Kavayitri Bahinabai Chaudhari

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Second Year Engineering

(Electronics and Telecommunication Engineering)

Faculty of Science and Technology

'A' Grade
NAAC Re-Accredited
3rd Cycle

SYLLABUS STRUCTURE

Semester – III& IV

W.E.F. 2019 – 20

Syllabus Structure for Second Year Engineering (Semester – III) (E & TC) (w.e.f. 2019 – 20) (As per AICTE Guidelines)

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Mathematics-III	B	3	1	-	4	40	60	-	-	100	4
Electrical Machines	C	3	-	-	3	40	60	-	-	100	3
Solid State Devices and Circuits	C	3	-	-	3	40	60	-	-	100	3
Digital System Design	D	3	-	-	3	40	60	-	-	100	3
Industrial Organization and Management	A	3	-	-	3	40	60	-	-	100	3
Programming Language Lab	C	-	-	2	2	-	-	25	25(PR)	50	1
Digital System Design Lab	D	-	-	2	2	-	-	25	25(PR)	50	1
Electronic Devices and Circuits Lab	D	1	-	2	3	-	-	25	25(PR)	50	2
		16	**1**	**6**	**23**	**200**	**300**	**75**	**75**	**650**	**20**

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

Syllabus Structure for Second Year Engineering (Semester – IV) (E & TC) (w.e.f. 2019 – 20) (As per AICTE Guidelines)

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Biology	B	3	1	-	4	40	60	-	-	100	4
Network and Lines	C	3	-	-	3	40	60	-	-	100	3
Analog and Digital Communication	D	3	-	-	3	40	60	-	-	100	3
Analog Circuits	D	3	-	-	3	40	60	-	-	100	3
Enter. Development program	A	3	-	-	3	40	60	-	-	100	3
Electronics Workshop	C	-	-	2	2	-	-	-	-	-	1
Analog and Digital Communication Lab	D	-	-	2	2	-	-	25	25(PR)	50	1
Analog Circuit Lab	D	-	-	2	2	-	-	25	25(PR)	50	1
Electronics Network Lab	D	1	-	2	3	-	-	25	25(PR)	50	2
Environment Studies	H	-	-	-	-	-	60	40	-	-	-
Internship – I*	H	-	-	-	-	-	-	-	-	-	-
		16	**1**	**8**	**25**	**200**	**300**	**75**	**75**	**650**	**21**

* Internship – I is a mandatory and non-credit course. It shall be during summer vacation after Semester – IV. The satisfactory completion of Internship – I should be submitted to University at the end of Semester – VIII.

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

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

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

Lecture 03	Hours/week	No. of weeks	Total hours	Semester credits
	3	14	42	3
Tutorial 01	1	14	14	1

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

Course objectives:

1. To introduce the solution methodologies for Fourier transform, Z-Transform and Laplace transform with applications in engineering
2. To provide an overview of probability and statistics to engineers.

Course outcomes:

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

COURSE CONTENT

Mathematicss -III		**Semester:**	III
Teaching Scheme:		**Examination scheme**	
Lectures:03	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
Tutorial:01	**1 hours/week**	**Duration of ESE:**	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 8 Hours**	**Marks: 12**

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

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

Fourier Transform:

Fourier sine and cosine integrals, Fourier sine transform, Fourier cosine transform, Inverse Fourier transform. Discrete Fourier Transform (DFT), Properties of DFT(without proof).

Unit–III	No. of Lectures: 8 Hours	Marks: 12
Z – Transform: Introduction, Definition, Region of convergence, Properties of Z-Transform, Inverse Z-Transform, Difference equation using Z-Transform.		
Unit–IV	**No. of Lectures: 09 Hours**	**Marks: 12**
Basic Probability & Statistics Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, Addition Law of probability, Multiplication Law of probability, Expectation of Discrete Random Variables, Variance, Moments, skewness and kurtosis		
Unit–V:	**No. of Lectures:09 Hours**	**Marks: 12**
Probability distributions and Sampling Binomial, Poisson and Normal distributions, Correlation and regression. **Test of significance:** Large sample test for single mean, difference of means for two samples and difference of standard deviations.		

Text Books:-

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010,2016
2. H.K.DASS "Advance Engineering Mathematics" S. Chand publications. Fifteenth revised edition 2006.
3. S. C. Gupta "Fundamentals of Statistics",Himalaya Publishing House ,sixth revised edition 2008.
4. Debashis Datta "Textbook of Engineering Mathematics'' 'New Age International Publication. Revised second edition

Reference Books :

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006..
3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
5. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.

Electrical Machines					
COURSE OUTLINE					
Course Title:	**Electrical Machines**	**Short Title:**	**EM**	**Course Code:**	

Course description:

The course considers the basic principles of electrical machines. In this course we will introduce some of the basic concepts and terminology that are used in modern electrical engineering. The students can use this knowledge to analyze electrical networks, D.C. machines, A.C. machines & transformer etc.

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

Prerequisite course(s):

Knowledge of Basics of Electrical and Electronics Engineering.

Course objectives:

1. Students will understand fundamentals, principles & theory of electrical machines.
2. Students will be able to learn knowledge of three phase system.
3. Students will able to learn & understand 1Ø, 3Ø transformers.
4. Students will understand fundamentals, principle of synchronous machine.
5. Students will study & understand about induction motors.

Course outcomes:

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

1. Apply knowledge of 3Ø system for measurement of 3Ø power & their parameters.
2. Describe constructional details, principle of operation, performance, starters of DC Machines.
3. Analyze different parameters of transformer & also they are familiar with V-V connection, Scott connection, testing of transformer.
4. Use & explain constructional details, principle of operation and working of Synchronous machines.
5. Describe fundamentals of 1Ø, 3Ø induction motor.

COURSE CONTENT

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

Unit–I:	**No. of Lectures: 09 Hours**	**Marks: 12**

Three Phase Circuits

Three Phase Circuits: Generation of 3ϕ supply, Phase sequence, Necessity of 3ϕ supply, star & delta connection of three phase winding, Line & phase voltages & currents in star & delta connections, power in three phase circuit with balance load for star & delta connection, measurement of three phase power by Single watt meter, two watt meter

method, calculation of Active, reactive, apparent power and power factor.		
Unit–II:	**No. of Lectures: 09 Hours**	**Marks: 12**
DC machine		
DC machine: Working principle, Construction, types, generator action, EMF equation, significance of back emf, Torque equation and speed equation of motor, Characteristics of shunt, series motor, necessity of starter, 3-point starter, speed control method, theoretical treatment of losses and power stages of Dc machine		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Transformers		
1ϕ Transformers: Working Principle, Construction, EMF equation, transformer on no load & on load phasor diagram, equivalent circuit of transformer, Open circuit and short circuit tests, Efficiency and regulation **3ϕ Transformers:** Star-star, delta-delta, star-delta, delta-star connection, v-v connection, scott connection, Auto-transformer & C.T, P.T.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Synchronous Machines		
Alternator: Principle of operation, construction, EMF equation, winding factor, voltage regulation by synchronous impedance method. **Synchronous motor:** Principle of operation, synchronous motors on load phasor diagram, V curve, hunting.		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Induction Motors		
3ϕ Induction motor: Principle of working, construction, Slip, torque equation (Tst & Tmax), torque - slip characteristics, different types of starters (DOL, star-delta, auto-transformer). **1ϕ Induction motors:** Principle of operation, types and applications.		
Text Books:		
1. B. Theraja, A. Theraja, "A Text book of Electrical Technology- Vol-I",S. Chand, 1st Edition, 2010. 2. B. Theraja, A. Theraja, "A Text book of Electrical Technology- Vol-II", S. Chand, 1st Edition, 2010.		
Reference Books:		
1. V N Mittle/ Arvind Mittal, "Basic Electrical Engineering", McGraw Hill Companies, 2nd Edition. 2. S. K. Bhattacharya, "Electrical Machine", Tata McGraw Hill 2nd Edition. 3. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.\ 4. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010 5. H. Cotton, "Electrical Technology", CBS Publication, 7th Edition		

