John – Pearson Educations Publishers
4. Derivatives And Risk Management - JayanthVerma- Tata Mcgraw Hill
5. Futures Markets: theory & practice" – Sunil K Parmeswaran – Tata McGraw Hill.
6. Financial Derivatives – Bishnupriya Mishra ,Swaroop – Excel Books
7. Risk Management: insurance & derivatives – Kotreshwar - Himalaya
8. Derivatives Valuation & Risk Management – David Thomas, Dubofsky Miller - Oxford Publication
9. Financial Derivatives – An introduction to Futures, Forwards, & Options – Read Head – Prentice Hall of India
10. Derivatives – T.V.Somnathan - Tata McGraw Hill.
11. Financial Derivative & Risk Management – O.P.Agrawal – Himalaya Publication
12. Risk Management & Insurance Arunajatesan Macmillan

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: IV

Paper: 406-A International Financial Management

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objectives of the course:

- To study the international environment in which the business operates
- To understand Exchange rate mechanism as well as international accounting practices

1. Fundamental of International Management **(06)**

1.1 International finance: Importance, goals, features, & Scope
1.2 Domestic Vs International finance
1.3 Emerging challenges & Responsibilities of finance Manager

2. Exchange Rate Mechanism **(26)**

2.1 Structure/ Features of Foreign Exchange Market.
2.2 Exchange Rate (08)
2.2.1 Forex reserves
2.2.2 Exchange rate theories
2.2.3 Currency future quotes
2.2.4 Speculations
2.2.5 Hedging
2.2.6 International Parity
2.2.6.1 Exchange Rate Determination
2.2.6.2 Factor Affecting Exchange Rate
2.2.6.3 Balance of Payment & Purchasing Power Parity (PPP) theory of Exchange.
2.2.6.4 Real Exchange Rate & Real Effective Exchange Rate
2.2.6.5 Interest Rate & Exchange Rate
2.2.6.6 Covered Interest Rate & Interest Rate Parity, Forward Rate Parity
2.2.6.7 The Fischer Effect
2.2.6.8 Exchange Rate Forecasting
2.3 Foreign Exchange Markets (05)
2.3.1 International Swap Market
2.3.1.1 Currency Swap
2.3.1.2 Fixed rate Currency Swap
2.3.1.3 Swap Risk
2.4 Global Financial Derivatives Market (03)
2.4.1 Structure of Derivatives Market
2.4.2 Credit Default Swap
2.4.3 VaR methodology and Analysis
2.5 Financial Integration (02)
2.6 Foreign Exchange Market in India (02)
2.7 Arbitrage- Two Point & Triangular Arbitrage (01)
2.8 Forward & future spot rate (02)
2.9 International Transaction Mechanism (03)
2.9.1 Nostro, Vostro and Loro Account,
2.9.2 SWIFT, CHIP, CHAP, Telegraphic Transaction (IT)

3. International Accounting **(06)**

3.1 Consolidation of Financial Statements & its analysis
3.2 Accounting of Inflationary trends
3.3 IFRS
3.4 Transfer pricing
3.5 Financing of foreign trade
3.5.1 Documentation
3.5.2 Modes of Payment
3.5.3 Methods of Financing
3.5.4 EXIM Bank

4. International Monetary system **(04)**

4.1 International Monitory Fund (IMF)
4.1.1 Constitution, Role & Responsibility of IMF
4.1.2 Funding facilities, International liquidity
4.1.3 Special Drawing Rights (SDR)
4.1.4 Role in Post Bretton Woods world
4.2 Convertibility & Currency

5. Balance of Payment **(06)**

5.1 India's Balance of Payment
5.2 Importance, Functions, Principles& Components of Balance of Payment
5.3 Accounting of Balance of Payment: Deficit & Surplus
5.4 Elasticity approach Vs Absorption Approach
5.5 General Equilibrium approach
5.6 Balance of Payment Vs Exchange Rate
g) Balance of Payment and Money Supply

REFERENCE BOOKS:

1. International Financial Management by V.K. Bhalla – Anmol Publications
2. International Financial Management by P. G. Apte, Tata McGrawHill
3. International Financial Management by ThumuluriSiddaiah (IFM) Pearson
4. International finance Marketing by V.A Avadhani – Himalaya Publication
5. International Finance Management by vyuplesh saran – Prentice Hall
6. International Finance Management by Cheol S. Eun& Bruce G Resnick , Tata McGraw Hill
7. International Finance Management by MadhuVij – Excel Books
8. International Financial Management Jain Macmillan

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: IV

Paper: 407 A – Case Studies in Financial Management

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objectives :

To depict thorough knowledge of the subject and develop decision making abilities

The student has to Select and discuss the case studies related to paper no. 105, 205, 207 and respective specialization papers no. 304, 305, 306, 307, 405, 406 those will have impact on business decision making in each paper.

Specialization –B – Marketing Management

North Maharashtra University, Jalgaon

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: IV

405 B – Marketing Research and Business Analytics

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objectives:

- The purpose of this course is to cultivate research skills in students and a beginning practitioner. The focus will be on qualitative (exploratory) and quantitative research execution and the application of research findings and analysis in decision making.
- The course is geared toward the practical application of research, though gaining a working knowledge of certain terminology will be important.

1. Introduction **(06)**

1.1. Marketing research: Meaning, Scope, Purpose, Uses, Limitations and Threats to Marketing Research
1.2. Marketing Research and Marketing Management
1.3. Business research and its application vis-à-vis marketing
1.4. Marketing research process
1.5. Marketing Intelligence system:
1.6. Concept, Components, Scope, Significance
1.7. MIS and Marketing Decision Support System (MDSS)
1.8. Ethics in Marketing Research

2. Data Collection **(08)**

2.1. Use of internet for primary data
2.2. Locating and Evaluating Secondary data
2.3. Measurement & Scaling
2.4. Concept of Measurement & Scaling
2.5. Types of measurement scales- Comparative, Non comparative
2.6. Attitude measurement scales, Attribute measurement scales
2.7. Questionnaire design & construction

3. Market Survey as a method of Data Collection **(12)**

3.1. Market survey: Nature, Meaning and Objectives of Market survey
3.2. Types of Market survey
3.3. Field work: Conducting a Survey
3.4. Conducting Consumer Perception survey
3.5. Conducting Consumer Satisfaction survey
3.6. Conducting Concept Testing survey
3.7. Preparation of Report based on the conducted survey

4. **Data Analysis Techniques and Interpretation** **(12)**
   - 4.1. Regression Analysis,
   - 4.2. Factor Analysis,
   - 4.3. Cluster Analysis,
   - 4.4. Discriminant Analysis,
   - 4.5. Conjoint Analysis,
   - 4.6. Multi-Dimensional Analysis
   - 4.7. The Interrelationship between Analysis and Interpretation
   - 4.8. Improper interpretation
   - 4.9. Improper Analysis
   - 4.10. The interpretative process

5. **Specific Research Applications** **(10)**
   - 5.1. Test Marketing
   - 5.2. Advertisement Research: Promotion Research, Brand Equity Research, Brand Name testing
   - 5.3. Industrial Marketing Research
   - 5.4. Export Marketing Research
   - 5.5. Sales Analysis forecasting
   - 5.6. Pricing Research
   - 5.7. Consumer Behavior Research
   - 5.8. Rural Marketing

6. **Live Project 1**: *Students should visit any marketing organizations and conduct the any one of mentioned in 3rd unit & unit 5th surveys and prepare a survey report.*

7. **Live Project 2:** *As mentioned in live project 1, students should enter the data in SPSS or MS Excel to test the above mentioned multivariate data analysis techniques.*

REFERENCE BOOKS

1. Market research - G.C. Beri – Tata McGraw Hill
2. Marketing Research – Naresh Malhotra – Pearson
3. Marketing Research-Rajendra Nargundkar – Tata McGraw Hill
4. Marketing Research by S L Gupta – Excel Books
5. Marketing Research – Suja Nair – Himalaya
6. Marketing Research – Burns and Bush – Pearson
7. Marketing Research – Luck and Rubin – Prentice Hall Publications
8. Marketing Research, Concept & Cases – Cooper Schindler. – Tata McGraw Hill
9. Research for Marketing Decisions – Paul Green, Donald Tull, Gerald Albaurn - Prentice Hall Publications
10. Marketing Research by Ramanuj Majumdar –New age International
11. Marketing Research by D.M. Sarawte – Everest
12. Marketing Research by Shajahan –Macmillan

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: IV

Paper: 406 B - Retail Management And Digital Marketing

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100
Required Lectures: 48 hours

Objectives:

- To develop understanding about the retail sector and its current requirements
- To highlight the new trends of using technology and equip students to handle such developments in markets and marketing practices.

1. Retailing: **(6)**

1.1. Concept
1.2. Importance
1.3. Functions
1.4. Indian Vs. Global Scenario

2. Retail format and retail locations **(6)**

2.1. Store and non-store retailing
2.2. Franchising
2.3. Unconventional channels

3. Merchandising: **(8)**

3.1. Concept, Importance, Functions
3.2. Steps in **merchandising** planning .
3.3. Category management: Definition and process
3.4. Introduction to Private label brands

4. Principles and Drivers of New Marketing Environment - Digital Media: **(10)**

4.1. Industry - Reaching Audience Through Digital Channels
4.2. Traditional and Digital Marketing
4.3. Introduction to Online Marketing Environment
4.4. Dotcom Evolution and Internet Relationships
4.5. Integrating E-Business to an Existing Business Model
4.6. Online Marketing Mix
4.7. Digital Signage

5. Internet Enabled Retailing **(8)**

5.1. Turning Experience Goods into Search Goods
5.2. Personalization through Mass Customization
5.3. Choice Assistance
5.4. Personalized Messaging
5.5. Selling through Online Intermediaries
5.6. Direct to Customer Interaction - Online Channel Design for B2C and B2B Marketing.

6. Integrating Online Communication into IMC Process - Online Advertising (10)

6.1. Email Marketing and Viral Marketing
6.2. Affiliate Marketing - Participatory
6.3. Communication Networks - Social Media Communities
6.4. Consumer Engagement
6.5. Networks - Customer – Led Marketing Campaigns
6.6. Legal and Ethical aspects related to Digital Marketing.

Reference Books

1. Retailing Management – Swapna Pradhan
2. Retail Management- Berman, Evans; Pearson
3. Retail Management Suja Nair- himalaya
4. Strauss Judy, E-Marketing, Prentice Hall, India

North Maharashtra University, Jalgaon

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: IV

Paper: 407 B: Case studies in Marketing

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100
Required Lectures: 48 hours

Objectives:

- To enhance analytical skills of students

The student has to select and discuss the case studies related to paper no 204 and respective specialization papers no 304. 305, 306, 307, 405 406, those will have impact on business decision making in each paper

Specialization – C – Human Resource Management

North Maharashtra University, Jalgaon

(NACC Accredited 'B' Grade University)

FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: IV

405 C – Performance & Compensation Management

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objectives:

- To study different performance parameters in organisation.
- To study Performance Management Process.
- To understand compensation structure in organisation.

Performance Management-

1. Introduction- **(07)**

1.1. Meaning, Definition and Purpose of Performance Management
1.2. Standards of Performance and Guidelines to set Performance Standards
1.3. Determinants of Performance
1.4. Approaches to Measure Performance
1.5. Characteristics of Ideal Performance System
1.6. Disadvantages of Poorly Implemented Performance System

2. Performance Management Process- **(04)**

2.1. Performance Planning
2.2. Performance Execution
2.3. Performance Assessment
2.4. Performance Review
2.5. Renewal & Re-contracting

3. Team Performance Management- **(05)**

3.1. Definition, Importance & Need of Teams
3.2. Types of Teams
3.3. Purposes and Challenges of Team Performance Management
3.4. Rewarding Team Performance
3.5. Techniques/Measures to enhance Team Performance

Compensation Management-

4. Introduction- **(08)**

4.1. Meaning, Concept, Objectives & Types of Compensation
4.2. Compensation Management Process
4.3. Determining Compensation: Wage Mix
4.4. Job Evaluation-Concept, Objectives, Principles and Methods/Techniques
4.5. Managerial/Executive Compensation

5. Wages & Salary Administration- **(10)**

5.1. Concept and Kinds of Wages
5.2. Objectives of Sound Wage Policy
5.3. Principles of Wages and Salary Administration
5.4. Wage Determinants
5.5. Wage Boards
5.6. Wage Differentials-

5.7. Concept, Rationale of Wage Differentials

5.8. Types of Wage Differential-Pay for Performance, Pay for Knowledge and Skills, Competency Based Pay

5.9. Methods of Wage Payments

5.10. Components of Wage Structure in India

6. **Incentives & Fringe Benefits** **(08)**

6.1. Incentives-

6.1.1. Meaning, Need and Types of Incentives

6.1.2. Individual & Group Incentive Plans

6.2. Fringe Benefits-

6.2.1. Meaning, Need, Objectives & Types

6.2.2. Advantages and Disadvantages of Fringe Benefits

*** Some Important Factors in Wage Administration MBA-HR Students must aware about-** **(06)**

i. Income Tax Calculations on Salaries/TDS and e-Return Filing
ii. Preparation of Salary Sheet
iii. Provident Fund Calculations
iv. Bonus Calculations
v. Gratuity Calculations
vi. Retirement Calculations
vii. Calculations of all above things on MS-Excel

** Faculties are expected to take efforts on these points to improve Skills and Knowledge of students about subject. The above calculations are not expected in Exam Paper.*

Reference Books

1. Performance Management – Kohli - Oxford University Press
2. Performance Management by Herman Aguinis.- Pearson
3. Compensation Management An Indian Perspective 2e –Bhattacharyya -Oxford University Press
4. Performance Management-Chadha, Macmillan
5. Compensation by Milkovich, Newman, VenkataRatnam – Tata McGraw Hill (SiE)
6. Essentials of Human Resource Management By P. SubbaRao – Himalaya Publishing
7. Human Resource Management By Snell, Bohalender - Cengage Learning
8. Human Resource Management-Pande & Basak, Pearson
9. Human Resource Management- Gary Dessler & Biju Varkkey - Pearson Prentice Hall
10. Human Resource Management by S. S. Khanka – S. Chand & Sons

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: IV

406 C – International Human Resource Management

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objectives:

- To study HRM practices in International Environment
- To compare domestic HRM practices w.r.to International context
- To get indepth knowledge on Repatriation

1. Introduction To (IHRM) International Human Resource Management (10)

1.1. IHRM: Definition,
1.2. Internationalization & HRM
1.3. Domestic Vs International HRM
1.4. Growing interest in IHRM
1.5. Functional positioning of IHRM
1.6. Organizational context of IHRM
1.7. International Division of Labour
1.8. Barriers to effective Global HRM

2. Social and Cultural Context of IHRM (08)

2.1. Culture & Cultural Sensitivity
2.2. Social Environment
2.3. Religions and Economic Implications
2.4. Multiculturalism
2.5. Cultural Predisposition
2.6. Cultural Dimensions
2.7. Managing across culture

3. International Joint Ventures (08)

3.1. Concept & Nature of International Joint Venture
3.2. Motives & Extent of Merger & Acquisitions
3.3. HRM factors in IJV
3.4. Role & impact of Culture in International Joint Venture
3.5. Methods of Overcoming Cultural &other Problems in IJV

4. Human Resource Practices in International environment (10)

4.1. Global HR Planning
4.2. Recruitment and Selection in International Context
4.2.1. Company Motive
4.2.2. Individual Motive
4.2.3. Recruitment Methods
4.2.4. Selection Criterion & Techniques
4.3. Emerging trends in training for competitive advantage
4.4. Developing staff through International assignment
4.5. Women Expatriates -The Glass Ceiling Phenomenon

5. International Industrial Relations (07)

5.1. Key Issues in International IR
5.2. Trade Union & International IR
5.3. IR policy of MNC's

5.4. MNC’s Characteristic in Neutralizing the power of Labour Unions
5.5. MNC’s Strategy towards International IR

6. Repatriation **(07)**

6.1. Concept of Repatriation
6.2. Benefits from returnees
6.3. Challenges of Re-entry
6.3.1. Individual Perspective
6.3.2. Organisational Perspective
6.4. Repatriation Process
6.5. Managing repatriation

REFERENCE BOOKS:

1. International Human Resource Management by K. Ashwathappa – Tata McGraw Hill
2. Introduction to International Human Resource Management, 5/E by Crawley, Oxford University Press
3. International Human Resource Management by Tony Edwards & Chris Rees.- Pearson
4. International Human Resource Management by Peter Dowling &Denice Welch – Cengage Learning
5. International Human Resource Management by Sengupta, Bhattacharya – Excel Books
6. International Human Resource Management By P. SubbaRao – Himalaya Publication
7. International Human Resource Management by P L Rao – Excel Books
8. International Human Resource Management (2/e) by Gupta -Macmillan

North Maharashtra University, Jalgaon

(NACC Accredited 'B' Grade University)

FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: IV

Paper: 407 C – Cases in Human Resource Management

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objective:

1. To Increase the understanding of what managers should and should not do in guiding a business to success.
2. To identify strategic issues that need to be addressed, evaluating strategic alternatives, and formulating workable plans of action.
3. To gain in-depth exposure to different industries and companies, thereby acquiring something close to actual business experience.

