COLLEGE OF ENGINEERING AND TECHNOLOGY,

BAMBHORI POST BOX NO. 94, JALGAON – 425001. (M.S.)

(With NBA Accredited Programmes)

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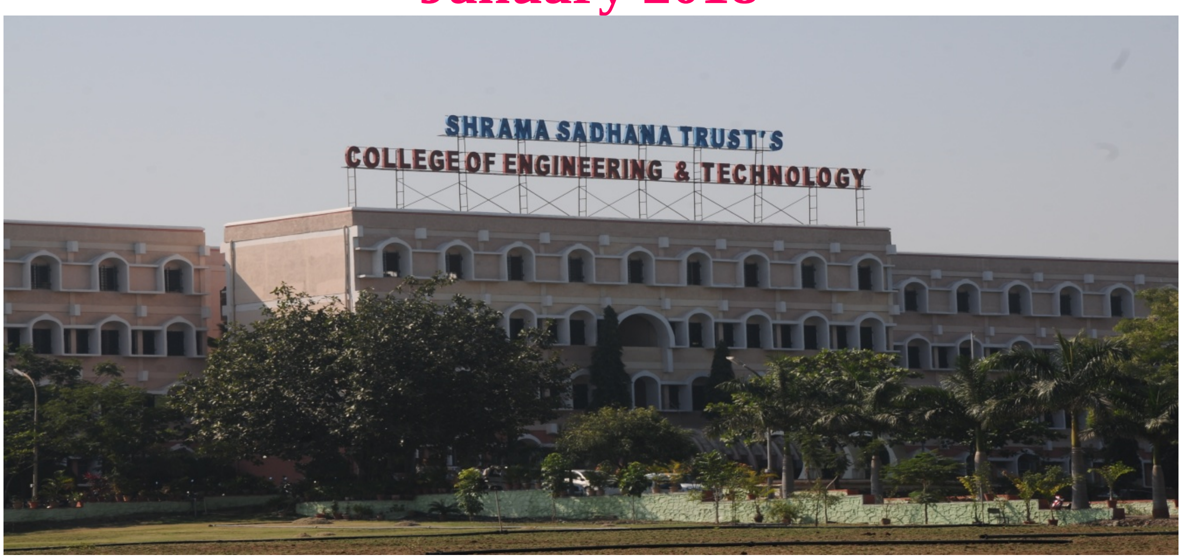
Mandatory Disclosure

Part-III

January 2018



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

ESTD. 1983
BAMBHORI,JALGAON
ISO 9001:2008

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Ref. No. COET/AICTE/MD/ / 18 **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. to page no. 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.)

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.

<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:

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.

Lectures	**Hours / Week**	**No. of weeks**	**Total hours**	**Semester credit**
	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

	Hours/week	No. of weeks	Total hours	Semester credit
Practical	**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.

Theory	Hours/ week	No. of weeks	Total hours	Semester credit
	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.

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	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.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**03**	**14**	**42**	**03**

Prerequisite Course(s): Knowledge of programming languages and data structures.

COURSE CONTENT

Software 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

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	**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

उत्तर महाराष्ट्र विद्यापीठ

अंतरी पेटवू ज्ञानज्योत

1990

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

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).

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

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							
ELECTIVE	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 1^{st} order system.
3. To study the dynamic characteristics 2^{nd} 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.

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.

Lecture	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
	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.

Lecture	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Knowledge of Mathematics at FE and SE level.

COURSE CONTENT

Electromagnetic 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

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. 7th Edition.
2) K. D. Prasad - Antenna and Wave Propagation, Satya Prakashan.
3) Electromagnetics- Schaum's outline series, 2nd 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.

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 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.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	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, 4^{th} 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.

	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	**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

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: 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

	Hours per	No. of Weeks	Total Hours	Semester Credits
Laboratory	**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

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).

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.

Lecture	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	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.

Practical	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	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.

<table>
<tr><th></th><th>Hours per Week</th><th>No. of Weeks</th><th>Total Hours</th><th>Semester Credits</th></tr>
<tr><td>Lecture</td><td>1</td><td>15</td><td>14</td><td rowspan="2">2</td></tr>
<tr><td>Practical</td><td>2</td><td>15</td><td>28</td></tr>
</table>

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.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**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.

Practical	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	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.