Solid State Devices and Circuits					
COURSE OUTLINE					
Course Title:	**Solid State Devices and Circuits**	**Short Title:**	**SSDC**	**Course Code:**	
Course description:					
This course provides the students with comprehensive study of basic components and solid state circuits. It deals with BJT, FET.					
Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**	
	03	**14**	**42**	**3**	
Prerequisite course(s):					
Basic knowledge of Electronics					
Course objectives:					
1. To give the brief idea about basics of Semiconductor Devices. 2. To familiarize the students to perform the frequency analysis of Solid State circuit. 3. To empower students to understand the working of BJT / FET amplifiers. 4. To learn low frequency analysis of single stage and multistage amplifiers. 5. To learn integrated circuit fabrication.					
Course outcomes:					
After successful completion of this course the student will be able to:					
1. Understand the principles of semiconductor Physics and to acquire basic knowledge of physical and electrical conducting properties of transistor. 2. Develop the ability to understand the working of BJT / FET amplifiers. 3. Develop the skill to build, and troubleshoot solid state circuits. 4. Understand and utilize the mathematical models of semiconductor junctions and MOS transistors for circuits and systems. 5. Understand the fundamental application of solid state devices in the electronic industry.					
COURSE CONTENT					
Solid State Devices and Circuits		**Semester:**	**III**		
Teaching Scheme:		**Examination scheme**			
Lectures:	**3 hours/week**	**End semester exam (ESE):**		**60 marks**	
		Duration of ESE:		**03 hours**	
		Internal Sessional Exams (ISE):		**40 marks**	
Unit–I:	**No. of Lectures: 09 Hours**	**Marks: 12**			
Semiconductor and Diode:					
Intrinsic and Extrinsic Semiconductors, Conduction mechanism, mobility, drift and diffusion currents, Einstein equation, mass action law, PN junction diode, current equation, diode resistances, temperature dependence and zener diode.					
Unit–II:	**No. of Lectures: 09 Hours**	**Marks: 12**			
Transistors:					

Bipolar Junction Transistor, I-V characteristics, determination of region of operation, Ebers-Moll Model, Load line and Q point, Stability,Methods of biasing, Bias compensation techniques and Thermal runaway.		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Small signal analysis of BJT :		
h-parameter analysis, CE,CB,CC configurations, CE-CC h parameter conversion, Miller theorem and its dual, CE-CE, CE-CB,CE-CC and Darlington configurations analysis. Frequency response of an amplifier $-F_L, F_H$,Gain.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Field Effect Transistor :		
JFET, MOSFET and their parameters, Transfer characteristics equations, Biasing analysis of FETs using analytical and graphical approach, Small signal analysis of FET for CS, CG,CD configurations,		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Integrated circuit fabrication process:		
Oxidation, diffusion, ion implantation, photolithography, etching, chemical vapor deposition, sputtering, twin-tub CMOS process.		
Text Books:		
1. Millman and Halkais, Integrated Electronics, TMH Publication, 2nd Edition 2. S Salivahanan, Suresh Kumar, Electronic Devices and Circuits, TMH Publication, 3rd Edition		
Reference Books:		
1. Louis Nashelsky & Robert Boylestad, Electronics Devices and Cercuits Theory, Pearson Publication, 10th Edition 2. Dr. R. S. Sedha , Electronics Circuits, , S Chand Publication, 4th Edition 3. T. Floyd, "Electronic Devices", 7th edition, Pearson, 2008. 4. D. Cheruku, B. Krishna, " Electronic Devices amd circuits", 2nd Edition, Pearson, 2012.		

Digital System Design					
COURSE OUTLINE					
Course Title:	**Digital System Design**	**Short Title:**	**DSD**	**Course Code:**	
Course description:					
This course is aimed at introducing the fundamentals of digital systems to undergraduate students. The goals of the course are to understand the basic principle of digital systems and application in different era.					
Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**	
	03	**14**	**42**	**03**	
Prerequisite course(s):					
Knowledge of number system, logic gates, simplification and implementation of logic system and also knowledge about semiconductor devices of Electronics Engineering.					
Course objectives:					
1. Students will get the knowledge of code conversion. 2. To understand the simplification using K-map . 3. To learn Combinational logic design using MUX,DEMUX. 4. To learn Sequential logic design using flip-flop. 5. Introduce students with programmable logic device, FPGA.					
Course outcomes:					
After successful completion of this course the student will be able to:					
1. Apply knowledge for conversion of different type of code. 2. Apply simplification of logical expression using K-map upto 5 variables 3. Apply basic principles to design Combinational logic circuit. 4. Apply basic principles to design Sequential logic circuit. 5. Explain basic concept of Programmable logic device.					
COURSE CONTENT					
Digital System Design			**Semester:**	**III**	
Teaching Scheme:			**Examination scheme**		
Lectures:	**3 hours/week**		**End semester exam (ESE):**		**60 marks**
			Duration of ESE:		**03 hours**
			Internal Sessional Exams (ISE):		**40 marks**
Unit–I:	**No. of Lectures: 08 Hours**		**Marks: 12**		
Logic Simplification and code convertors					
Review of Boolean Algebra and De Morgan's Theorem, ,SOP & POS forms, canonical forms Karnaugh maps up to 5 variables, Don't care conditions, Binary Codes, Hamming code ,Code Conversion- Binary to gray, Gray to Binary, BCD to Excess3 And BCD to seven segment decoder.					
Unit–II:	**No. of Lectures: 08 Hours**		**Marks: 12**		
MSI devices/Combinational Logic Circuits					

MSI devices like Half and Full Adders/ Substractors using basic gates and NAND gate, Parallel Adders IC 7483, BCD adder, 1 bit and 2bit Comparators, Multiplexers, Demultiplexer, Decoder, ALU.

Unit–III:	**No. of Lectures: 09 Hours**	**Marks: 12**

Sequential Logic Circuits and Design

Classification of sequential circuits Synchronous and Asynchronous sequential circuit, Building blocks like S-R, JK and Master-Slave JK FF, T flip flop, D Flip flop , Excitation table and conversion of Flip flops- Convert SR to JK, JK to SR flip flop ,JK to D and JK to T flip flop
Shift registers- Types of Shift registers and operation of SISO, SIPO, PIPO, PISO, Bidirectional Shift Register, Universal Shift Register, Ring Counter, and Twisted Ring Counter.

Unit–IV:	**No. of Lectures: 09 Hours**	**Marks: 12**

Counters and sequential circuits

Asynchronous /Ripple counters-Design of ripple counters and Mod –N ripple counter using Flip-flop.
Synchronous counter - Design of Synchronous counters and Mod –N Synchronous counter, Up Down Counter.
Design of synchronous Finite state Machine:
Synchronous Sequential Circuit design –Synchronous sequential Circuit model ,Mealy Model and Moore Model, Block Diagram, State Diagram, State table, State Assignment ,Design Procedure, State equivalence and minimization, Design example. Introduction to ASM charts.

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

Logic Families and Semiconductor Memories

TTL NAND gate, Specifications, Noise margin, Propagation delay, fan-in, fan-out, Tristate TTL, ECL, CMOS families and their interfacing.
Memory elements, Concept of programmable logic devices like-FPGA. Logic implementation using programmable devices.