The student has to Select and discuss the case studies related to paper no. 104, 106, 206, and respective specialization papers no. 304, 305, 306, 307, 404, 405 those will have impact on business decision making in each paper.

To solve the case studies following steps may be considered –

Steps to solve case Study

1. Fact/ Summary
2. Problem Identification
3. Assumptions (if Any)
4. Analysis of problems
5. Alternate Solution
6. Feasibility of solution
7. Best (optimum) Solution
8. Action/Implementation Plan

Specialization –D – Operations Management

North Maharashtra University, Jalgaon

(NACC Accredited 'B' Grade University)

FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: IV

405 D –Industrial & Productivity Management

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 50 hours

Objectives :-

1) To study work study work management to improve productivity of organization.
2) To study measurement of work of labour & optimal utilization of plant & equipment to decrease waste, scrape.

1) Introduction to Industrial Engineering and Management **(06)**

a) Indian Industry
b) Stages of Scientific & Technological Revolution
c) Growth of Indian Manufacturing Industry
d) New Industrial Policy
e) Major Areas of Indian Industry
f) Globalization of Indian industry

2) Work Study **(06)**

a) Definition, concept, need and advantages of Work Study
b) Objectives of Method Study
c) Procedure/steps of Method Study
d) Recording Techniques
e) Micro-motion study and Therbligs
f) SIMO Chart
g) Principles of motion economy

3) Work Measurement **(08)**

a) Concepts of Work measurement and its objectives
b) Techniques and uses of work measurement
c) Time Study and Methods of timing
d) Work Sampling
e) Predetermined motion time & Systems (PMTS)
f) Method Time Measurement (MTM)
g) Work factor
h) Use of Motion Time Tables
i) Ergonomics

4) Productivity **(08)**

a) Concept, Importance & Benefits of Productivity
b) Productivity & Production
c) Measurement of productivity
d) Productivity Index
e) Means of increasing productivity
f) Productivity improvement procedure

g) Six lines of Attack to improve Productivity
h) Productivity & Standard of Living

5) Waste Scrap & Disposal Management **(08)**

a) Types & Cost of wastages
b) Causes and Remedies of wastage
c) Wastage of resources and preventive steps
d) Wastage control Programme and Salvage operation
e) Scrap Disposal and Surplus

6) Constraint Management **(12)**

a) Managing constraints across the organization
b) Theory of Constraints (TOC)
    i) Measuring capacity, utilization & Performance
    ii) Principles of TOC
c) Identification & Management of Bottleneck
d) Product mix decisions using bottlenecks
e) Economies of scale
f) Capacity timing & Sizing strategies
g) Procedure for long term capacity Decisions
    i) Estimate capacity Requirement
    ii) Identify Gaps
    iii) Develop Alternatives
    iv) Evaluate alternatives

REFERENCE BOOKS:

1) Industrial Engineering and Production Management by M. Mahajan, DhanpatRai and Sons.
2) Operations Management by Krajewski, Ritzman, Malhotra - Pearson
3) Industrial Engineering and Management by O.P. Khanna, DhanpatRai and Sons.
4) Industrial and Business Management by MartandTelsang, S. Chand
5) Purchasing and Supply Management- Donald Dobler and David Burt-Tata McGraw Hill
6) Materials Management by P Gopalkrishnan and M Sundaresan- Tata McGraw Hill
7) Materials Management – Rajendra Mishra – Excel Booksss
8) Purchasing and Materials Management-NK Nair-Vikas
9) Operations &Materials Management by K. ShridharBhat –HPH
10) Production and Operations Management – Chary - Tata McGraw Hill

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

Paper: 406 D – International Quality Management

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 50 hours

1) Foundations of Quality Management **(10)**

a) Quality: Meaning, Definition, Importance, Dimension, Types, Benefits
  i) Five views of Quality
  ii) Quality & Competitive advantage
  iii) Quality & Profitability
  iv) Quality as a source of value

b) Quality Management:Principles,
  i) Traditional Vs. Modern Quality Management
  ii) Strategic Quality Management

c) Total Quality Management (TQM) : Meaning, Scope & Elements
  i) TQM Vs. Traditional Management Practices

d) Deming's Quality Principles

2) Administrative systems for Quality Management **(10)**

a. The Fork model for quality management- The Handle
b. The Fork model for quality management- The Neck
c. The Fork model for quality management- Daily Management
d. The Fork model for quality management- Cross-functional Management
e. Resource requirements of the detailed fork model

3) ISO series of Standards **(08)**

a. ISO 9000-2000 system
b. ISO 9001-2000 system
c. ISO 9004-2000 system
d. ISO 14000 Series
e. QS 9000 Series

4) Total Quality Management **(06)**

a. TQMEX model
b. Japanese 5-S practice
c. Quality control circles
d. Business process Re-engineering

5) Six Sigma Management **(08)**

a. Concept, Six Sigma Terminology
b. DMAIC Model
c. Benefits and Costs of Six Sigma Management
d. Six Sigma Roles and Responsibilities

6) Kaizen **(06)**

a. Concept
b. Kaizen versus innovation
c. Kaizen and Management
d. Companywide Quality control
e. Characteristics of Companywide Quality control
f. Kaizen Strategy and Practice

REFERENCE BOOKS:

1) Total Quality Management- Poornima Charantimath, Pearson Education
2) Quality Management by Howard Gitlow, Alan J, Rosa O, David Levine, Mcgraw-Hill, 3rd Edition
3) Total Quality Management - ShridharBhat - Himalaya Publishing House
4) Total Quality Management- Besterfield, Pearson Education
5) Total Quality Management- S.D. Bagade, Himalaya Publishing House
6) Total Quality Management – Shailendra Nigam – Excel Books
7) Total Quality Management - ShridharBhat- Himalaya Publishing House

Paper: 407 D – Case study

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 50 hours

Objective:

- To gain in-depth exposure to different industries and companies, thereby acquiring something close to actual business experience.

The student has to Select and discuss the case studies related to paper no. 105 and respective specialization papers no. 304, 305, 306, 307, 404, 405 those will have impact on business decision making in each paper.

Specialization –E – International Business Management

North Maharashtra University, Jalgaon

(NACC Accredited 'B' Grade University)

FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: IV

405E-International Human Resource Management And Diversity Management

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objective of the Course:

- To develop a sound conceptual framework for understanding International HRM.
- To get in-depth knowledge in Diversity Management.
- To be able to understand management of global teams.

1. INTRODUCTION: OVERVIEW (4)

1.1. Concepts of international management
1.2. What is IHRM
1.3. Issues in IHRM
1.4. Barriers to effective Global HRM
1.5. Expanding the role of HRM in international firms
1.6. Domestic Versus International HRM

2. **INTERNATIONAL STRATEGIC HUMAN RESOURCE MANAGEMENT (8)**

2.1. Introduction
2.2. Peculiarities of Global Strategic Management
2.3. Value Creation
2.4. Global Strategic Management Process
2.5. MNC's Business Strategies and HRM Strategies
2.6. Formulation of Alternative Business Unit Level Strategies
2.7. Collaborative Strategies
2.8. Organizational and Human Resource Strategies

3. INTERNATIONAL INDUSTRIAL RELATIONS (8)

3.1. Introduction
3.2. Three Actors of Industrial Relations
3.3. Trade Unions
3.4. Concerns of Trade Unions in Multinational Companies
3.5. Collective Negotiations
3.6. Disputes/ Conflicts
3.7. Quality Circles and Participative Management

4. MANAGING CULTURAL DIVERSITY (10)

4.1. Introduction
4.2. Culture and its factors
4.3. Cross-cultural Differences in the Workplace
4.4. Workforce Diversity
4.5. Breaking the Glass-ceiling for Women and Minorities
4.6. Globalization and Mobility of Human Resources
4.7. Managing Diversity: Strengths and Weaknesses
4.8. Strategies for Managing Workforce Diversity

5. MANAGING PEOPLE IN INTERNATIONAL CONTEXT **(8)**

5.1. Human Resource Management and Beyond
5.2. French Culture and people Management
5.3. The American Model of People Management
5.4. Japanese People Management
5.5. Chinese Model of People Management
5.6. Indian People Management

6. LEADING AND MANAGING GLOBAL TEAMS **(10)**

6.1. Cross-Cultural misperceptions, misinterpretation and misevaluation
6.2. Managing expatriates effectively, equitably and ethically
6.3. Managing multicultural workforce
6.4. Domestic multiculturalism
6.5. Teams: the organization in microcosm
6.6. Types of diversity in teams
6.7. Cultural diversity's impact on teams
6.8. Conditions of high-performing multicultural teams
6.9. Managing culturally diverse teams

REFERENCE BOOKS:

1. International Human Resource Management by K. Ashwathappa – Tata McGraw Hill
2. Introduction to International Human Resource Management, 5/E by Crawley, Oxford University Press
3. International Human Resource Management by P L Rao – Excel Books
4. International Human Resource Management By P. SubbaRao – Himalaya Publication
5. International Human Resource Management by Tony Edwards & Chris Rees.- Pearson
6. International Human Resource Management by Peter Dowling &Denice Welch – Cengage Learning
7. International Human Resource Management by Sengupta, Bhattacharya – Excel Books
8. International Human Resource Management (2/e) by Gupta -Macmillan

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: IV

406E-International Marketing Management

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objective of the Course:

1. To develop a sound conceptual framework for understanding International Marketing management practices.
2. To get in-depth knowledge in International Marketing Mix Strategies.
3. To be able to understand Export Management.

1. **Introduction to International marketing.**
   - 1.1. International Market.
   - 1.2. International Marketing.
   - 1.3. International orientation and stages.
   - 1.4. International Market orientation.
   - 1.5. International Marketing environment; External & Internal environment. International trading environment, trading blocs
   - 1.6. International market entry strategies.
2. **International Product strategy.**
   - 2.1. Hierarchy of product, Product design strategy.
   - 2.2. Product life cycle management.
   - 2.3. Product planning for global markets.
   - 2.4. Standardization vs. Adaptation.
   - 2.5. Packaging and labeling.
3. **International Pricing strategy.**
   - 3.1. Role of Pricing, Factors affecting Pricing.
   - 3.2. Pricing strategies – cost based, Transfer pricing, Dumping, Skimming price, penetration price, price discounts.
   - 3.3. Price market relationship, Price escalation, cost of exporting, Taxes, tariffs, exchange rate.
   - 3.4. Price control: Approaches to lessening price escalation, leasing in international markets.
4. **International Promotion strategy.**
   - 4.1. Promotion decisions: complexities and issues, International advertising.
   - 4.2. Marketing environment & Promotional strategies.
   - 4.3. Role of export promotion organizations, Trade fairs and exhibitions.
   - 4.4. International marketing communication mix.
5. **International Distribution.**
   - 5.1. International distribution channels, types of channels.
   - 5.2. International channel conflict and channel decisions.
   - 5.3. Distribution planning and functional excellence.
   - 5.4. International logistics management and strategy.
6. **Export Management.**
   - 6.1. Export procedure and documentation.
   - 6.2. Managing export decisions.
   - 6.3. Export contracts; risk coverage.
   - 6.4. Exit policy.
   - 6.5. Limitations of International marketing.

REFERENCE BOOKS:

1. International Marketing, R.M.Joshi, OUP
2. Global Marketing Management, K. Lee, OUP
3. International Marketing-Cateora.
4. Managing International Marketing –Varkey.
5. Creating Market across the Globe: Strategies for business excellence – Korwar
6. Essence of International Marketing –Stan Paliwoda.
7. Global Marketing Management-Warren J. Keegan.
8. International Marketing Management-Subhash Jain.
9. International Marketing Micheal- R Czinkota, IIkka A Ronkainen
10. International Marketing, R.M. Joshi

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: IV

Paper:407 E–Cases in International Business Management

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objective:

- To be able to understand & solve case studies in International Business Management.

The student has to Select and discuss the case studies related to respective specialization papers no. 304E, 305E, 306E, 307E, 404E, and 405E those will have impact on business decision making in each paper.

Specialization –F – Agro Business Management

North Maharashtra University, Jalgaon

(NACC Accredited 'B' Grade University)

FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: IV

405 F- RURAL DEVELOPMENT

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objectives

- To understand the basic concept regarding rural development.
- To create awareness about various schemes and programs which are helpful for rural development.

1. Rural Development **(7)**

1.1. Concept and Basic Elements of Rural Development
1.2. Nature & Scope of Rural Development
1.3. Importance of Rural Development
1.4. Objectives of Rural Development

2. Approaches and Determinants of Rural Development **(8)**

2.1. Community Development Programmes
2.2. Intensive Agricultural District Programme
2.3. Concept of Integration
2.4. Changes in the utilization of natural resources
2.5. Changes in employment, an increase in Capital.