<table>
<tr><th rowspan="2">Practical</th><th>Hours per Week</th><th>No. of Weeks</th><th>Total Hours</th><th>Semester Credits</th></tr>
<tr><td>2</td><td>15</td><td>28</td><td>1</td></tr>
</table>

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

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 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

उत्तर महाराष्ट्र विद्यापीठ
अंतरी पेटवू ज्ञानज्योत
1990

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
Database Management System

Short Title Course Code
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
Heat Transfer	**HT LAB**	

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

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

LOAD DESTRIBUTION OF MECHANICAL ENGINEERING DEPARTMENT
Academic Year: 2017-2018 FOR: - First Semester

Date: 01/08/2017

Sr. No.	NAME	CLASS	SUBJECT	Theory (Hr)	Tutorial (Batch X Hr)	Practical (Batch X Hr)	Total Load
1	Dr. S. P. Shekhawat	SE(A)	ET	03	-----	03*02=06	12
		SE(B)	ET	03	-----	-----	
2	Mr. N. K. Patil	BE (B)	OR	03	-----	-----	10
		BE (IND)	ERT	03	-----	-----	
		BE	SEMINAR	-----	-----	02	
		BE	PROJECT	-----	-----	02	
3	Mr. K. Shrivastava	FE (B)	ICEEM	03	------	------	18
		TE (A)	HT	03	------	04*02=08	
		BE	SEMINAR	-----	-----	02	
		BE	PROJECT	-----	-----	02	
4	Mr. M.V. Rawlani	BE (A)	OR	03	-----	-----	10
		BE (IND)	ORT	03	-----	-----	
		BE	SEMINAR	-----	-----	02	
		BE	PROJECT	-----	-----	02	
5	Mr. P. G. Damle	TE(A)	MD-I	03	-----	04*02=08	18
		TE(B)	MD-I	03	-----	-----	
		BE	SEMINAR	-----	-----	02	
		BE	PROJECT	-----	-----	02	
6	Mr. D. B. Sadaphale	SE (A)	FM	03	01*01=01	-----	18
		SE (B)	FM	03	01*01=01	03*02=06	
		BE	SEMINAR	-----	-----	02	
		BE	PROJECT	-----	-----	02	
7	Mr. P. N. Ulhe	SE(A)	SOM	04	01*01=01	-----	13
		SE(B)	SOM	03	01*01=01	-----	
		BE	SEMINAR	-----	-----	02	
		BE	PROJECT	-----	-----	02	
8	Mr. P. M. Solanki	TE (A)	CG	01	-----	-----	16
		BE (A)	CAD/CAM	03	-----	04*02=08	
		BE	SEMINAR	-----	-----	02	
		BE	PROJECT	-----	-----	02	
9	Mr. P. D. Patil	SE (A)	SS-III	01	-----	-----	23
		SE (B)	SS-III	01	-----	03*02=06	
		BE (B)	CAD/CAM	03	-----	04*02=08	
		BE	SEMINAR	-----	-----	02	
		BE	PROJECT	-----	-----	02	

10	Mr. M. V. Kulkarni	TE (B)	HT	03	-----	04*02=08	18
		SE (Elect.)	PPE	03	-----	-----	
		BE	SEMINAR	-----	-----	02	
		BE	PROJECT	-----	-----	02	
11	Mr. A. R. Bhardwaj	SE (A)	ME-I	03	-----	-----	07
		BE	SEMINAR	-----	-----	02	
		BE	PROJECT	-----	-----	02	
12	Mr. D. C. Talele	TE(A)	TOM-II	03	-----	-----	18
		TE(B)	TOM-II	03	-----	04*02=08	
		BE	SEMINAR	-----	-----	02	
		BE	PROJECT	-----	-----	02	
13	Dr. P.P. Bornare	TE(A)	ICE	03	-----	-----	18
		TE(B)	ICE	03	-----	04*02=08	
		BE	SEMINAR	-----	-----	02	
		BE	PROJECT	-----	-----	02	
14	Mrs. J. R. Surange	SE (A)	MSM	03	-----	03*02=06	16
		SE (B)	ME-I	03	-----	-----	
		BE	SEMINAR	-----	-----	02	
		BE	PROJECT	-----	-----	02	
15	Mr. C. K. Mukherjee	TE (A)	I&SE	03	-----	-----	07
		BE	SEMINAR	-----	-----	02	
		BE	PROJECT	-----	-----	02	
16	Mr. A. V. Rajput	BE (A)	AE- I	03	-----	04*02=08	18
		BE (B)	AE- I	03	-----	-----	
		BE	SEMINAR	-----	-----	02	
		BE	PROJECT	-----	-----	02	
17	Mr. A. J. Puri	SE (B)	MSM	03	-----	03*02=06	16
		TE (B)	I&SE	03	-----	-----	
		BE	SEMINAR	-----	-----	02	
		BE	PROJECT	-----	-----	02	
18	Mr. T.G. Patil	BE (A)	RAC	03	-----	04*02=08	18
		BE (B)	RAC	03	-----	-----	
		BE	SEMINAR	-----	-----	02	
		BE	PROJECT	-----	-----	02	
19	Mr. Jayesh A. Gosavi	BE (B)	RAC	-----	-----	04*02=08	08