Text Books:

1. R.P. Jain, "Modern digital Electronics", Tata McGraw Hill, 4th edition, 2009.
2. W.H. Gothmann,"Digital Electronics- An introduction to theory and practice", PHI, 2nd edition 2006.
3. D.V. Hall, "Digital Circuits and Systems", Tata McGraw Hill, 1989.
4. G.K.Kharate, "Digital Electronics" Oxford university press, 1st edition,2010.

Reference Books:

1. Charles Roth, "Digital System Design using VHDL", Tata McGraw Hill 2nd edition 2012.
2. John M Yarbrough "Digital Logic Application and Design, Brooks/cole, Thomson Learning Vikas Publishing House.
3. Douglas Perry, "VHDL", Tata McGraw Hill, 4th edition, 2002.
4. Charles Routh, "Digital System Design using VHDL" Tata McGraw Hill, 2nd edition, 2012.

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

Course description:

This course provides an introduction to: basics of management their organizational structures with human resources development, financial management, quality management & industrial acts.

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

Prerequisite course(s):

Basic knowledge of Management science and its concept.

Course objectives:

1. Students will understand fundamental principle of Organization and Management.
2. Student will learn the concept of organization Structure.
3. Student will get the knowledge of financial resource for enterprise.
4. Student will gain knowledge about man power planning in industry for proper utilization of available resources.
5. Students will become aware about importance of quality standards and industrial safety.

Course outcomes:

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

1. Students will demonstrate knowledge about management science and get motivation for Entrepreneurship.
2. Students will able to know about various organizational structures and their application in industry.
3. Students will able get information about financial sources for setting the capital for start up.
4. Students will be able to understand the utilization of available resources like men, material and machines etc
5. Student will able understand the knowledge regarding ISO standards, Industrial acts and accident avoidance.

COURSE CONTENT

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

Unit–I:	No. of Lectures: 09 Hours	Marks: 12

Management and principles of Management:

Introduction to definition of management. Evolution of management, Introduction to scientific management by F.W Taylor, Administrative management by Fayol. Functions of management. Principles of management, management skills and roles. Relation between Administration Management and Organization.

Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**
Organizational structure:		
Concept, Organization theories and forms of organizational structure. Types of ownership partnership, proprietorship. Joint stock company, private limited, public limited, co-operative organization. Public sector and Joint Venture.		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Financial Management:		
Definition and functions of financial management. Capital structure fixed and working capital. Sources of finance – external and internal sources, Loans from banks, Public deposits, Trade credit. Engineering Economics – wants, utility, demand, Elasticity of demand and supply.		
Unit–IV:	**No. of Lectures: 09 Hours**	**Marks: 12**
Human Resources Management:		
Factors affecting on human resource planning concept, Need of human resource planning. Sources of recruitment, selection test. Objectives and benefit of training methods to workers, labour welfare, Communication and discipline in industries. E-business and E-governance.		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Industrial Labour Legislation:		
Importance and necessity of labour act, Industrial act: factories act Industrial Accidents and safety Quality- concept, quality control, ISO 9000 series standards in general.		
Text Books:		
1. M.Mahajan: Industrial Engineering & Production Management, Dhanpat Rai & company.		
Reference Books:		
1. O.P.Khanna:- Industrial Engineering & Management, Dhanpat Rai &Company. 2. Koontz: Essential of Management, TMH 6/edition. 3. M.Y.Khan & P.K.Jain :- Financial Management, TMH.		

Programming Language Lab				
LAB COURSE OUTLINE				
Course Title:	**Programming Language Lab**	**Short Title:**	**PL Lab**	**Course Code:**
Course description:				
This course introduces C++ as an object-oriented programming language. C++ programming provides students with the means of writing efficient, maintainable, and portable code.				

Laboratory	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	02	**14**	**28**	**01**

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

Prerequisite course(s):

C programming

Course objectives:

1. To learn the characteristics of an object oriented programming language.
2. To learn and understand the syntax and semantics of the C++ programming language.
3. To learn and understand various object oriented concepts along with their applicability contexts.
4. To enhance problem solving and programming skills in C++.

Course outcomes:

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

1. Implements and understand the concept of function overloading and operator overloading.
2. Demonstrate the use of inheritance concepts with the help of programs.
3. Understand use of arrays and pointers in C++ programming.
4. Demonstrate the use of polymorphism, Binding and virtual functions.

LAB COURSE CONTENT

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

- **Introduction to C++:** Difference between C and C++, Evolution of C++, Disadvantages of Conventional Programming, Programming Paradigms, Preface to Object Oriented Programming, Key concepts of Object Oriented Programming.
  Basics of C++: C++ Environments, Structure of C++ program.
- **Function in C++:** Parts of a function, Passing Arguments, Inline functions, Function Overloading.
- Class and Objects, Constructors and Destructors, Operator overloading.
- **Inheritance:** Single Inheritance, Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance, Hybrid Inheritance.
- **Arrays:** One dimensional array declaration and initialization, Characteristics of Arrays, Passing array elements to a function, Two-dimensional arrays, Three or Multi-dimensional array, Array of pointers, Array of classes.
- **Pointers:** Features of pointers, Pointers declaration, void pointers, Pointer to class, Pointer to object, this pointer, Pointer to members.
- **Binding, Polymorphism, virtual Functions:** Introduction, Binding in C++, Rules for virtual functions, working of virtual function, pure virtual functions.
- Function Templates, Class Templates

Concern faculty member should suitably frame at least **Eight** Laboratory assignments using C++ programming language from the following list.

1. Write a program to demonstrate use of simple class and object.
2. Write a program to demonstrate use of parameterized constructor.
3. Write a program to demonstrate use of overloading constructors.
4. Write a program to demonstrate use of function overloading.
5. Write a program to overload unary operator using member function.
6. Write a program to overload binary operator using member function.
7. Write a program to demonstrate use of single inheritance, multiple inheritances.
8. Write a program to demonstrate use of function templates.
9. Write a program to demonstrate use of array of pointers.
10. Write a program for the copy constructor.
11. Write a program to demonstrate use of multilevel inheritance and hybrid inheritance.
12. Write a program to demonstrate use of class templates.
13. Write a program to overload unary operator using friend function.
14. Write a program to demonstrate use of virtual functions.

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

Text Books:

1. Ashok N. Kamthane, "Programming in C++", Pearson Education, 2nd Edition, 2013.
2. E. Balagurusamy, "Object Oriented Programming with C++", McGraw Hill, 6th Edition, 2013.

Reference Books:

1. Yashavant P. Kanetkar, "Let Us C++", BPB Publications, 2nd Edition, 2003.
2. Robert Lafore, "Object Oriented Programming in C++", Pearson Education, 4th Edition, 2002.
3. Mahesh Bhave, Sunil Patekar, "Object Oriented Programming with C++", Pearson Education 2nd Edition, 2012.
4. Herbert Schildt, "The Complete Reference C++", TMH, 4th Edition, 2003.

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

Digital System Design Lab					
LAB COURSE OUTLINE					
Course Title:	**Digital System Design Lab**	**Short Title:**	**DSDL**	**Course Code:**	

Course description:

In this laboratory course emphasis is on the understanding of combinational and sequential circuits. The Students can use this knowledge to design and implement combinational and sequential circuits and also works on simulation technique on VHDL tool.

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

End Semester Exam (ESE) Pattern:

Prerequisite course(s):

Concepts of Basic Electrical and Electronics Engineering.

Course objectives:

1. To Design and implement various combinational and sequential logic circuits.
2. To implement various sequential circuits like counter and shift registers.
3. Introduce students with programmable logic device FPGA.

Course outcomes:

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

1. To design and implement combinational logic circuit like code converters, adder, subtract or etc
2. To design and implement sequential logic circuit using FSM logic
3. Understand programmable logic device FPGA.