3. 3. Rural Development Special Schemes and policies **(7)**

3.1. Stress on special schemes
3.2. Limitations of special schemes
3.3. Strengthening special schemes
3.4. Need and Goals of rural development policy
3.5. Rural development policy in India

4. 4. Employment Generation Programs **(10)**

4.1. Characteristics of Rural Employment
4.2. Measures needed for employment generation
4.3. Incidence of rural unemployment
4.4. Crash scheme for Rural Development
4.5. Pilot Intensive Rural Employment projects
4.6. Antyodaya
4.7. Employment Guarantee scheme
4.8. Jawahar Rojgar Yojana

5. Role of Banking and Finance in Rural Development **(8)**

5.1. Role of Cooperative and Commercial Banking in Rural sector
5.2. NABARD, its Schemes & Patterns
5.3. Role of Self-Help Groups in rural development
5.4. The role of foreign investment

6. Rural Development Administration and Panchayati Raj Institution **(8)**

6.1. Functions of Panchayati Raj System
6.2. Merits & demerits of Panchayati Raj System
6.3. Strengthening the Panchayati Raj System
6.4. Rural Development Administration

Reference Books:

1. Rural Development by – Dr. I. Satya Sundaram, Himalaya Publishing House
2. Rural Development and Planning in India – Devendra Thakur, Deep & Deep Publications, New Delhi
3. Rural Industrialization in India – Shrinivas Thakur – Streling Publishess, New Delhi
4. Dynamics of Rural Development Power Structure – S.N. Chandhary – Amar Prakashan, New Delhi.
5. Integrated Rural Development Programme in India: Policy & Administration – A.K.Shrivastva – Deep &Deep Publications, New Delhi.
6. Integrated Rural Development – R.C. Arora – S. Chand Sons, New Delhi
7. Rural Development, Principles, policies and management- Katar Singh, Sage Publication

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: IV

406 F- Agro entrepreneurship and Project Management

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objectives

1) To understand the basic concepts of entrepreneurship and project management
2) To aware learners towards agro entrepreneurship.
3) To provide proper guidance to set a particular agro based project.

1. Rural Entrepreneurship (8)

1.1. Concept of rural entrepreneurship
1.2. Aims of rural entrepreneurship
1.3. Opportunities and barriers to entrepreneurship in rural India
1.4. Policies Governing Entrepreneurship

2. Skill Development, ICT and rural entrepreneurship (10)

2.1. Skills required for entrepreneurship
2.2. Rural applicability
2.3. Government training programs for skill development
2.4. Rural ICT initiatives
2.5. Role of ICT in changing rural India
2.6. Need to create rural ICT entrepreneurs

3. Introduction to Project Management (10)

3.1. Searching for a Business Idea
3.2. Project Identification and Project formulation
3.3. Project Analysis, Project Risk
3.4. Project Planning, Project Design and Network Analysis
3.5. Project Report, Project Appraisal
3.6. Location of an Enterprise, Factory Design and Layout

4. Project Finance and Financial Analysis (10)

4.1. Source of Development of Finance, Project Financing
4.2. Financial Analysis, Funds flow analysis
4.3. Ratio Analysis, Investment process
4.4. Break Even Analysis, Profitability analysis
4.5. Social Cost- Benefit Analysis, Budget and planning Process, Benchmarking
4.6. Role of various Government institutions for Promoting Agri. projects.

5. Project Reports (10)

5.1. Preparation of project reports for –
5.2. Milk and Milk Products
5.3. Live Stocks
5.4. Medicinal plants
5.5. Agro Tourism
5.6. Irrigation
5.7. Fertilizer /Pesticides
5.8. Floriculture and Horticulture

Reference Books

1. Entrepreneurship Development- Theories and Practices- N.P.Singh
2. Project Management- Vasant Desai – Himalaya Publication
3. Management in Agricultural Finance.- Jain S.C.Vora and Company. Publishers Pvt. Ltd. Entrepreneurship and Technology- Vasant Desai
4. Agri-Business Management- Iwase Smita-Everest Publishing House
5. Agricultural Policy in India – Karla O.P. - Bombay Popular Prakashan Mumbai
6. Text Book of Animal Husbandry – Banerjee G.C.-Oxford & IBH Publisher New Delhi.
7. Rural and Agricultural Marketing –Pandey, Mukesh and Deepak Tiwari-International Book Distribution Co. New Delhi.
8. Organizing Rural Business Policy Planning and Management- Rajagopal-Sage Publication, New Delhi.

North Maharashtra University, Jalgaon

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: IV

407 F- Case Studies in Agri Business management

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objective:

- To get knowledge regarding agribusiness concepts and process.

The Student has to select and discuss the case studies related to respective specialization papers no 304,305,306,307,404 and 405 those will have impact on business decision making in each paper.

Specialization –G – Information Technology & Systems Management

North Maharashtra University, Jalgaon

(NACC Accredited 'B' Grade University)

FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: IV

Paper: 405G: INTERNET TECHNOLOGY

60 + 40 Pattern: External Marks 60 +Internal Marks (20 Marks Theory + 20 Marks Practical= 40 Marks)= Maximum Total Marks: 100

Required Lectures: 48 hours (32 Hours Theory + 18 Hours Practical)

Objectives of the course:

- To understand Technical aspect of Internet Technology
- To learn Advanced web programming
- To gain the knowledge for building & customising your own web page

1. **Introduction to Internet Technology** **(5)**
   - 1.1. Browser, Server, Client, ISP, Protocol, DNS, URL, WWW
   - 1.2. HTML Basics **:** HTML Page Block Diagram, Tags- Singular & Paired Tags, Attributes
   - 1.3. Simple & Dynamic Web pages.
2. **Designing Web Page** **(12)**
   - 2.1. Block & Text Formatting Tags, Special Characters, Image tags
   - 2.2. Links – To a page, Within Page, To a Site.
   - 2.3. Links And Images – Image Mapping Layout
   - 2.4. List (OL, UL, DL)
   - 2.5. Tables- Frames (Nested, I Frame)
   - 2.6. Head Elements – Base Font, Meta Tags, Scripts, Styles
3. **Cascading Style Sheet (CSS)** **(5)**
   - 3.1. Inline
   - 3.2. Embedded
   - 3.3. Sep. /External
   - 3.4. Transaction Effect (Marquee Tag)
4. **VB Script** **(15)**
   - 4.1. Variables-Definition, Naming rules, Data types, Constant, Arrays, operator.
   - 4.2. VB Script Control Structure-Conditional, looping, branching
   - 4.3. VB Script built-in function, Typecasting variables, Math, date, String, Formatting -Function
5. **ASP** **(05)**
   - 5.1. What are ASPs?
   - 5.2. Understanding Client – Server Model
   - 5.3. ASP versus Client side Scripting
   - 5.4. Setting PWs and/or IIS
   - 5.5. Dissecting your First ASP Script.
   - 5.6. Understanding ASP Script.
6. **Database connectivity using ASP** **(06)**
   - 6.1. Using Database- Reading From a Database Using ASP
   - 6.2. Deleting Database records

REFERENCE BOOKS:

1. The Complete Reference to HTML - Thomas Powell
2. Dynamic HTML for Dummies – Michael Hyman
3. ASP Developers Guide – Greg Vuczek
4. ASP in 21 Days – Scott Mitchell and James Atkinson
5. ASP 3.0 – A Beginner's Guide – Mercer
6. HTML - Beginner's Guide - Willart
7. Mastering ASP- Ivan Bayross

Practical List

1. Create a web page to demonstrate text & block formatting tags.
2. Create a web page to demonstrate various list tags
3. Crate a web page to demonstrate Image tags.
4. Create a web page to demonstrate different linking tags.
5. Demonstrate table tag with all attributes & values
6. Demonstrate frame and frameset tags
7. Demonstrate form tags & different element tags
8. Create a web page to demonstrate CSS(Internal & External).
9. Validate form controls using vb script function
10. Implement your own tags using XML

North Maharashtra University, Jalgaon

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: IV

Paper: 406G: SOFTWARE PROJECT MANAGEMENT

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objective:

- To provide basic project management skills with a strong emphasis on issues and problems associated with delivering successful IT projects.
- The module is designed to provide an understanding of the particular issues encountered in handling IT projects and to offer students methods, techniques and 'hands-on' experience in dealing with them. Upon completion of this module students will be able to undertake and be aware of aspects of project management.

1. **Introduction to Software Project Management** **(8)**
   Definition-Project, Importance of Software Project Management, Software Projects Vs Other Projects, Ways to Categorize Software Projects, Problem with S/W Projects, Requirement Specification & Management Control
2. **Project Planning** **(8)**
   Introduction, Select Project, Identify Project scope & objectives, Identify project infrastructure, Analyze Project Characteristics, Identify Project Products & Activities, Estimate effort for each activity, identify activity risk & Allocate Resources
3. **Programme Management & Project Evaluation** **(8)**
   Introduction, Programme management, Managing the allocation of resources within programmes, Strategic Programme Management, Aids to Programme Management, Evaluation of Individual Projects, Technical Assessment, Cost- Benefit Evaluating Techniques & risk Evaluation
4. **Selection of an appropriate project approach & Software Effort Estimation** **(8)**
   Project Selection Approach- Introduction, Choosing Technologies, Choice of Process Models, Structure Vs Speed Delivery, Waterfall Model, V-Model, Spiral Model, Software Prototyping, Managing iterative Processes

Software Effort Estimation- Introduction, Problems with over & under Estimates, the basis for Software estimating, Software Effort estimation Techniques, Expert Judgment, COCOMO- a parametric Model

5. **Project organization & Implementation** **(8)**
   Project organization**-** Organization Structures, Comparison of organizational structures in projects, Level of project organizations, Functional & project Managers Comparison

Project Implementation- Information Systems Project Success, Information Systems Project Failure, Information Technology Failure, Critical Success Factors, Reasons for Information System Project Failure, Quality Control in project Implementation, User involvement in Project Implementation, Integrated Requisitioning System

6. **Risk Management & Software Quality** **(8)**
   Risk Management**-** Introduction, Categories of Risk, Framework, risk identification, risk assessment, risk planning, risk management, evaluating risk to the schedule
   Software Quality-Introduction, Software Quality in Project Planning, Importance of Software Quality, Practical Software Quality Measures, Product Vs Process Quality Management, External Standards, Techniques to help enhance software quality, Quality Plans

REFERENCE BOOKS:

1. Bob hughes & Mike Cotterell, "Software Project Maangement", Tata McGraw Hill, Fourth Edition
2. David L. Olson, "Introduction to Information Systems Project Management", McGRAW-HILL International Edition
3. Ramesh, Gopalaswamy, "Managing Global Projects", Tata McGraw Hill, 2001.
4. Royce, "Software Project Management", Pearson Education, 1999.
5. Jalote, "Software Project Management in Practice", Pearson Education, 2000

North Maharashtra University, Jalgaon

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: IV

Paper: 407G : CYBER LAWS & CYBER SECURITY

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures:50 hours

Objectives:

- To understand the fundamentals of cyber security and cyber offenses, be familiar with cybercrime techniques and prevention through cyber laws, gain knowledge of cyber forensics and the security mechanisms.

1. Introduction **(06)**

1.1. Terminologies : cyberspace, cybercrime, cyber security, Cyber squatting, cyberpunk, cyber warfare, cyber terrorism
1.2. Cyber security needs
1.3. Cyber criminals : Introduction, Cybercriminals Groups
1.4. Classification of cyber crimes
1.5. Cybercrime categories
1.6. Cybercrime : The legal perspective

2. Cyber offenses **(08)**

2.1. Hackers, crackers, Freakers : Introduction
2.2. Planning cybercrime
2.3. Social engineering
2.4. Cyber stalking
2.5. Cyber cafe and cybercrime
2.6. Attack vector
2.7. Bot nets

3. Cybercrime techniques **(10)**

3.1 Proxy servers and Anonymizers, phishing
3.2 Password cracking
3.1. Key loggers and spywares
3.2. Virus and worms
3.3. Trojan horse and backdoors
3.4. Steganography
3.5. Dos and DDos attacks
3.6. SQL injection
3.7. Buffer overflow

4. Phishing and Identity theft **(08)**

4.1. Phishing : Introduction
4.2. Phishing methods : Dragnet, Rod-and-reel , Lobsterpot, Gillnet
4.3. Techniques of phishing
4.4. Phishing Toolkits and Spy Phishing
4.5. Phishing countermeasures
4.6. Personally Identifiable Information (PII)
4.7. Types of Identity theft
4.8. Techniques of Identity theft
4.9. Identity Theft Countermeasures

5. **Legal Perspective of Cyber security& Forensics fundamentals** **(08)**
   5.1. Need for cyber laws: The Indian context
   5.2. Indian IT Act 2000
   5.3. Changes made in IT Act 2000
   5.4. Digital signatures and the Indian IT Act
   5.5. Cybercrime and punishment
   5.6. Cyber forensics : introduction, types
   5.7. Needs of cyber forensics
   5.8. Cyber forensics and digital evidence

6. **Cyber Security: Organization Implications** **(08)**
   6.1. Search Breach: PI Collecting by Organization, Insiders threats in Organization
   6.2. Privacy Dimension
   6.3. Key-challenges in Organization
   6.4. Cost of cyber crimes and IPR issues
   6.5. Organizational guidelines for Internet usage, safe computing guidelines and computer usage policy
   6.6. Forensics best practices for organization

REFERENCE BOOKS:

1. Nina Godhbole, SunitBelapure Cyber Security understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley India
2. Marjie T. Britz Computer Forensics and Cyber Crime: An Introduction, Pearson
3. AlfaredBasta and Wolf Holten, Computer Security Concepts, Issues and Implementation, CENGAGE learning
4. Raghu Santanam, M. Sethumadhavan, MohitVirendraCyber Security, Cyber Crime and Cyber Forensics, IGI Global
5. George M. Mohay,Alison AndersonComputer and intrusion forensics, Artech House
6. G. Ram Kumar, Cyber Crimes-A primer on Internet Threats & Email Abuses,Viva Books

Specialization – H – Retail Management

North Maharashtra University, Jalgaon

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: IV

Paper: 405 H: International Retailing

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objective:

- To get acquainted about emerging trends in global retailing in 21st century.
- To provide basic knowledge of International retailing, Global Markets along with problems.
- To study the role of financial management in International marketing.

1. International Marketing **(8)**

1.1. Concept, Importance, Need of International Marketing
1.2. International Marketing Research and Information system
1.3. Problems in International Marketing
1.4. EPRG Orientation
1.5. International Retailing in 21st century

2. Internationalization of Retailing **(8)**

2.1. Internationalization of Retailing-Need, Scope
2.2. Evolution of International Retailing
2.3. FDI in retailing
2.4. Drivers of International Retailing
2.5. Live Exercise- Students should observe recent trends in Retailing along with FDI followed by group discussion in class room.