20	Mr. Sameer Ahmad Farooque	TE(B)	MD-I	-----	-----	02*02=04	12
		BE (B)	AE- I	-----	------	04*02=08	
21	Mr. Ashwin P. Thakkar	SE (A)	FM	-----	01*01=01	03*02=06	08
		SE (B)	FM	-----	01*01=01	-----	
22	Mr. Smith M. Arbat	TE (A)	CG	-----	-----	04*02=08	17
		TE (B)	CG	01	-----	04*02=08	
23	Mr. M.M. Gosavi	SE (A)	SS-III	-----	-----	03*02=06	14
		TE(A)	ICE	-----	-----	04*02=08	
24	Mr. Mahesh A. Marathe	SE (Elect.)	PPE	-----	-----	03*02=06	12
		SE (B)	ET	-----	-----	03*02=06	
25	Miss. Chetana S. Chopade	SE(A)	SOM	-----	01*01=01	-----	14
		SE(B)	SOM	-----	01*01=01	-----	
		TE(B)	MD-I	-----	-----	02*02=04	
		TE(A)	TOM-II	-----	-----	04*02=08	

Mr. D.C. Talele
Time Table I/C

Prof. Dr. S.P. Shekhawat
HOD

LOAD DESTRIBUTION OF MECHANICAL ENGINEERING DEPARTMENT
Academic Year: 2017-2018   FOR: - Second Semester

Date: 03/01/2018

Sr. No.	NAME	CLASS	SUBJECT	Theory (Hr)	Tutorial (Batch X Hr)	Practical (Batch X Hr)	Total Load
1	Dr. S. P. Shekhawat	SE(A)	TOM-I	02	-----	01*02=02	10
		SE(B)	TOM-I	02	-----	01*02=02	
		T.E.	SEMINAR-I	-----	-----	02	
2	Mr. N. K. Patil	FE(A)	IMEED	04	-----	02*02=04	20
		SE(A)	TOM-I	02	-----	-----	
		SE(B)	TOM-I	02	-----	-----	
		T.E.	MQC	-----	-----	01*02=02	
		T.E.	SEMINAR-I	-----	-----	02	
		TE	MINOR PROJECT	-----	-----	02	
		BE	PROJECT	-----	-----	02	
3	Mr. K. Shrivastava	FE (C)	IMEED	04	------	03*02=06	20
		TE (B)	TURBO M/C	04	------	01*02=02	
		T.E.	SEMINAR-I	-----	-----	02	
		BE	PROJECT	-----	-----	02	
4	Mr. M.V. Rawlani	FE (D)	IMEED	04	------	03*02=06	19
		TE (A)	NACM	03	------	------	
		T.E.	SEMINAR-I	-----	-----	02	
		TE	MINOR PROJECT	-----	-----	02	
		BE	PROJECT	-----	-----	02	
5	Dr. P. G. Damle	TE(A)	MD-II	03	-----	04*02=08	26
		TE(B)	MD-II	03	-----	04*02=08	
		T.E.	SEMINAR-I	-----	-----	02	
		BE	PROJECT	-----	-----	02	
6	Mr. D. B. Sadaphale	BE (A)	PPE	03	-----	02*02=04	18
		BE (B)	PPE	03	-----	02*02=04	
		T.E.	SEMINAR-I	-----	-----	02	
		BE	PROJECT	-----	-----	02	
7	Mr. P. N. Ulhe	BE(A)	MV	04	-----	01*02=02	18
		BE(B)	MV	04	-----	01*02=02	
		T.E.	SEMINAR-I	-----	-----	02	
		TE	MINOR PROJECT	-----	-----	02	
		BE	PROJECT	-----	-----	02	
8	Mr. P. M. Solanki	FE (B)	IMEED	04	------	03*02=06	25
		BE (A)	FEA&ST	03	-----	04*02=08	
		T.E.	SEMINAR-I	-----	-----	02	
		BE	PROJECT	-----	-----	02	
9	Mr. P. D. Patil	FE (E)	IMEED	04	------	03*02=06	19