LAB COURSE CONTENT

Digital System Design Lab		Semester:	III
Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**	**End semester exam (ESE):**	**25 Marks**
		Internal Continuous Assessment (ICA):	**25 Marks**

Perform any eight practicals from the list given below.

1. Realization of logic gates OR, AND, NOT, NOR, NAND gates using discrete components and verify their truth tables.
2. Design and implement 4-bit binary to Gray code converter
3. Implement 4-bit binary adder using IC 7483
4. Implement BCD to 7-segment decoder using IC 7447
5. Verify the truth table of multiplexer and Demultiplexer using IC
6. Study of Decade Counter
7. Study of JK, D type and T-Type flip-flop using IC 7476

8. Study of ALU
9. Study of Shift Register
10. Study of Synchronous counter using IC 74191
11. Design 4-bit UP/DOWN synchronous counter using IC.
12. Realization of half and full Adder using VHDL.

Text/Reference Books:

1. R.P.Jain, M.M.S Anand , "Digital Electronics practice using Integrated circuits" , Tata McGraw Hill.
2. R.P. Jain, "Modern digital Electronics", Tata McGraw Hill, 4th edition, 2009.
3. Douglas Perry, "VHDL", Tata McGraw Hill, 4th edition, 2002.
4. W.H. Gothmann, "Digital Electronics- An introduction to theory and practice", PHI, 2nd edition, 2006.
5. D.V. Hall, "Digital Circuits and Systems", Tata McGraw Hill, 1989
6. Charles Roth, "Digital System Design using VHDL", Tata McGraw Hill 2nd edition 2012.

Guide lines for ICA:

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

Guidelines for ESE:

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

Electronic Devices and Circuits Lab					
LAB COURSE OUTLINE					
Course Title:	**Electronic Devices and Circuits Lab**	**Short Title:**	**EDC**	**Course Code:**	

Course description:

In this laboratory course emphasis is on the understanding of basic Electronic Devices & circuits.

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

End Semester Exam (ESE) Pattern:

Prerequisite course(s):

Basic concepts of Basic Electrical and Electronics Engineering.

Course objectives:

1. The objective of this laboratory is to understand the concepts, working and characteristics of Different Diodes.
2. To understand BJT and FET Biasing and compensation techniques.
3. To learn BJT and FET characteristics.
4. To learn amplifiers analysis and frequency response.
5. To understand the Integrated circuit fabrication process

Course outcomes:

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

1. Verify the working of different diodes, transistors, FET and measuring instruments. Identifying the procedure of doing the experiment.
2. Design the circuits with basic semiconductor devices (active & passive elements), measuring instruments & power supplies that serves many practical purposes.
3. Design and analyze the amplifier circuits using BJT and FET and study the frequency response.
4. Construct, analyze and troubleshoot the designed circuits.
5. Measure and record the experimental data, analyze the results, and prepare a formal laboratory report

LAB COURSE CONTENT

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

Perform any eight practicals from the list given below.

1. Determine Q- point and Stability factor of BJT for voltage divider biasing.
2. Determine Q- point of FET for self biasing.
3. To draw the input and output characteristics of transistor in CE Configuration & determine Input Resistance (Ri), Output Resistance (Ro) and Current amplification Factor (β) of the given transistor.
4. To draw the Drain and Transfer characteristics of FET in CS Configuration & determine the drain resistance (rd), amplification factor (μ) and Trans-Conductance (gm) of the given FET.
5. To determine h parameter for CE configuration.
6. Plot the transfer and drain characteristics of n-channel MOSFET and calculate its parameters, namely; drain resistance, mutual conductance and amplification factor.
7. To obtain the frequency response of the Common Emitter BJT Amplifier & measure the Voltage gain and Bandwidth.
8. To obtain the frequency response of the Common Source FET Amplifier & measure the Voltage gain and Bandwidth.
9. To measure the voltage gain and plot the frequency of response of CC amplifier.
10. To obtain the frequency response of the CE-CE BJT Amplifier & measure the Voltage gain and Bandwidth
11. To obtain the frequency response of the CE-CB BJT Amplifier & measure the Voltage gain and Bandwidth
12. Study of Integrated circuit fabrication process.

Reference Books:

1. Millman and Halkais, Integrated Electronics TMH Publication, 2nd Edition
2. Louis Nashelsky & Robert Boylestad, Electronics Devices and Circuits Theory, Pearson Publication, 10th Edition
3. Dr. R. S. Sedha, Electronics Circuits by, S Chand Publication,4th Edition

Guide lines for ICA:

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

Guidelines for ESE:

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

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Second Year Engineering

(Electronics and Telecommunication Engineering)

Faculty of Science and Technology

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

COURSE OUTLINE

Semester - IV

W.E.F. 2018 – 19

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

Course description:

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

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

Prerequisite course(s):

Course objectives:

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

Course outcomes:

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

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

COURSE CONTENT

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

Unit–I:	No. of Lectures: 09 Hours	Marks: 12
Diversity of Organism and Cell Biology		
Introduction: Living systems, Bio-mimicry, Metabolism, Taxonomy, Concept of species, Structural organization of life, Concepts of modern cell, history of cell, Cell theory, Structure of cell:- Cell shape, size and cell number, Types of cells:- Prokaryotic cells and Eukaryotic cells, Chemistry of cells.		

Cell Division: Cell cycle, mitosis, meiosis, mitotic cell division, cell cycle check points, meiotic cell division, embryonic cell division, cell death.		
Unit–II:	**No. of Lectures: 09 Hours**	**Marks: 12**
Plant and Animal Kingdom		
Plant Kingdom: Introduction to plants, Salient features of major plant groups: Bryophyta, Pteridophyta, Gymnospermae, Angiospermae, **Plant Growth & Development:** Introduction, Seed Dormancy, Seed Germination, Phases of growth, Plant growth hormones. **Animal Kingdom:** Animal Classification, Salient features of non-chordates up to phylum level: Phylum porifera, phylum cindaria, phylum ctenophore, phylum platyhelminthes.		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Plant Cell and Animal cell culture and Applications		
Plant Cell Culture: Brief introduction to cell culture with respect to the properties of plant cells, Media requirements, Typical media used, Classification of tissue culture, callus culture, cell suspension culture, Application of callus culture and cell suspension culture, Plant cell cultivation Bioreactors **Animal Cell Culture:** Brief introduction to animal cell culture, Culture medium: Natural and Artificial media, introduction to balanced salt solutions and simple growth medium, Brief discussion on the chemical, physical and metabolic functions of different constituents of culture medium, Animal Bioreactors.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Microbial Culture and Applications:		
Introduction, Microbial Culture Techniques, growth curve, Pure culture techniques – microbial culture media, isolation, identification and maintenance of cultures, incidences of microorganisms in soil, water, air, food and sewage, food spoilage organisms, Applications of Microbial Culture Technology.		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Biotechnology and its Applications:		
Definitions, scope of Biotechnology, Recombinant DNA Technology: Making Recombinant DNA, Tools in Genetic Engineering, Polymerase Chain reaction (PCR). **Applications of Biotechnology:** Bioinformatics, Biomechanics, Biotechnology of waste treatment, Biosensors, Forensic science, Food Biotechnology, Fermentation Technology.		
Text Books:		

1. B.D. Singh " Genetics" Kalyani Publications
2. C.B. Pawar" Cell Biology" Himalaya Publications, Third Edition.
3. C.B. Pawar" Cell and Molecular Biology" Himalaya Publications.
4. Text book of Zoology by V.K. Agrawal, S. Chand Publication.
5. Text book of Botany by Dr. B.P. Pandey S. Chand Publication.
6. Text book of Biotechnology by R.C. Dubey, S. Chand Publications

Reference Books:

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

Network and Lines					
COURSE OUTLINE					
Course Title:	**Network and Lines**	**Short Title:**	**NL**	**Course Code:**	

Course description:

This course introduces the different techniques to analyze electric circuit to the students. They also enhance the ideas about types of network function & analysis of two port networks using Z, Y, h, ABCD parameters. Emphasis are given to the topics related to network analysis , complex frequency, frequency domain concept, properties of LC, RC, and RL., design of different types of filters and attenuators.

