SHRI RAMDEOBABA COLLEGE OF ENGINEERING AND MANAGEMENT, NAGPUR

An Autonomous College of Rashtrasant Tukadoji
Maharaj Nagpur University, Nagpur, Maharashtra (INDIA)

TEACHING SCHEME & SYLLABUS
2016-17

B.E. ELECTRONICS ENGINEERING

Published by
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ISO 9001 : 2008 CERTIFIED ORGANISATION

About the Department :

Department of Electronics Engineering was established in 1986.The National Board of Accreditation; New Delhi has accredited the department thrice in succession in the year 2003, 2007 & 2013. The Department offers a PG programme in M.Tech. (VLSI Design). It is recognized centre for M.E. (by research) and Doctoral programmes of RTM Nagpur University. The department has received a grant of Rs. 10 lakhs from AICTE under its MODROB scheme to carry out projects in CMOS VLSI area. The Department has15 state of the art labs with investment over Rs. 2 crores. The major softwares include VLSI design, development and verification platforms, such as Mentor Graphics FPGA advantage, digital design simulation, synthesis tool and Synopsis's analog/digital tool set. The backend place and route vendor specific tools are Xilinx's ISE Development Platform, Altera's NIOS II Development Platform, Tanner tool, ORCAD 15.7. The design Platforms include vertex 5 Development platform and Embedded System Design environment like NIOS II, Embedded Evaluation CYCLONE III Platform, ARM 7/9 Development Platform. Advanced Communication trainers and test equipments include Fiber Optic Trainer, Spectrum Analyzer, Digital Storage Oscilloscope, MIC Trainer, Digital Signal Processors and simulation tools MATLAB 2013R, Labview 8.0 are also part of the state-of-the- art laboratories.

Vision of Department

Electronics Engineering Department endeavors to facilitate state of the art technical education in the field of electronics engineering by infusing scientific temper in students leading towards research and to grow as centre of excellence in the field of microelectronics.

Mission of Department

- To promote quality education through stimulating environment for dissemination of knowledge and technology.
- To impart necessary technical, professional skills with moral and ethical values to enable students for achieving a successful career.
- To develop centre of excellence in the field of microelectronics and its allied areas with continuing education program.
- To foster research and development in collaboration with institutions/industries.

1. Program Educational Objectives (PEO's)

Program Objectives

1. To prepare graduates to solve engineering problems exhibiting a foundation in mathematics, science and electronics engineering fundamentals.
2. To inculcate an ability to design and develop electronic systems to cater the needs of the society.
3. To instill sense of professional and ethical values, effective communication, teamwork, multidisciplinary approach and lifelong learning to excel in professional career / higher studies.

Program outcomes

1. An ability to apply knowledge of mathematics, science and engineering.
2. An ability to design and conduct experiments as well as to analyze and interpret data.
3. An ability to design an electronic system, component or process to meet socio economic needs.
4. An ability to think critically, formulates, analyze and solve complex problems pertaining to the discipline.
5. An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.
6. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
7. An understanding of professional and ethical responsibility.
8. An ability to function independently and in a group to accomplish a common goal.
9. An ability to communicate effectively
10. An ability to understand engineering and management principles and apply to manage projects considering economic factors.
11. A recognition of the need for and an ability to engage in life- long learning.

Teaching Scheme for First Year (Semester I and II) Bachelor of Engineering

GROUP 1: SEMESTER I / GROUP 2: SEMESTER II

Sr. No.	Code	Course	L	T	P	Credits	Maximum Marks			Exam Duration
							Internal Assessment	End Sem Exam	Total	
1	MAT101/ MAT102	Engineering Mathematics-I/II	4	1	0	9	40	60	100	3 Hrs.
2	PHT101	Engineering Physics	4	1	0	9	40	60	100	3 Hrs.
3	PHP101	Engineering Physics lab	0	0	3	3	25	25	50	-
4	EET101	Electrical Engineering	3	1	0	7	40	60	100	3 Hrs.
5	EEP101	Electrical Engineering lab	0	0	2	2	25	25	50	-
6	CST101	Computer Programming	2	0	0	4	40	60	100	3 Hrs.
7	CSP101	Computer Programming lab	0	0	2	2	25	25	50	-
8	HUT101	Communication Skills	2	0	0	4	40	60	100	3 Hrs.
9	HUP101	Communication Skills lab	0	0	2	2	25	25	50	-
10	PEP101	Sports/Yoga	0	0	2	0	-	-	-	-
		TOTAL	**15**	**3**	**11**	**42**	**300**	**400**	**700**	

Teaching Scheme for First Year (Semester I and II) Bachelor of Engineering

GROUP 1 : SEMESTER II / GROUP 2 : SEMESTER I

Sr. No.	Code	Course	L	T	P	Credits	Maximum Marks			Exam Duration
							Internal Assessment	End Sem Exam	Total	
1	MAT102/ MAT101	Engineering Mathematics-II/I	4	1	0	9	40	60	100	3 Hrs.
2	CHT101	Engineering Chemistry	4	1	0	9	40	60	100	3 Hrs.
3	CHP101	Engineering Chemistry lab	0	0	3	3	25	25	50	-
4	CET101	Engineering Mechanics	3	1	0	7	40	60	100	3 Hrs.
5	CEP101	Engineering Mechanics lab	0	0	2	2	25	25	50	-
6	MET101	Engineering Drawing	3	0	0	6	40	60	100	4 Hrs.
7	MEP101	Engineering Drawing lab	0	0	3	3	25	25	50	-
8	HUT102	Social Skills	2	0	0	4	40	60	100	3 Hrs.
9	INP102	Workshop	0	0	2	2	25	25	50	-
		TOTAL	**16**	**3**	**10**	**45**	**300**	**400**		

DEPARTMENT OF ELECTRONICS ENGINEERING

Scheme of Examination of Bachelor of Engineering (Electronics Engineering)
Semester Pattern - III Semester B.E. (Electronics Engineering)

Sr. No.	Code	Course	L	T	P	Credits	Maximum Marks			Exam Duration
							Internal Assessment	End Sem Exam	Total	
1	MAT203	Engineering Mathematics III	3	1	0	7	40	60	100	3Hrs
2	EET205	Network Theory	3	1	0	7	40	60	100	3Hrs
3	ENT201	Electronic Devices	4	1	0	9	40	60	100	3Hrs
4	ENP201	Electronic Devices lab	0	0	2	2	25	25	50	3Hrs
5	ENT202	Digital Logic Design	4	1	0	9	40	60	100	3Hrs
6	ENP202	Digital Logic Design lab	0	0	2	2	25	25	50	3Hrs
7	PHT201	Electronic Engineering Materials & IC Fabrication	3	1	0	7	40	60	100	3Hrs
8	CSP211	Object Oriented Data Structure lab	0	0	2	2	25	25	50	3Hrs
9	CHT201	Environmental Studies I	2	0	0	0				
		Total	**19**	**5**	**6**	**45**				

Scheme of Examination of Bachelor of Engineering (Electronics Engineering)
Semester Pattern IV Semester B.E. (Electronics Engineering)

Sr. No.	Code	Course	L	T	P	Credits	Maximum Marks			Exam Duration
							Internal Assessment	End Sem Exam	Total	
1	MAT243	Engineering Mathematics IV	3	1	0	7	40	60	100	3Hrs
2	ENT203	Electromagnetic Fields	4	1	0	9	40	60	100	3Hrs
3	ENT204	Analog Circuits	4	1	0	9	40	60	100	3Hrs
4	ENP204	Analog Circuits lab	0	0	2	2	25	25	50	3Hrs
5	ENT205	Electronic Circuits	3	1	0	7	40	60	100	3Hrs
6	ENP205	Electronic Circuits lab	0	0	2	2	25	25	50	3Hrs
7	ENT208	Electronic Measurement & Instrumentation	3	1	0	7	40	60	100	3Hrs
8	ENP208	Electronic Measurement & Instrumentation lab	0	0	2	2	25	25	50	3Hrs
9	CHT202	Environmental Studies II	2	0	0	0				
		Total	**19**	**5**	**6**	**45**				

Scheme of Examination of Bachelor of Engineering (Electronics Engineering)
Semester Pattern V Semester B.E. (Electronics Engineering)

Sr. No.	Code	Course	L	T	P	Credits	Maximum Marks			Exam Duration
							Internal Assessment	End Sem Exam	Total	
1	HUT301	Principles of Economics & Management	3	1	0	7	40	60	100	3Hrs
2	ENT301	Digital System Design with HDL	3	1	0	7	40	60	100	3Hrs
3	ENP301	Digital System Design with HDL lab	0	0	2	2	25	25	50	3Hrs
4	ENT302	Statistical Signal Analysis	4	1	0	9	40	60	100	3Hrs
5	ENP302	Statistical Signal Analysis lab	0	0	2	2	25	25	50	3Hrs
6	ENT303	Field & Radiating System	3	1	0	7	40	60	100	3Hrs
7	ENT304	Microprocessor & Interfacing	4	1	0	9	40	60	100	3Hrs
8	ENP304	Microprocessor & Interfacing lab	0	0	2	2	25	25	50	3Hrs
9	ENP305	Circuit Simulation lab	0	0	2	0				
		Total	**17**	**5**	**8**	**45**				

Scheme of Examination of Bachelor of Engineering (Electronics Engineering)
Semester Pattern VI Semester B.E. (Electronics Engineering)

Sr. No.	Code	Course	L	T	P	Credits	Maximum Marks			Exam Duration
							Internal Assessment	End Sem Exam	Total	
1	ENT306	Microwave Engineering	3	1	0	7	40	60	100	3Hrs
2	ENP306	Microwave Engineering lab	0	0	2	2	25	25	50	3Hrs
3	EET315	Control System Engineering	3	1	0	7	40	60	100	3Hrs
4	ENT307	Microcontroller Based Design	3	1	0	7	40	60	100	3Hrs
5	ENT308	Computer Organization	3	0	0	6	40	60	100	3Hrs
6	ENT309	Analog Communication Engineering	3	1	0	7	40	60	100	3Hrs
7	ENP309	Analog Communication Engineering lab	0	0	2	2	25	25	50	3Hrs
8	ENP310	Electronic Product Design lab	0	0	2	2	25	25	50	3Hrs
9	ENT311	Open Elective I	3	1	0	7	40	60	100	3Hrs
10	EDP313	PCB Design	0	0	2					
		Total	**18**	**5**	**8**	**47**				

VI Sem	Open Electives
ENT311-1	Consumer Electronics
ENT311-2	IC Design Techniques
ENT 311-3	Arduino Playground

Scheme of Examination of Bachelor of Engineering (Electronics Engineering)
Semester Pattern VII Semester B.E. (Electronics Engineering)

Sr. No.	Code	Course	L	T	P	Credits	Maximum Marks			Exam Duration
							Internal Assessment	End Sem Exam	Total	
1	ENT401	Digital Communication	3	1	0	7	40	60	100	3Hrs
2	ENT402	CMOS VLSI Design	3	1	0	7	40	60	100	3Hrs
3	ENP402	CMOS VLSI Design Lab	0	0	2	2	25	25	50	3Hrs
4	ENT403	Digital Signal Processing	3	1	0	7	40	60	100	3Hrs
5	ENP403	Digital Signal Processing Lab	0	0	2	2	25	25	50	3Hrs
6	ENT404	Elective -I	4	0	0	8	40	60	100	3Hrs
7	ENT405	Elective -II	4	0	0	8	40	60	100	3Hrs
8	ENP406	Project Phase-I	0	0	4	8	100		100	
9	HUT401	Technical Communication	2	0	0	0				
		Total	**19**	**3**	**8**	**49**				

Elective-I	Elective-II
ENT404-1 Electronic System Design	ENT405-1 Power Electronics & Industrial Automation
ENT404-2 Wireless Communication	ENT405-2 Optical Communication
ENT404- 3 Medical Electronics	ENT405-3 Micro Electro Mechanical Systems

Scheme of Examination of Bachelor of Engineering (Electronics Engineering)
Semester Pattern VIII Semester B.E. (Electronics Engineering)

Sr. No.	Code	Course	L	T	P	Credits	Maximum Marks			Exam Duration
							Internal Assessment	End Sem Exam	Total	
1	ENT407	Computer Communication Networks	3	1	0	7	40	60	100	3Hrs
2	ENP407	Communication and Networking Lab	0	0	2	2	25	25	50	3Hrs
3	ENT408	Advanced Processors & Embedded Systems	4	1	0	9	40	60	100	3Hrs
4	ENP408	Advanced Processors & Embedded Systems Lab	0	0	2	2	25	25	50	3Hrs
5	ENT409	Elective -III	4	0	0	8	40	60	100	3Hrs
6	ENT410	Elective -IV	4	0	0	8	40	60	100	3Hrs
7	ENP411	Project Phase-II	0	0	4	8	50	50	100	
8	EDT413	Industrial Design & Reliability of Electronic Equipments	2	0	0					
		Total	**17**	**2**	**8**	**44**				

Elective-III	Elective-IV
ENT409-1 Advanced Digital Signal Processing	ENT410-1 Design for Testability
ENT409-2 CMOS & RF Design	ENT410-2 Mechatronics
ENT409-3 Switching Theory & Finite Automata	ENT410-3 Digital Image Processing

Syllabus of Group 1 - Semester I and Group 2 - Semester I, Bachelor of Engineering

Course Code : MAT101 **Course : Engineering Mathematics-I**

L: 4 Hrs., T: 1 Hrs., P: 0 Hrs., Per week **Total Credits : 09**

Course Objective

Course objective of this course is to provide understanding the concepts of Mathematics and its application to Engineering. This course introduces the student to Differential Calculus for one and several variable, Differential Equations and Infinite Series.

Course Outcomes

On successful completion of the course, student shall be able to

1. Solve Engineering problems using the concept of Differential Calculus.
2. Get analytical solution of Ordinary Differential Equations in Engineering.
3. Test convergence of Infinite series.

Syllabus

Unit - I :

Ordinary Differential Calculus: Successive differentiation, Taylor's and Maclaurin's series for function of one variable, indeterminate forms, curvature, radius of curvature and circle of curvature.

Unit - II :

Partial Differentiation: Functions of several variables, first and higher order derivative, Euler's Theorem, Chain rule and Total differential coefficient, Jacobians. Taylor's and Maclaurin's series for function of two variables, Maxima and minima for function of two variables, Lagrange's method of undetermined multipliers.

Unit - III :

Infinite Series: Convergence, divergence and oscillation of series, General properties, Tests of convergence, Alternating series.

Unit - IV :

First Order Differential Equation: First order first degree differential equations: Linear, reducible to linear, exact and reducible to exact differential equations; Non-linear differential equations.

Unit - V :

Higher Order Differential Equation: Higher order differential equations with constant coefficient, method of variation of parameters, Cauchy's and Legendre's homogeneous differential equations, simultaneous differential equations, differential equation of the type $d^2y/dx^2 = f(x)$ and $d^2y/dx^2 = f(y)$.