3. Global Retail Markets **(8)**

3.1. Strategic planning process for global retailing
3.2. Challenges facing by global retailers,
3.3. Challenges & Threats in global retailing,
3.4. Factors affecting the success of a global retailing strategy
3.5. Innovative emerging trends in global retailing
3.6. A study of US and Asian Markets

4. Selection of International Retail Market **(6)**

4.1. Need to select International retail market
4.2. Study and analysis of retailing in global arena/setting
4.3. Different methods of international retailing
4.4. Different modes of market entry for international retailers

5. Competing in Foreign Market **(5)**

5.1. Multi country competition and global competition
5.2. Competitive advantages in foreign market
5.3. Cross market subsidization
5.4. Global Structure
5.5. International retail marketing mix- concept & importance
5.6. Managing brand at international level

6. **Competing in Foreign Market II** **(5)**
    6.1. Global issues in Supply chain Management: Forces behind globalization
    6.2. World class SCM
    6.3. World class demand management (WCDM)
    6.4. World class logistics management (WCLM)
7. **Financial Management in International Retailing** **(8)**
    7.1. Importance of financial management in international retailing
    7.2. Financial performances and Financial strategy
    7.3. Strategic Cost Management
    7.4. Accounting Methods
    7.5. Strategic Profit Model
    7.6. Financial ratios in Retailing

REFERENCE BOOKS:

1. Retail Management: Arif Shaikh and Kaneez Fatima, Himalaya Publishing
2. Retailing Management: Suja Nair, Himalaya Publishing
3. Retail Management: Swapna Pradhan, Tata Mc Graw Hill
4. The art of Retailing- A.J.Lamba, Tata McGraw Hill Education
5. Retail Management-A Strategic Approach: Berry Berman & J.R.Evans, Prentice Hall of India, New Delhi
6. Retail Management: S.L.Gupta, Wisdom Publications
7. Managing the Supply Chain-the definitive Gudie-David Simchi Levi, Philip Kaminsky and Edith Simchi Levi, Tata Mc-Graw Hill, 2004
8. World Class Supply Management: The key to SCM- Burt, Dobler and Starling, Tata McGraw Hill, Seventh Edition, 2006.
9. High performance interactive marketing- Christopher Ryan, Viva Books Ltd, 2003.

North Maharashtra University, Jalgaon

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: IV

Paper: 406 H: Information Technology in Retail Management

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objective:

- To understand the role of Information technology in retail management.
- To get acquainted about Enterprise Resource Planning and E Commerce.
- To provide knowledge of E-retailing, Online Shopping, Mobile shopping etc.

1. Retail Management & Information System **(8)**

1.1. Role of IT in business
1.2. Importance of IT in retail
1.3. The need for product identification
1.4. Factors affecting the use of IT in Retail
1.5. Radio frequency Identification (RFID) - Concept and applications in retailing.

2. Application of IT and its areas for impact **(8)**

2.1. Adopting coding system
2.2. Inventory control
2.3. Sales analysis and point of sales,
2.4. Sales forecasting
2.5. Collaborative planning forecasting replenishment (CPFR)

3. Essential requirement of Information System **(6)**

3.1. Ease of creation
3.2. Inventory level
3.3. EDI: Electronic data interchange
3.4. Database Management

4. Enterprise Resource Planning **(6)**

4.1. Implementing ERP solutions
4.2. Need and Benefits of ERP
4.3. Use of ERP: Globalization and Retail Market

5. New trends in IT Application in Retailing **(8)**

5.1. Web enable system and Data mining tools
5.2. LAN and WAN strategies
5.3. Interactive kiosks
5.4. Efficiency in operation and merchandise

6. E-retailing and Use of IT **(12)**

6.1. How firms are using the Internet to expand their markets
6.2. E-retailing-concepts, growing importance in 21st century
6.3. Interactive home shopping
6.4. Mobile shopping: Apps, Smart cards, e-cash,
6.5. Retailing through television : Asian sky shop
6.6. Online shopping: Shopping carts e.g. e-bay, Amazon, Flip cart etc.
6.7. Strategies for E-commerce
6.8. Limitations to the web applications
6.9. Live Exercise –Students may visit personally or may observe any retail Supermarket on Internet which provides online services to customers followed by group discussion in classroom.

REFERENCE BOOKS:

1. Retail Management: Arif Shaikh and Kaneez Fatima, Himalaya Publishing
2. Retailing Management: Suja Nair, Himalaya Publishing
3. Retail Management: Swapna Pradhan, Tata Mc. Graw Hill
4. The art of Retailing- A.J.Lamba, Tata McGraw Hill Education
5. Retail Management-A Strategic Approach: Berry Berman & J.R.Evans, Prentice Hall of India, New Delhi
6. Retail Management: S.L.Gupta, Wisdom Publications
7. Enterprise Resource Planning-

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: IV

Paper: 407 H: Cases in Retail Management

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objectives:

- To provide a foundation for an understanding of the various dimensions of Retail Management along with problems through case studies.

The student has to Select and discuss the case studies related to respective specialization papers no. 304-H , 305 H, 306 H, 307 H, 405 H, 406 H, those will have impact on business decision making in each paper:

While solving case study students may use following steps-

- Summary of the case
- Problem Identification
- Analysis of Problem
- Alternative Solution
- Best Solution

Specialization – I – Hospitality Management

North Maharashtra University, Jalgaon

(NACC Accredited 'B' Grade University)

FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

405 I: Food & Beverage Management

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objective:

- To study food & Beverage operations in hospitality industry
- To study how to develop Consumer product relationship
- To study production of food & beverages services.

1. **Food & Beverage Operations and Management:** **08**
   - 1.1. Food and Beverage operations.
   - 1.2. The Hospitality industry and its Products.
   - 1.3. The Business environment.
   - 1.4. The Legal framework.
   - 1.5. Setting organizational goals & objectives.
   - 1.6. Quality in the management of Food & Beverage operations.

2. **Developing the Consumer - Product Relationship**. **08**
   - 2.1. Framework for developing a consumer- Product relationship.
   - 2.2. Market Research.
   - 2.3. Market segmentation.
   - 2.4. Idea evaluation.
   - 2.5. Concept development.
   - 2.6. Product development.

3. **Food Production.** **08**
   - 3.1. Menu Planning.
   - 3.2. Health & Safety.
   - 3.3. Centralized food production systems.
   - 3.4. Volume in food production.
   - 3.5. Purchasing & Control.
   - 3.6. Operations control.

4. **Beverage Provisions.** **08**
   - 4.1. Compiling Wine and Drinks list
   - 4.2. Pricing of Wines and Drinks
   - 4.3. Purchasing
   - 4.4. Storage and cellar management
   - 4.5. Beverage control.

5. Operational Areas Equipment & Staffing: **08**

5.1. Food production areas
5.2. Food production equipments
5.3. Food and Beverage service areas
5.4. Food and Beverage service equipment
5.5. Automatic vending
5.6. Staffing

6. Food and Beverage service: **08**

6.1. Food and Beverage service as two systems
6.2. Customer relations
6.3. Managing volume
6.4. Sales promotion and merchandising
6.5. Managing and service sequence
6.6. Revenue control

Reference Books

1. Food and Beverage Management - By John Cousins, David Coskett. Pearson Education India.
2. Food and Beverage Management By Anupam Mukherji by Gyan publishing house – New Delhi.
3. The SAGE Handbook of Hospitality Management edited by Roy C Wood, Bob Brotherto.
4. Food and Beverage Management By Bernard Davis, Andrew Lockwood, Ioannis Pantelidis, Peter Alcott published By Roultedge – UK
5. Food and Beverage Service by R. Singaravelavan- Oxford

North Maharashtra University, Jalgaon

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: III

406 I: Event Management

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objectives

- To study different things needed to organize an event
- How to plan, organize, manage & Marketing an Event
- To study necessary steps to organize conference

1. Introduction to Event and Event Management **(08)**

1.1. Introduction & Definition of Event,
1.2. Need of Event Management,
1.3. Objectives of Event Management,
1.4. Events and Event Management,
1.5. Types of event & event management,
1.6. 5 C's of Event,
1.7. Growing importance of events in India.
1.8. Role of event management companies,
1.9. managing customer expectations,
1.10. Challenges in Event management

2. Event Planning & Team Management **(08)**

2.1. Introduction, Establish Objectives,
2.2. Preparing event proposal,
2.3. Use of planning tools.
2.4. Principles of event management planning,
2.5. important steps in planning & designing an Event,
2.6. importance of creativity in event planning, Event feasibility,
2.7. coordinating technical resources, Site inspection.
2.8. Protocols, Dress codes,
2.9. staging, importance of staffing,
2.10. managing human resources,
2.11. Leadership, Traits and characteristics

3. Event Marketing **(10)**

3.1. Introduction, Importance of event marketing,
3.2. five P's of Event marketing: Product, Price, Place, Promotion, Public relation.
3.3. Image, Branding,
3.4. Market Research,
3.5. Relationship Building,
3.6. Preparing press releases and press packs,
3.7. Internet event marketing,
3.8. Use of social media for event marketing.

4. **Event Safety and Security** **(06)**
   - 4.1. Introduction, Security,
   - 4.2. occupational safety,
   - 4.3. crowd management,
   - 4.4. major risks and emergency planning,
   - 4.5. reporting of incidences, measures for emergency
5. **Organizing the Conference** **(08)**
   - 5.1. Introduction, venue confirmation,
   - 5.2. Making the bookings, speaker selection,
   - 5.3. conference budgeting,
   - 5.4. conference marketing strategies,
   - 5.5. audio visual requirements, risk analysis,
   - 5.6. attendee evaluation.
6. **Planning a Wedding Event** **(08)**
   - 6.1. Introduction, wedding planning,
   - 6.2. venue selection and liaison,
   - 6.3. client briefings, budgeting,
   - 6.4. list of guests and invitations,
   - 6.5. list of gifts,
   - 6.6. Menus and catering services,
   - 6.7. flowers , table decorations, transportation etc.

References

1. Event Marketing and Management: Gaur, Sanjaya Singh, Vikas Publishing House Pvt Ltd, 2003
2. Marketing Management: Philip Kotler, Prentice Hall of India Pvt Ltd, 11 th edition,
3. Event Planning and Management: Sharma, Diwakar, Deep & Deep Publication Pvt Ltd, 2005.
4. Events Management: Raj, Razaq, SAGE Publication India Pvt Ltd, 2009
5. Event Marketing: Leonard H Hoyle, 2013 (ISBN 8126524679),
6. Event Management: Bhavana Chaudhari, Dr Hoshi Bhiwandiwalla, - Nirali Publications, Pune.

North Maharashtra University, Jalgaon

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FACULTY OF COMMERCE & MANAGEMENT

New Syllabus: M.B.A.

SEMESTER: IV

407 I–Cases in Hospitality Management

60 + 40 Pattern: External Marks 60 +Internal Marks 40 = Maximum Total Marks: 100

Required Lectures: 48 hours

Objective:

- To be able to understand & solve case studies in the context of Hospitality Management.

The student has to Select and discuss the case studies related to respective specialization papers no. 304J, 305J, 306J, 307J, 405J, and 406J those will have impact on business decision making in each paper.

Department of Applied Science
Teaching Load Distribution
SEM-I 2018-19

Sr. No	Name of Faculty	FE/SE	Subject	Th	Tut	Pr	FE Load	Total LOAD
1	Dr. S. S. Patil	FE	M-I (A,F)	06	04		10	**16**
		SE	M-III (Comp-A) Comp-A,B, IT (T)	03	03			
2	M. V. Deshpande	FE	M-I (C,H)	06	05		11	**17**
		SE	M-III (Comp-B) Comp-A&B(T)/ETC T	03	03			
3	A. V. Khambayat	FE	M-I (E,I)	06	05		11	**16**
		SE	M-III (IT) M-III EL (T)	03	02			
4	C. Wagh	FE	M-I	-	08		08	**15**
		SE	M-III EL Comp-A/IT/ETC/EL (T)	03	04			
5	Mr. Dhole	FE	M-I (D,G)	06	02		08	**14**
		SE	M-III Etc ETC/Comp/EL(T)	03	03			
6	Dr. K. S. Patil	FE	Physics (F)	03	04	08		**15**
7	C. U. Nikam	FE	Physics (G,I)	05	04	08		**17**
8	M. B. Patil	FE	Physics (H,I)	05	04	08		**17**
9	D. I. Desai	FE	Chemistry(D,E)	05	04	08		**17**
10	A. R. Mali	FE	Chemistry(A,E)	05	04	08		**17**
11	U. T. Patil	FE	Chemistry(C)	03	04	08		**15**
12	N .B. Bhoi	FE	Engllish(A,D)	06	--	08		**14**
13	P. R. Nichole	FE	Engllish(E)	03	--	06		**09**
14	T. Chavan	FE	Engllish(C)	03	--	10		**13**

Department of Applied Science
Teaching Load Distribution
SEM-II 2018-19

Sr. No	Name of Faculty	FE/SE	Subject	Th	Tut	Pr	FE Load	Total LOAD
1	Dr. S. S. Patil	FE	M-I (A,F)	06	04		10	**16**
		SE	M-III Mech-A	03	03			
2	M. V. Deshpande	FE	M-I (C,H)	06	04		10	**16**
		SE	M-III Mech-B	03	03			
3	A. V. Khambayat	FE	M-I (E,I)	06	05		11	**16**
		SE	M-III (IT) Civil A	03	02			
4	Mr. H. M. Dhole	FE	M-I (D,G)	06	03		09	**17**
		SE	Civil B	03	01			
			Biostat	03	01			
5	Dr. K. S. Patil	FE	Physics (A)	03	02	08	**13**	
6	C. U. Nikam	FE	Physics (C,E)	05	03	08	**16**	
7	M. B. Patil	FE	Physics (D,E)	05	03	08	**16**	
8	D. I. Desai	FE	Chemistry G	03	03	08	**14**	
9	A. R. Mali	FE	Chemistry H	03	03	10	**16**	
10	U. T. Patil	FE	Chemistry (F,I)	06	02	03	**14**	
11	N .B. Bhoi	FE	Engllish (G,H)	06	--	12	**18**	
12	Ms. T. Chavan	FE	Engllish (F,I)	06	--	12	**18**	
						Total	**190**	

DEPARTMENT OF BIOTECHNOLOGY, SSBT's, COET, BAMBHORI, JALGAON

TEACHING LOAD DISTRIBUTION

ACADEMIC YEAR: 2017-2018 (TERM –I)

Date: 26/05/2017

SR.NO.	NAME	DESIGNATION	YEAR	SUBJECT	TH (Hrs)	PR BATCH X (Hrs)	TOTAL
1.	Dr. I. D.Patil	Prof. & HOD	SE	BPCAls	03+01(T)	--	08
			BE	Project-I & Seminar-II	--	2*2	
2.	Jayant P.P.	Assistant Prof.	TE	Mol. Bio	03	04	15
			BE	DSP	03	--	
			BE	Int. D. Elective	03	--	
			BE	Project-I	--	02	
3.	Gaurav Khodape	Assistant Prof.	TE	BIEM	03	--	16
			TE	PTC	01	02	
			BE	Bio info	03	02	
			BE	BPED	03	--	
			BE	Project -I	--	02	
4.	Komal Patil	Assistant Prof.	SE	CB	03	02	15
			TE	BIA	03	--	
			BE	Elective -I	03	02	
			BE	Project-I	--	02	
5.	Nikita Deshmukh	Assistant Prof.	SE	MB	03	--	14
			TE	ENZY	03	--	
			SE	MB	--	04	
			BE	Seminar-II	--	02	
			BE	DSP	--	02	
6.	Ygendra Thakare (Contributory Lecturer in Place of Mrs. Sarika S. Pawar)	Assistant Prof.	SE	UO-I	03	02	**15**
			SE	Soft Skill	01	02	
			TE	CRE	03	02	
			TE	BIA	--	02	
					TOTAL	**:**	**83**