		TE (A)	MQC	03	-----	01*02=02	
		T.E.	SEMINAR-I	-----	-----	02	
		BE	PROJECT	-----	-----	02	
10	Mr. M. V. Kulkarni	FE (F)	IMEED	04	------	03*02=06	19
		TE (A)	TURBO M/C	03	------	01*02=02	
		T.E.	SEMINAR-I	-----	-----	02	
		BE	PROJECT	-----	-----	02	
11	Mr. A. R. Bhardwaj	SE (B)	ME-II	04	-----	-----	
		T.E.	SEMINAR-I	-----	-----	02	10
		TE	MINOR PROJECT	-----	-----	02	
		BE	PROJECT	-----	-----	02	
12	Mr. D. C. Talele	BE (B)	FEA&ST	03	-----	04*02=08	15
		T.E.	SEMINAR-I	-----	-----	02	
		BE	PROJECT	-----	-----	02	
13	Dr. P.P. Bornare	TE(A)	PBM	03	-----	-----	12
		BE(A)	AUTO-II	03	-----	-----	
		T.E.	SEMINAR-I	-----	-----	02	
		TE	MINOR PROJECT	-----	-----	02	
		BE	PROJECT	-----	-----	02	
14	Mrs. J. R. Surange	FE (G)	IMEED	04	------	03*02=06	19
		TE (B)	MQC	03	-----	01*02=02	
		T.E.	SEMINAR-I	-----	-----	02	
		BE	PROJECT	-----	-----	02	
15	Mr. C. K. Mukherjee	SE (A)	MD	01	-----	04*02=08	25
		SE (B)	MD	01	-----	04*02=08	
		TE (B)	NACM	03	-----	-----	
		T.E.	SEMINAR-I	-----	-----	02	
		BE	PROJECT	-----	-----	02	
16	Mr. A. V. Rajput	FE (H)	IMEED	04	------	03*02=06	19
		BE (B)	AE- II	03	-----	-----	
		T.E.	SEMINAR-I	-----	-----	02	
		TE	MINOR PROJECT	-----	-----	02	
		BE	PROJECT	-----	-----	02	
17	Mr. A. J. Puri	SE (A)	ME-II	04	-----	-----	13
		TE (B)	PBM	03	-----	-----	
		T.E.	SEMINAR-I	-----	-----	02	
		TE	MINOR PROJECT	-----	-----	02	
		BE	PROJECT	-----	-----	02	

18	Mr. T.G. Patil	SE (A)	AT	03	01*01=01	01*02=02	16
		SE (B)	AT	03	01*01=01	01*02=02	
		T.E.	SEMINAR-I	-----	-----	02	
		BE	PROJECT	-----	-----	02	
19	Mr. Jayesh A. Gosavi	TE (A)	TURBO M/C	-----	-----	03*02=06	16
		TE (B)	TURBO M/C	-----	-----	03*02=06	
		T.E.	SEMINAR-I	-----	-----	02	
		TE	MINOR PROJECT	-----	-----	02	
20	Mr. Sameer Ahmad Farooque	TE (A)	MQC	-----	-----	03*02=06	14
		TE (B)	MQC	-----	-----	02*02=04	
		T.E.	SEMINAR-I	-----	-----	02	
		TE	MINOR PROJECT	-----	-----	02	
21	Mr. Ashwin P. Thakkar	SE (A)	TOM-I	-----	-----	02*02=04	12
		SE (B)	TOM-I	-----	-----	02*02=04	
		T.E.	SEMINAR-I	-----	-----	02	
		TE	MINOR PROJECT	-----	-----	02	
22	Mr. Smith M. Arbat	FE (I)	IMEED	04	------	04*02=08	16
		T.E.	SEMINAR-I	-----	-----	02	
		TE	MINOR PROJECT	-----	-----	02	
23	Mr. M.M. Gosavi	SE (A)	AT	-----	01*01=01	02*02=04	14
		SE (B)	AT	-----	01*01=01	02*02=04	
		T.E.	SEMINAR-I	-----	-----	02	
		TE	MINOR PROJECT	-----	-----	02	
24	Mr. Mahesh A. Marathe	BE(A)	MV	-----	-----	03*02=06	16
		BE(B)	MV	-----	-----	03*02=06	
		T.E.	SEMINAR-I	-----	-----	02	
		TE	MINOR PROJECT	-----	-----	02	
25	Miss. Chetana S. Chopade	BE(A)	PPE	-----	-----	02*02=04	12
		BE(B)	PPE	-----	-----	02*02=04	
		T.E.	SEMINAR-I	-----	-----	02	
		TE	MINOR PROJECT	-----	-----	02	