Unit - VI :

Applications of Differential Equation: Applications of first order first degree differential equations: Simple electrical circuits in series. Application of higher order differential equations: Mechanical and electrical Oscillatory circuits (free, damped, forced oscillations)

Text Books :

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, Delhi.
2. A text book of Applied Mathematics Volume I & II, by P. N. Wartikar and J. N. Wartikar, Pune Vidhyarthi Griha Prakashan, Pune-411030 (India)
3. Advanced Engineering Mathematics, 2 ed , Jain ,Iynger , Narosa publication

Reference Books :

1. Advanced Engineering Mathematics by Erwin Kreyszig, 8th edition, Neekunj print process, Delhi.
2. Schaum's Outline of Differential Equations, Richard Bronson , TMH, 3ed, New Delhi
3. Engineering Mathematics by Srimanta, Paul
4. A text book of Applied Mathematics I, T. Singh, K.L. Sarda, Professional Publishing House Pvt.Ltd., Nagpur.

Syllabus of Group 1 - Semester I and Group 2 – Semester II, Bachelor of Engineering

Course Code : PHT101 **Course : Engineering Physics**

L: 4 Hrs, T: 1 Hr, P : 0 Hr., Per week **Total Credits : 09**

Course Objectives :

1. To develop the ability to apply concepts in elementary physics to understanding of engineering applications;
2. To introduce more advanced physics concepts, which form the basis of modern engineering;
3. To provide a sound foundation in mathematical formulation of concepts learnt and their applications;
4. To elaborate the general nature of concepts learnt and of possibility of their cross-disciplinary application;
5. To develop skills for numerical problem solving in areas covered

Course Outcomes :

At the end of the course the students

1. will be able to recognize and analyze phenomena of interference, diffraction and polarization of light waves ;
2. will understand principles of laser action and basic working of many types of laser devices ;
3. will understand geometrical theory of optical fibre communication and the phenomena of attenuation and dispersion of electrical signals in the fibre ;
4. will understand fundamental notions in quantum mechanics such as wave particle duality, de Broglie matter waves, Heisenberg uncertainty relations, wave function of system, quantum confinement, quantization of energy and quantum tunneling of potential barriers;
5. will understand concepts like Fermi energy and density of states, understand calculation of carrier density and electrical conductivity in intrinsic and semiconductors and understand the behaviour of pn-junction;
6. will understand broad principles of electromagnetic electron lenses, cyclotron, mass spectrograph and working of the CRO;
7. will understand the reasons for novel properties at nano-scale, be familiar with elements of some of the methods of synthesis and characterization and some of the properties of such materials ;
8. will be able to understand and perform numerical calculations in areas of optics, lasers, optical fibres, quantum physics, semiconductors, charged particle devices and nano physics at the level defined above for these.

Unit-I :

Optics :

Interference in thin films, division of amplitude and wavefront, wedge-shaped films, Newton's rings, antireflection coatings; Diffraction, single slit, double slit, Different types of polarization of light, Malus' law, production of plane polarized light, birefringence, wave plates.

Unit-II :

Quantum Physics :

Wave-particle duality, wave packets, Heisenberg uncertainty relations; Wave function, probability Schrodinger's equation, time dependent equation and its separation; Infinite potential and finite potential wells, phenomenon of tunneling.

Unit-III :

LASERs and Optical Fibres :

Interaction of matter and radiation, LASER, spontaneous and stimulated emission, population inversion; Common types of lasers and their applications; Optical fibres, structure, types, propagation in a fibre, modes of propagation, signal attenuation, signal distortion.

Unit-IV :

Mass Spectrograph and Particle Accelerators :

Principles of electron optics, cathode ray tube, cathode ray oscilloscope, mass spectrographs, particle accelerators.

Unit-V :

Semiconductors :

Band structure of solids, band diagrams of insulators, semiconductors and conductors, Fermi level in conductors and semiconductors, carrier concentration, conductivity, effective mass; Junction diode and its band diagram, depletion region and barrier potential, diode rectifier equation.

Unit-VI :

Nanophysics:

What is Nanotechnology? Fullerenes and nanoparticles; Outline of methods of preparation; Elements of electron microscopy; Scanning probe microscopy, Outline of properties – physical, thermal, optical, electrical, magnetic; Quantum size-effects; CNTs; Applications.

Text Books :

1. Fundamentals of Physics: D. Halliday, R. Resnik and J. Walker, John Wiley.
2. Engineering Physics: S. Jain and G.G. Sahasrabudhe, Universities Press (2010) / Applied Physics : S. Jain Sahastrabuddhe and S.M. Pande.
3. Introduction to Nanoscience and Nanotechnology: K.K. Chattopadhyay and A.N. Banerjee, PHI Learning (2009)

Reference Books :

1. Electronic Engineering Materials and Devices: J. Allison, TMH.
2. Engineering Physics: H. Malik and A.K. Singh, TMH (2010).
3. Engineering Physics: D.K. Bhattacharya and A.Bhaskaran, Oxford University Press (2010)

Syllabus of Group 1 - Semester I and Group 2 – Semester II, Bachelor of Engineering

Course Code: PHP101 **Course: Engineering Physics Laboratory**

L: 0 Hrs., T: 0 Hrs., P: 3 Hrs., Per week **Total Credits: 03**

Course Outcomes :

1. Students should be able to perform tasks like leveling, alignment, reading vernier scales, do specific measurements, systematically record observations, do calculations from data collected and draw conclusions.
2. Students gain working familiarity with instruments like simple spectrometer, travelling microscope, lenses, prisms, ammeter, voltmeter, the CRO, power supplies etc.;
3. Students gain better understanding of concepts like interference, diffraction, polarization, energy band gap \in semiconductor etc.
4. Students gain a working knowledge of estimating errors in an experiment for which background theory is known;
5. Students should be able to subject data collected to statistical and error analysis.

A minimum of 8 experiments to be performed from the following list of experiments.

List of Experiments :

In addition to the demo experiments, the Lab turns will be utilized for performing the experiments based on the following list:

1. Study of diodes
2. Study of transistors
3. Study of thermistors
4. Study of phenomena of interference due to thin films.
5. Diffraction of light by slit(s), an edge, obstacles, etc.
6. Hall effect
7. Study of CRO
8. Graph plotting, curve fitting, visualization using Mathematica

Reference Books :

1. Physics Lab Manual written by the Teaching Faculty of Physics Department, RCOEM.

Syllabus of Group 1 - Semester I and Group 2 - Semester II, Bachelor of Engineering

Course Code : EET101 **Course : Electrical Engineering**

L:3 Hr., T:1 Hrs., P:0 Hrs., Per week **Total Credits : 07**

Course Outcomes :

Upon completion of this course, the students shall be able to,

1. Apply the basic laws of electric and magnetic circuits to obtain the unknown quantities.
2. Represent and interpret the sinusoidal electrical quantities mathematically as well as graphically in the form of waveforms/phasors and analyze the 1-phase/3-phase AC circuits to determine the unknown quantities.
3. Determine the power losses/efficiency and voltage drop/voltage regulation of a 1-phase transformer at full load condition and demonstrate the knowledge related with its need, construction, principle, types and applications.
4. Describe the construction, principle, applications and performance characteristics of DC machines and Induction motors.
5. Demonstrate the concept of electrical power generation, transmission, distribution and the understanding about conventional/renewable energy sources.
6. Demonstrate the understanding about necessity of electrical earthing, safety & protecting devices, electrical energy utilization, illumination sources and their selection.

Unit-I :

DC Electric Circuits : Definition of EMF, Current, Power, Energy Resistance, Variation of resistance with physical parameters viz. length, area, specific resistivity and temperature. Ohm's law, resistances in series and parallel, current and voltage division rules, KVL & KCL, star delta transformation and related numerical. Measurement of DC electrical quantities.

Magnetic Circuit: Concept of MMF, Flux, reluctance, analogy with electric circuits, B-H curve, simple numerical on series magnetic circuits.

Unit-II :

AC Circuits : Generation of single phase and three phase alternating EMF. Average and RMS values for sinusoidal waveform. Phasor representation of sinusoidal electrical quantities, Steady state behavior of RLC circuits with sinusoidal excitation. Reactance, impedance, Power & Energy in AC Circuits. Simple numerical on series and parallel AC circuits. Concept & importance of power factor & its improvement (with simple numerical).

Simple analysis of balanced three phase AC circuits, Star-delta resistive networks. Measurement of AC electrical quantities.

Unit-III :

Introduction to Electrical Power System :

Introduction to Power Generation (Thermal, Hydro, Nuclear, Wind and Solar) with block schematic representation only. Single line diagram for Generation, Transmission & Distribution through different voltage levels; Low voltage radial distribution system (Over head & underground, single phase and three phase).

Necessity of equipment earthings, Fuses (Rewirable and HRC), MCB, ELCB.Basic operation of UPS and Inverters (Block schematic representation).

Unit-IV :

Single phase Transformer :

Principle of operation, Construction Transformer ratings, No load and On load operation with leakage reluctance, losses, efficiency, Definition & formula for voltage regulation, OC/ SC test, equivalent circuit referred to primary side of transformer.

Unit-V :

Rotating Electric Machines :

DC Machines: DC Generator-Principle of working, construction (without details of armature winding), classification of DC generators. DC Motors-Back EMF, necessity of starters, speed and torque equations, characteristics of motors, speed control of DC motors (without numerical), Application of DC motors.

Three Phase Induction Motors: Working principles, types and construction of three phase Induction Motor, synchronous speed, torque, sleep, torque speed characteristics, applications of three phase Induction motor.

Single Phase Induction Motors: operating principle of capacitor start and run single phase induction motor and its applications.

Unit-VI :

Utilization of Electrical Energy :

Illumination: Definition of luminous flux, luminous intensity, Candle power, illumination, Luminance, Luminous efficiency (lumens/watt) of different types of lamps, working principle of Fluorescent/Sodium Vapour/ Mercury vapor & CFL Lamps. Simple numerical to determine number of lamps to attain a given average lux level in an area.

Electric Heating: Advantages of Electrically produced heat, types and applications of Electric heating equipment, transfer of heat (conduction, convection, radiation); Resistance ovens, Induction heating (Core & coreless type), Dielectric heating. (Note. Numerical excluded)

Tariff: One part (KWH based) tariff with simple numerical; to calculate the domestic electricity charges.

Text Books :

1. Elements of Electrical sciences: P. Mukhopadhyay, N. Chand & Bros Roorkee (1989).
2. Electrical Technology: B. L. Thareja, S. Chand Publications.
3. Basic Electrical Engineering: S. B. Bodkhe, N. M. Deshkar, P. P. H. Pvt. Ltd.

Reference Books :

1. Basic Electrical Engineering: T.K. Nagasarkar& M. S. Sukhija, Oxford Univ. Press.
2. Utilization of Electrical Energy: H. Pratab, Dhanpatrai& Sons.
3. Utilization of Electrical Energy: E. Openshaw Taylor, Orient Longman.
4. Websites: www.powermin.nic.in, www.mnes.nic.in, www.mahaurja.com.

Syllabus of Group 1 - Semester I and Group 2 - Semester II, Bachelor of Engineering

Course Code : EEP101 — **Course: Electrical Engineering Lab**

L:0 Hr., T:0Hrs., P:2 Hrs., Per week — **Total Credits : 02**

Course Outcomes :

Upon completion of this course, the students shall be able to,

1. Connect the electric circuits based on the syllabus of theory subject EET101 and test the performance by way of observation, calculations and conclusion.
2. Demonstrate the concept and significance of power factor and how it can be improved.
3. Conduct an electrical energy survey of connected load at residential premises and demonstrate the understanding of energy tariff by calculating the energy bill in accordance with the norms of State Electricity Distribution Company.

List of Experiments :

1. To verify Kirchoff's voltage and current law using D.C. source.
2. To study the R-L-C series circuit with AC source
3. To study R-L-C parallel circuit with AC source
4. To perform direct load test on 1-phase transformer for finding regulation and efficiency
5. To perform open circuit and short circuit tests on 1-phase transformer
6. To study 3-phase star delta connections and verify different relations of voltage ,current and power
7. To study the speed control techniques for DC shunt motor
8. To study the importance of power factor and improvement of power factor using static capacitors.
9. To analyze energy bill of residential category and prepare energy sheet.

Syllabus of Group 1 - Semester I and Group 2 - Semester II, Bachelor of Engineering

Course Code: CST101 — **Courses: Computer Programming**

L: 2 Hrs. T: 0 Hrs. P: 0 Hrs. Per week — **Total Credits: 4**

Course Outcomes :

On successful completion of the course, students will be able to

1. Understands basics of computer, software, number systems, flowchart and algorithms.
2. Design and code well-structured C programs.
3. Write program on the basis of decision control structures and loop control structures.
4. Perform sorting and various other operations on 1-D and 2-D array.
5. Perform operations on structures, functions and pointers.

Syllabus

Unit-I :

Computer Fundamentals: Basic Structure of a computer, Input/output devices and memories and types of computer. Introduction to DOS and Windows OS, Number Systems: Decimal, Binary, Octal, Hexadecimal and conversion from one to another. Algorithm – Conventions used in writing algorithm, Software Life Cycle, Program and Programming Language System Software- Translator, Compiler, Interpreter, Linker, Loader. Languages – Procedural, Object oriented, High level, assembly, Machine Language and Flowchart

Unit-II :

C Programming Language: Keyword, Constant, Variable, Data types, Operators, Types of Statements, Preprocessor Directives, Decision Control Statement-if, if-else, Nested if-else statement, Switch case.

Unit-III :

Loop Control Structure: go to, while, for, do while, break, continue Storage class, Enumerated Data types, Renaming Data types with typedef(), Type Casting, Bitwise Operators.

Unit-IV :

Array: Introduction, array Declaration, Single and multidimensional array Pointers: Introduction, Definition and use of pointer, Pointer arithmetic, pointer operators, pointer and array, pointer to pointer

Unit-V :

Structures and Union: Declaring and using structure, Structure initialization, Structure within structure, array of structure, pointer to structure.

Unit-VI :

Function Programming : Introduction, User Defined and Library Function, Parameter passing, Return value, Recursion, pointer and function

Text Books :

1. Mastering C: K. R. Venugopal and S. R. Prasad, Tata McGraw Hill
2. Programming in ANSI C,5th ed. : E. Balguruswami McGraw Hill

Reference Books :

1. Let Us C.9thed: Yashwant Kanetkar, BPB Publication
2. Programming with C: Byron Gottfried, Schaums Outline Series.

Syllabus of Group 1 - Semester I and Group 2 - Semester II, Bachelor of Engineering

Course Code: CSP 101 **Course: Computer Programming Lab**

L: 0 Hrs., T: 0 Hrs., P:2 Hrs. Per week **Total Credits: 2**

Course Outcomes :

On successful completion of the course, students will be able to

1. Implement programs based on if-else, switch and loop structure.
2. Implement programs based on 1-D and 2-D numeric and character arrays.
3. Perform operation on structure and pointer.
4. Design programs based on functions.