Theory Load: 45
Practical Load:38
Total Load : 83

Dr. I. D.Patil

HOD, Biotech

TEACHING LOAD DISTRIBUTION

ACADEMIC YEAR: 2017-2018 (Term II)

Date: 16/12/2017

SR.NO.	NAME	DESIGNATION	CLASS	SUBJECT	TH (Hrs)	PR BATCH X (Hrs)	TOTAL
1	Dr. I.D.Patil	Prof. & HOD	TE	IPR &E	03	--	11
			TE	Minor Project	--	02	
			TE	Seminar -I	--	02	
			BE	Project -II	--	04	
2	Mrs. S. S. Pawar	Assistant Prof.	TE	MT	03	02	18
			SE	UO-II	03	02	
			SE	PHT	03	02	
			SE	CA	01	02	
3	Mr. Jayant P. Parpalliwar	Assistant Prof.	BE	BPI	03	02	19
			TE	GENE	03	02	
			BE	Ele -II	03	02	
			BE	Project-II	--	04	
4	Mr. Gaurav Khodape	Assistant Prof.	SE	IMMU	03+01	--	20
			TE	BPE	03	--	
			BE	BPMS	03	02	
			TE	BPE & FT	--	04	
			BE	Project-II	--	04	
5	Ms. Komal Patil	Lecturer	SE	BCH	04	02	18
			TE	FT	03	--	
			BE	Ele -III	03	--	
			SE	IMMU	--	02	
			TE	Minor Project	--	02	
			TE	Seminar -I	--	02	
						Total	86

Total load:
TH:42
PR: 44

Dr. I.D.Patil
(HOD, BIOTECH DEPT)

Copy to : 1.Principal
2. D.O.A
3. Applied Science

DEPARTMENT OF BIOTECHNOLOGY, SSBT's, COET, BAMBHORI, JALGAON

Date: 10/08/2018

TEACHING LOAD DISTRIBUTION
ACADEMIC YEAR: 2018-2019 (TERM –I)

SR.NO.	NAME	DESIGNATION	YEAR	SUBJECT	TH (Hrs)	PR BATCH X (Hrs)	TOTAL
1.	Dr. I. D.Patil	Prof. & HOD	SE	BPCAls	03	--	14
			TE	CRE	03		
			SE	UO	--	02	
			SE	GMP	--	02	
			BE	Project-I & Seminar-II	--	2*2	
2.	Mrs. S.S. Pawar	Assistant Prof.	BE	BPED	03	-	17
			TE	BIA	03	02	
			TE	CRE	--	02	
			SE	UO	03	02	
			BE	Project-I	--	02	
3.	Mr. Jayant P.P	Assistant Prof.	TE	ENZY	03	--	20
			TE	Mol. Bio	--	04	
			BE	DSP	03	02	
			BE	Int. D. Elective	03	--	
			SE	GMP	01	--	
			SE	MB	--	02	
			BE	Project-I	--	02	
4.	Mr. Gaurav Khodape	Assistant Prof.	SE	BIEM	03	--	18
			TE	BIEM	03	--	
			BE	Bio info	03	02	
			TE	PTC	01	02	
			SE	GMP	--	02	
			BE	Project -I	--	02	
5.	Dr. Mrs. Bhagyashree Dandi	Contributory Lecturer	SE	MB	03	02	08
			TE	Mol. Bio	03	--	
6.	Mr. Swapnil Deshmukh	Contributory	BE	FB (Ele-I)	03	02	05

		Lecturer					
					TOTAL	**:**	**82**

Theory Load: 44
Practical Load:28
Project & Seminar Load: 10

Dr. I. D.Patil
HOD, Biotech

TEACHING LOAD DISTRIBUTION

ACADEMIC YEAR: 2018-2019 (Term II)

Date: 13/12/2018

SR.NO.	NAME	DESIGNATION	CLASS	SUBJECT	TH (Hrs)	PR BATCH X (Hrs)	TOTAL
1	Dr. I.D.Patil	Prof. & HOD	SE	IPR &E	03	--	18
			TE	IPR &E	03		
			TE	BPE & FT	--	04	
			TE	Seminar -I	--	02	
			BE	Project -II	--	04	
			TE	Minor Project	--	02	
2	Mrs. S. S. Pawar	Assistant Prof.	SE	PHT	03	04	23
			TE	MT	03	02	
			SE	Environmental Biotechnology	--	04	
			BE	ELE-III	03	--	
			BE	Project-II	--	04	
3	Mr. Jayant P. Parpalliwar	Assistant Prof.	SE	IMMU	--	02	22
			TE	GENE	03	02	
			BE	BPI	03	02	
			BE	Ele -II	03	02	
			BE	Project-II	--	04	
			SE	Environmental Biotechnology	01	--	
4	Mr. Gaurav Khodape	Assistant Prof.	SE	IMMU	03	02	23
			SE	BCH	--	04	
			TE	BPE	03	--	
			BE	BPMS	03	02	
			BE	Project-II	--	04	
			TE	Minor Project	--	02	
5	X1	Contributory Lecturer	SE	BCH	03	--	06
			TE	FT	03	--	
6	Mrs. Sakina Hussain	Contributory Lecturer	SE	Biology (Comp, IT, Ele, Che, E&Tc)	15	5 (Tutorial)	20
						Total	112

Total load:
TH: 55
PR: 57

Dr. I.D.Patil
(HOD, BIOTECH DEPT)

Copy to : 1.Principal
2. D.O.A
3. Applied Science

Shrama Sadhana Bombay Trust's

COLLEGE OF ENGINEERING AND TECHNOLOGY

BAMBHORI, POST BOX NO. 94, JALGAON – 425001 (M.S.)

Included under section 2 (f) & 12 (B) of the UGC Act, 1956

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ISO 9001:2015

DEPARTMENT OF CHEMICAL ENGINEERING
TEACHING LOAD DISTRIBUTION
Academic Year 2018 – 19 (Term – II)

Sr. No.	Name of the Faculty Member	Class	Name of the Course	TH in Hrs.	PR in Hrs.			Total in Hrs.
					Hrs. per Batch	No. of Batches	Total in Hrs.	
1	Dr. K.S.WANI	T.E.	CRE-I	3	--	--	--	05
			Seminar-I	--	2	--	2	
2	Dr. V.R.DIWARE	B.E.	CPDPE	3	2	2	4	23
			CAPEDMS	3	2	1	2	
			PROJECT	--	4	--	4	
		T.E.	PED-II	3	--	--	--	
			Minor Project	--	2	--	2	
			Seminar-I	--	2	--	2	
3	Dr. S.A.THAKUR	B.E.	Elective III PU	3	--	--	--	18
			PROJECT	--	4	--	4	
		T.E.	PEEC	3	--	--	--	
			MT-II	--	4	1	4	
			Minor Project	--	2	--	2	
			Seminar-I	--	2	--	2	
4	V.P.SANGORE	B.E.	Elective II IPC	3	--	--	--	23
		T.E.	Entrepreneurship	--	2	2	4	
			Minor Project	--	2	--	2	
			Seminar-I	--	2	--	2	
		S.E.	MS	3	2	2	4	
			CEL- II	1	2	2	4	
5	Dr. N.Y.GHARE	B.E.	PROJECT	--	4	--	4	25
		T.E.	MT-II	3	4	1	4	
			Minor Project	--	2	--	2	
			Seminar-I	--	2	--	2	
		S.E.	THD - II	3	2	1	2	
			MEBC	3	2	1	2	
6	R.S.RANE	B.E.	CAPEDMS	-	2	1	2	22
			Elective II IPC	-	2	2	4	
		T.E.	CET	3	--	--	--	
			CRE - I	--	2	2	4	
			Seminar-I	--	2	--	2	
		S.E.	PME	3	--	--	--	
			THD - II	--	2	1	2	
			MEBC	--	2	1	2	

Head of the Department

SSBT'S COLLEGE OF ENGINEERING & TECHNOLOGY, BAMBHORI.

DEPARTMENT OF CHEMICAL ENGINEERING

TEACHING LOAD DISTRIBUTION FOR TERM- I

YEAR- 2018-2019

SR. NO.	NAME	YEAR	SUBJECT	TH (Hrs)	PR BATCH x (Hrs)	TOTAL
1	DR.K.S.WANI	B.E.	PCT/BCE(ELE-I)	3	0	03
2	DR. V.R.DIWARE	B.E.	CRE-II	3	2X2=4	
			Lab (Ele-I)	0	2X2=4	
			PROJECT	0	2	
			SEMINAR	0	2	
		T.E.	PED-I	3	0	
			PHT	3	0	21
3	DR.S.A.THAKUR	B.E.	PDC	3	0	
			PROJECT	0	2	
			SEMINAR	0	2	
		T.E.	MT-I	3	1x4=4	14
4	V.P.SANGORE	T.E.	IIA	3	1X2=2	
		S.E.	IC	3	2X1=2	
			THD-I	3	2X2=4	
			CE Lab-I	1	2X2=4	22
5	DR.N.Y.GHARE	B.E.	TP	3	0	
			EE(Int. Disci)	3	0	
			PROJECT	0	2	
			SEMINAR	0	2	
			PDC	0	2X2=4	
		S.E.	FM	3	2X2=4	21
6	R.S.RANE	T.E.	IEM	3	0	
			DA&I	1	0	
		S.E.	CEM	3	0	
			IOM	3	0	10
7	MISS R.P.BARI	T.E.	MT-I	0	1x4=4	
			IIA	0	1x2=2	
			PHT	0	2X2=4	
			DA&I	0	2X2=4	14
					TOTAL	105

TT In-charge

HOD (CHEMICAL ENGG)

SSBT'S COLLEGE OF ENGINEERING & TECHNOLOGY, BAMBHORI.
DEPARTMENT OF CHEMICAL ENGINEERING
TEACHING LOAD DISTRIBUTION FOR TERM II,
SEM : IV, VI, & VIII
YEAR 2017-2018

SR. NO.	NAME	YEAR	SUBJECT	TH(Hrs)	(Hrs) x PR BATCH	TOTAL
1	Dr. K.S.WANI	T.E.	CRE-I	3	--	5
			SEMINAR-I (TE)	--	2	
2	Dr. V.R.DIWARE	B.E.	CPDPE	3	2X2=4	23
			CAPEDMS	3	2X1=2	
		T.E.	PED-II	3	--	
			PROJECT(BE) , MINOR PROJECT, SEMINAR-I (TE)	--	8	
3	Dr. S.A.THAKUR	B.E.	ELECTIVE III PU	3	--	18
		T.E.	PEEC	3	--	
		S.E.	LAB MO	--	4X1=4	
			PROJECT(BE) , MINOR PROJECT, SEMINAR-I (TE)	--	8	
4	Shri. V.P.SANGORE	B.E.	ELECTIVE II IPC	--	2X1=2	
		T.E.	CRE - I	--	2X1=2	26
			ENTREPRENEURSHIP	--	2X2=4	
		S.E.	APC	3	2X2=4	
			CEP I	3	--	
			LAB CP	--	2X2=4	
			MINOR PROJECT, SEMINAR-I (TE)	--	4	
5	Dr. N.Y.GHARE	T.E.	MT-II	3	4X2=8	27
			CET	3	--	
		S.E.	PCAL	3	--	
			PCAL(TU)	--	1X1=1	
			MO(TU)	--	1X1=1	
			PROJECT(BE), MINOR PROJECT, SEMINAR-I (TE)	--	8	
6	MISS SHUBHANGI R. DESHMUKH	B.E.	ELECTIVE II IPC	3	2X1=2	28
			CAPEDMS	--	2X1=2	
		S.E.	MO	3	4X1=4	
			CEP - II	3	--	
			LAB CA	1	2X2=4	
			MO(TU)	--	1X1=1	
			PCAL(TU)	--	1X1=1	
		T.E.	CRE - I	--	2X1=2	
			SEMINAR-I (TE)		2	
					TOTAL	127

HOD (CHEMICAL ENGG)

SSBT'S COLLEGE OF ENGINEERING & TECHNOLOGY, BAMBHORI.

DEPARTMENT OF CHEMICAL ENGINEERING

TEACHING LOAD DISTRIBUTION FOR TERM I
SEM: III, V & VII
YEAR- 2017-2018

SR. NO.	NAME	YEAR	SUBJECT	TH (Hrs)	PR BATCH x (Hrs)	TOTAL
1	DR.K.S.WANI	B.E.	PCT/BCE(ELE-I)	3	0	03
2	DR. .R.DIWARE	B.E.	CRE-II	3	2X2=4	
			Lab (Ele-I)	0	2X2=4	
			PROJECT	0	2	
			SEMINAR	0	2	
		T.E.	PED-I	3	0	
			PHT	3	0	21
3	DR.S.A.THAKUR	B.E.	PDC	3	0	
			PROJECT	0	2	
			SEMINAR	0	2	
		T.E.	MT-I	3	1x4=4	14
4	V.P.SANGORE	T.E.	IIA	0	2X2=4	
			DA&I	1	1X2=2	
		S.E.	AIOC	3	2X2=4	
			AOC	3	2X2=4	21
5	N.Y.GHARE	B.E.	TP	3	0	
			EE(Int. Disci)	3	0	
			PROJECT	0	2	
			SEMINAR	0	2	
			PDC	0	2X2=4	
		T.E.	DA&I	0	1X2=2	
		S.E.	FFO	3	1X2=2	
			FFO (Tu)	1	1X1=1	22
6	MISS SHUBHANGI R. DESHMUKH	T.E.	MT-I	0	1x4=4	
			IIA	3	0	
			PHT	0	2X2=4	
		S.E.	CEM	3	0	
			SS-III	1	2X2=4	
			FFO	0	1X2=2	
			FFO (Tu)	1	1X1=1	22
7	M.B. AHIRRAO	T.E.	IEM	3	0	03
					TOTAL	106

HOD (CHEMICAL ENGG)

ITEM NO.17(A)

DEPARTMENT –CIVIL ENGINEERING

Teaching work Load of all classes in current Year 2018-19(Term wise)