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

Prerequisite course(s):

Knowledge of Basic Electrical and Electronics Engineering and their concept.

Course objectives:

1. Study and understand the basic concepts and modern engineering methods of circuit analysis with passive and active elements.
2. To learn the importance of Laplace transform to network.
3. To understand the basic concept of two port network, resonance, attenuators and design of filters.

Course outcomes:

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

1. Understand basics electrical circuits with nodal and mesh analysis.
2. Appreciate electrical network theorems.
3. Apply Laplace Transform for steady state and transient analysis.
4. Determine different network functions.
5. Appreciate the frequency domain techniques.

COURSE CONTENT

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

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

Network Thoerems :

Node and Mesh Analysis, Source transformation, Network theorems: Superposition, Thevenins, Norton's, Maximum power Transfer theorem as applied to AC. circuits.

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

Resonant Circuits:		
Concept of resonance, types of resonance, Q-factor and their significance, Series resonance, resonance frequency with derivation, variation of impedance, current with frequency, bandwidth with derivation and selectivity, examples, Parallel resonance, resonance frequency, bandwidth and selectivity, examples.		
Unit–III:	**No. of Lectures: 09 Hours**	**Marks: 12**
Laplace Transforms and Network Functions:		
Laplace Transforms : Partial fractions, Concept of complex frequency, Definition and Concept of Laplace transform, Laplace transform of basic R, L and C Component, Analysis of RC, RL and RLC networks using Laplace transform with and without initial condition & numerical. **Network Functions:** Driving point Immittance function, Transfer point impedance and admittance function, Voltage and current transfer function, Concept of pole and zero in network function, Necessary condition for transfer function.		
Unit–IV:	**No. of Lectures: 09 Hours**	**Marks: 12**
Two Port Networks and interconnections:		
Introduction of two port network and their different parameters such as Z, Y, h, ABCD parameters and numerical, Concept of reciprocity and symmetry condition for two port network parameters, Inter connection of two port networks in series, parallel and cascade connection (only derivation).		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Attenuators and Filters:		
Attenuators : Concept of Neper and Decibel (dB) and their relation, Introduction of attenuator, types of attenuator, design of symmetrical 'T' and 'π' attenuator, examples. **Filters** : Filters fundamentals & Design of different types of filters such as constant K-type Low pass and high pass filter, examples, Design of m-derived low pass and high pass filter, examples. Basic concept of band pass, band stop filter (only block diagram).		
Text Books:		
1. D. Choudhary, "Network and system", New Age international Publication, 1st Edition, Reprint 2005. 2. A. Sudhakar, S. Palli, "Circuit & Networks Analysis and Synthesis", Tata MH 3rd Edition, 2009. 3. A. Chakraborti, "Circuit Theory (Analysis and synthesis)", Dhanpat Rai Publication, 6th Edition, .2012.		
Reference Books:		
1. John G. Proakis, Dimitris G. Manolakis, Digital Signal Processing Principles, algorithms and applications, Pearson Prentice Hall, Fourth edition 2. I.J. Nagrath, S.N. Sharan, R.Ranjan,S.Kumar, Signals and Systems,TMH, 2nd Edition		

Analog & Digital Communication					
COURSE OUTLINE					
Course Title:	**Analog & Digital Communication**	**Short Title:**	**ADC**	**Course Code:**	

Course description:

This course is aimed at introducing the fundamentals of analog & digital communication to undergraduate students. The goals of the course are to understand the basic principle of analog & digital communication and application in different era.

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

Prerequisite course(s):

Knowledge of analog & digital signal & fundamentals

Course objectives:

1. To understand fundamentals, principles & theory of communication system.
2. To learn about Amplitude, frequency & phase modulation systems along with noise in communication system.
3. To learn knowledge of waveform coding techniques.
4. To study & understand different digital modulation technique.
5. To understand fundamentals of coding & decoding of information.

Course outcomes:

After successful completion of this course students will be able to:

1. Demonstrate knowledge about fundamental principles, theories and concept of communication system.
2. Use & explain different methods of analog communication.
3. Analyze the behavior of a communication system in presence of noise
4. Explain different waveform coding techniques as well as digital modulation technique.
5. Analyze the bit error performance of signal.

COURSE CONTENT

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

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**
Fundamental of Modulation Systems		
Review of signals and systems, Principles of Amplitude Modulation Systems-Mathematical representation of AM wave, frequency domain representation of AM signal, AM transmitter & receiver, DSB, SSB modulations. Angle Modulation, Representation of FM and PM signals.		
Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**
Noise Analysis in modulation systems		
Review of probability and random process-Ergodic & Gaussian process, Noise & types of noise, Guassian and white noise characteristics, Noise in Frequency modulation systems. Pre-emphasis and De-emphasis, Threshold effect in angle modulation.		
Unit–III:	**No. of Lectures: 09 Hours**	**Marks: 12**
Waveform Coding and Baseband Shaping for Data Transmission		
Pulse Code Modulation, Quantization noise in PCM, Delta Modulation, Adaptive Delta modulation, Time Division multiplexing, T1 Multiplexers. Discrete PAM Signals and Power Spectra of Discrete PAM Signals, ISI & Nyquist's Criterion for Distortion less Baseband Binary Transmission, Eye Pattern		
Unit–IV:	**No. of Lectures: 09 Hours**	**Marks: 12**
Digital Modulation Techniques		
Digital Modulation schemes- Phase Shift Keying, Frequency Shift Keying, DPSK, Quadrature phase shift keying, Minimum Shift Keying, comparison FSK, PSK, QPSK, MSK, M-ary Modulation Techniques- M-ary PSK, QAM		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Information and Detection Theory		
Uncertainty, Information and Entropy, Source coding theory, Huffman coding and Discrete memory less channels, mutual information, channel capacity and channel coding theory, differential entropy and mutual information, channel capacity theorem		
Text Books:		
1. G. Kennedy, B. Davis, "Electronic Communication Systems", Tata McGraw Hill Edition, 4th Edition, 1999. 2. S. Kundu, "Analog and Digital Communication", Pearson, ISBN 978-81-317- 3187-1 3. Proakis J.G., ``Digital Communications'', 4th Edition, McGraw Hill, 2000.		
Reference Books:		
1. D. Roddy, J. Coolen, "Electronic Communications", Pearson, 4th Edition, 2011 2. S. Haykin, "Digital Communications", Wiley Student Edition, ISBN 9971-51-205-X. 3. Wozencraft J. M. and Jacobs I. M., ``Principles of Communication Engineering",John Wiley, 1965. 4. Barry J. R., Lee E. A. and Messerschmitt D. G., ``Digital Communication'', Kluwer Academic Publishers, 2004. 5. Ranjan Bose, "Information Theory, Coding & Cryptography", 2nd Edition, McGraw Hill, 2010.		

Analog Circuits					
COURSE OUTLINE					
Course Title:	**Analog Circuits**	**Short Title:**	**AC**	**Course Code:**	

Course description:

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

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

Prerequisite course(s):

Knowledge of Basics of Electronics.

Course objectives:

1. To give the brief idea about basics of transistor configurations.
2. To understand the frequency analysis of analog electronics circuit.
3. To understand the design and working of BJT / FET amplifiers, oscillators and Operational Amplifier.
4. To gain the knowledge of analog integrated circuits.
5. To learn analysis and effect of feedback on various amplifier configuration.