Mr. D.C. Talele
Time Table I/C

Prof. Dr. S.P. Shekhawat
HOD

LOAD DESTRIBUTION OF MECHANICAL ENGINEERING DEPARTMENT
Academic Year: 2017-2018 FOR: - First Semester

Date: 01/08/2017

Sr. No.	NAME	CLASS	SUBJECT	Theory (Hr)	Tutorial (Batch X Hr)	Practical (Batch X Hr)	Total Load
1	Dr. S. P. Shekhawat	SE(A)	ET	03	-----	03*02=06	12
		SE(B)	ET	03	-----	-----	
2	Mr. N. K. Patil	BE (B)	OR	03	-----	-----	10
		BE (IND)	ERT	03	-----	-----	
		BE	SEMINAR	-----	-----	02	
		BE	PROJECT	-----	-----	02	
3	Mr. K. Shrivastava	FE (B)	ICEEM	03	------	------	18
		TE (A)	HT	03	------	04*02=08	
		BE	SEMINAR	-----	-----	02	
		BE	PROJECT	-----	-----	02	
4	Mr. M.V. Rawlani	BE (A)	OR	03	-----	-----	10
		BE (IND)	ORT	03	-----	-----	
		BE	SEMINAR	-----	-----	02	
		BE	PROJECT	-----	-----	02	
5	Mr. P. G. Damle	TE(A)	MD-I	03	-----	04*02=08	18
		TE(B)	MD-I	03	-----	-----	
		BE	SEMINAR	-----	-----	02	
		BE	PROJECT	-----	-----	02	
6	Mr. D. B. Sadaphale	SE (A)	FM	03	01*01=01	-----	18
		SE (B)	FM	03	01*01=01	03*02=06	
		BE	SEMINAR	-----	-----	02	
		BE	PROJECT	-----	-----	02	
7	Mr. P. N. Ulhe	SE(A)	SOM	04	01*01=01	-----	13
		SE(B)	SOM	03	01*01=01	-----	
		BE	SEMINAR	-----	-----	02	
		BE	PROJECT	-----	-----	02	
8	Mr. P. M. Solanki	TE (A)	CG	01	-----	-----	16
		BE (A)	CAD/CAM	03	-----	04*02=08	
		BE	SEMINAR	-----	-----	02	
		BE	PROJECT	-----	-----	02	
9	Mr. P. D. Patil	SE (A)	SS-III	01	-----	-----	23
		SE (B)	SS-III	01	-----	03*02=06	
		BE (B)	CAD/CAM	03	-----	04*02=08	
		BE	SEMINAR	-----	-----	02	
		BE	PROJECT	-----	-----	02	

10	Mr. M. V. Kulkarni	TE (B)	HT	03	-----	04*02=08	18
		SE (Elect.)	PPE	03	-----	-----	
		BE	SEMINAR	-----	-----	02	
		BE	PROJECT	-----	-----	02	
11	Mr. A. R. Bhardwaj	SE (A)	ME-I	03	-----	-----	07
		BE	SEMINAR	-----	-----	02	
		BE	PROJECT	-----	-----	02	
12	Mr. D. C. Talele	TE(A)	TOM-II	03	-----	-----	18
		TE(B)	TOM-II	03	-----	04*02=08	
		BE	SEMINAR	-----	-----	02	
		BE	PROJECT	-----	-----	02	
13	Dr. P.P. Bornare	TE(A)	ICE	03	-----	-----	18
		TE(B)	ICE	03	-----	04*02=08	
		BE	SEMINAR	-----	-----	02	
		BE	PROJECT	-----	-----	02	
14	Mrs. J. R. Surange	SE (A)	MSM	03	-----	03*02=06	16
		SE (B)	ME-I	03	-----	-----	
		BE	SEMINAR	-----	-----	02	
		BE	PROJECT	-----	-----	02	
15	Mr. C. K. Mukherjee	TE (A)	I&SE	03	-----	-----	07
		BE	SEMINAR	-----	-----	02	
		BE	PROJECT	-----	-----	02	
16	Mr. A. V. Rajput	BE (A)	AE- I	03	-----	04*02=08	18
		BE (B)	AE- I	03	-----	-----	
		BE	SEMINAR	-----	-----	02	
		BE	PROJECT	-----	-----	02	
17	Mr. A. J. Puri	SE (B)	MSM	03	-----	03*02=06	16
		TE (B)	I&SE	03	-----	-----	
		BE	SEMINAR	-----	-----	02	
		BE	PROJECT	-----	-----	02	
18	Mr. T.G. Patil	BE (A)	RAC	03	-----	04*02=08	18
		BE (B)	RAC	03	-----	-----	
		BE	SEMINAR	-----	-----	02	
		BE	PROJECT	-----	-----	02	
19	Mr. Jayesh A. Gosavi	BE (B)	RAC	-----	-----	04*02=08	08