CSP101practicals based on above CST 101 syllabus

Syllabus of Group 1- Semester I and Group 2-Semester II, Bachelor of Engineering

Course Code : HUT101 **Course:-Communication Skills**

L:2 Hrs.,T:0Hrs.,P:0Hrs.,Per week **Total Credits:4**

Course Outcomes :

1. Students have better reading comprehension, pronunciation, and functional English grammar.
2. Students are able to write letters and resumes
3. Students are able to organize their thoughts for effective presentation and writing.
4. Students are able to learn skills to present themselves well in an interview, and handle a Group Discussion

Syllabus

Unit-I :

Communication :

What is Communication, the Media of Communication, Channels of Communication, Barriers to Effective Communication, Role of Communication Skills in Society.

Unit-II :

Reading Comprehension :

The Process of Reading, Reading Strategies Central idea, Tone and Intention, Comprehension Passages for practice.

Unit-III :

Professional Speaking:

Components of an effective talk, Idea of space and time in public speaking, Tone of voice, Body language, Timing and duration of speech, Audio-Visual Aids in speech. Presentation Skills, Group Discussion and Job Interviews

Unit IV :

Orientation to Literary and Scholarly Articles :

Preferably two fictional and two non-fictional texts (Selected by the teachers and the Head). The art of writing articles on social, cultural, scientific and technical issues (Paragraph Writing), Exercises.

Unit V :

Business Correspondence :

Types and Formats of Business letters, Routine Business Letters (Inquiry, Order, Instruction, Complaint, Adjustment), Sales Letters, Resumes and Job applications, Business Memos, Emails.

Unit VI :

Grammar:

Synonym and Antonym, Give one word for, Voice, Narration and Comparison of Adjectives and Adverbs, Transformation of sentences and Common Errors, Idioms and Phrases, Note Making, Précis writing.

Text Book :

1. M. Ashraf. Rizvi. Effective Technical Communication. Tata Mc Graw-Hill Publishing Company Limited.2009

Reference Books :

1. Sanjay Kumar and Pushp Lata. Communication Skills. Oxford Publication
2. Meenakshi Raman and Sangeeta Sharma. Technical Communication. Second Edition Oxford Publication.2011
3. Anne Nicholls. Mastering Public Speaking. Jaico Publishing House.2003
4. Dr Asudani .V. H An easy approach to English. Astha Publication Nagpur. 2009 , 3rd Edition.

Syllabus of Group 1- Semester I and Group 2-Semester II, Bachelor of Engineering

Course Code : HUP101 **Course:-Communication Skills Practical**

L:0Hrs.,T:0Hrs.,P:2Hrs.,Per week **Total Credits:2**

Course Outcomes

On successful completion of the course, students will be able to

1. Learn presentation skills
2. Understand effective strategies for Personal Interview and Group Discussions
3. Learn and apply effective language skills – listening, speaking, reading and writing

Sr. No	Name of the Practical	Activities Taken	Medium of Practical
1	Speaking Skills	1. Introduction to effective ways of speaking 2. Oral presentations Extempore / Debate / JAM/Self-introduction	PPT Based, Activity Based
2	Presentation Skills	1. Preparing visual aids/PPTs on given topics	PPT Based, Activity Based, English Edge software
3	Group Discussion-Orientation	1. GD types 2. GD techniques/rules - videos 3. General/familiar topics for discussion	English Edge software Oxford Publication CD, PPT based Activity based
4	Group Discussion-Practice session	1. Divide in group of 6 2. Classification of topics 3. Feedback	PPT Based, Activity Based
5	Group Discussion-Mock	1. Divide in group of 6 2. Mock GDs - types 3. Feedback	Activity Based
6	Interview Techniques-Orientation	1. Various types of interviews 2. Types of interviews 3. Self-analysis 4. KYC sheet 5. Self-introduction	English Edge software Oxford Publication CD Activity Based
7	Interview Techniques Practice Sessions	1. Video 2. Non-verbal communication 3. Types of interview questions	Oxford Publication CD, Activity Based
8	Interview Techniques-Mock Interviews **Optional Practicals**	1. Mock Interviews (One to One) **Teacher can decide any other Practical apart from the ones mentioned below**	Activity Based
9	Listening Skills	1. Listening Barriers	PPT Based, Activity Based
10	Non Verbal Communication	1. Kinesics in com/interviews 2. Activities/Role play	English Edge software based, PPT based
11	Use Figurative Language	1. Intro phrases/ Idioms/proverbs/ pronunciation	PPT Based, Activity Based

Syllabus of Group 1 - Semester I and Group 2 - Semester II, Bachelor of Engineering

Course Code :PEP101 **Course: Sports/Yoga**

L:0 Hr., T:0Hrs., P:2 Hrs., Per week **Total Credits : 00**

Course Outcomes

On successful completion of the course, students will be able to

1. More number of students are participating in sports activities.
2. Students interest toward physical fitness has been increased.
3. Students are getting basic knowledge of yoga & sports.

BRIEF OBJECTIVES OF SPORTS/YOGA PRACTICAL CLASSES

It has long been proven that a healthy body leads to a healthy mind. With a strong belief in this, Physical Education department at RCOEM will conduct sports/yoga classes with the objective of maintaining health, fitness and wellness of students as well as create awareness about need for good health and physical fitness. The objective would also be todevelop team spirit, social skills as well as identify and develop leadership qualities in students through various sports group activities. Training of students to understand the rules of various national and international games would also be an important objective. Sport activities would also be conducted with the objective to provide recreation to the students which is an important neutralizer for stress. Additionally, the objective would be to evaluate fitness of students so as to recommend and conduct specific Yoga and Sport activities.

PROGRAMME OUTLINE

1. Sports

1. Introduction to sports i.e. volleyball, cricket, football, basketball, badminton, T.T., Athletics.
2. Health and safety issues related to sports; Knowledge, recognition and ability to deal with injuries and illnesses associated with sports.
3. Awareness about sports skills, techniques and tactics.
4. Rules, regulations and scoring systems of different games (Indoor & Outdoor).
5. Trials of students to participate in inter-collegiate/University level games.

2. Yoga: Includes asanas like sitting, standing and lying, Surayanamaskar, Pranayam.

3. Physical fitness test: this would include speed, Cardiovascular Endurance, strength, skill & flexibility, body composition (fat weight & lean body weight).

Syllabus of Group 1 - Semester II and Group 2 – Semester II, Bachelor of Engineering

Course Code: MAT102 **Course: Engineering Mathematics-II**

L: 4 Hrs., T: 1 Hrs., P: 0 Hrs., Per week **Total Credits: 09**

Course Objective

The objective of this course is to expose student to understand the basic importance of Integral Calculus and Vector calculus. The student will become familiar with fitting of curves and regression analysis.

Course Outcomes

On successful completion of the course, student shall be able to

1. Understand and use the concepts of Integral Calculus for Engineering problems.
2. Apply technique of Vector differentiation and integration to various Engineering problems.
3. Know basic statistical techniques required for Engineering.

Syllabus

Unit-I :

Integral Calculus I : Beta and Gamma functions, Differentiation of definite integrals, Mean value and root mean square values.

Unit-II :

Integral Calculus II : Tracing of curves (Cartesian, polar and parametric curves), rectification of simple curve, quadrature, volumes and surface of solids of revolutions(Cartesian, polar and parametric forms).Theorem of Pappus and Guldin.

Unit-III :

Multiple Integrals and their Applications: Elementary double integrals, change of variable (simple transformation), change of order of integration (Cartesian and polar), application to mass, area, volume and centre of gravity (Cartesian and polar forms), elementary triple integrals.

Unit-IV :

Vector Calculus I: Scalar point function, Vector point function, vector differentiation, gradient, divergence and curl, directional derivatives with their physical interpretations, solenoidal and irrotational motions, Scalar potential function.

Unit-V :

Vector Calculus II: Vector integration: Line integrals, work done, conservative fields, surface integrals and volume integrals, Stoke's theorem, Gauss divergence theorem, Green's theorem and their simple applications.

Unit VI :

Statistics: Fitting of straight line, $y = a + bx$, parabola $y = a + bx + cx^2$ and the exponential curves by method of least squares, Coefficient of linear correlation, lines of regression , rank correlation, multiple regression and regression plane of the type $z = a + bx + cy$, coefficient determination.

Text Books :

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, Delhi
2. A text book of Applied Mathematics Volume I & II, by P. N. Wartikar and J. N. Wartikar, Pune Vidhyarthi Griha Prakashan, Pune-411030 (India)
3. Advanced Engineering Mathematics, 2 ed , Jain ,Iynger , Narosa publication

Reference Books :

1. Advanced Engineering Mathematics by Erwin Kreyszig, 8th edition, Neekunj print process, Delhi.
2. Engineering Mathematics: Principal and Applications Srimanta, Paul, Oxford Univ Press,(2011)
3. Higher Engineering Mathematics: B.V. Ramana, TMH

Syllabus of Group 1 - Semester I and Group 2 - Semester II, Bachelor of Engineering

Course No. CHT101 **Course : Engineering Chemistry**

L: 4 Hrs., T: 1 Hrs., P: 0 Hrs., Per week **Total Credits : 09**

Course Outcomes :

Upon successful completion of the course, the student should be familiar with and be able to gain:

1. Knowledge of water analysis, waste water analysis, boiler water chemistry and desalination of water enable the students to overcome the difficulties, to a larger extent; that often come across in the field of (i) Civil engineering, (ii) Public health and environmental engineering (iii) Ocean engineering (iv) Thermal and electrical power generation sectors and process engineering.
2. Better understanding to surmount over the difficulties faced in the selection of proper and economical constructional materials to be used; the impact of change in the physicochemical and mechanical properties of the concrete type composites due to variation in their chemical composition.
3. To apply the knowledge of 'Principles of Tribology' for reduction of friction and wear in the process engineering, manufacturing and production engineering and automotive engineering fields.
4. Knowledge for proper selection and design of engineering materials having better corrosion resistance and to implement effective measures to minimize corrosion.
5. Better insight in the selection of materials for modern technologies which demand with unusual combination of properties that cannot be met by any of the conventional metal alloys, ceramics and polymeric materials viz in aerospace applications, military warfare materials, nuclear installations, electrical electronic components devices, nano materials process engineering field etc.

Syllabus

Water Treatment :

Water Treatment for Industrial Applications: Brief introduction regarding sources, impurities in water, hardness of water and their types. Softening of water using lime-soda process: principles in hot and cold lime-soda process. Zeolite softener, demineralization by synthetic ion exchange resins. Boiler troubles: Carryover, Priming and Foaming, Scales and Sludges, Caustic Embrittlement, Boiler Corrosion-causes and effects on boiler operation and methods of prevention. External and Internal conditioning : Phosphate, Carbonate and Calgon conditioning.

Water Treatment for Domestic Water:

Domestic water treatment : Brief discussion and Chemistry involved in the process of sedimentation, coagulation, filtration and sterilization by UV, Ozone, Chlorination including Break point chlorination. Desalination of water using reverse osmosis and electro dialysis.

Numericals Based on Water Softening: Numericals based on (1) lime-soda (2) zeolite / ion-exchange water treatment processes.

Cement :

Process parameters involved in the manufacturing of portland cement, manufacture of portland cement, microscopic constituents of cement and their effects on strength; setting and hardening of cement.

Types and uses of cement : Pozzolonic; Rapid hardening, Low heat and High alumina cements. Additives and admixtures used in cement: Accelerators, Retarders, Air entrainment agents, Water repellants.

Chemical approach to Nanomaterials :

General introduction to nanotechnology, timeline and milestone, overview of different nanomaterials available, potential use of nanomaterials in electronics, sensors, medical applications, catalysis, environment and cosmetics.

Physical chemistry related to nanoparticles such as colloids and clusters: conductivity and enhanced catalytic activity compared to the same materials in the macroscopic state.

Synthesis of nanomaterials: ' Top-Down'- photolithography and 'Bottom-Up'- sol-gel method .

Carbon nanotubes: Single-walled and multi-walled carbon nanotubes, their structures, properties and applications.

Potential risks of nanomaterials- Health and environmental impact.

Fuels and combustion :

Introduction, Calorific value, Higher and Lower calorific value, flame temperature and flame intensity , determination of calorific value by Bomb calorimeter and Boy's calorimeter, numericals based on the determination of calorific value by Bomb and Boy's Calorimater.

Solid Fuels:

Types of coals, proximate and ultimate analysis of coal, its significance, Carbonization of Coal.

Liquid and Gaseous Fuels:

Liquid fuels: mining & fractional distillation of crude petroleum, use of gasoline in internal combustion engine, octane number, cetane number, flash point of combustible liquid fuel, knocking. Fisher-Tropsch's process for manufacture of synthetic gasoline, thermal and catalytic cracking: fixed bed and fluid bed catalytic cracking, aviation gasoline.

Gaseous fuels:

CNG and Significance of flue gas analysis by Orsat apparatus.

Numericals based on Combustion Calculations:

Numericals based on combustion calculations for solid fuels. Numericals based on combustion calculations for liquid and gaseous fuels.

Friction, Wear and Lubricants :

Introduction, lubrication mechanism : Hydrodynamic, Boundary and Extreme pressure lubrication. Classification of lubricants- Solid, Semisolid and Liquid lubricants, Blended oils using different additives viz.:-

Anti-oxidants, E. P. additive, corrosion inhibitor, viscosity index improver, etc. synthetic lubricants viz.:- Dibasic acid esters, Polyglycol ethers and Silicones, Lubricating Emulsions. Properties of Greases: Drop point and consistency test, Properties of liquid lubricants: Viscosity and Viscosity Index, Aniline point, Cloud & Pour point and Decomposition stability. Criteria for selection of lubricants under different conditions of load and speeds.

Corrosion :

Electrochemistry and Theories of Corrosion :

Introduction to corrosion, Cause and Consequences of corrosion, Measurement of corrosion rate, Galvanic series, Dry and Wet corrosion, Pilling-Bedworth rule, factors affecting the rate of corrosion.

Types of corrosion and Preventive Methods; Different types of corrosion (Pitting, Stress, Intergranular and

Galvanic), protection against corrosion, design and selection of engineering materials, cathodic and anodic protection, Brief discussion about Protective Coatings: Metallic, Inorganic, Organic coatings, Corrosion inhibitors.

Text Books :

1. Text Book of Engineering Chemistry, S. S. Dara, S. Chand and Company Ltd., New Delhi.
2. Textbook of Engineering Chemistry, P. C. Jain and Monica Jain, Dhanpat Rai and Sons, New Delhi.
3. Text Book of Environmental Chemistry and Pollution Control, S. S. Dara; S. Chand and Company Ltd., New Delhi.
4. Textbook of Engineering Chemistry, S. N. Narkhede, R. T. Jadhav, A. B. Bhake, A. U. Zadgaonkar, Das Ganu Prakashan, Nagpur.
5. Applied Chemistry, A. V. Bharati and Walekar, Tech Max Publications, Pune.
6. Engineering Chemistry, Arty Dixit, Dr. Kirtiwardhan Dixit, Harivansh Prakashan, Chandrapur.