Course outcomes:

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

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

COURSE CONTENT

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

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

Diodes Circuits & BJT Amplifiers

Diode Circuits, Basic clipper , clamper & multiplier Biasing schemes for BJT and FET amplifiers, bias stability various configurations (such as CE/CS, CB/CG, CC/CD) and their features, small signal analysis, low frequency transistor models, estimation of voltage gain,

input resistance, output resistance etc.,		
Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**
Feedback amplifiers		
Feedback amplifiers: Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance amplifier. Oscillators: Review of the basic concept, Barkhausen criterion, RC oscillators(phase shift, Wien bridge etc.), LC oscillators (Hartley, Colpitt, Clapp etc.)		
Unit–III:	**No. of Lectures: 09 Hours**	**Marks: 12**
Multistage & power amplifiers		
Low frequency analysis of multistage amplifiers. High frequency transistor models, frequency response of single stage and multistage amplifiers, cascode amplifier. Various classes of operation (Class A, B, AB, C), their power efficiency		
Unit–IV:	**No. of Lectures: 09 Hours**	**Marks: 12**
Operational Amplifier		
Differential amplifier: Basic structure and principle of operation, differential gain, common mode gain, CMRR. OP-AMP applications: review of inverting and non-inverting amplifiers, summing amplifier, subtractor, integrator and differentiator, Instrumentation amplifier using 3 op-amp, log amplifier, antilog amplifier, Schmitt trigger, precision rectifier.		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Filters & Convertors		
Active filters: Design and frequency scaling of Ist & IInd order Low pass, high pass, band pass and band stop filters, Digital-to-analog converters (DAC): Weighted resistor, R-2R ladder, Inverted R-2R DAC, Analog to-digital converters (ADC): successive approximation, flash type, counter type & dual slop ADC.		
Text Books:		
1. Millman and Halkais, Integrated Electronics, TMH Publication, 2nd Edition 2. R. A. Gaikwad, Op Amp and Liner Integrated Circuits, Pearson, 4th Edition 3. S Salivahanan, Suresh Kumar, Electronic Devices and Circuits, TMH Publication, 3rd Edition		
Reference Books:		
1. Louis Nashelsky & Robert Boylestad, Electronics Devices and Cercuits Theory, Pearson Publication, 10th Edition 2. Dr. R. S. Sedha , Electronics Circuits, , S Chand Publication, 4th Edition 3. K. Botkar, "Integrated Circuits", Khanna Publishers, 10th Edition, 2010 4. J.V. Wait, L P. Huelsman & G.A. Korn Introduction to Operational Amplifier- Theory and Applications,, Mcgraw Hill, 2nd Edition 5. D. Roy Choudhary, S. Jain, "Linear Integrated Circuits", New Age International (P) limited,4th Edition, 2010.		

Entrepreneurship Development Program					
COURSE OUTLINE					
Course Title:	**Entrepreneurship Development Program**	**Short Title:**	**EDP**	**Course Code:**	

Course description:

Last few decades have seen the advent of various new disciplines in the area of management. One such discipline, Entrepreneurship has emerged quite recently. The syllabus explore the concept of entrepreneurship, financial requirements of a new enterprise, Expansion strategies of an enterprise, challenges for small enterprises and Institutional Support for small enterprises

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

Prerequisite course(s):

Basic knowledge of Industrial Organization and Management.

Course objectives:

1. The objective is to understand Entrepreneurial quality.
2. Understand the role of small scale enterprises in economic development of a country and understand the linkage between small and large scale enterprises.
3. Develop advanced knowledge on how to assess business opportunities to overcome failures.
3. You can effectively combine your understanding of technology and entrepreneurship in a cross- disciplinary fashion to identify and develop attractive opportunities within your field of experience**.**
5. Understand the concept of human resource management, Marketing management, financial management, Production and Operation management in a new enterprise.

Course outcomes:

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

1. Understand the concept of entrepreneurship and learn the procedure of setting up an enterprise.
2. Develop advanced knowledge about key processes necessary to bring new products and services to market and key challenges facing the entrepreneur at different stages of the entrepreneurial**.**
3. Understand the importance of theories, models and management of the entrepreneurship to become successful entrepreneur. .
4. Demonstrate ability to work in multidisciplinary teams and understand the impact of engineering solutions in a global, economic, environmental, and societal context.
5. Develop effective management and policy towards successful entrepreneur.

COURSE CONTENT

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

Unit–I:	**No. of Lectures: 09 Hours**	**Marks: 12**

Introduction, Concept of entrepreneurship:

Significance of entrepreneurship, Theories of entrepreneurship, Models of entrepreneurship development, Definition of entrepreneur: Traits and characteristics of successful entrepreneur , Functions of an entrepreneur, Types of entrepreneurs, Factors influencing entrepreneur, Professional vs. family entrepreneurs, Entrepreneurial leaders vs. managers, Entrepreneurial process: Entrepreneurial motivation, Entrepreneurial barriers, Women as entrepreneur, Role of woman entrepreneurs in society, Barriers to women entrepreneurs.

Unit–II:	**No. of Lectures: 09 Hours**	**Marks: 12**

Financial requirements of a new Enterprise:

Estimating financial requirements, Estimation of fix capital requirements, Estimation of working capital requirements Identifying the sources of finance –sources of long-term financing: Sources of medium term financing , Sources of short-term financing Institutions providing financial assistance: Venture capital funding- venture capital funding in the Indian scenario, Venture capital funding process, Importance of financial management, Working capital management, Accounting and book keeping, Financial statement, Financial ration analysis

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

Expansion strategies of an Enterprise:

Expanding and enterprise: Expansion through concentration, Expansion through integration, Expansion through diversification , Expansion through cooperation, Expansion through internationalization, Expansion through digitalization , Organization life cycle, Strategic management, The essence of business ethics

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

Challenges for small Enterprises:

Problem faced by small enterprises: Managerial problems, Marketing management, Human resource, Production management, Technological problems Role of central and state governments in promoting small enterprises: Fiscal and tax concessions for small enterprises, Industrial policies for small enterprises, Importance of marketing, Customer relationship management (CRM), Marketing services

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

Institutional Support for small enterprises and decision support system

Institutions supporting small scale enterprises: Small scale industries (SSI) board, Khadi and village industries commission (KVIC), Micro, small and medium enterprises development organization (MSME-DO), National small industries corporation limited (NSIC), National institute for entrepreneurship and small business development (NIESBUD),Indian institute of entrepreneurship (IIE), State industrial development / Investment Corporation (SIDCs/SIICs), State directorate of Industries (SDIs), District industry centers (DICs), Industry associations , Non-Governmental organization

Institutions providing financial association: Small industries development bank of India (SIDBI), State financial corporation (SFCs) Technological up gradation and moderation of small enterprises: ISO 9000/14001 certification fee reimbursement scheme,

Text / Reference Books:

1. Alpana Trehan, “Entrepreneurship” Published –Dreamtech Press.
2. Jack M. Kaplan, “Patterns of Entrepreneurship” Published -WILEY.
3. Poornima M. Charantimath, “Entrepreneurship Development –Small Business Enterprises” Publisher –Pearson.
4. Thomas W. Zimmerer & Norman M. Scarborough, “Essential Of Entrepreneurship and Small Business Management” 4th Edition , Publisher –Pearson.

Electronics Workshop Lab					
LAB COURSE OUTLINE					
Course Title:	**Electronic Workshop Lab**	**Short Title:**	**EW**	**Course Code:**	
Course description:					
Also in this laboratory course emphasis is on the understanding of the CRO, Multimeter, Function generator, power supply. The students can use this knowledge to design PCB.					