20	Mr. Sameer Ahmad Farooque	TE(B)	MD-I	-----	-----	02*02=04	12
		BE (B)	AE- I	-----	------	04*02=08	
21	Mr. Ashwin P. Thakkar	SE (A)	FM	-----	01*01=01	03*02=06	08
		SE (B)	FM	-----	01*01=01	-----	
22	Mr. Smith M. Arbat	TE (A)	CG	-----	-----	04*02=08	17
		TE (B)	CG	01	-----	04*02=08	
23	Mr. M.M. Gosavi	SE (A)	SS-III	-----	-----	03*02=06	14
		TE(A)	ICE	-----	-----	04*02=08	
24	Mr. Mahesh A. Marathe	SE (Elect.)	PPE	-----	-----	03*02=06	12
		SE (B)	ET	-----	-----	03*02=06	
25	Miss. Chetana S. Chopade	SE(A)	SOM	-----	01*01=01	-----	14
		SE(B)	SOM	-----	01*01=01	-----	
		TE(B)	MD-I	-----	-----	02*02=04	
		TE(A)	TOM-II	-----	-----	04*02=08	

Mr. D.C. Talele
Time Table I/C

Prof. Dr. S.P. Shekhawat
HOD

LOAD DESTRIBUTION OF MECHANICAL ENGINEERING DEPARTMENT
Academic Year: 2017-2018 FOR: - Second Semester

Date: 03/01/2018

Sr. No.	NAME	CLASS	SUBJECT	Theory (Hr)	Tutorial (Batch X Hr)	Practical (Batch X Hr)	Total Load
1	Dr. S. P. Shekhawat	SE(A)	TOM-I	02	-----	01*02=02	10
		SE(B)	TOM-I	02	-----	01*02=02	
		T.E.	SEMINAR-I	-----	-----	02	
2	Mr. N. K. Patil	FE(A)	IMEED	04	-----	02*02=04	20
		SE(A)	TOM-I	02	-----	-----	
		SE(B)	TOM-I	02	-----	-----	
		T.E.	MQC	-----	-----	01*02=02	
		T.E.	SEMINAR-I	-----	-----	02	
		TE	MINOR PROJECT	-----	-----	02	
		BE	PROJECT	-----	-----	02	
3	Mr. K. Shrivastava	FE (C)	IMEED	04	------	03*02=06	20
		TE (B)	TURBO M/C	04	------	01*02=02	
		T.E.	SEMINAR-I	-----	-----	02	
		BE	PROJECT	-----	-----	02	
4	Mr. M.V. Rawlani	FE (D)	IMEED	04	------	03*02=06	19
		TE (A)	NACM	03	------	------	
		T.E.	SEMINAR-I	-----	-----	02	
		TE	MINOR PROJECT	-----	-----	02	
		BE	PROJECT	-----	-----	02	
5	Dr. P. G. Damle	TE(A)	MD-II	03	-----	04*02=08	26
		TE(B)	MD-II	03	-----	04*02=08	
		T.E.	SEMINAR-I	-----	-----	02	
		BE	PROJECT	-----	-----	02	
6	Mr. D. B. Sadaphale	BE (A)	PPE	03	-----	02*02=04	18
		BE (B)	PPE	03	-----	02*02=04	
		T.E.	SEMINAR-I	-----	-----	02	
		BE	PROJECT	-----	-----	02	
7	Mr. P. N. Ulhe	BE(A)	MV	04	-----	01*02=02	18
		BE(B)	MV	04	-----	01*02=02	
		T.E.	SEMINAR-I	-----	-----	02	
		TE	MINOR PROJECT	-----	-----	02	
		BE	PROJECT	-----	-----	02	
8	Mr. P. M. Solanki	FE (B)	IMEED	04	------	03*02=06	25
		BE (A)	FEA&ST	03	-----	04*02=08	
		T.E.	SEMINAR-I	-----	-----	02	
		BE	PROJECT	-----	-----	02	
9	Mr. P. D. Patil	FE (E)	IMEED	04	------	03*02=06	19