Year Course Semester	Subject	Load pattern per week				No.of Batches	Total Equivalent load per week			Total work load
		Th	Pr	Drg	Tut		Th	Pr	Drg	
SemI	SUR&G	3X2	2			6	6	12		52
SE	ICE	3X2					6			
(Civil)	ESE	3X2					6			
	BIOLOGY	3X2			2		8			
	MTE-I	1X2				6	2	12		
			2							
SemII	IFM	3X2	2			6	6	12		
SE	ISM	3X2					6			76
(Civil)	CACED	3X2		2		6	6		12	
	GEOLOGY	1X2	2			6	2	12		
	M-III	3X2			2		8			
	MTE-II		2			6		12		
SemI	SD-I	3X2		2		8	6		16	112
TE	IE-I	3X2	2			8	6	16		
(Civil)	FM-II	3X2	2			8	6	16		
	EE-I	3X2	2			8	6	16		
	CM-I	3X2					6			
	TOM-I	1X2	2			8	2	16		
Sem-II	SD-II	3X2		2		8	6		16	132
TE(Civil)	TOS-II	3X2					6			
	GTE-I	3X2	2			8	6	16		
	IE-II	3X2	2			8	6	16		
	CM-II	3X2					6			
	TOM-II		2			8		2		
	SEMINAR-I		2							
	MINOR		2					52		
	PROJECT					26				

SemI BE (Civil)	E&C WRE-I GTE-II ELE-I PROJECT-I SEMINAR-II	3X2 3X2 3X2 3X2	2 2 2 2 2			8 8 8 35 -	6 6 6 6	16 16 16 70 48		190
SemII BE (Civil)	WRE-II ELE-II EE-II ELE-III PROJECT-II IND.LECTURE	3X2 3X2 3X2 3X2 1	2 2 4	 2		8 8 8 35	6 6 6 6 1	16 16 140	 16	213

LOAD DISTRIBUTION FOR CIVIL ENGG DEPARTMENT 2018-2019 SEM-I

SR NO.	NAME	CLASS	SUBJECT	THEORY (Hr)	TUTORIAL (BATCHXHr)	PRACTICAL (BATCHXHr)	TOTAL LOAD
1.	DR. M. HUSSAIN	TE	EE-I	3	-	-	10
			INT ELE	3			
			PRO & SEM			4	
2.	DR.S.L.PATIL	SE	SUR&G	6	-	3X2=6	16
			PRO & SEM			4	
3.	Dr.S .B.PAWAR	BE	ELE-I	3	-	2X2=4	15
			IE-I			4	
			PRO & SEM			4	
4.	DR.P.A.SHIRULE	BE	E&C	6	-	4X2=8	18
			PRO & SEM			4	
5.	F.I.CHAVAN	SE	ICE	3			18
		TE	FM-II	3		1X2=2	
		SE	MTE-I			1X2=2	
		TE	IE-I			1X2=2	
		TE	TOM-I			1X2=2	
			PRO & SEM			4	
6.	SONALI.B.PATIL	TE	FM-II	3		1X2=2	19
		TE	EE-I	3		2X2=4	
		SE	MTE-I			1X2=2	
		TE	TOM-I	1			
			PRO & SEM			4	
7.	JYOTI R. MALI	TE	SD-I	3		3X2=6	18
		TE	IE-I	3			
			MTE-I			1X2=2	
			PRO & SEM			4	
8.	J.N.KALE	TE	CM-I	6			18
		BE	ELE-I			3X2=6	
		TE	IE-I			1X2=2	
		BE	PRO & SEM			4	
		SE	SUR-I			2X2=4	

9.	PANKAJ PUNASE	TE	SD-I	3		4X2=8	20
		TE	GTE-I	3		1X2=2	
			PRO & SEM			4	
10	NIDHI JAIN	BE	WRE-I	3			17
		TE	IE-I			4X2=8	
		SE	SUR&G			3X2=6	
11	MAHESH KOLI	SE	ESE	6			14
			FM-II			4X2=8	
12	MADHURI MALPANI	BE	WRE-I	3			17
		TE	FM-II			2X2=4	
		TE	EE-I			4X2=8	
		BE	E&C			1X2=2	
13	BHUPENDRA PATIL	SE	ICE	3			15
		SE	MTE-I	2		3X2=6	
		TE	TOM-I			2X2=4	
14	SNEHA INGOLE	BE	GTE-II	3		5X2=10	17
			EE-I			2X2=4	
15	PRATIKSHA KANDARE	TE	IE-I	3			15
		BE	E&C			3X2=6	
		BE	GTE-II			2X2=4	
		TE	SD-I			1X2=2	
16	POONAM BAVISKAR	BE	ELE-I	3		2X2=4	18
		TE	TOM-I	1		5X2=10	

LOAD DISTRIBUTION FOR CIVIL ENGG DEPARTMENT 2018-20119 SEM-II

SR NO.	NAME	CLASS	SUBJECT	THEORY (Hr)	TUTORIAL (BATCHXHr)	PRACTICAL (BATCHXHr)	TOTAL LOAD
1.	DR. M. HUSSAIN	BE	EE-II	8			16
		TE	MINOR PRO& SEM			4	
		BE	PRO-II			4	
2.	DR.S.L.PATIL	SE	GEOLOGY	2		6X2=12	22
		BE	PRO-II			4	
		TE	MINOR PRO& SEM			4	
3.	DR.S .B.PAWAR	BE	IPC	3			17
			WRE-II			3X2=6	
		TE	MINOR PRO& SEM			4	
			PRO-II			4	
4.	DR. P.A.SHIRULE	BE	ASD	6		4X2=8	22
		TE	MINOR PRO& SEM			4	
		BE	PRO-II			4	
5.	F.I.CHAVAN	BE	WRE-II	1		4X2=8	25
		SE	ISM	6			
			IFM			1X2=2	
		TE	MINOR PRO& SEM			4	
		BE	PRO-II			4	
6.	J.N.KALE	TE	CM-II	3			22
		TE	SD-II	3		4X2=8	
		TE	MINOR PRO& SEM			4	
		BE	PRO-II			4	
7.	SONALI.B.PATIL	SE	IFM	6		1X2=2	22
			EE-II			3X2=6	
		TE	MINOR PRO& SEM			4	
		BE	PRO-II			4	
8.	JYOTI R. MALI	SE	CACED	3			24
		TE	IE-II	3		4X2=8	

			MTE-II			1X2=2	
		TE	MINOR PRO& SEM			4	
		BE	PRO-II			4	
9.	PANKAJ PUNASE	TE	TOS-II	3			22
		TE	SD-II	3		4X2=8	
		TE	MINOR PRO&SEM			4	
		BE	PRO-II			4	
10	BHUPENDRA PATIL	SE	CACED	3		3X2=6	19
		BE	WRE-II	2			
		SE	MTE-II			2X2=4	
		TE	MINOR PRO &SEM			4	
11	POONAM BAVISKAR	TE	IE-II	3		1X2=2	19
		TE	MTE-II			3X2=6	
		BE	ASD			1X2=2	
		SE	CACED			1X2=2	
		TE	MINOR PRO & SEM			4	
12	MADHURI MALPANI	BE	WRE-II	3			22
		SE	CESGI	3			
		TE	EE-II			5X2=10	
		TE	IE-II			1X2=2	
		TE	MINOR PRO & SEM			4	
13	SNEHA INGOLE	TE	GTE-I	3		5X2=10	20
		BE	IPC	3			
		TE	MINOR PRO & SEM			4	
14	NIDHI JAIN	TE	TOS-II	3			22
		TE	GTE-I	3		3X2=6	
		BE	ASD			3X2=6	
		TE	MINOR PRO & SEM			4	
15	MAHESH KOLI(X1)	SE	CESGI	3			17
		TE	IFM			5X2=10	
		TE	MINOR PRO & SEM			4	
16	X2	CM-II	3				19

		TOM-II				6X2=12	
		TE	MINOR PRO & SEM			4	

ISO 9001:2015

Shrama Sadhana Bombay Trust's

COLLEGE OF ENGINEERING AND TECHNOLOGY

BAMBHORI, POST BOX NO. 94, JALGAON – 425001 (M.S.)

Included under section 2 (f) & 12 (B) of the UGC Act, 1956

Grade B ++ (2.91) NAAC Accredited

DEPARTMENT OF COMPUTER ENGINEERING
TEACHING LOAD DISTRIBUTION
Academic Year 2018 – 19 (Term – II)

Sr. No.	Name of the Faculty Member	Class	Name of the Course	TH in Hrs.	PR in Hrs.			Total in Hrs.
					Hrs. per Batch	No. of Batches	Total in Hrs.	
1	G. K. Patnaik	BE(A)	CD	3	--			10
		BE(B)	CD	3	--			
		BE	PROJECT	--			4	
2	K.P. Adhiya	SE(A)	COA	3				18
		SE(A)	COA LAB		2	4	8	
		BE	PROJECT	-			4	
		ME	PC	3				
3	M. E. Patil	SE(A)	FA	3				18
		BE(B)	MC	3				
		SE(B)	ITWS	1	2	3	7	
		ME	STQA	3	2	1	5	
4	Sandip S. Patil	SE(B)	DSA	3	-			18
		SE(B)	DSALAB		2	5	10	
		ME	SC	3	2	1	5	
5	Ashish T. Bhole	TE(A)	OOMD	3	-			19
		TE(A)	OOMD LAB	-	2	4	8	
		BE(A)	MC	3				
		ME	WE	3				
		BE	PROJECT	-			2	
6	D. D. Puri	FE	PPS	3	-			16
		FE	PPS LAB		2	4	8	
		SE(B)	FA	3				
		BE	PROJECT	-			2	
7	Shital A. Patil	TE(B)	DBMS	3	-			17
		TE(B)	DBMS LAB	-	2	4	8	
		BE(B)	CD LAB	-	2	2	4	
		BE	PROJECT	-			2	
8	N. Y. Suryavanshi	TE(B)	ADA	3	-			17
		BE(A)	CD LAB	-	2	4	8	
		BE(B)	CD LAB	-	2	2	4	
		BE	PROJECT	-			2	
9	Dipak Bage	TE(B)	OS	3				17
		TE(B)	OS LAB	-	2	4	8	
		TE(A)	OS LAB		2	2	4	
		BE	PROJECT	-			2	
10	Nilima Patil	TE (A)	WPL		2	3	6	19
		BE(B)	SMQA	3				
		BE(B)	SMQA LAB		2	4	8	
		BE	PROJECT	-			2	
11	Priti R. Sharma	BE(A)	DWM	3	-			17
		BE(A)	DWM LAB	-	2	4	8	
		SE(B)	ITWS	-	2	2	4	
		BE	PROJECT	-			2	

12	Y. Borse	BE(A)	SMQA	3	-			19
		BE(A)	SMQA LAB	-	2	4	8	
		TE(A)	WPL		2	3	6	
		BE	PROJECT	-			2	
13	Akash Waghmare	TE(A)	DBMS	3	-			20
		TE(A)	DBMS LAB	-	2	4	8	
		TE(B)	OOMD LAB		2	2	4	
		ME	ADBMS	3	2	1	5	
14	Satpal Rajput	TE(A)	ADA	3	-			16
		FE	PPS	3				
		FE	PPS LAB		2	4	8	
		BE	PROJECT				2	
15	Sushant Bahekar	TE(A)	OS	3				16
		TE(A)	OS LAB	-	2	2	4	
		FE	PPS	3				
		FE	PPS LAB	-	2	2	4	
		BE	PROJECT	-			2	
16	Pravin K. patil	SE (B)	COA	3	--			20
		SE(B)	COA LAB	-	2	4	8	
		TE(A)	MIS	3				
		TE	CPP		2	2	4	
		BE	PROJECT	-			2	
17	Dhanashree Tayade	BE(B)	DWM	3	-			17
		BE(B)	DWM LAB	-	2	4	8	
		TE(B)	WPL		2	2	4	
		BE	PROJECT	-			2	
18	Shweta Pandey	SE(A)	DSA	3	-			16
		SE(A)	DSA LAB	-	2	3	6	
		SE(B)	ITWS	1	2	2	5	
		BE	PROJECT	-			2	
19	Archana Shinde	TE(B)	OOMD	3				16
		TE(B)	OOMD LAB	-	2	2	4	
		FE	PPS	3				
		FE	PPS LAB		2	2	4	
		BE	PROJECT				2	
20	Kajal Visrani	TE(B)	MIS	3	-			17
		SE(A)	ITWS		2	1	2	
		TE	CPP		2	6	12	

Head of the Department

SST's College of Engineering & Technology, Bambhori, Jalgaon

DEPT OF E&TC, Tentative Load Distribution for UG 2018-19, Semester - I

Sr. No.	Faculty Member	Class	Subject	Theory	Practical	Project & Seminar	Total
1	Dr. S. R. Suralkar	SE	DSD	3	4	4	
		BE	FOC		2		13
2	Dr. M.P. Deshmukh	SE COM and IT	AEC	9	6	4	19
3	Mr D. U. Adokar	TE	MPI	4	6	4	
		FE	BEEE	4+1(T)			19
4	Mr. V.M. Deshmukh	TE	EME	4		4	
		TE	FCS		6		
		SE	SNS	3			
		FE	BEEE		2		19
5	Mr. N.M. Kazi	BE	CCN	6		4	
		BE	FOC		4		
		TE	CP-III		6		
		FE	BEEE		2		22
6	Dr. P. H. Zope	BE	DSP	6	10	4	
		TE	CP-III	1			23
		SE	PL		2		
7	Mr. A.H. Karode	BE	FOC	6	10	4	22
		SE	DSD		2		
8	Mr. A.C. Wani	SE	SSDC I	3+1(T)	6	4	
		TE	ECD	4	6		24
9	Mr. S.P. Ramteke	SE COM	SNS	6		4	
		SE COM	AEC		12		22
10	Mr. S. A. Hingonekar	BE	AE	3		4	
		BE	DSP		6		
		TE	IOM	3			
		SE COM	AEC		4		20
11	Mr. S.K. Khode	NIL					
12	Mr. A. R. Bari	SE	ECM	3		4	
		TE	CSII	4	6		
		BE	VLSI		4		21
13	Mrs. M. T.Deshmukh	FE	BEEE	4+1(T)	8	4	
		TE	FCS	4			21
14	Ms. P. M. Shanbhag	SE Civil	BE	6	12	4	22
15	Mr Y.S. Santwani	BE	VLSI	6	12	4	22
TOTAL				95	138	56	289

Dr S.R. Suralkar

Professor & Head

SST's College of Engineering & Technology, Bambhori, Jalgaon

DEPT OF E&TC, Tentative Load Distribution for UG 2018-19, Semester - II

Sr. No.	Name of the Faculty Member	Class	Name of the Course	TH in Hrs.	PR in Hrs.			Total in Hrs.
					Hrs. per Batch	No. of Batches	Total in Hrs.	
1	Dr.S.R.Suralkar	TE	E. M.	03	-	-	03	13
		TE	E.M.	-	02	02	04	
		TE	Seminar	-	02	01	02	
		BE	Project	-	04	01	04	
2	Dr.M.P.Deshmukh	FE	BEEE	05	-	-	05	15
		FE	BEEE	-	03	02	06	
		BE	Project	-	04	01	04	
3	D.U.Adokar	SE	DE	06	-	-	06	18
		SE	DE	-	03	02	06	
		TE	Seminar	-	02	01	02	
		BE	Project	-	04	01	04	
4	Dr.V.M.Deshmukh	SE	NL	03	-	-	03	18
		SE	ENL	01	02	02	04	
		BE	SMC	-	02	03	06	
		BE	Project	-	04	01	04	
5	N.M.Kazi	TE	A.S.	-	03	02	06	20
		BE	TNM	08	-	-	08	
		BE	SMC	-	02	01	02	
		BE	Project	-	04	01	04	
6	P.H.Zope	BE	E.S.	08	-	-	08	20
		BE	E.S.	-	04	02	08	
		BE	Project	-	04	01	04	
7	A.H.Karode	SE	DE	-	05	02	10	21
		TE	EM	-	02	01	02	
		TE	I.M.	03	-	-	03	
		TE	Seminar	-	02	01	02	
		BE	Project	-	04	01	04	
8	S.P.Ramteke	BE	RMT	08	-	-	08	20
		BE	RMT	-	04	02	08	
		BE	Project	-	04	01	04	
9	S.A.Hingonekar	TE	IETR	03	-	-	03	20
		SE	EDP	03	-	-	03	
		BE	RMT	-	04	02	08	
		TE	Seminar	-	02	01	02	
		BE	Project	-	04	01	04	
10	A.R.Bari	SE	ADC	04	-	-	04	21
		TE	ADC	-	02	02	04	
		TE	AVE	03	-	-	03	
		TE	AVE	-	03	02	06	