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

End Semester Exam (ESE) Pattern:	**Practical (PR)**
Prerequisite course(s):	
Fundamental concepts of Basic Electrical and Electronics Engineering.	
Course objectives:	
1. To familiarize the students in introducing different electronic instruments. 2. To understand the different hardware components. 3. To solve the layout designing problems 4. To understand the various steps involve in designing of PCB . 5. To study the techniques of troubleshooting of PCB.	
Course outcomes:	
Upon successful completion of lab Course, student will be able to:	
1.Understand the functions of different instruments (multimeter, function generator, power supply, CRO etc.) and their handling. 2. Design the layout artwork of electronic circuit. 3.Describe the etching drilling process of electronic circuit. 4.Understand the soldering techniques. 5.Apply the techniques for troubleshoot the problems of PCB designing.	

LAB COURSE CONTENT			
Electronics Workshop		**Semester:**	**IV**
Teaching Scheme:		**Examination scheme**	
Laboratory:	**2 hours/week**	**Internal Continuous Assessment (ICA):**	**25 marks**

List of laboratory assignments.

1. Study of Digital multimeters and power supply.
2. Study of Cathode Ray Oscilloscope
3. Study of Signal Generator
4. Study of Hardware Components
5. To built and test any basic electronic circuit on bread board.
6. Preparation of artwork and Layout of above circuit.

7. Preparation of Etching and Drilling of Cu clad laminate.
8. Preparation of component mounting and soldering of above circuit and testing

Text/ Reference Books:

1. K. A. Krishnamurty, M. R. Raghuveer, "Electrical and Electronics Engineering for Scientists and Engineers," Willey Eastern Limited.
2. Bosschart, Printed circuit board-Design and Technology.
3. H.S.Kalsi, Electronics Instrumentation, TMH Publication, 3rd Edition
4. Albert D.Helfrick, William D.Cooper, Modern Electronics Instrumentation and Measurement Techniques, PHI.

Guide lines for ICA:

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

Analog and Digital Communication Laboratory					
LAB COURSE OUTLINE					
Course Title:	**Analog and Digital Communication Lab**	**Short Title:**	**ADCL**	**Course Code:**	
Course description:					
This course is aimed at introducing the fundamentals of analog & digital communication to undergraduate students. The goals of the course are to understand the basic principle of analog & digital communication and application in different era.					
Laboratory	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**	
	02	14	28	1	
End Semester Exam (ESE) Pattern:		**Practical (PR)**			
Prerequisite course(s):					
Knowledge of analog & digital signal & fundamentals					
Course objectives:					
1. To understand the basic concepts of communication. 2. To learn Amplitude & frequency modulation systems. 3. To understand effect of noise on communication system. 4. To study & understand waveform coding techniques as well as line coding 5. To learn digital modulation technique.					
Course outcomes:					
Upon successful completion of lab Course, student will be able to:					
1. Describe different analog modulation schemes. 2. Analyze the behavior of a communication system in presence of noise. 3. Use & explain waveform coding techniques. 4. Describe different line coding. 5. Analyze system performance of digital modulation systems.					
LAB COURSE CONTENT					
Analog and Digital Communication Lab		**Semester:**	**IV**		
Teaching Scheme:		**Examination scheme**			
Practical:	**2 hours/week**	**End semester exam (ESE):**		**25 marks**	
		Internal Continuous Assessment (ICA):		**25 marks**	

Perform any eight practicals from the list given below.

1. Study of AM transmitter and calculate of modulation index of AM wave by envelope method
2. Analyze and generate A.M. Demodulation signal by diode detector
3. Study of FM and calculate of modulation index of FM wave
4. F.M. Demodulation (Phase discriminator/Ratio detector method.)
5. To Construct and Verify Pre-emphasis and De-emphasis and Plot the Waveforms.
6. DSB-SC signal generation using balanced modulator
7. To understand waveform of Delta Modulation and Demodulation
8. To understand waveform of Adaptive Delta Modulation and Demodulation.
9. To generation and detection of FSK I/P and O/P waveform.
10. To generation and detection of PSK I/P and O/P waveform
11. To generation and detection of QPSK/QAM I/P and O/P waveform
12. To Study different line codes (NRZ, RZ, polar RZ, bipolar(AMI),Manchester

Text Books:

1. G. Kennedy, B. Davis, “Electronic Communication Systems”, Tata McGraw Hill Edition, 4th Edition, 1999.
2. S. Kundu, “Analog and Digital Communication”, Pearson, ISBN 978-81-317- 3187-1
3. Proakis J.G., ``Digital Communications", 4th Edition, McGraw Hill, 2000.

Reference Books:

1. H. Taub, D. L. Schilling and G. Saha, “Principles of Communication Systems”, Tata McGraw-Hill Edition, 3 rd Edition, 2011.
2. D. Roddy, J. Coolen, “Electronic Communications”, Pearson, 4th Edition, 2011
3. S. Haykin, “Digital Communications”, Wiley Student Edition, ISBN 9971-51-205-X.
4. Wozencraft J. M. and Jacobs I. M., ``Principles of Communication Engineering", John Wiley, 1965.

Guide lines for ICA:

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

Guidelines for ESE:

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

Analog Circuits Lab					
LAB COURSE OUTLINE					
Course Title:	**Analog Circuits Lab**	**Short Title:**	**ACL**	**Course Code:**	
Course description:					
This course provides the students with comprehensive study of basic components and circuits of Analog Electronics. It deals with BJT, FET, Op Amp, DAC and ADC.					
Laboratory	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**	
	02	14	28	1	
End Semester Exam (ESE) Pattern:		**Practical (PR)**			
Prerequisite course(s):					
Basic knowledge of Electronics					
Course objectives:					
1. To give the brief idea about basics of transistor configurations. 2. To familiarize the students to perform the frequency analysis of any Analog electronics circuit. 3. To understand the design and working of BJT / FET amplifiers, oscillators and Operational Amplifier. 4. To prepare the students for operational amplifier, DAC, ADC Circuit Design. 5. To learn power amplifiers and its applications.					
Course outcomes:					
Upon successful completion of lab Course, student will be able to:					
1. Acquire basic knowledge of physical and electrical conducting properties of transistor. 2. Develop the ability to understand the design and working of BJT / FET amplifiers. 3. Able to design amplifier circuits using BJT s And FET's and observe the amplitude and frequency responses of common amplifier circuits 4. Observe the effect of negative feedback on different parameters of an Amplifier and different types of negative feedback topologies. 5. Observe the effect of positive feedback and able to design and working of different Oscillators using BJTS.					
LAB COURSE CONTENT					
Analog Circuits Lab		**Semester:**	**IV**		
Teaching Scheme:		**Examination scheme**			
Practical:	**2 hours/week**	**End semester exam (ESE):**		**25 marks**	
		Internal Continuous Assessment (ICA):		**25 marks**	

Perform any eight practicals from the list given below.

1. BJT/FET Q point & load line.
2. Frequency Response of CE-CE cascade
3. Effect of Emitter Bypass Capacitor (CE Configuration).
4. Cross over distribution & its elimination.
5. Effect of partial feedback for voltage shunt configuration.
6. Effect of feedback for current series configuration.
7. Output and Frequency of RC Phase Shift Oscillator.
8. Output and Frequency of Colpitt Oscillator
9. OP-AMP as an Integrator & Differentiator.
10. OP-AMP as an Schmitt trigger.
11. OP-AMP Low Pass Filter.
12. OP-AMP High Pass Filter.

Text Books:

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

Reference Books:

1. Louis Nashelsky & Robert Boylestad, Electronics Devices and Cercuits Theory, Pearson Publication, 10th Edition
2. Dr. R. S. Sedha , Electronics Circuits, , S Chand Publication, 4th Edition

Guide lines for ICA:

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

Guidelines for ESE:

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

Electronics Network Lab					
LAB COURSE OUTLINE					
Course Title:	**Electronics Network Lab**	**Short Title:**	**ENL**	**Course Code:**	

Course description:

In this laboratory course emphasis is on the understanding of basic electrical circuits. The Students can use this knowledge to analyze Electrical networks and Design of different filters and attenuators.