Reference Books :

1. Engineering Chemistry by Gyngell, McGraw Hill Publishing Company, New Delhi.
2. Engineering Chemistry (Vol I), Rajaram and Curiacose, Tata McGraw Hill Publishing Company, New Delhi.
3. Engineering Chemistry (Vol II), Rajaram and Curiacose, Tata McGraw Hill Publishing Company, New Delhi.
4. Engineering Chemistry, Saraswat and Thakur, Vikas Publication, New Delhi.
5. Engineering Chemistry, B. S. Sivasankar, Tata Mcgraw Hill Publishing Company, New Delhi.
6. Engineering Chemistry, O. G. Palan, Tata Mcgraw Hill Publishing Company, New Delhi.
7. Engineering Chemistry, R. Shivakumar, Tata Mcgraw Hill Publishing Company, New Delhi.
8. Chemistry of Cement, J. D. Lee, Mcgraw Hill Publishing Company, New Delhi.
9. Nanomaterials Chemistry, C. N. R. Rao, A. Muller, A. K. Cheetam, Wiley VCH verlag GmbH and Company, Weinheim.

Syllabus of Group 1 - Semester I and Group 2 - Semester II, Bachelor of Engineering

Course Code : CHP101 **Course: Engineering Chemistry Lab**

L:0 Hr., T:0Hrs., P:3 Hrs., Per week **Total Credits : 03**

Minimum of **Eight** practicals will be performed based on the theory.

Text Books :

1. Text Book on Experiments and Calculations in Engineering Chemistry: S. S. Dara; S. Chand and Company Ltd., New Delhi.
2. Practical Engineering Chemistry: S. N. Narkhede, R. T. Jadhav, A. B. Bhake, A. U. Zadgaonkar, Das Ganu Prakashan, Nagpur.

Reference Books :

1. Concise Laboratory Manual in Engineering Chemistry: R. Shivakumarand J. Prakasan, Tata McGraw Hill Publishing Company, New Delhi.

Syllabus of Group 1 - Semester II and Group 2 - Semester I, Bachelor of Engineering

Course Code: CET101 **Course: Engineering Mechanics**

L:3 Hr., T:1 Hrs., P:0 Hrs., Per week **Total Credits : 07**

Course Outcomes :

After Completion of the course in Engineering Mechanics, the student should be able to

1. Define and Describe the various parameter related to statics and dynamics behaviour of the rigid bodies.
2. Understand and describe physical phenomenon with the help of various theories.
3. Explain and analyse various physical phenomenon with the help of diagrams.
4. Describe and analyse the engineering problems with the acquired knowledge of engineering mechanics

Syllabus

Unit-I :

Fundamental of Engineering Mechanics :

Fundamentals of Engineering Mechanics, axiom's of mechanics, resultant of concurrent force system. Moment of a force, couples, resultant of non-concurrent force system

Unit-II :

Equilibrium of Force System :

Equilibrium of concurrent force system, Equilibrium of non-concurrent force system Friction: Law's of friction, simple application, wedge friction, belt friction.

Unit-III :

3-D Force system & Analysis of trusses :

Moment of a force about a point and about an axis, resultant of spatial concurrent & Non concurrent force system, wrench, equilibrium of concurrent and non-concurrent force system. Analysis of simple trusses (Joint & Section Method)

Unit-IV:

Centroids and moment of inertia :

Centroids locating by first principle, centroid of composite areas, Second moment and product of inertia of plane areas. Moment of Inertia of composite areas. Transfer theorems for moment of Inertia and Product of Inertia.

Virtual work method

Virtual work principle, application of virtual work principle.

Unit-V :

Kinematics & Kinetics of Particles :

Rectilinear motion of a particle with variable acceleration, Projectile motion, normal and tangential components of acceleration, kinetics of particle and several interconnected particles. D'Alembert's principle, problems on connected system of particles.

Unit-VI :

Collision of elastic bodies :

Principle of conservation of momentum, Impulse momentum equation, work energy equation, coefficient of restitution, impact of elastic bodies.

Text Books :

1. Engineering Mechanics: F. L. Singer Harper & Row Publications.
2. Fundamentals of Engineering Mechanics : A.K. Sharma, Sai Publications.
3. Engineering Mechanics :A.K.Tayal, Umesh Publications, New Delhi.
4. Engineering Mechanics : P.B. Kulkarni, Professional Publications.

Reference Books :

1. Engineering Mechanics: Timoshenko & Young, Tata McGraw Hill Publications, New Delhi.
2. Engineering Mechanics: Bear and Johnston, Tata McGraw Hill Publications, New Delhi.
3. Engineering Mechanics: I. H. Shames, Phi Pvt. Ltd., India.

Syllabus of Group 1 - Semester II and Group 2 - Semester I, Bachelor of Engineering

Course Code : CEP101 **Course : Engineering Mechanics Lab**

L:0 Hr., T:0Hrs., P:2 Hrs., Per week **Total Credits : 02**

Course Outcome :

After Completion of the course in Engineering Mechanics Practical, the student should be able to

1. Define and explain different terminologies of simple lifting machines.
2. Understand and perform practicals on equilibrium of concurrent and non-concurrent force systems.
3. Describe various terminologies related to friction and mass moment of inertia.
4. Explain graphical solutions of equilibrium conditions in engineering mechanics.
5. Analyse the experimental data collected based on practicals and discuss the results.

Minimum of Eight Practical will be performed based on the theory

List of Experiment

Experiments On"Simple Lifting Machines"

1. Law of machine for Differential Axle and Wheel
2. Law of machine for Single Purchase Crab
3. Law of machine for Double Purchse Crab

Experiments On"Equilibrium of force systems"

4. Jib Crane (Equilibrium of concurrent Forces)
5. Simple Beam (Equilibrium of Non-concurrent Forces)
6. Shear Leg Apparatus(Equilibrium of 3-D concurrent forces)

Experiments On"Friction & Inertia"

7. Inclined Plane (Coefficient of friction using Inclined Plane)
8. Belt Friction(Coefficient of friction using coil friction set-up)
9. Fly-Wheel (Mass moment of Inertia of fly-wheel)

Graphical Methods in Engineering Mechanics

10. Resultant of concurrent force systems
11. Resultant of Non-concurrent force system
12. Reactions for simply supported beams
13. Forces in members of simple Trusses
14. Moment of Inertia (Mohr's Circle)

Syllabus of Group 1- Semester II & Group 2- Semester I, Bachelor of Engineering

Course Code: MET101 **Course : Engineering Drawing**

L: 3 Hrs. T: 0 Hrs. P: 0 Hrs. Per week **Total Credits: 06**

Course Outcomes : The expected learning outcome is that, the students shall be able to :

1. Draw & interpret technical drawings.
2. Convert 2-D drawing to 3-D drawing & vice-versa.
3. Represent the various positions of planes & solids in different orientations.
4. Develop the solid surface for sheet metal working.

Syllabus (Only First Angle Method of Projection)

Unit I :

Introduction: Lines, Lettering & Dimensioning, Preparation of Sheet Layout.
Scales - Plain Scale, Diagonal Scale, Vernier Scale.
Engineering Curves; Ellipse: Directrix Focus, Concentric Circles & Rectangle Method.
Parabola: Directrix Focus, Rectangle Method, Tangent Method.
Hyperbola: Directrix Focus & Asymptote Method.

Unit II :

Theory of Projections - Concept of Projection, First & Third angle projection methods.
Orthographic Projections: Conversion of given 3 dimensional View to 2 dimensional representation.

Unit III :

Projections of Lines: Oblique Lines, Traces. Applications of lines.

Unit IV :

Projections of Planes - Polygonal Lamina, Circular Lamina.
Projections of Solids- Cube, Prism, Pyramid, Tetrahedron, Cylinder, Cone.

Unit V :

Sections of Solids & Development of Lateral Surfaces- Cube, Prism, Pyramid, Tetrahedron, Cylinder, Cone.

Unit IV :

Isometric Projections: Isometric Scale, Conversion of given 2 dimensional views to Isometric Projection/View.

Books :

1. Engineering Drawing by N.D. Bhatt, Charotar Publishing House Pvt. Ltd.
2. Engineering Drawing by D. A. Jolhe, Tata McGraw Hill Publications
3. Engineering Graphics by H. G. Phakatkar, Nirali Publication.
4. Engineering Graphics by A. R. Bapat, Allied Publishers

References :

1. Engineering Drawing by R.K. Dhawan, S. Chand Publications
2. Engineering Drawing by K.L. Narayana & P. Kannaiah, SciTech Publication.

Syllabus of Group 1- Semester II & Group 2- Semester I, Bachelor of Engineering

Course Code: MEP101 **Course: Engineering Drawing Lab**

L: 0 Hrs. T: 0 Hrs. P: 3 Hrs. Per week **Total Credits: 03**

Course Outcome : The expected learning outcome is that, the students shall be able to:

1. Draw & interpret technical drawings.
2. Plan the sheet layout for the given drawing.
3. Convert 2-D drawing to 3-D drawing & vice-versa.
4. Represent the various positions of planes & solids in different orientations.
5. Develop the solid surface for sheet metal working.
6. Use & demonstrate drafting package.

List of Sheets : (50% of the sheets to be drawn in Auto CAD)

Sheet No.1: Engineering Scales & Curves
Sheet No.2: Orthographic Projections
Sheet No.3: Projection of Lines
Sheet No.4: Application of Lines
Sheet No.5: Projection of Planes
Sheet No.6: Projection of Solids
Sheet No.7: Section & Development of Solids
Sheet No.8: Isometric Projections

Books :

1. Engineering Drawing by N.D. Bhatt, Charotar Publishing House Pvt. Ltd.
2. Engineering Drawing by D. A. Jolhe, Tata McGraw Hill Publications
3. Engineering Graphics by H. G. Phakatkar, Nirali Publication.
4. Engineering Graphics by A. R. Bapat, Allied Publishers

References :

1. Engineering Drawing by R.K. Dhawan, S. Chand Publications
2. Engineering Drawing by K.L. Narayana & P. Kannaiah, SciTech Publication.
3. AutoCAD 14 for Engineering Drawing by P. Nageshwara Rao, Tata McGraw Hill Publications

Syllabus of Group 1- Semester II and Group 2-Semester I, Bachelor of Engineering

Course Code: HUT102 **Course:-Social Skills**

L:2 Hrs.,T:0Hrs.,P:0Hrs.,Per week **Total Credits:4**

Course Outcomes :

On successful completion of the course, students will be able to

1. Learn the basic concepts of personnel management or manpower planning and the process of recruitment and selection that they will go through as engineers.
2. Learn leadership skills, industrial relations, work organizations, and impact of industry on society.
3. Learn about the political systems and institutions working in India, laws and legislations affecting industry and the application of political principles like democracy in industry.
4. Learn the importance and application of Economics in Engineering.
5. Learn about culture/civilization and develop cross cultural capacity.
6. Learn about Personal, Professional and social ethics.

Syllabus

Unit I :

Industrial Sociology :

- Meaning and scope of Industrial Sociology
- Work Organization and its types.
- Concept of Leadership: Meaning, changing roles and its types.
- Concept of Power and Authority: Meaning, Importance, sources and Delegation
- Industrial Culture in India: Effects of Industrialization and Urbanization on Indian Society.

Unit II :

Industrial Psychology :

- Meaning and scope of Industrial Psychology
- Recruitment, Selection and Training
- Industrial fatigue
- Motivation, Theories of motivation: Maslow's Need Priority Theory, Macgregor's X And Y Theory, McClelland's Needs Theory
- Dealing with Self: Stress, health, and coping; interpersonal relationships; gender roles; environmental adjustments.

Unit III

Political Orientation :

- Indian Constitution, features and federal structure.
- Fundamental rights
- Directive principles of state policy
- Industrial Democracy.
- Role of Bureaucracy in Modern Democratic states.

Unit IV:

Economics :

- Development of Indian Economy
- Infrastructure in the Indian Economy: Energy, power, transport system, road transport system, Rail-Road co ordination, water transport, Civil aviation, communication system, urban infrastructure, science and technology, private investment in infrastructure.
- Role of Public and Private sector in Indian Economy.
- Challenges before Indian Economy in 21st Century.
  Poverty, Unemployment, Corruption, Regional Imbalance, Growth of educational sector.

Unit V :

Culture and Civilization :

- Concept of Culture and Civilization.
- Study of engineering skills with special reference to Egyptian and Indus Valley Civilization.
- Role of Engineers as agent of change with specific reference to change in Indian Society during 20th and 21st century.
- Multiculturalism: Meaning, scope and significance especially in Indian context.

Unit VI :

Ethics and social responsibility:-

- Personal and professional ethics
- Corporate social responsibility
- Social capital, social audit.
- Role of entrepreneurship in nation building.
- Developing scientific and humanitarian outlook for the welfare of nation and society.

Text Books :

1. Social & Human Skills by Dr. Vinod Asudani & Dr. Monika Seth.
2. RuddarDatt and K.P.M.Sundharam, (67th Revised edition-2013), Indian Economy, S .Chand and Company Ltd, New Delhi.
3. Edmund G. Seebauer and Robert L Barry (2010 reprint) Fundamental of Ethics for Scientists and Engineers, Oxford University Press.

Reference Books :

1. P.C. Tripathi and P.N. Reddy, Principles of Management, (4th edition, 2008), Tata MacGraw Hill Publishing Co. Ltd., New Delhi
2. Martand.T. Telsang, Industrial and Business Management, (2001), S.Chand and Co. Ltd. New Delhi
3. Dr. V.H. Asudani: An Easy Approach To Social Science, (3rd edition, 2008), Astha Publication, Nagpur
4. Tariq Modood, Multiculturalism (Themes for 21st Century Series)(1st Publication 2007), Polity Press, Cambridge, U.K. ISBN-13:97807456-3288-9.

Syllabus of Groups 1- Semester II and Group 2 – Semester I, Bachelor of Engineering

Course Code : INP102 **Course: Workshop**

L: 0 Hr., T: 0 Hrs., Per week **Total Credits : 02**

Course Objectives :

To impart practical training (hands-on experience) regarding use and operations of various tools, equipment and machine with basic knowledge of manufacturing process and materials.

Course Outcomes :

1. Student will be able to read job drawing, identity and select proper material, tools, equipments and process / machines for manufacturing the required job.
2. Student will be use basic marking and measuring instruments to inspect the job for confirming desired dimensions and shape.
3. Student will be able observe and follow precaution during operation.

List of Experiments :

SHOP	No. of Experiments /Jobs
Fitting Shop	1. Introduction of fitting tools, equipments, machines, material & processes.
	2. Manufacturing & fitting practice for various joints & assembly.
	3. Drilling tapping & pipe threading operations.
Carpentry Shop	1. Introduction of carpentry tools, equipments, machines, material & processes.
	2. Manufacturing of carpentry joints.
	3. Turning practice on wood working lathe.
	4. Demonstration & practice on universal wood working machine.
Welding Shop	1. Introduction of welding tools, equipments, machines, material & processes.
	2. Fabrication of joints like lap, butt, corner, T etc.
	3. Fabrication of lap joint by spot welding process.
Smithy Shop	1. Introduction of smithy tools, equipments, machines, material & processes.
	2. Forging of combine circular/square/hexagonal cross section.