		TE (A)	MQC	03	-----	01*02=02	
		T.E.	SEMINAR-I	-----	-----	02	
		BE	PROJECT	-----	-----	02	
10	Mr. M. V. Kulkarni	FE (F)	IMEED	04	------	03*02=06	19
		TE (A)	TURBO M/C	03	------	01*02=02	
		T.E.	SEMINAR-I	-----	-----	02	
		BE	PROJECT	-----	-----	02	
11	Mr. A. R. Bhardwaj	SE (B)	ME-II	04	-----	-----	
		T.E.	SEMINAR-I	-----	-----	02	10
		TE	MINOR PROJECT	-----	-----	02	
		BE	PROJECT	-----	-----	02	
12	Mr. D. C. Talele	BE (B)	FEA&ST	03	-----	04*02=08	15
		T.E.	SEMINAR-I	-----	-----	02	
		BE	PROJECT	-----	-----	02	
13	Dr. P.P. Bornare	TE(A)	PBM	03	-----	-----	12
		BE(A)	AUTO-II	03	-----	-----	
		T.E.	SEMINAR-I	-----	-----	02	
		TE	MINOR PROJECT	-----	-----	02	
		BE	PROJECT	-----	-----	02	
14	Mrs. J. R. Surange	FE (G)	IMEED	04	------	03*02=06	19
		TE (B)	MQC	03	-----	01*02=02	
		T.E.	SEMINAR-I	-----	-----	02	
		BE	PROJECT	-----	-----	02	
15	Mr. C. K. Mukherjee	SE (A)	MD	01	-----	04*02=08	25
		SE (B)	MD	01	-----	04*02=08	
		TE (B)	NACM	03	-----	-----	
		T.E.	SEMINAR-I	-----	-----	02	
		BE	PROJECT	-----	-----	02	
16	Mr. A. V. Rajput	FE (H)	IMEED	04	------	03*02=06	19
		BE (B)	AE- II	03	-----	-----	
		T.E.	SEMINAR-I	-----	-----	02	
		TE	MINOR PROJECT	-----	-----	02	
		BE	PROJECT	-----	-----	02	
17	Mr. A. J. Puri	SE (A)	ME-II	04	-----	-----	13
		TE (B)	PBM	03	-----	-----	
		T.E.	SEMINAR-I	-----	-----	02	
		TE	MINOR PROJECT	-----	-----	02	
		BE	PROJECT	-----	-----	02	

18	Mr. T.G. Patil	SE (A)	AT	03	01*01=01	01*02=02	16
		SE (B)	AT	03	01*01=01	01*02=02	
		T.E.	SEMINAR-I	-----	-----	02	
		BE	PROJECT	-----	-----	02	
19	Mr. Jayesh A. Gosavi	TE (A)	TURBO M/C	-----	-----	03*02=06	16
		TE (B)	TURBO M/C	-----	-----	03*02=06	
		T.E.	SEMINAR-I	-----	-----	02	
		TE	MINOR PROJECT	-----	-----	02	
20	Mr. Sameer Ahmad Farooque	TE (A)	MQC	-----	-----	03*02=06	14
		TE (B)	MQC	-----	-----	02*02=04	
		T.E.	SEMINAR-I	-----	-----	02	
		TE	MINOR PROJECT	-----	-----	02	
21	Mr. Ashwin P. Thakkar	SE (A)	TOM-I	-----	-----	02*02=04	12
		SE (B)	TOM-I	-----	-----	02*02=04	
		T.E.	SEMINAR-I	-----	-----	02	
		TE	MINOR PROJECT	-----	-----	02	
22	Mr. Smith M. Arbat	FE (I)	IMEED	04	------	04*02=08	16
		T.E.	SEMINAR-I	-----	-----	02	
		TE	MINOR PROJECT	-----	-----	02	
23	Mr. M.M. Gosavi	SE (A)	AT	-----	01*01=01	02*02=04	14
		SE (B)	AT	-----	01*01=01	02*02=04	
		T.E.	SEMINAR-I	-----	-----	02	
		TE	MINOR PROJECT	-----	-----	02	
24	Mr. Mahesh A. Marathe	BE(A)	MV	-----	-----	03*02=06	16
		BE(B)	MV	-----	-----	03*02=06	
		T.E.	SEMINAR-I	-----	-----	02	
		TE	MINOR PROJECT	-----	-----	02	
25	Miss. Chetana S. Chopade	BE(A)	PPE	-----	-----	02*02=04	12
		BE(B)	PPE	-----	-----	02*02=04	
		T.E.	SEMINAR-I	-----	-----	02	
		TE	MINOR PROJECT	-----	-----	02	