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

End Semester Exam (ESE) Pattern:

Prerequisite course(s):

Basic concepts of Basic Electrical and Electronics Engineering.

Course objectives:

1. To acquire the practical concepts in order to analyze the network
2. To prepare students to perform the analysis and design of various types of filters and attenuator circuits.

Course outcomes:

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

1. Determine driving and transfer functions of the network.
2. Calculate different parameters of two port network.
3. Calculate the resonance frequency and bandwidth of series circuit.
4. Determine the attenuation of resistive network.
5. Design different types of Filters.

LAB COURSE CONTENT

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

Perform any eight practicals from the list given below.

1. Determine transfer / driving point Impedance function of given two port reactive network.
2. Determine Z parameter of two port network.
3. Determine Y parameter of two port networks.
4. Determine transmission parameter of two port networks.
5. Study of Series resonance, find BW and Q- factor.
6. Design, build and test symmetrical T or Π attenuator. Also find its attenuation in db.
7. Frequency response of constant k- low pass filters and find out cut off frequency.

8. Frequency response of constant k- high pass filters and find out cut of frequency.
9. Frequency response of m- derived low pass filters and find out cut of frequency.
10. Frequency response of band pass filter and find out cut of frequency.

Text Books:

1. D. Choudhary, "Network and system", New Age international Publication.
2. A. Sudhakar, S. Palli, "Circuit & Networks Analysis and Synthesis", Tata MH 3rd Edition, 2009.
3. A. Chakraborti, "Circuit Theory (Analysis and synthesis)",Dhanpat Rai Publication,2012.

Reference Books:

1. John G. Proakis, Dimitris G. Manolakis, Digital Signal Processing Principles, algorithms and applications, Pearson Prentice Hall, Fourth edition
2. I.J. Nagrath, S.N. Sharan, R.Ranjan,S.Kumar, Signals and Systems,TMH, 2nd Edition.

Guide lines for ICA:

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

Guidelines for ESE:

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

Environmental Studies					
COURSE OUTLINE					
Course Title:	**Environmental Studies**	**Short Title:**	**EVS**	**Course Code:**	
Course description:					
The course aims to percolate the importance of environmental science and environmental studies.					
COURSE CONTENT					
Environmental Studies		**Semester:**	**IV**		
		Examination scheme			
		End Semester Exam (ESE):	**60 marks**		
		Duration of ESE:	**03 hours**		
		Internal Continuous Assessment (ICA):	**40 marks**		
Unit–I:	**No. of Lectures: 02 Hours**				
Multidisciplinary nature of environmental studies Definition, scope and importance Need for public awareness.					
Unit–II:	**No. of Lectures: 08 Hours**				
Natural Resources : **Renewable and non-renewable resources** Natural resources and associated problems. a. Forest resources : Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b. Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c. Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d. Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. e. Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies. f. Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification. • Role of an individual in conservation of natural resources. • Equitable use of resources for sustainable lifestyles.					
Unit–III:	**No. of Lectures: 06 Hours**				
Ecosystems • Concept of an ecosystem. • Structure and function of an ecosystem. • Producers, consumers and decomposers. • Energy flow in the ecosystem.					

- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following ecosystem :-
  a. Forest ecosystem
  b. Grassland ecosystem
  c. Desert ecosystem
  d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit–IV:	No. of Lectures: 08 Hours	

Biodiversity and its conservation

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

Unit–V:	No. of Lectures: 08 Hours	

Environmental Pollution
Definition

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

Unit–VI:	No. of Lectures: 07 Hours	

Social Issues and the Environment

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

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

Human Population and the Environment

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

Unit–VIII:	**No. of Lectures:**	

Field work

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

Reference Books:

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

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Internship – I

Internship is a mandatory and non-credit course. It is mandatory for all admitted students to undergo Internship during the degree course. The course Internship – I shall be of THREE weeks duration during summer vacation after Semester - IV. Following are the intended objectives of internship training:

- Will expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry.
- Provide possible opportunities to learn, understand and sharpen the real time technical / managerial skills required at the job.
- Exposure to the current technological developments relevant to the subject area of training.
- Experience gained from the 'Industrial Internship' will be used in classroom discussions.
- Create conditions conducive to quest for knowledge and its applicability on the job.

Students shall choose to undergo Internship / Innovation / Entrepreneurship related activities for Internship. Students shall choose either to work on innovation or entrepreneurial activities resulting in start-up or undergo internship with industry/ NGO's/ Government organizations / Micro / Small / Medium enterprises / academic institutions / research institutions. In case student want to pursue their family business and don't want to undergo internship, a declaration by a parent may be submitted directly to the Department Head / TPO.

During the last year of FOUR year Bachelor of Engineering course the student should take project work, as specified in the curriculum, based on the knowledge acquired by the student during the degree course and during Internship. The project work provides an opportunity to build a system based on area where the student likes to acquire specialized skills. The work may also be on specified task or project assigned to the student during Internship.

The internship activities and list of sub-activities for Internship – I are as under.

- Inter/ Intra Institutional Activities:
    - Training with higher Institutions such as IITs, NITs, University Departments, Recognized Research Labs etc.

  - Soft skill training organized by Training and Placement Cell of the respective institutions
  - Online certification courses by SWAYAM, NPTEL, QEEE etc.
  - Learning at Departmental Lab/Tinkering Lab/ Institutional workshop
  - Working for consultancy/ research project within the institutes
  - Training on Software (As per the need of respective branch)
  - Field Survey / Case Study
- Internship:
  - Internship with Industry/Govt. / NGO/ PSU/ Any Micro/ Small/ Medium enterprise/ academic institutions / research institutions
  - Online Internship

Faculty Mentor/Supervisors have to play active roles during the internship and minimum 20 students are to be supervised by each faculty mentor or as per the departmental strength. Mentor shall be responsible for selection of Internship activities by the student under his/her supervision and shall avoid repetition of activities by the student. The college / Institute shall facilitate internship for the students.

Every student is required to prepare a file for Internship – I containing documentary proofs (daily training diary, comprehensive report and completion certificate) of the activities done by him/her. The students should record in the daily training diary the day to day account of the observations, impressions, information gathered and suggestions given, if any. It should contain the sketches & drawings related to the observations made by the students. The daily training diary should include Date, Time of Arrival, Time of Departure, Main points of the day. The daily training diary should be signed after every day by the supervisor/ in charge of the section where the student has been working.

After completion of Internship, the student should prepare a comprehensive report to indicate what he / she has observed and learnt in the training period. The report should include Internship Objectives (in measurable terms), Internship Activities, and Internship Outcome.

The completion certificate should be signed by the supervisor / in charge of the section where the student has been working with performance remark as Satisfactory / Good / Excellent.

The evaluation of Internship – I shall be in Semester – V. The evaluation shall be done by expert committee constituted by the concerned department including Department Head/ TPO/ faculty mentor or guide. It should be evaluated on the basis of the following criteria:

- Regularity in maintenance of the diary.
- Adequacy & quality of information recorded.
- Originality.
- Adequacy and purposeful write-up.
- Practical applications, relationships with basic theory and concepts taught in the course.
- Skill / knowledge acquired

Hence the satisfactory completion of Internship – I shall be submitted to the university at the end of Semester - VIII of FOUR year Bachelor of Engineering course. Only after successfully completion of Internship- I (during summer vacation after Semester – IV) and Internship- II (during summer vacation after Semester – VI), Internship should be printed in the final year mark sheet as COMPLETED.