Text Books :

1. Elements of workshop technology vol -1 by Hajra Choudhari
2. Elements of workshop technology vol -1 by Raghuwanshi ma

Reference Book :

1. Workshop manuals
2. Manufacturing technology by P.C. Sharma
3. Workshop manuals by Kannaiah Narayan

III SEMESTER

Syllabus for Semester III, EN/EDT/EC/EE/M

Course Code: MAT203 **Course: Engineering Mathematics – III**

L: 3 Hrs, T: 1 Hr, P: 0 Hrs. Per week **Total Credits: 07**

New Course Objectives :

The objective of this course is to expose student to understand the basic concepts of Laplace transform. Fourier series and Fourier Transforms, It also focuses on Matrices, Partial Differential Equations and Function of a Complex Variable.

New Course Outcomes :

On successful completion of the course, student shall be able to

1. Understand Laplace transforms, Fourier series, Fourier Transforms and Partial Differential equations to solve engineering problems.
2. Understand Matrices to solve system of equations.
3. Make use of complex variables to evaluate Contour Integrations.

Syllabus

Uunit I :

Laplace Transforms : Laplace transforms and their properties, Application for Laplace Transform to solve ordinary differential equations including simultaneous Differential Equations. Solution of one dimensional Partial differential equations by Laplace Transform method.

Unit II :

Functions of a Complex Variable: Function of a complex variable, Analytic functions, Cauchy-Riemann conditions, Conjugate functions, singularities, Cauchy's integral theorem and integral formula, Taylor's and Laurent's theorem, Residue theorem, contour integration.

Unit III :

Fourier Series: Periodic Function and their Fourier series expansion, Fourier Series for even and odd function, Change of interval, half range expansions. Practical Harmonic Analysis.

Unit IV :

Fourier Transform: Definition, Fourier Integral Theorem, Fourier Sine and Cosine Integrals, Finite Fourier Sine and Cosine Transform.

Unit V :

Partial Differential equations: Partial differential equation of first order first degree i.e. Lagrange's form. Linear homogeneous PDE of n^{th} order with constant coefficient, method of separation of variables, Applications of partial differential equations.

Unit VI :

Matrices: Rank of matrix, consistency of system of equations, Linear dependence, linear and orthogonal transformations. Characteristics equations, eigen values and eigen vectors. Reduction to diagonal form, Cayley Hamilton theorem, Sylvester's theorem, determination of largest eigen values and eigen vector by iteration method.

Text Book :

1. Higher Engineering Mathematics: B. S. Grewal,43^{rd} ed: Khanna Publishers, Delhi (India).
2. A text book of Applied Mathematics Volume I & II: P. N. Wartikar & J. N. Wartikar, 9^{th} ed: Pune Vidhyarthi Griha Prakashan, Pune-411030 (India).

Reference Books :

1. Advanced Engineering Mathematics,8^{th} ed: Erwin Kreyszig Neekunj print process, Delhi.
2. Schaum's Outline of Complex Variables, 2^{nd} ed: Murray R Spiegel, Seymour Lipschutz, John J. Schiller, Dennis Spellman, TMH, New Delhi.
3. Advanced Engineering Mathematics, 2^{nd} ed :Jain, Iyengar , Narosa publication.
4. Advanced Engineering Mathematics: H K Dass, S. Chand Publications.

Syllabus for Semester III, B.E. (Electronics Engineering)

Course Code : EET205 **Course: Network Theory**

L: 3 Hrs, T: 1 Hr, P: 0 Hrs. Per week **Total Credits: 07**

Course Objectives :

1. The course will prepare students to write the equilibrium equation and apply the matrix approach.
2. The course will prepare students to apply basic tools for converting physical circuits and networks into their mathematical models and develop the s-plane for them.
3. The course will prepare the students to understand all theorems and transformation tools.
4. The course will prepare students to analyze the circuits and networks with all sort of synthesized signals.

Course Outcomes :

1. To understand the equilibrium equation on mesh and nodal basis and apply the matrix approach for solution of electrical circuits with and without mutual coupling .
2. To understand various network theorems and use them for getting exact solution of all type of balanced single and unbalanced three phase network
3. To understand how to analyze the initial and final conditions of a network circuit.
4. To understand s-domain of the circuit and study how to find out the time domain response using s-plane.
5. To understand application of two port network in network analysis and to find symmetry and reciprocity of a two port network and its network parameters.

Syllabus

Unit I :

Nodal and mesh-basis equilibrium equation, matrix approach for complicated network containing voltage current sources and reactance's, source transformations, duality, Mesh basis equation for coupled circuits.

Unit II :

Network Theorems : Superposition, Reciprocity, Thevenin's Norton's Maximum Power transfer, Compensation, Tellegen's theorem as applied to AC circuits.

Unit III :

Three phase unbalanced circuit and power calculations, Duality, Behavior of series and parallel resonant circuit. Introduction to band pass, high pass, low pass and band reject filters.

Unit IV :

Laplace transforms and properties, partial fractions, singularity functions, waveform synthesis, analysis of RC, RL, and RLC networks with and without initial conditions with Laplace transforms, Evaluation of initial conditions.

Unit V :

Transient behavior, concept of complex frequency, Driving points and transfer functions, poles and zeros of Immitance function, their properties, sinusoidal response from pole-zero locations,convolution Theorem and integral solutions.

Unit VI :

Two port Network Parameters and inter-connections, Symmetrical and reciprocal conditions, Problems on all parameters and control sources.

Text Book :

1) Network Analysis: M. E. Van Valkenburg, 3rd Edition, 592 pages.
2) Linear Network Theory, Volume 1, Anand Ramchandra Kelkar, Pramond Shioram Pandit Saroj Prakashan, 1974 - 531 pages

Reference Books :

1) Modern Network Analysis: S. P. Ghosh, A. K. Chokroborty, Tata McGraw Hill Publication, 2010, 965 pages
2) Networks and Systems by D. Roy Choudhury, 2nd Edition, April 15, 2009
3) Network Analysis, Gk Mithal , Published by Khanna Publishers, 2003 Edition.

Syllabus for Semester III, B.E. (Electronics Engineering)

Course Code: ENT201 **Course : Electronic Devices**

L: 4 Hrs, T: 1 Hr, P: 0 Hrs. Per week **Total Credits : 09**

Course Objectives:

The objective of this course is to provide students with

1. Understanding operating principles of electronic devices and their models.
2. Knowledge of semiconductor device physics of diodes, transistors (BJT&MOSFET).
3. Concepts of load line, biasing and stability, BJT/FET based amplifier configurations.
4. Performance analysis of BJT amplifier using low frequency small signal model.
5. Working principles of power semiconductor and optical devices with applications.

Course Outcomes:

Upon completion of this course, students will demonstrate the ability to:

1) Utilize electronic devices in electronic circuits.
2) Analyze the characteristics and biasing of diode, BJT, FET and MOSFET.
3) To understand low frequency BJT Parameteres.
4) Understand fundamentals of Optical & Power devices.
5) Explore role of electronic devices in real world applications.

Syllabus

Unit I :

Diode Theory : P N Junction diode, Zener diode, Tunnel, Schottky diode – operation, characteristics and applications such as Rectifiers.

Unit II :

Bipolar Junction Transistor : Operation, characteristics, Ebers-Moll model, biasing, Load line concept, Bias stabilization, Stabilization Techniques.

Unit III :

Low frequency analysis of BJT: Hybrid model, Determination of h-parameters from characteristics, Analysis of BJT amplifier circuit using h-parameters, simplified Hybrid model, Miller's theorem.

Unit IV :

Field effect Transistor : JFET and MOSFET – Classification, construction, Operation, Characteristics, Biasing, CMOS inverter circuit.

Unit V :

Power Electronic devices - SCR, DIAC, TRIAC & UJT

Unit VI :

Optical Semiconductor devices - LED, Photo diode, photo transistor, recent trends/developments.

Text Books :

1. Integrated Electronics, 2nd Edition: Millman, Halkias, Parikh TMH

Reference Books :

1. Electronic devices and Circuit Theory, 9th edition: R. Boylestad, Pearson Education
2. Foundation of Electronics Circuits and Devices, 4th Edition: Meade Thompson
3. Electronic Devices and Circuits, 4th Edition: David A. Bell, PHI.
4. Power Electronics: P.C. Sen, Tata-McGraw Hill
5. Optical semiconductor devices: Mitsuo Fukuda, Wiley
6. An Introduction to semiconductor Devices: Donald Nemen, Tata-McGraw Hill

Syllabus for Semester III, B.E. (Electronics Engineering)

Course Code: ENP201 **Course : Electronic Devices**

L: 0 Hrs, T: 0 Hr, P: 2 Hrs. Per week **Total Credits : 02**

Electronic Devices Laboratory :

Course objectives :

The objective of this course is to provide students with

1. Familiarization of various electronic components and their specifications.
2. Understanding of Lab Equipments such as CRO, bread-board, Function Generator, Multi-meter etc.
3. Basic concepts of DC analysis of diodes and transistors.
4. Understanding of transistor bias configurations.

Course Outcomes :

Upon completion of this course, student shall demonstrate ability to:

1. Understand various electronic components and their specifications.
2. Use the Lab Equipments such as CRO, bread-board, Function Generator, Multi-meter etc.
3. Perform DC analysis of diodes and transistors.
4. Design and analyze common rectifier circuit such as half wave, full wave and bridge rectifiers and compute rectifier parameters with resistive load.
5. Analyze transistor bias configurations.
6. Apply knowledge gained in interpretation and design of various electronic circuits.

Syllabus for Semester III, B.E. (Electronics Engineering)

Course Code : ENT202 **Course : Digital Logic Design**

L: 4 Hrs, T: 1 Hr, P: 0 Hrs. Per week **Total Credits : 09**

New Course Objectives :

The objective of this course is to provide students with

1. Knowledge of number systems, codes and Boolean algebra.
2. Knowledge of logic families and their performance parameters.
3. Understanding of different digital logic design and optimization tchniques.
4. Understanding of combinational, sequential, arithmetic circuits & their hierarchical implementation.
5. Theoritical foundation to Identify, formulate, and solve engineering problems in the area of digital logic design.

New Course Outcomes :

Upon completion of this course, students will demonstrate the ability to:

1. Perform arithematic operations with different number systems.
2. Use logic/function minimization techniques for digital circuits.
3. Design and analyze combinational, sequential and arithmetic circuits.
4. To design a digital system, components or process to meet desired needs within realistic constraints.

Syllabus

Unit I :

Number Systems & Codes : Analog V/s Digital systems, Number Systems, Boolean algebra, Boolean identities, Digital Codes – Binary, Gray, Hex, ASCII, BCD, Self Complimentary, Conversion, D Morgan's laws, SOP, POS, representation of signed numbers.

Unit II :

Logic Families : Transistor as a switch, Logic families (TTL, ECL) and their characteristics – Fan-In,Fan-Out, Propagation Delay, Power dissipation, Noise Margin, Timing issues. Comparison of different logic Families.

Unit III :

Combinational circuits : Basic and Universal, Implementation of Boolean expression using logic gates, Karnaugh Map, simplification using K-Maps, Decoders, Encoders, Multiplexers, Demultiplexers.

Unit IV :

Sequential Elements : Latches, Flip Flops – RS, D, JK, Master Slave JK, T flip flop, their excitation and truth tables, Conversion of one Flip Flop to another, Timing and Clocking issues: setup and hold time, Rise time, fall time, metastability, clock skew & jitter.

Unit V :

FSM Design : Introduction to finite state machine, synchronous/asynchronous counter, Shift Registers.

Unit VI :

Arithmetic Circuits : Adders and Subtractors, Comparators, Multipliers, Recent trends/developments.

Text Books :

1. Digital Logic and Computer Design: Morris Mano, PHI, 3rd Edition.
2. Modern Digital Electronics : RP Jain, Tata McGraw Hill, 3rd Edition.

Reference Books :

1. Introduction to Digital Systems, 2nd Edition 2003:James E. Palmer, David E. Perlman, Tata McGraw Hill Publishing company Ltd
2. Digital Integrated Electronics: H.Taub & D.Shilling, Mc Graw Hill Publication. 2004
3. Digital Electronics: Ryan ,Tata Mc Graw Hill.
4. Fundamentals of digital circuits: A. Anand Kumar, Prentice-Hall of India
5. Digital Electronic Principles, 3rd Edition: Malvino, PHI

Syllabus for Semester III, B.E. (Electronics Engineering)

Course Code : ENP202 **Course : Digital Logic Design**

L: 0 Hrs, T: 0 Hr, P: 2 Hrs. Per week **Total Credits: 02**

Course objectives :

1. To understand and functional verification of various gates and flip flop using Digital/Universal Trainer.
2. Design of various combinational, sequential and arithmetic digital circuits with ICs.
3. To design a digital system, components or process to meet desired needs within realistic constraints.

Course Outcomes :

Student will be able to:

1. Understand working / specifications of different combinational/sequential/arithmetic ICs used for digital circuit design.
2. Identify, formulate, and solve engineering problems in the area of digital logic circuit design.
3. Debug digital design, document and efficiently communicate in lab report.
4. To function on multi-disciplinary teams through digital circuit experiments and projects.

Syllabus for Semester III, B.E. (Electronics Engineering)

Course Code: PHT201 **Course : Electronic Engineering Material and IC Fabrication**

L: 3 Hrs, T: 1 Hr, P: 0 Hrs. Per week **Total Credits: 07**

Course Objectives :

1. Understand electronic, magnetic and optical properties of materials and their physical origins;
2. Learn about materials and methods used in fabrication of electronic components;
3. Understand materials used in and working principles of some semiconductor opto-electronic devices;
4. Exposure to elements of IC fabrications techniques

Course Outcomes :

1. The student will understand concepts such as polarizability, susceptibility, dielectric constant, superconductivity, magnetic permeability magnetization and hysteresis as applicable to materials;
2. The student will have some understanding of why materials show electrical properties like conduction, Joule losses, magnetic properties like ferromagnetism, antiferromgnetism, ferrimagnetism and optical properties of emission and absorption;
3. The student will understand the behaviour of dielectric under external static and time-varying electric fields;
4. The student will understand the classification of magnetic materials and their importance in electric devices.
5. The student will know about processes used in fabrication of resistors, inductors, capacitors and relays.
6. The student will understand choice of materials for and working of LEDs, semiconductor LASERs, semiconductor heterostructures and solar cells;
7. The student will know about the different stages in IC fabrication and some details of processes used in each stage.

Syllabus

Unit I :

Dielectrics in static fields: Polarisation, dielectric constant; Dielectric behavior of mono-atomic and polyatomic gases, liquids and solids, polar and non-polar dielectrics, Clausius-Mosotti equation; Elementary ideas of ferroelectric, piezoelectric and pyroelectric materials.

Unit II :

Dielectrics in alternating fields:Complex dielectric constant, dipolar relaxation, dielectric loss, loss tangent, dielectric breakdown.

Unit III :

Conductors and superconductor: Conductivity of pure metals and alloys;Ohm's law and the relaxation time of electrons, Relaxation time, collision time, and mean free path, Electron scattering and the resistivity of metals, The heat developed in a current-carrying conductor, The thermal conductivity of metals, Super- conductivity

Unit IV :

Magnetic Materials: Origin of permanent magnetic moment, spin and orbital magnetic moment of electron; Dia, para, ferro, ferri, and anti-ferromagnetism, soft and hard magnetic materials, ferrites.