Mr. D.C. Talele
Time Table I/C

Prof. Dr. S.P. Shekhawat
HOD

SSBT's College of Engineering & Technology, Bambhori, Jalgaon.
Teaching Load Distribution
Semester I & III (Academic Year: 2016 - 17)

SR. NO	NAME	SUBJECT	MBA-I			MBA-II			TOTAL
			Theory	Lab	Project	Theory	Lab	Project	
1	Dr.V.S.Rana.	Organizational Behavior-I	4						12
		Global Marketing Management				4			
		Field Work / Survey						4	
2	Mr.P.A.Anawade	Quantitative Techniques	4						12
		Consumer Behavior and Service Marketing				4			
		Field Work / Survey						4	
3	Dr. Saroj B.Patil	Corporate Communication Skills	4						16
		Human Capital Mgt & Development				4			
		Strategic Human Resource Management				4			
		Field Work / Survey						4	
4	Mr.H.A.Salunkhe	Corporate Social Responsibility	4						16
		Banking & Investment Management				4			
		Tax Management				4			
		Field Work / Survey						4	
5	Ms.R.A.Modiyani	Business Accounting	4						16
		Strategic Management				4			
		Strategic Financial Management				4			
		Field Work / Survey						4	
6	Mr. Mukesh Ahirrao	Managerial Economics				4			16
		Product and Brand Management				4			
		Tally & Advance Excel	4						
		Field Work / Survey						4	
7	Ms. Faroza Kazi	Management Science	4						16
		Management Information System & ERP				4			
		Labour Laws				4			
		Field Work / Survey						4	
8	Ms.Sanjivani Lokhande	Human Resource Management	4						20
		Industrial Relations & Labour Welfare				4			
		Legal Aspect of Business				4			
		Sales & Distribution Management				4			
		Field Work / Survey						4	
		Total =	**32**	**0**	**0**	**60**	**0**	**32**	**124**

Time Table Incharge **HOD (MBA)**

Semester II & IV (Academic Year: 2016 - 17)

Date: 5.07.2016

SR. NO	NAME	SUBJECT	MBA-I			MBA-II			TOTAL
			T	L	P	Theory	Lab	Project	
1	Dr.V.S.Rana.	Marketing Management	4						12
		Case Studies in Marketing				4			
		Field Work / Survey						4	
2	Er.P.A.Anawade	Operations Management	4						12
		Retail Management And Digital Marketing				4			
		Field Work / Survey						4	
3	Dr. S. B.Patil	IT For Managers	4						12
		e-Commerce & Excellence Management				4			
		Field Work / Survey						4	
4	Dr.H.A.Salunkhe	Financial Management	4						16
		Financial Derivatives				4			
		International Financial Management				4			
		Field Work / Survey						4	
5	Dr.R.A.Modiyani	Management Accounting	4						16
		Current Business Scenario				4			
		Case Studies in Financial Management				4			
		Field Work / Survey						4	
6	Mr. M.B. Ahirrao	Global Economics Scenario	4						16
		Entrepreneurship & Project Management				4			
		Marketing Research and Business Analytics				4			
		Field Work / Survey						4	
7	Ms. F.A. Kazi	Management Science	4						16
		International Human Resource Management				4			
		Cases in Human Resource Management				4			
		Field Work / Survey						4	
8	Ms.S. B. Lokhande	Organizational Behavior – II	4						16
		Indian Commercial Laws				4			
		Performance & Compensation Management				4			
		Field Work / Survey						4	
		Total =	**32**	**0**	**0**	**52**	**0**	**32**	**116**

Time Table I/C **HOD - MBA** **PRINCIPAL**

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 5^{th} 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.