		BE	Project	-	04	01	04	
11	Mrs.M.T.Deshmukh	TE	PE	03	-	-	03	21
		TE	PE	-	03	02	06	
		TE	MP	-	01	02	02	
		SE	EW	-	02	02	04	
		TE	Seminar	-	02	01	02	
		BE	Project	-	04	01	04	
12	Ms.P.M.Shanbhag	FE	BEEE	05	-	-	05	21
		FE	BEEE	-	03	02	06	
		TE	MP	-	02	02	04	
		TE	Seminar	-	02	01	02	
		BE	Project	-	04	01	04	
13	Y.S.Santwani	BE	SMC	08	-	-	08	22
		BE	SMC	-	04	02	08	
		TE	Seminar	-	02	01	02	
		BE	Project	-	04	01	04	

Dr S.R. Suralkar

Professor & Head

S.S.B.T.'s College of Engineering & Technology, Bambhori
Electrical Engineering Department
Tentative Teaching Load Distribution (UG)
Term –I Academic Year 2018-19

Sr. No.	Name of the Staff	Year	Subject	Th.	Pr.	Tu.	Total Load (Hrs)
1	Dr. P. J. Shah	FE	BEEE	3			**16**
		TE	PE	3	6		
		BE	Seminar-II		2		
		BE	Project-I		2		
2	Dr. P. V. Thakre	SE	ECA	3	2		**18**
		BE	IDC	3	6		
		BE	Seminar-II		2		
		BE	Project-I		2		
3	Mr. V. S. Pawar	FE	BEEE	3	2	2	**20**
		BE	IEE (Elect.-I)	3	6		
		BE	Project-I		2		
		BE	Seminar-II		2		
4	Mr. M. M. Ansari	TE	EM/C-II	3	6		**21**
		BE	EAC*	3			
		SE	EW	1	4		
		BE	Project-I		2		
		BE	Seminar-II		2		
5	Mr. S. M. Shembekar	TE	PS-II	3	6		**20**
		BE	PSOC	3			
		FE	BEEE		4		
		BE	Project-I		2		
		BE	Seminar-II		2		
6	Mr. D. S. Patil	SE	NT	3	--		**22**
		BE	HVE	3	6		
		TE	EEW	--	6		
		BE	Project-I		2		
		BE	Seminar-II		2		
7	Mr. N.S. Mahajan	SE	EM/C-I	3	6		**22**
		TE	EME	3			
		FE	BEEE		6		
		BE	Project-I		2		
		BE	Seminar-II		2		
8	Ms. Bipasha Roy Patra	SE	IOM	3	--		**21**
		SE Mech. B	EDC	3	6		
		TE	SA-I	1	6		
		SE	EW		2		
9	Mr. A. S. Borole	SE Mech. A	EDC	3	6		**18**
		TE	IOM	3	--		
		SE	ECA		4		
		FE	BEEE			2	
Total Load				**56**	**118**	**4**	**178**

*Interdisciplinary Elective

HOD

S.S.B.T.'s College of Engineering & Technology, Bambhori
Electrical Engineering Department
<u>Tentative Teaching Load Distribution (UG)</u>
Term –II Academic Year 2018-19

Sr. No.	Name of the Faculty Member	Class	Name of the Course	TH in Hrs.	TU	PR in Hrs.			Total in Hrs.
					Hrs. per Batch	Hrs. per Batch	No. of Batches	Total in Hrs.	
1	Dr. P. J. Shah	SE	ADE	03		02	03	09	13
		BE	Project-II					02	
		TE	Minor Project					01	
		TE	Seminar-I					01	
2	Dr. P. V. Thakre	SE	EEM	03		02	02	07	17
		FE	BEEE	03+1	01		02	06	
		BE	Project-II					02	
		TE	Minor Project					01	
		TE	Seminar-I					01	
3	Mr. V. S. Pawar	TE	CS-I	03		02	03	09	19
		FE	BEEE	03+1	01		02	06	
		BE	Project-II					02	
		TE	Minor Project					01	
		TE	Seminar-I					01	
4	Mr. M. M. Ansari	SE	EM/C-II	03				03	18
		BE	PSS	03		02	03	09	
		SE	MI			02	01	02	
		BE	Project-II					02	
		TE	Minor Project					01	
		TE	Seminar-I					01	
5	Mr. S. M. Shembekar	BE	SGP	03		02	03	09	19
		FE	BEEE			02	03	06	
		BE	Project-II					02	
		TE	Minor Project					01	
		TE	Seminar-I					01	
6	Mr. D. S. Patil	TE	EM-II	03		02	03	09	18
		SE	MI	01		02	02	05	
		BE	Project-II					02	
		TE	Minor Project					01	
		TE	Seminar-I					01	
7	Mr. N.S. Mahajan	BE	FACTS & PQ	03				03	18
		TE	EMD	03				03	
		SE	EM/C-II			02	03	06	
		SE	EEM			02	01	02	
		BE	Project-II					02	
		TE	Minor Project					01	
		TE	Seminar-I					01	
8	Ms. B. B. Patra	TE	MPMC	03		02	03	09	20
		SE	ED	03				03	
		FE	BEEE			02	03	06	
		BE	Project-II					02	
9	Mr. A. S. Borole	BE	PSDP	03		02	03	09	20
		TE	ED	03				03	
		TE	SA-II			02	03	06	
		TE	Minor Project					01	
		TE	Seminar-I					01	
Total									162

HOD

S.S.B.T'S College of Engineering & Technology, Bambhori, Jalgaon

Department of Information Technology

Load Distribution (Term-I) 2017-18

Sr. No.	Staff Name	Designation	Class	Subject	Theory	Practical	Total Load
1	Dr. U. S. Bhadade	Professor	SE.IT	OOT	3	2*3=6	13
			BE IT	Project & Seminar	--	4	
2	Mrs. A. K. Bhavsar	Asso. Prof	SE IT	SS-III	--	2*3=6	21
			TE IT	SE	3	2*4=8	
			BE.IT	Project & Seminar	--	4	
3	Mr. S. J. Patil	Asst. Prof	BE IT	ERP	3		18
			TE.IT	CN	3	2*4=8	
			BE.IT	Project & Seminar	--	4	
4	Mr. N. P. Jagtap	Asst. Prof	SE IT	DSGT	3+1(T)	--	17
			BE IT	ES	3	2*3=6	
			BE IT	Project & Seminar	--	4	
5	Mr. S. H. Rajput	Asst. Prof	TE IT	FLAT	3	--	17
			BE IT	AI	3	2*3=6	
			SE IT	SS-III	1		
			BE IT	Project & Seminar	--	4	
6	Mr. R. B. Sangore	Asst. Prof	BE ALL	ERP & SAP	3		16
			SE IT	IT	3	2*3=6	
			BE IT	Project & Seminar	--	4	
7	Mr. S. K. Singh	Asst. Prof	BE IT	AUP	3	2*3=6	22
			TE IT	JPL	1	2*4=8	
			BE IT	Project & Seminar	--	4	
8	Miss. T. A. Patil	Asst. Prof	TE IT	SP	3	2*4=8	17
			SE IT	DSGT	-	2*3=6	
9	Mrs. M. Rode	Asst. Prof	SE IT	DSM	3	2*3=6	17
			TE IT	LL	--	2*4=8	
						Total	158

- Mr. P. A. Anawade Asst. Prof. of MBA department is taking POM of TE IT.

HOD IT
(Dr. U. S. Bhadade)

SSBT's College of Engineering and Technology

Department of Information Technology

Load Distribution - Term - II (2017-18)

Sr. No.	Staff Name	Designation	Class	Subject	Theory	Practical	Project	Total Load
1	Dr. U. S. Bhadade	Professor & Head	TE	DBMS	3	2*2		11
			BE	PROJECT			4	
2	Mrs. A. K. Bhavsar	Asso. Professor	TE	OOMD	3	2*4		21
			SE	DC		2*3		
			BE	PROJECT			4	
3	Mr. S. J. Patil	Asst. Professor	BE	IS	3	2*3		22
			FE	CP	3	2*3		
			BE	PROJECT			4	
4	Mr. N. P. Jagtap	Asst. Professor	BE	DWM	3	2*3		22
			SE	CGM	3	2*3		
			BE	PROJECT			4	
5	Mr. S. H. Rajput	Asst. Professor	SE	DC	3			20
			TE	DBMS		2*2		
			BE	SMQA	3	2*3		
			BE	PROJECT			4	
6	Mr. R. B. Sangore	Asst. Professor	SE	CO	3			18
			TE	OS	3	2*4		
			BE	PROJECT			4	
7	Mr. S. K. Singh	Asst. Professor	SE	DS	4	2*3		22
			TE	WPL		2*4		
			BE	PROJECT			4	
8	Ms. Tejashri Patil	Asst. Professor	SE	ADL	1	2*3	2*3	13
			TE	MIS	3			
			BE	CC	3			
9	Ms. Priyanka Gaikwad	Asst. Professor	SE	MPMCI	4	2*3	2*3	13
			TE	E-COM	3			
								162

SSBT's College of Engineering and Technology

Department of Information Technology

Load Distribution - Term - I (2018-19)

Sr. No.	Staff Name	Designation	Class	Subject	Theory	Practical	Project	Total Load
1	Dr. U. S. Bhadade	Professor & Head	TE	SE	3	2*3		13
			BE	Project & Seminar			4	
2	Mrs. A. K. Bhavsar	Asso. Professor	TE	SP	3	2*3		16
			SE	OB	3			
			BE	Project & Seminar			4	
3	Mr. S. J. Patil	Asst. Professor	BE	CN	3	2*3		16
			BE	ERP	3			
			BE	Project & Seminar			4	
4	Mr. N. P. Jagtap	Asst. Professor	BE	ES	3	2*4		18
			SE	DSGT	3			
			BE	Project & Seminar			4	
5	Mr. S. H. Rajput	Asst. Professor	TE	FLAT	3			18
			TE	JPL		2*2		
			SE	OOP	1	2*3		
			BE	Project & Seminar			4	
6	Mr. R. B. Sangore	Asst. Professor	BE	AP	3	2*4		18
			TE	POM	3			
			BE	Project & Seminar			4	
7	Mr. S. K. Singh	Asst. Professor	BE	AUP	3	2*4		18
			SE	JPL	1	2*1		
			BE	Project & Seminar			4	
8	M. R. Mahajan	Asst. Professor	BE	ERP & SAP	3			15
			TE	LL		2*3		
			SE	DSGT		2*3		
								132

Shrama Sadhana Bombay Trust's

COLLEGE OF ENGINEERING AND TECHNOLOGY

BAMBHORI, POST BOX NO. 94, JALGAON – 425001 (M.S.)

Included under section 2 (f) & 12 (B) of the UGC Act, 1956

Grade B++ (2.91) NAAC Accredited

ISO 9001:2015

DEPARTMENT OF INFORMATION TECHNOLOGY
TEACHING LOAD DISTRIBUTION
Academic Year 2018 – 19 (Term – II)

Sr. No.	Name of Faculty Mamber	Class	Name of Course	TH in Hrs.	Practical in Hrs			Project	Total
					Hrs. per Batch	No. Of Batches	Totals in Hrs		
1	Dr. U.S. Bhadade	SE IT	Digital Electronics (DE)	3	2	3	6	4	13
2	Mrs. A. K. Bhavsar	SE IT	Finance & Accounting (FA)	3	--	--	--	4	16
		TE IT	Object Oriented Modeling and Design (OOMD)	3	2	3	6		
3	Mr. S.J. Patil	TE IT	Operating System (OS)	3	2	1	2	4	20
		BE IT	Internet Security (IS)	3	2	4	8		
4	Mr. N. P. Jagtap	TE IT	Database Management System (DBMS)	3	--	--	--	4	18
		BE IT	Data Ware housing and Mining (DWM)	3	2	4	8		
5	Mr. S. H. Rajput	SE IT	IT Workshop (ITW/S)	1	2	3	6	4	20
		TE IT	E- Commerce (E-COM)	3	--	--	--		
		TE IT	Database Management System (DBMS)	--	2	2	6		
6	Mr. R.B. Sangore	SE IT	Computer Organization & Architecture (COA)	3	2	3	6	4	18
		BE IT	Computer Network and Security (CNS)	3	--	--	--		
		TE IT	Operating System (OS)	--	2	1	2		
7	Mr. S. K. Singh	SE IT	Data structure & Algorithms (DSA)	3	2	3	6	4	18
		TE IT	Operating System (OS)	--	2	1	2		
		BE IT	Cloud Computing (CC)	3	--	--	--		
8	Ms. M. R. Mahajan	TE IT	Web Programming Lab (WPL)	--	2	3	6	--	17
		TE IT	Management Information System (MIS)	3	--	--	--		
		BE IT	Computer Network and Security (CNS)	--	2	2	8		
			Total	40			72	28	140

Head of the Department

ISO 9001:2015

Shrama Sadhana Bombay Trust's

COLLEGE OF ENGINEERING AND TECHNOLOGY

BAMBHORI, POST BOX NO. 94, JALGAON – 425001 (M.S.)