Unit V :

Photonics: Double hetero-structures: General characteristics, materials used, discussion in the context of LED, LASER, solar cells, Solar Cells: Photovoltaic effect, Applications.

Unit VI :

Passive components and elements of IC fabrication: Resistors-Carbon-composition resistors, insulated resistors, moulded resistors, film type resistors, alloy resistors, metallic oxide film resistors, wire-wound resistors, nonlinear resistors, variable resistors; Capacitors- Paper capacitors, impregnated paper capacitors metallized paper capacitors, ceramic dielectric capacitors, plastic dielectric capacitors, electrolytic capacitor, variable capacitors; Inductors-Air cored coils, cored coils, ferrite core coils; Relays- Electromagnetic relays, Reed type, induction type, thermal type, general purpose relays, electronic relays. IC Fabrication-Integrated circuits, IC elements, fabrication of epitaxial diffused ICs; Doping of semiconductor: Epitaxial doping, doping by diffusion, ion implantation; Etching: Wet chemical, Plasma Etching.

Text Books :

1. Electrical Engineering Materials, A.J. Dekker, Prentice Hall of India.
2. Optoelectronics and Photonics [Principles and Practices], S. O. Kasap, Pearson Edu.,Prentice Hall 2013.
3. Semiconductor physics and devices, S.S. ISLAM, OXFORD University Press.

Reference Books :

1. Electrical Engineering Materials, C.S. Indulkar and S. Thruvengadam, S. Chand and Company.
2. Introduction to Semiconductor Materials and Devices, M. S. Tyagi, John Willey and Sons.
3. Principles of Electronic ceramics, L. L. Hench and J. K. West, John Wiley and Sons
4. Semiconductor devices: Basic Principles, Jasprit Singh, Wiley Student Edition.
5. Materials Science and Engineering, V. Raghavan, Prentice-Hall of India.

Syllabus for Semester III, B.E. (Electronics Engineering)

Course Code: CSP211 **Course : Object Oriented Data Structure**

L: 0 Hrs, T: 0 Hr, P: 2 Hrs. Per week **Total Credits: 02**

Course Objective :

The objective of this course is to provide students

1. The understanding of concepts of data structures and their implementation.
2. The understanding of fundamentals of Object Oriented programming like defining classes, objects, invoking methods, etc.
3. The ability to apply Object Oriented Techniques to design programs and solve specified problems.
4. The Understanding to implement efficient programs by reusing the existing code using Inheritance.

Course Outcomes :

On completion of course, the student will be able to,

1. To perform file handling and operations on data structures like Stacks, Queues & Linked List.
2. To perform operation on Classes, Objects, Constructors & Destructor.
3. Able to implement the concept of object oriented programming in C++ programing language.

Practicals based on following topics in C language :

1. File handling
2. Linked List
3. Structures
4. Stacks and Queues

Practicals based on following topics in C++ language :

1. Simple programs in C++
2. Friend and virtual functions (Inline functions)
3. Classes, Objects, Constructor and Destructor
4. Operator overloading
5. Inheritance
6. Polymorphism

Text Book :

1. Let us C : YashwantKanetkar, BPB Publication
2. Programming in ANSI C: E. Balguruswamy, McGraw Hill Publication
3. Object oriented programming with C++: E. Balguruswamy, McGraw Hill Publication

Syllabus for Semester III, B.E. (Electronics Engineering)

Course Code: CHT201 **Course : Environmental Studies – I**

L: 2 Hrs, T: 0 Hr, P: 0 Hrs. Per week **Total Credits: 00**

Course Objective :

1. The objective of the course is to create an increased sensitivity among students for environmental issue and energies them into doing things for the environment.
2. The goal of this course is to provide students with the scientific background needed to understand how the Earth works and how we, as human beings, fit into that.
3. Objective of this course is to develop concern for our own environment which will lead us to act at our own level to protect the environment we all live in.
4. The objective of the course is to make student aware about vital importance are natural resources, ecosystems, biodiversity and its conservation, environmental pollution, social issues and environment human population and environment.

Course Outcome :

1. Students will get the sufficient information that will clarify modern environmental concepts like equitable use of natural resources, more sustainable life styles etc.
2. Students will realize the need to change their approach so as to perceive our own environmental issues correctly, using practical approach based on observation and self learning.
3. Students become conversant with the fact that there is a need to create a concern for our environment that will trigger pro-environmental action; including simple activities we can do in our daily life to protect it.
4. By studying environmental sciences, students are exposed to the environment that enables one to find out solution of various environmental problems encountered on and often.
5. At the end of the course, it is expected that students will be able to identify and analyze environmental problems as well as the risks associated with these problems and efforts to be taken to protect the environment from getting polluted. This will enable every human being to live in a more sustainable manner.

Syllabus

Unit I :

Multidisciplinary Nature of Environmental Studies: Definition, scope and importance; Need for public awareness.

Unit II:

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 :

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 (Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems i. e. ponds, streams, lakes, rivers, oceans, estuaries)

Unit IV :

Biodiversity and its Conservation: Introduction - Definition: genetic, species and ecosystem diversity; Biogeographical 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.

Text Books :

1. Environmental Chemistry and Pollution Control: *N. W. Ingole, D. M. Dharmadhikari, S. S. Patil, Das Ganu Prakashan, Nagpur.*
2. Environmental Chemistry: *K. Bhute, A. Dhamani, A. Lonkar, S. Bakare, Celebration Infomedia, India.*

Reference Books :

1. Text Book of Environmental Chemistry and Pollution Control:*S. S. Dara; S. Chand and Company Ltd., New Delhi.*
2. Environmental Studies-From Crisis to Cure, Second Edition:*R. Rajagopalan, Oxford University Press, New Delhi.*
3. Text Book of Environmental Studies:*E. Bharucha, University Press (India) Private Ltd., Hyderabad, India.*

IV SEMESTER

Syllabus for Semester IV, B.E. (Electronics Engineering)

Course Code : MAT243 — **Course: Engineering Mathematics – IV**

L: 3 Hrs, T: 1 Hr, P: 0 Hrs. Per week — **Total Credits: 07**

New Course Objectives :

The objective of this course is to expose student to understand the basic concepts of Numerical methods, Z-transforms and special functions. It also focuses on probability theory and its applications in engineering.

New Course Outcomes :

On successful completion of the course, student shall be able to

1. Understand numerical method to solve algebraic equations and differential equations. Make use of Z-transform to solve difference equations.
2. Prepare student to understand Probability Theory and use it for analysis of data.
3. Use special functions for solving differential equation by series solution method.

Syllabus

Unit I :

Numerical Methods: Error analysis, solution of algebraic and transcendental equations. False position method, Newton Raphson method and their convergence. Solution of system of linear equations, Gauss elimination method, Gauss Seidal method, Crout's method. Numerical solution of ordinary differential equation by Taylor's series method, Euler modified method, Runge Kutta method, Milne's Predictor Corrector method.

Unit II :

Z Transform : Formation and solution of difference equations, definition and properties of Z- Transform, its inversion, relation with Laplace transform and Fourier transform, application of z-transform to solve difference equations with constant coefficient.

Unit III :

Random Variable and Probability distribution: Random Variables: Discrete and continuous, Probability density function, probability distribution function for Discrete and continuous random variables, joint distributions.

Unit IV :

Mathematical expectations: Definitions of Mathematical expectations, functions of random variables, the variance and standard deviation, moment generating function, other measures of central tendency and dispersion, skewness and kurtosis.

Unit V :

Probability distribution: Bernoulli distribution, Poisson distribution, relation between binomial and Poisson distribution, Normal distribution, relation between binomial and normal distribution. The central limit theorem, exponential distribution.

Unit VI :

Special functions and series solution: Series solution of differential equations by Frobenius method, Bessel's **functions**, Legendre's polynomials, recurrence relations, Rodrigue's formula, generating function, orthogonal properties Bessel's and Legendre's functions.

Text Books :

1. Higher Engineering Mathematics :B. S. Grewal. , 43rd ed: Khanna Publishers, Delhi (India).
2. Theory and Problems of probability and statistics : 2nd ed :J. R. Spiegal ,Schaum series

Reference Books :

1. Introductory method of numerical analysis, 4edition :S. S. Sastry, 4th ed:PHI, New Delhi
2. Advanced Engineering Mathematics , 8th edition :Erwin Kreyszig,8th ed: Wiley India, Delhi.
3. Advanced Engineering Mathematics, 2nd edition: Jain, Iyengar, Narosa publications

Syllabus for Semester IV, B.E. (Electronics Engineering)

Course Code: ENT203 **Course: Electromagnetic Fields**

L: 4 Hrs, T: 1 Hr, P: 0 Hrs. Per week **Total Credits: 09**

Course Objectives :

The objective of this course is to provide students with

1. Concepts and applications of vector calculus to three dimensional space.
2. Understanding to solve the problems related to physical laws governing electromagnetic fields in different media.
3. Basic understanding of Maxwell's equations and its application in static and time-varying fields.
4. An insight to electromagnetic wave propagation phenomenon & its properties.

Course Outcomes :

Upon completion of this course, students will demonstrate the ability to:

1. Identify, analyze and solve electrostatic and magneto static engineering problems by applying basic electromagnetic laws and mathematical concepts.
2. Apply Maxwell's equations to problems involving static & time-varying fields.
3. Determine various parameters of uniform plane waves in different Media
4. Apply field theory concepts in Microwave engineering.

Syllabus

Unit I :

Vector Algebra & Co-ordinate Geometry: Scalars and Vectors, Vector Algebra, Cartesian co-ordinate system, differential lengths, surfaces and volumes, Dot and cross product, Cylindrical and Spherical co-ordinate system, Irrotational and Solenoidal fields, Coulombs law.

Unit II :

Electric Fields: Electric field Intensity , Field due to different charge distributions, Electric Flux density, Gauss law & its applications, Divergence and its significance, Divergence theorem.

Unit III :

Energy and Potential: Energy expended in moving a point charge in an electric field, Potential and potential difference, Gradient and its physical significance, Dipole, Energy Density in the Electrostatic field, Poisson's & Laplace's equations, Uniqueness theorem.

Unit IV :

Steady Magnetic Fields: Biot-Savert law, Amperes Circuital law, Curl and its physical significance, Stokes theorem, Magnetic flux and magnetic flux density, Scalar and Vector Magnetic potential.

Unit V :

Time varying Magnetic Fields: Faradays law, Displacement current, Maxwell's equations for steady and time varying fields in point form and integral form, Retarded potentials, Maxwell's equations in phasor form.

Unit VI :

Uniform Plane Wave: Uniform plane wave, Wave equations, Propagation constant, attenuation constant, phase constant, Solution of wave equation in free space, Perfect dielectric, lossy dielectric, Poynting vector theorem & its proof, relation between E & H vectors, intrinsic impedance, frequency, wavelength, velocity, Skin Depth.

Text Books :

1. Engineering Electromagnetics: William Hyat, John Buck , Tata McGraw Hill.
2. Electromagnetic Waves & Radiating Systems, Second Edition: Advard C. Jordan, Keith G. Balman, Prentice-Hall of India.

Reference Books :

1. Problems and Solutions in Electromagnetics: W. H. Hyat, J. A. Buck, Tata McGraw Hill Education Private Limited, New Delhi.
2. Theory and Problems of Electromagnetics: Joseph A. Edminister, Schaum's outline series in Engineering, McGraw Hill Book Company
3. Principles of Electromagnetics: 4th Edition : Matthew N. O. Sadiku, , Oxford University Press.
4. Electromagnetic Fields (Theory and Problem): T.V.S. Arun Murthy, S. Chand & Company Ltd.

Syllabus for Semester IV, B.E. (Electronics Engineering)

Course Code: ENT204 **Course: Analog Circuits**

L: 4 Hrs, T: 1 Hr, P: 0 Hrs. Per week **Total Credits: 09**

Course objectives :

The objective of this course is to provide students with

1. Fundamental concepts and application of operational amplifier.
2. Techniques to design electronic circuits/systems using discrete components & operational amplifier IC to meet the desired specifications.
3. Understanding theory and applications of Industrial timer IC 555, ADC/DAC and PLL IC 565.

Course Outcomes :

Upon the completion of this course, students will demonstrate the ability to:

1. Analyze the characteristics of operational amplifier with and without feedback.
2. Utilize operational amplifiers for basic linear and non linear applications.
3. Use Industrial timer IC 555, ADC/DAC and PLL IC 565 ICs for designing electronic circuits/systems for desired application.

Syllabus

Unit I :

Differential amplifier, DC and AC analysis, Constant current Bias circuits, Level shifting techniques, cascaded differential amplifier stages.

Unit II :

Characteristics of an operational amplifiers, Open loop and closed loop Op-amp Configuration, Op-amp Parameters & their analysis.

Unit III :

Simple Op-amp Circuits: inverting, non-inverting amplifiers, summers, integrators and differentiators, log, antilog circuits. Differential amplifier configurations, instrumentation amplifiers. Current to voltage and voltage to current converter

Unit IV :

Precision rectifiers, sinusoidal oscillators: RC phase shift, Wein bridge, Quadrature oscillator, with frequency and amplitude stabilization, elementary idea of active filter, First /second order Low pass and High pass Butterworth filters, Band pass and Band reject filters.

Unit V :

Op-amp's non-Linear application: Clipper, clamper, comparator, zero crossing detector, Schmitt trigger circuits, Triangular wave generator , Monostable, astable multivibrator circuits using op-amps, sample/hold circuits, D/A converter: Binary weighted resistor type and R-2R ladder, A/D converter: The parallel comparator (Flash) type, Successive approximation converter.

Unit VI :

Timer IC LM-555: Internal block schematic, astable, monostable configurations and its application, PLL IC 565: Operating principle lock range and capture range, PLL application: frequency multiplier and FSK demodulator, Recent trends/developments.

Text Books :

1. Linear Integrated Circuits: D. Roy Choudhary, Shail Jain, 4th Edition, New Age International.
2. Operational Amplifiers Design & Applications: Tobey Graeme, Huelsman, 3rd Edition, McGraw hill

Reference Books :

1. Design with Operational Amplifiers and Analog Integrated Circuits, 3rd Edition: Sergio Franco, TMH,
2. Operational Amplifiers: G. B. Clayton,5th Edition, International Edition
3. Operational Amplifiers and Linear Integrated Circuits, 4th Edition: Coughlin Driscoll, PHI Analog Filter Design: M. E. Van Valkenburg ,PHI.
4. Operational Amplifier: Ramakant Gaikwad,2nd Edition, Prentice Hall
5. Op-Amps and linear ICs: Fiore J. M, Thomson Delmar learning.2001.

Syllabus for Semester IV, B.E. (Electronics Engineering)

Course Code: ENP204 **Course: Analog Circuits**

L: 0 Hrs, T: 0 Hr, P: 2 Hrs. Per week **Total Credits: 02**

Analog Circuits Laboratory:

Course objectives:

1. To identify and use different electronic components to design OPAMP based circuits.
2. To use OPAMP and Timer IC 555 for designing electronic circuits.
3. To assemble, test, analyze and troubleshoot electronic circuits using various analog ICs.
4. To impart skills required to use EDA tools for electronic circuit design.