Included under section 2 (f) & 12 (B) of the UGC Act, 1956

Grade B++ (2.91) NAAC Accredited

DEPARTMENT OF MECHANICAL ENGINEERING
TEACHING LOAD DISTRIBUTION

Academic Year 2018 – 19 (Term – II)

Sr. No.	Name of the Faculty Member	Class	Name of the Course	TH in Hrs.	PR in Hrs.			Total in Hrs.
					Hrs. per Batch	No. of Batches	Total in Hrs.	
1	Dr. S. P. Shekhawat	SE(A)	IEDP	03	-----	-----	-----	14
		SE(B)	IEDP	03	-----	-----	-----	
		TE	MINOR PROJECT	-----	-----	-----	02	
		TE	SEMINAR-I	-----	-----	-----	02	
		BE	PROJECT-II	-----	-----	-----	04	
2	Mr. N. K. Patil	FE (F)	EG	03	02	03	06	24
		TE(B)	MQC	03	02	02	04	
		TE	MINOR PROJECT	-----	-----	-----	02	
		TE	SEMINAR-I	-----	-----	-----	02	
		BE	PROJECT-II	-----	-----	-----	04	
3	Mr. K. Shrivastava	FE (G)	EG	03	02	03	06	28
		TE (A)	TURBO M/C	03	02	04	08	
		TE	MINOR PROJECT	-----	-----	-----	02	
		TE	SEMINAR-I	-----	-----	-----	02	
		BE	PROJECT-II	-----	-----	-----	04	
4	Mr. M.V. Rawlani	TE (A)	NACM	03	-----	-----	-----	14
		TE (B)	NACM	03	-----	-----	-----	
		TE	MINOR PROJECT	-----	-----	-----	02	
		TE	SEMINAR-I	-----	-----	-----	02	
		BE	PROJECT-II	-----	-----	-----	04	
		BE(A&B)	Industrial Lecture	-----	-----	-----	-----	
5	Dr. P. G. Damle	TE(A)	MD-II	03	-----	-----	-----	22
		TE(B)	MD-II	03	02	04	08	
		TE	MINOR PROJECT	-----	-----	-----	02	
		TE	SEMINAR-I	-----	-----	-----	02	
		BE	PROJECT-II	-----	-----	-----	04	
6	Mr. D. B. Sadaphale	SE (A)	FMM	03	02	03	06	22
		SE (B)	FMM	03	02	03	06	
		TE	MINOR PROJECT	-----	-----	-----	02	
		TE	SEMINAR-I	-----	-----	-----	02	
7	Mr. P. N. Ulhe	BE(A)	MV	03	02	04	08	22
		BE(B)	MV	03	-----	-----	-----	
		TE	MINOR PROJECT	-----	-----	-----	02	
		TE	SEMINAR-I	-----	-----	-----	02	
		BE	PROJECT-II	-----	-----	-----	04	
8	Mr. P. M. Solanki	FE (H)	EG	03	02	03	06	24
		BE (A)	FEA&ST	03	02	04	08	
		BE	PROJECT-II	-----	-----	----	04	

9	Mr. P. D. Patil	FE (I)	EG	03	02	03	06	28
		TE(A)	MQC	03	02	04	08	
		TE	MINOR PROJECT	-----	-----	-----	02	
		TE	SEMINAR-I	-----	-----	-----	02	
		BE	PROJECT-II	-----	-----	-----	04	
10	Mr. M. V. Kulkarni	SE (B)	AT	-----	02	03	06	24
		TE(B)	TURBO M/C	03	02	4	08	
		BE (A)	PPE	03	-----	-----	-----	
		TE	MINOR PROJECT	-----	-----	-----	02	
		TE	SEMINAR-I	-----	-----	-----	02	
11	Mr. A. R. Bhardwaj	FE (E to H)	WP	04	-----	-----	-----	12
		TE	MINOR PROJECT	-----	-----	-----	02	
		TE	SEMINAR-I	-----	-----	-----	02	
		BE	PROJECT-II	-----	-----	----	04	
12	Mr. D. C. Talele	SE(B)	MQC	01	02	01	02	22
		BE(B)	FEA&ST	03	02	04	08	
		TE	MINOR PROJECT	-----	-----	-----	02	
		TE	SEMINAR-I	-----	-----	-----	02	
		BE	PROJECT-II	-----	-----	-----	04	
13	Dr. P.P. Bornare	TE(B)	PBM	03	-----	-----	-----	22
		BE(B)	AUTO-II	03	-----	-----	-----	
		BE(B)	PPE	-----	02	04	08	
		TE	MINOR PROJECT	-----	-----	-----	02	
		TE	SEMINAR-I	-----	-----	-----	02	
		BE	PROJECT-II	-----	-----	-----	04	
14	Mr. C. K. Mukherjee	SE (A)	IECO	03	-----	-----	-----	22
		SE (B)	IECO	03	-----	-----	-----	
		TE (A)	MD-II	-----	02	02	04	
		BE(A)	PPE	-----	02	04	08	
		TE	MINOR PROJECT	-----	-----	-----	02	
		TE	SEMINAR-I	-----	-----	-----	02	
15	Mr. A. V. Rajput	T.E. (B)	M.Q.C.	-----	02	02	04	19
		BE(A)	AUTO-II	03	-----	-----	-----	
		BE(B)	MV	-----	02	04	08	
		TE	MINOR PROJECT	-----	-----	-----	02	
		TE	SEMINAR-I	-----	-----	-----	02	
16	Mr. A. J. Puri	SE (A)	MQC	01	02	03	06	22
		TE (A)	PBM	03	-----	-----	-----	
		TE (A)	MD-II	-----	02	02	04	
		TE	MINOR PROJECT	-----	-----	-----	02	
		TE	SEMINAR-I	-----	-----	-----	02	
		BE	PROJECT-II	-----	-----	-----	04	
17	Mr. T.G. Patil	SE (A)	AT	04		-----		22
		SE (B)	AT	04	02	03	06	
		TE	MINOR PROJECT	-----	-----	-----	02	
		TE	SEMINAR-I	-----	-----	-----	02	
		BE	PROJECT-II	-----	-----	-----	04	
18	Mr. A.D. Sardar	SE (B)	MQC	------	02	02	04	11
		B.E. (B)	PPE	03	-----	-----	----	
		TE	MINOR PROJECT	-----	-----	-----	02	
		TE	SEMINAR-I	-----	-----	-----	02	

Head of the Department

SSBT's College of Engineering & Technology, Bambhori, Jalgaon.
Teaching Load Distribution
Semester I & III (Academic Year: 2017 - 18)

SR. NO	NAME	SUBJECT	MBA-I			MBA-II			Engg	TOTAL
			Th	L	Pro	Th	L	Proj	Th	
1	Dr.V.S.Rana.	Organizational Behavior-I	4							12
		Global Marketing Management				4				
		Field Work / Survey						4		
2	Mr.P.A.Anawade	Statistics & Quantitative Methods	4							11
		Priciples of Mgmt (IT Dept)							3	
		Field Work / Survey						4		
3	Dr. Saroj B.Patil	Corporate Communication Skills	4							20
		Human Capital Mgt & Development				4				
		Strategic Human Resource Management				4				
		Industrial Relations & Lab Welfare				4				
		Field Work / Survey						4		
4	Mr.H.A.Salunkhe	Corporate Social Responsibility	4							20
		Banking & Investment Management				4				
		Tax Management				4				
		Sales & Distribution Management				4				
		Field Work / Survey						4		
5	Ms.R.A.Modiyani	Business Accounting	4							20
		Strategic Management				4				
		Strategic Financial Management				4				
		Consumer Behavior and Service Mktg				4				
		Field Work / Survey						4		
6	Mr. Mukesh Ahirrao	Managerial Economics	4							19
		Product and Brand Management				4				
		Tally & Advance Excel				4				
		Industrial Eco. & Mgmt (Chem Dept)							3	
		Field Work / Survey						4		
7	Ms. Faroza Kazi	Management Science	4							19
		Management Information System				4				
		Labour Laws				4				
		Industrial Org & Mgmt (Ele Dept)							3	
		Field Work / Survey						4		
8	Ms.Sanjivani Lokhande	Human Resource Management	4							**18**
		Legal Aspect of Business				4				
		Priciples of Mgmt (Comp. Dept)							3	
		Priciples of Mgmt (Comp. Dept)							3	
		Field Work / Survey						4		
		Total =	**32**	**0**	**0**	**60**	**0**	**32**	**15**	**139**

Time Table I/C **HOD - MBA** **PRINCIPAL**

SSBT's College of Engineering & Technology, Bambhori, Jalgaon.
Teaching Load Distribution
Semester I & III (Academic Year: 2018 - 19)

SR. NO	NAME	SUBJECT	MBA-I		MBA-II			TOTAL
			Th	Pro	Th	L	Proj	
1	Dr.V.S.Rana.	Organizational Behavior-I	4					**16**
		Global Marketing Management			4			
		Sales & Distribution			4			
		Field Work / Survey					4	
2	Mr.P.A.Anawade	Statistics & Quantitative Methods	4					**20**
		Legal Aspects of Business			4			
		Product & Brand Management			4			
		Field Work / Survey					4	
3	Dr. Saroj B.Patil	Corporate Communication Skills	4					**20**
		Human Capital Mgt & Development			4			
		Strategic Human Resource Management			4			
		Human Capital Mgmt & Development			4			
		Field Work / Survey					4	
4	Ms.R.A.Modiyani	Corporate Social Responsibility	4					**20**
		Strategic Management			4			
		Tax Management			4			
		Strategic Financial Management			4			
		Field Work / Survey					4	
5	Mr. Mukesh Ahirrao	Managerial Economics	4					**20**
		Business Accounting & Costing	4					
		Tally & Advance Excel			4			
		Tally & Advance Excel			4			
		Field Work / Survey					4	
6	Ms. Faroza Kazi	Management Science	4					**20**
		Management Information System			4			
		Labour Laws			4			
		Industrial Relation & Labor Welfare					4	
		Field Work / Survey					4	
		Total =	**32**	**0**	**60**	**0**	**32**	**116**

Time Table I/C **HOD – MBA** **Principal**

SSBT's College of Engineering & Technology, Bambhori, Jalgaon.
Department of Business Administration
Teaching Load Distribution
Semester II & IV (Academic Year: 2017 - 18) (Term - II)

Date: 06.03.2018

SR. NO	NAME	SUB CODE	SUBJECT	MBA-I		MBA-II		TOTAL
				TH	Proj	TH	Proj	
1	Dr.V.S.Rana.	204	Marketing Management	4				16
		407B	Cases in Marketing Management			4		
		406A	International Financial Management			4		
		408	Summer Internship Project				4	
2	Mr.P.A.Anawade	208	Operations Management	4				16
		405B	Retail Management & Digital Marketing			4		
		405A	Financial Derivatives			4		
		408	Summer Internship Project				4	
3	Dr. Saroj B. Patil	202	IT for Managers	4				16
		402	E-Commerce & Excellence Management			4		
		405C	Performance & Compensation Management			4		
		408	Summer Internship Project				4	
4	Dr. Richa A. Modiyani	405 A	Financial Derivatives			4		16
		406 A	International Financial Mgt			4		
		407 A	Cases in Financial Mgt			4		
		408	Summer Internship Project				4	
5	Mr. Mukesh Ahirrao	203	Global Economic Scenario	4				20
		205	Financial Management	4				
		404	Entrepreneurship and Project Management			4		
		407A	Cases in Financial Management			4		
		408	Summer Internship Project				4	
6	Ms. Faroza Kazi	201	Business Research Methods	4				20
		401	Current Business Scenario			4		
		406C	International HRM			4		
		407C	Cases in HRM			4		
		408	Summer Internship Project				4	
7	Ms. Sanjeevani Lokhande	206	Organizational Behavior	4				20
		207	Services Management	4				
		403	Indian Commercial Laws			4		
		405B	Marketing Research & Consumer Behavior			4		
		408	Summer Internship Project				4	
			Total =	**32**	**0**	**64**	**28**	**124**

Time Table I/C **HOD - MBA** **PRINCIPAL**

Shrama Sadhana Bombay Trust's
COLLEGE OF ENGINEERING AND TECHNOLOGY
BAMBHORI, POST BOX NO. 94, JALGAON – 425001 (M.S.)
Included under section 2 (f) & 12 (B) of the UGC Act, 1956
Grade B++ (2.91) NAAC Accredited
ISO 9001:2015

DEPARTMENT OF BUSINESS ADMINISTRATION (M.B.A.)
TEACHING LOAD DISTRIBUTION
Academic Year 2018 – 19 (Term – II) (SEM-II & IV)

Sr. No.	Name of the Faculty Member	Class	Name of the Course	TH in Hrs	Project Hours	PR in Hrs.			Total in Hrs.
						Hrs. per Batch	No. of Batches	Total in Hrs.	
1	Dr. V. S. Rana.	MBA-I	204: Marketing Management	4					16
		MBA-I	206: Organizational Behavior-II	4					
		MBA-II	407B: Cases in Marketing Mgt	4					
		MBA-II	408: Summer Internship Project		4				
2	Dr. P. A. Anawade	MBA-I	208: Operations Management	4					16
		MBA-II	403: Indian Commercial Laws	4					
		MBA-II	406B: Retail Mgt & Digital Marketing	4					
		MBA-II	408: Summer Internship Project		4				
3	Dr. S. B. Patil	MBA-I	202: IT for Managers	2		01	02	02	16
		MBA-II	402: Innovation Management	4					
		MBA-II	405C: Performance & Compensation Mgt	4					
		MBA-II	408: Summer Internship Project		4				
4	Dr. R. A. Modiyani	MBA-I	205: Financial Management	4					20
		MBA-I	207: Services Management	4					
		MBA-II	406A: International Financial Mgt	4					
		MBA-II	405B: Marketing Research & Consumer Beh.	4					
		MBA-II	408: Summer Internship Project		4				
5	Mr. M. B. Ahirrao	MBA-I	203: Global Economic Scenario	4					20
		MBA-II	404: Entrepreneurship and Project Mgt	4					
		MBA-II	405A: Financial Derivatives	4					
		MBA-II	407A: Cases in Financial Management	4					
		MBA-II	408: Summer Internship Project		4				
6	Ms. F. A. Kazi	MBA-I	201: Business Research Methods	4					20
		MBA-II	401: Business and Government	4					
		MBA-II	406C: International HRM	4					
		MBA-II	407C: Cases in HRM	4					
		MBA-II	408: Summer Internship Project		4				

Head of the Department

Internal Continuous Evaluation System in place

The internal continuous evaluation system in place at this college level is done as per University guidelines currently enforce/ received before the start of term. The schedule for, performance of practicals is notified on the departmental lab notice board. This schedule is batchwise and it also indicates the completion/ submission date of practical, drawing and assignment sheets. It is meant for those subjects for whom term work marks are to be sent to the University.

The attendance record of the students is maintained in ERP software and in the register meant for this purpose. This register also evaluates the performance of the students under the following headings:

a) Attendance in class/practical
b) Performance in class/practical
c) Class tests/ viva voce
d) Assignment/ Journal

The above are quantified and marks are awarded in the next week, displayed and consolidated at the end of term. At term end the term work assessment programme is displayed and the work is evaluated by two faculty members who are appointed by the Principal and the term work marks are forwarded to the University under the signature of both the examiners.

Students' assessment of Faculty, System in place.

- During the 5th week of the term the feedback by the students is taken subject wise for the staff who teach them. A set of questionnaire is circulated them and feedback is obtained. This feedback is taken by academic monitoring committee comprising of three HOD's and Coordinator of Academic and Research and Development. The feedback is submitted to the Principal and he apprises the faculty member about their weak points and they are given the opportunity to improve upon their deficiencies and their weak points during the term itself.

Also during the term, students are free to pass on the difficulties through suggestion boxes kept at various location and if they are related to their academic difficulties, their difficulties are solved and the concerned faculty is advised by the Principal with sole aim of improvement in academics. Personal hearing is given by Coordinator of Academics and Research and Development and the Principal.