Course Outcomes:

Student will be able to:

1. Design OPAMP based circuits/systems for desired applications.
2. design practical electronic circuits using Timer IC 555 and other Linear ICs
3. Interpret data manual and select different analog ICs to design, assemble and test electronic circuits for various applications.
4. Use EDA tool in the design and analysis of electronic circuits.

Syllabus for Semester IV, B.E. (Electronics Engineering)

Course Code: ENT205 **Course : Electronic Circuits**

L: 3 Hrs, T: 1 Hr, P: 0 Hrs. Per week **Total Credits : 07**

Course Objectives:

The objective of this course is to provide students with

1. Understanding of fundamental concepts of Amplifier & its Mathematical analysis.
2. Techniques for analyzing variety of circuits like regulators, amplifiers, oscillators.
3. Deep understanding of Power amplifier classification and performance.
4. Feedback concept and its application in amplifier and oscillator design.
5. Understanding design aspect of regulator circuits.

Course Outcomes :

Upon completion of this course, students will demonstrate the ability to:

1. Understand and evaluate the performance specifications of regulator, amplifier and oscillator.
2. Apply feedback techniques in amplifier, oscillator and regulator design.
3. Use electronic devices in electronic circuit/systems design with realistic constraints.

Syllabus

Unit I :

Amplifiers: Classification of amplifiers, distortions in amplifiers, RC coupled amplifier, Low frequency response of RC coupled stage, effect of emitter (or source) bypass capacitor on low frequency response.

Unit II :

Large-signal Amplifiers: Class A large signal amplifiers and derivation of efficiency, second harmonic distortion, Higher order harmonic generation and calculation of power output, The transformer coupled audio power amplifier, impedance matching and derivation of its efficiency, Class B amplifiers, push-pull amplifiers, power considerations, Class AB operation

Unit III :

Feedback in amplifiers: Classification of Feedback amplifiers, the feedback concept, Nyquist Criterion, general characteristics of negative feedback amplifier, effect of feedback on output & input resistances, effect of feedback on bandwidth and gain, feedback and stability, Gain and Phase Margins.

Unit IV :

Oscillators: Barkhausen Criterion, classification, LC Oscillators - Hartley and Colpitts, derivation of frequency, RC Oscillators – RC phase shift and Wein bridge oscillators, derivation of frequency, Crystal oscillator, frequency stability.

Unit V :

Wave shaping circuits : Introduction, types of wave shaping circuits – high pass RC circuit, low pass RC circuit, Multivibrators – Astable, monostable and bi-stable, Schmitt trigger.

Unit VI :

Regulated Power Supply: - Fundamentals of regulated power supply, stabilization, Design of - Zener shunt regulator, emitter follower regulators, series voltage regulator with Darlington pair. Design factors to consider – output peak to peak ripple, over voltage and over load protection.

Text Books :

1. Integrated Electronics, 2nd Edition: Millman, Halkias,Parikh Tata-McGraw Hill, 2010
2. Microelectronic Circuits: Theory and Applications, Adel S. Sedra, Kenneth C. Smith, Arun N. Chandorkar, 5th edition Oxford University Press,2010
3. Pulse digital and switching waveform, Millman and H.Taub , 3rd edition, Tata-McGraw Hill

Reference Books :

1. Electronic Devices and Circuit Theory, 10th Edition: R. Boylestad, Pearson Education,2009
2. Foundation of Electronics Circuits and Devices, 4th Edition: Meade, Thompson (Delmar Learning),2003
3. Electronic Devices and Circuits, 5th Edition: David A. Bell, Oxford University press, 2008
4. Microelectronics: Circuit Analysis and Design: Donald Nemen, 4th edition Tata-McGraw Hill publication, 2010

Syllabus for Semester IV, B.E. (Electronics Engineering)

Course Code: ENP205 **Course: Electronic Circuits**

L: 0 Hrs, T: 0 Hr, P: 2 Hrs. Per week **Total Credits: 02**

Electronic Circuits Laboratory:

Course objectives:

The objective of this course is to provide students with

1. Understanding of amplifiers, their frequency response and feedback concept.
2. Understanding basic concept of stability and oscillations.
3. Design and simulation of various electronic circuits.

Course Outcomes:

Upon completion of this course, student shall demonstrate ability to:

1. Analyze frequency response of an amplifier circuit.
2. Understand design process in amplifier and oscillator circuits & perform its simulation.
3. Design of regulator circuit and its analysis.
4. To enhance hands-on experience, through real circuit implementation.

Syllabus for Semester IV, B.E. (Electronics Engineering)

Course Code: ENT208 **Course : Electronic Measurement and Instrumentation**

L: 3 Hrs, T: 1 Hr, P: 0 Hrs. Per week **Total Credits: 07**

Course Objectives:

The objective of this course is to provide students with understanding of

1. Necessary foundation of electronic measurement techniques and its use for voltage, current, power, energy, frequency & time measurement.
2. Working principal and use of moving coil instruments for measurements of voltage, current, power, energy etc.
3. Understanding application of bridges in resistance, capacitance and Inductance measurement and their use in real life industrial applications.
4. Knowledge of working principle of various instruments like CRO, DSO, LCR, and Spectrum Analyzer for testing and measurement.

Course Outcomes:

Upon completion of this course, students will demonstrate the ability to:

1. Select and use precise/accurate instrument for measurement of various electrical parameters.
2. Understand the technical specifications associated with different electrical/electronic equipments and their application areas.
3. Identify and minimize errors in electrical/electronic measurement.
4 Select suitable transducer for measurement of physical parameters.
5. Interpret the data using statistical analysis.
6. Understand modern trends in data acquisition systems

Syllabus

Unit – I:

Indicating Instruments - purpose of instrumentation, Basic elements of instrumentation, Statistical analysis and measurement of errors, Static and dynamic characteristics methods of producing deflecting, controlling and damping torques. Principle and operation of ammeters, voltmeters and wattmeters, moving iron and moving coil, dynamometer. Extension of instrument range.

Unit – II:

Detectors: PMMC galvanometer, dc & ac voltmeter, ammeter, multimeter, watt-hour meter, three phase wattmeter, power factor meter, instrument transformers. Measurement of low, medium and high resistance. Sensors – pressure, temperature, light. Transducer – thermocouple, RTD(resistance temperature detector).

Unit – III:

Bridges : General Balance Equation; Circuit diagram; Phasor diagram and Advantages as well as Disadvantages and Applications of Wheat stone, Kelvin, Max-well, Hay, Schering, Weinbridge Potentiometers, Measurement of Inductance, capacitance using AC bridges like Anderson, Ownens; De-Sauty's. Shielding and earthing.

Unit – IV:

Analog/Digital Meters: signal conditioning measurement meters, AC voltmeter using rectifiers, True RMS voltmeter, Electronic multimeter, Digital voltmeter, Q-meter, RF power and voltage measurements. Measurement of Energy- A.C. single phase and poly-phase induction type energy meters.

Unit – V:

Oscilloscope: Digital storage oscilloscope – 2 and 4 channel, delay line, multiple trace, Triggering, delayed sweep.

Unit – VI:

Frequency and Power Measurement: Frequency, and Time measurement, signal analysis. frequency counters – measurement of frequency and time interval – extension of frequency range. Function generators – RF signal generators – Sweep generators – Frequency synthesizer –wave analyzer – Harmonic distortion analyzer – spectrum analyzer, Recent trends/developments.

Text Book:

1. Electrical Measurement: A.K.Sawhney, Dhanpat Rai & Sons Publication, 11th Edition
2. Electronic Measurement Systems, 2nd revised edition, 2009: U. A. Bakshi, A. V. Bakshi, K. A. Bakshi, Technical Publications Pune.

Reference Books:

1. Electronic Instrumentation & Measurement Technique: W.D. Cooper & A.D.Helfrick., 3rd Edition

Syllabus for Semester IV, B.E. (Electronics Engineering)

Course Code: ENP208 **Course: Electronic Measurement and Instrumentation**

L: 0 Hrs, T: 0 Hr, P: 2 Hrs. Per week **Total Credits: 02**

Course Objective:

The objective of this course is to

1. Introduce to students the theory and applications of measurement and instrumentation systems for electrical & electronics engineering
2. Prepare students to know the characteristics of different instrumentation systems
3. Provide students a brief look on electrical, electronic measurement and their application, terms and error calculation
4. Learn the basic operations of DC and AC meters
5. Get students familiar with oscilloscope operations & signal generators
6. Learn the basic operations of power meters

Course Outcomes:

At the end of this course, students will be able to:

1. Explain basic concepts and definitions in measurement.
2. Perform the operation on electronic instruments for parameter measurement
3. Explain the operation of oscilloscopes and the basic circuit blocks in the design of an oscilloscope.
4. Explain the techniques used in signal analysis
5. Calculate reactive power in three phase circuits

Syllabus for Semester IV, B.E. (Electronics Engineering)

Course Code: CHT202 **Course: Environmental Studies – II**

L: 2 Hrs, T: 0 Hr, P: 0 Hrs. Per week **Total Credits: 00**

Course Objective:

1. Main objective of the course is to make the students aware of environmental issues which often come across.
2. It is envisaged to provide the students' with basic scientific background which is needed to understand how the Earth works, how we, as human beings, fit into it, prerequisites to understand environmental issues.
3. To adopt multidisciplinary approach which encompasses chemical sciences, biological sciences, environmental engineering and sciences to protect the mother earth and environment.
4. Course is to develop concern for our own environment which will lead us to act at our own level to surmount over the environment problems we face.
5. One of the objectives of the course is to make the students aware about importance of natural resources, ecosystems, biodiversity and its conservation, environmental pollution, social issues and environment human population and environment.

Course Outcome:

1. Students will get the sufficient information that will clarify modern environmental concepts like equitable use of natural resources, more sustainable life styles etc.
2. Students will realize the need to change their approach so as to perceive our own environmental issues correctly, using practical approach based on observation and self learning.
3. Students become conversant with the fact that there is a need to create a concern for our environment that will trigger pro-environmental action; including simple activities we can do in our daily life to protect it.
4. By studying environmental sciences, students is exposed to the environment that enables one to find out solution of various environmental problems encountered on and often.
5. At the end of the course, it is expected that students will be able to identify and analyze environmental problems as well as the risks associated with these problems and efforts to be taken to protect the environment from getting polluted. This will enable every human being to live in a more sustainable manner.

Syllabus

Unit – I:

Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, and 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; Diaster management: floods, earthquake, cyclone and landslides.

Unit – II:

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 – III:

Human Population and the Environment: Population growth, variation among nations, Population explosion – Family Welfare Programme; 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.

Field work

Visit to a local area to document environmental assetsriver/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.

Text Books:

1. Environmental Chemistry and Pollution Control: N. W. Ingole, D. M. Dharmadhikari, S. S. Patil, Das GanuPrakashan, Nagpur. First Edition
2. Environmental Chemistry: K. Bhute, A. Dhamani, A. Lonkar, S. Bakare, Celebration Infomedia, India. First Edition

Reference Books:

1. Text Book of Environmental Chemistry and Pollution Control:S. S. Dara; S. Chand and Company Ltd., New Delhi. Thirteenth Edition
2. Environmental Studies-From Crisis to Cure, Second Edition:R. Rajagopalan, Oxford University Press, New Delhi.
3. Text Book of Environmental Studies:E. Bharucha, University Press (India) Private Ltd., Hyderabad, India. First Edition

V SEMESTER

Syllabus of Semester V B.E. (Electronics Engineering)

Course Code: HUT301 **Course: Principles of Economics and Management**

L : 03 Hrs., T : 01 Hr., Per week **Total Credits : 07**

Course Objectives:

1. To orient the student in basic and relevant principles of economics and management.

Course Outcome:

1. Students will understand the basic concepts of economics.
2. Students will develop the understanding of micro economics with reference to various laws.
3. Students will develop the understanding of operation of economy.
4. Students will be familiar with basic principles of management.
5. Students will be familiar with concepts of Human Resource.
6. Students will be familiar with Finance.

Syllabus

Unit-I: Introduction to Economics Meaning and scope, Basic Ecomomics concepts: Goods, Utility, Value, Wealth, Income, Saving, Investment, Eqilibrium, Static, Dynamics , Types of Business Organizations: Individual, Partnership, Joint-stock, Cooperative Enterprise, public Enterprises.

Unit-II: Micro-Economics Law of Diminishing Marginal Utility, Concept of Demand, Law of Demand, Elasticity of Demand, Concept of Supply, Law of Supply, Elasticity of Supply, Indifference curve, Types of Market(Perfect and Imperfect Competition)

Unit-III: Macro-Economics Concepts of Inflation and Deflation, Business cycles, Functions of Central Bank and Commercial banks, Monetary and Fiscal Policies, Direct and indirect taxes, Evolution of Indian Economy: Mixed Economy and LPG

Unit-IV: Introduction to Management Definition, nature and scope of Management, Functions of Management – Planning, Organizing, Directing and Controlling.

Unit-V: Human Resource Management Human resource planning, Analyzing work and designing Job, Incentives and Performance Based Payments, Job safety, and health, Work Stress

Unit-VI : Financial Management Meaning, nature and scope of financial management, Profit and loss account, Balance sheet, Budgets, Ratio analysis, Depreciation and its methods.

Text Books

1. K.K. Dewett; Modern Economic Theory ; , (43rd edition); S. Chand and Co. Ltd. New Delhi.
2. P.C. Tripathi, P. N. Reddy ; Principles of Management; Tata MacGraw Hill Publishing Co. Ltd. New Delhi.
3. K Aswathappa; Human Resource Management: Tata McGraw-Hill Publishing Company Ltd., New Delhi.
4. Financial Management: Ravi M. Kishore, TaxmanAllied Services(P) Ltd., New Delhi.

Reference Books

1. K.K. Dewett and J.D. Verma; Elementary Economic Theory ;(28th edition) S. Chand and Co. Ltd; New Delhi.
2. Rudradutt, K. P. M. Sundaram; Indian Economy (45th revisededition); S. Chand and Co. Ltd. New Delhi.
3. Martand.T. Telsang; Industrial and Business Management ; S. Chand and Co. Ltd. New Delhi.
4. T. Ramasamy; Principles of Management; Himalaya Publishing House,(10th edition) Mumbai.

Syllabus of Semester V B.E. (Electronics Engineering)

Course Code: ENT301 **Course: Digital System Design with HDL**

L: 03 Hrs. , T : 01 Hr., Per week **Total Credits : 07**

Course Objective:

The objective of this course is to provide students with

1. Introduction to digital system design flow and approaches.
2. Need and language basics of Hardware description language.
3. Design of combinational and sequential circuits using VHDL.
4. Ability to develop test bench for digital designs.
5. Architectural understanding of Programmable Logic Devices like FPGA and CPLD.
6. Timing, synthesis issues and constraints for digital system design.

Course Outcomes:

Upon completion of this course, students will demonstrate the ability to:

CO 1 : Design a digital system, components or process to meet desired needs within realistic constraints.

CO 2 : Effectively code and testing of digital systems.

CO 3 : Understand digital system design flow, timing, synthesis and FPGA implementation issues.

CO 4 : Solve engineering problems in the area of digital system design.

Syllabus

Unit-I

Introduction to VHDL, design units, data objects, signal drivers, inertial and transport delays, delta delay, VHDL data types, concurrent and sequential statements.

Unit-II

Subprograms – functions, procedures, attributes, generic, generate, package, IEEE standard logic library, file I/O, test bench, component declaration, instantiation, configuration.

Unit-III

Combinational logic circuit design and VHDL implementation of following circuits – fast adder, subtractor, decoder, encoder, multiplexer, ALU, barrel shifter, 4X4 key board encoder and multiplier.

Unit-IV

Synchronous sequential circuits design – flip flops, counters, registers, finite state machines, Mealy and Moore, FSM design and its VHDL implementation, linear feedback shift register.

Unit-V

Design issues race, hazards, metastability, clock skew and timing considerations, synchronizers. Introduction to synthesis, synthesis constraint, stages of synthesis, technology mapping. Static timing analysis.

Unit-VI

Introduction to place & route process, introduction to ROM, PLA, PAL, Architecture of CPLD and FPGA (Xilinx / Altera).

Text Books

1. Fundamental of Digital Logic with VHDL design; Stephen Brown, Zvonko Vranesic; TMH.
2. VHDL Primer ; J Bhasker ; Pearson Education
3. VHDL-a Design Oriented Approach; S. S. Limaye; Tata McGraw-Hill Education.

Reference Books

1. Digital System Design Using VHDL ; Charles H. Roth; Thomson.
2. VHDL Synthesis Primer; J Bhasker; Prentice Hall.
3. VHDL Modular Design and Synthesis of Cores and System; Zainalabedin Navabi; McGraw Hill Professional.

Syllabus of Semester V B.E. (Electronics Engineering)

Course Code : ENP301 **Course : Digital System Design with HDL**

L : 0 Hrs., P : 02 Hr., Per week **Total Credits : 02**

Digital System Design with HDL Laboratory:

Course Objectives:

1. To provide familiarity with simulation and analysis tools for Digital System design.
2. To understand different modeling styles in VHDL.
3. To design combinational, sequential, arithmetic blocks and hierarchical implementation.
4. To understand digital system design flow and FPGA implementation issues.
5. Identify, formulate, and solve engineering problems in the area of digital system design.

Course Outcomes:

Student will be able to:

1. Use the techniques, skills, and modern EDA tools, necessary for digital system design
2. Design combinational, arithmetic, sequential building blocks and their hierarchical implementation, as per the specifications.
3. Understand functional simulation, synthesis, optimization, place and route , timing analysis and FPGA implementation related issues.
4. To design a digital system, components or process to meet desired needs within realistic constraints
5. Debug VHDL design, document and efficiently communicate in lab report.
6. To function on multi-disciplinary teams through digital system design experiments and projects.

Syllabus of Semester V B.E. (Electronics Engineering)

Course Code: ENT302 **Course: Statistical Signal Analysis**

L : 04 Hrs., T : 01 Hr., Per week **Total Credits : 09**

Course Objectives

The objective of this course is to provide students with

1. Understanding of the fundamentals of signals and systems and representation in time and frequency domain.
2. Establishing theoretical foundations for probabilistic and statistical processes related to information theory.
3. In-depth knowledge of signal analysis techniques in analog and digital communication systems.
4. Concept of sampling and its importance in signal transmission and reconstruction.

Course Outcomes:

Upon the completion of this course, students will demonstrate the ability to:

1. Skillfully use complex mathematics for the analysis of signals and systems in time and frequency domain.
2. Understand and appreciate the importance of Fourier transform techniques in communication engineering.
3. Apply statistical and probabilistic techniques for signal processing.
4. Build necessary foundation for Digital Signal Processing, Digital Communication, and Image Processing.

Syllabus

Unit I

Elementary continuous & discrete time signal, basic operations on signals, classification of signals, signals and vectors, vector space, orthogonality in signals, system classification.

Unit II

Time domain analysis of CT/DT system, convolution and their properties, causality, correlation, impulse response of interconnected systems.

Unit III

Fourier series analysis of CT periodic signals, properties, Fourier spectrum, Gibb's phenomenon, Continuous Time Fourier transform, properties, FT of periodic signals, application to signal modulation and demodulation, system analysis with FT.

Unit IV

Fourier analysis of Discrete Time signals, properties, frequency response of Discrete Time systems, Discrete Fourier Transform(DFT), properties of DFT.

Unit V

Sampling, Nyquist Criteria of sampling, analog to digital conversion, sampling types, sampling theorem, anti aliasing filter, signal reconstruction, signal transmission though linear system, distortion less transmission through a system, linear phase system, ideal filter, signal and system bandwidth, relationship between bandwidth and rise time.

Unit VI

Probability, permutations and combinations, probability density function, mean, moments, properties of expectation and variance, Binomial, Poisson's Uniform, Gaussian and Rayleigh Distribution, Random variables, random process, power spectral density, cross spectral density, white noise, LTI system with random input signals.

Text Books

1. Signals and Systems; Simon Haykin, Barry van Veen; John Wiley and Sons. 2nd edition, 2002
2. Modern Digital and Analog Communication Systems; B. P. Lathi; Oxford University Press.4th edition 2009

Reference Books

1. Signals and Systems; A.V. Oppenheim, A.S. Willsky and I.T. Young; Prentice Hall. 1st edition ,1983
2. Signal and System; P. Rameshbabu, R. Anandandanatarajan; Scitech Publication, 4th edition, reprint 2013
3. Signals and Systems; Nagrath, S. N. Sharan, R. Ranjan, S. Kumar; Tata McGraw Hill.1st edition, 2001
4. Fundamentals of Signals & Systems; Michael J Roberts; Tata McGraw Hill.1st edition, 2011

Syllabus of Semester V B.E. (Electronics Engineering)

Course Code: ENP302 **Course: Statistical Signal Analysis**

L : 0 Hrs., P : 02 Hr., Per week **Total Credits : 02**

Course Objective:

The objective of this course is to provide students with

1. Understanding of the fundamentals of signals and systems and their representation in time and frequency domain.
2. Frequency domain analysis of continuous time and discrete time signals with Fourier Transform.
3. Understanding and verification of Nyquist Criteria.
4. Verification of Probabilistic and statistical Process.

Course Outcomes:-

Upon the completion of this course students will be able to:

1. Strengthen their knowledge and understanding of various parameters of signals and systems
2. Demonstrate skills in the use of complex mathematics for the analysis of signals.
3. Develop necessary foundation / Platform for digital signal Processing.

Syllabus of Semester V B.E. (Electronics Engineering)

Course Code: ENT303 **Course: Field and Radiating System**

L: 03 Hrs. , T : 01 Hr., Per week **Total Credits : 07**

Course Objectives:

The objective of this course is to provide students with

1. Fundamental concepts of Electromagnetic wave theory.
2. Understanding of wave propagation in transmission lines and waveguides.
3. Importance of the basic antenna parameters such as radiation pattern, effective area, radiation intensity, directivity, gain, beam efficiency, aperture efficiency and radiation efficiency.
4. Design of antenna arrays for specific patterns.
5. Understanding and knowledge of various antennas and their applications

Course Outcomes:

Upon completion of this course, students will demonstrate the ability to:

1. Understand wave propagation in transmission line and waveguides.
2. Predict and analyze behavior of Electromagnetic waves in transmission lines and waveguides.
3. Understand the antenna structure, its design, limitations and tradeoffs.
4. Apply field and radiating theory concepts in Microwave engineering.

Syllabus

Unit-I

Guided Waves, Waves between parallel planes, TE, TM, TEM, waves and their characteristics, attenuation in parallel plane guides, wave impedances.

Unit-II

Rectangular Waveguides, TM, TE waves in rectangular waveguides and their characteristics, wave impedance.

Unit-III

Transmission lines, transmission line equations and their solutions. Transmission line parameters, characteristic impedance, propagation constant, attenuation constant and phase constant, waveforms distortion, distortion less transmission lines, loading of transmission lines, reflection coefficient and VSWR, Equivalent circuits of transmission lines. Smith chart, Stub matching.

Unit-IV:

Concept of radiation, Scalar and vector potentials, retarded potentials, field due to a current elements, power radiated and radiation resistance, reciprocity theorem applied to antennas, gain and aperture of antenna, radiation intensity, impedance, directivity.

Unit-V

Two elements arrays and their directional characteristics, linear arrays analysis, broadside and end fire arrays, pattern multiplication, binomial arrays.

Unit-VI

Study of parabolic antenna, folded dipole, Yagi-Uda antenna, log–periodic antenna, horn antenna, traveling wave antenna and cassegrain antenna.

Text Books

1. Electromagnetic Waves and Radiating Systems ; Edward C, Jordan and Keith G. Balmain;Prentice Hall India, 2nd Edition
2. Antennas and Wave Propagation ; John D. Kraus ; Tata McGraw Hill, 4th Edition

Reference Books

1. Electromagnetic Waves ; R K Shevgaonkar ;Tata McGraw Hill, 1st Edition
2. Antenna Theory : Analysis and Design ; C.A. Balanis ; Wiley India, 3rd Edition
3. Antenna and Propagation ; G.S. Raju ; Pearson Publication, 1st Edition

Syllabus of Semester V B.E. (Electronics Engineering)

Course Code : ENT304 **Course : Microprocessor and Interfacing**

L : 04 Hrs., T : 01 Hr., Per week **Total Credits : 09**

Course Objectives :

The objective of this course is to provide students with

1. Introduction to microprocessor 8085, architecture and organization.
2. Knowledge of various assembler directives and assembly language instructions with usages.
3. Understanding the program flow execution with timing diagrams.
4. Knowledge of interfacing techniques for memory, I/O subsystems and peripheral devices.
5. Basic knowledge of 8086 architecture and features.

Course Outcomes:

Upon the completion of this course, students will demonstrate the ability to:

1. Understand the architecture of microprocessor, micro controller and computer systems.
2. Develop assembly language programs to exploit architectural features of microprocessor.
3. Interface memory, I/O, peripherals, sensors, actuators with microprocessor.
4. Build necessary foundation for study of advanced processors and embedded system design.

Syllabus

Unit-I

Introduction to RISC and CISC processors, Harvard and Von Neumann architecture, organization of a computer with MPU, Introduction to Intel's 8085, architecture, pin diagram, bus concepts, addressing modes.

Unit-II

Instruction set, stack and subroutines- simple & nested, stack manipulation, simple programs, timing diagrams.

Unit-III

Memory mapping, interrupts-concept and structure, interrupt service routines, interrupt programming of 8085.

Unit-IV

Methods of data transfer-serial, parallel, synchronous & asynchronous, IN/OUT instructions, handshaking concepts, architecture and interface of 8255 with 8085.

Unit-V

Interfacing of LED, ADC, DAC, stepper motor, simple & multiplexed SSD, keyboard, display interface, hardware considerations-bus contention.

Unit-VI

Introduction to Intel's 8086 processor architecture, segmentation, pipelining, addressing mode, assembler directives.

Text Books

1. Microprocessor: Architecture, Programming & applications with 8085; Ramesh S.Gaonkar; Penram International, 5th Edition.
2. Microprocessors and Digital Systems; D. V. Hall; McGraw Hill, 2nd Edition.
3. Advanced Microprocessors and Peripherals; A. K. Ray & K. M. Bhurchandi; McGraw Hill, 3rd Edition.

Reference Books

1. 8085 Microprocessor: Programming and Interfacing**;** N. K. Srinath; PHI, 1st Edition.
2. Microcomputer systems: the 8086/8088 family: Architecture, Programming, and Design; Yu-cheng Liu, Glenn A. Gibson; Prentice-Hall, 2nd Edition.
3. Experiments in Microprocessor and Digital Systems; D.V. Hall, Marybelle B. Hall; ; McGraw Hill, 2nd Edition.

Syllabus of Semester V B.E. (Electronics Engineering)

Course Code: ENP304 **Course: Microprocessor and Interfacing**

L : 0 Hrs., P : 02 Hr., Per week **Total Credits : 02**

Course objectives:

1. To develop the skills for assembly language programming.
2. To interface peripherals with microprocessor.

Course Outcomes:

Student will be able to:

1. Understand working of microprocessor based systems.
2. Design Microprocessor based mini project.

Syllabus of Semester V B.E. (Electronics Engineering)

Course Code : ENP305 **Course : Circuit Simulation**

L: 0 Hrs. , P:02 Hrs Per week **Audit Course**

Course objectives:

The objective of this course is to provide students with

1. Technique to create and simulate circuit schematics.
2. Understanding of various stimulus types and their corresponding analysis types, and to determine desired results.
3. Understanding of SPICE netlist and commands.

Course Outcomes:

Upon the completion of this course, students will demonstrate the ability to:

1. Create and simulate circuit schematics with Orcad Capture CIS.
2. Apply various stimulus types and their corresponding analysis types, and to analyze obtained results.
3. Create a text file (netlist) listing all of the components and node connections and use SPICE commands for obtaining simulation results of electronic circuits.

VI SEMESTER

Syllabus of Semester VI B.E. (Electronics Engineering)

Course Code: ENT306 **Course: Microwave Engineering**

L : 03 Hrs., T : 01 Hr., Per week **Total Credits : 07**

New Course Objectives:-

The objective of this course is to provide students with

1. Theoretical foundation to analyze microwave devices and components.
2. The concepts of S-parameter terminology to describe the microwave circuits.
3. The knowledge of Microwave test bench for microwave measurements.
4. An understanding of working principle and applications of microwave systems.

New Course Outcomes:-

Upon the completion of this course, students shall be able to :

1. Understand the working and applications of microwave vacuum tube devices like Klystron, Magnetron, Travelling Wave Tube and Backward wave Oscillators.
2. Perform Scattering parameters analysis of Microwave networks.
3. Handle microwave equipments and perform a variety of microwave measurements.
4. Understand the working of microwave solid state devices, modern microwave systems and microwave radiation hazards.

Syllabus

Unit-I

Causes of failure of conventional tubes at high frequency, History of microwaves, microwave frequency bands. Two-cavity klystron amplifier, Reflex Klystron oscillator.

Unit-II

Travelling wave tube, Backward wave oscillator, and Magnetron: Cylindrical magnetron, parallel plate magnetron, voltage tunable magnetron.

Unit-III

Introduction to S-matrix and S-parameters, attenuators, tees, directional couplers, circulators, isolators, gyrators, phase shifter, cavity resonator and their S-parameters.

Unit-IV

Microwave Test Bench, measurement of VSWR , frequency, power, attenuation, insertion loss, directivity, beam width, radiation pattern and gain of various microwave antennas. Microwave filter by Image parameter and Insertion loss method.

Unit-V

Introduction to microstrip lines, characteristic impedance, losses, quality factor, Gunn diode as oscillator, Detector Diode, PIN diode and its application.

Introduction to microwave solid state devices and monolithic microwave integrated circuits.

Unit-VI

Basics of Microwave systems: Radar, RF ID, microwave imaging, modern trends in microwave engineering, effect of microwave on human body, EMI/EMC.

Text Books

1. Microwave device and circuits: Microwave Devices and Circuits; Samuel Y. Liao; 3rd Edition, Pearson Publication.

Reference Books

1. Elements of Microwave Engineering; R. Chatterjee; 2nd ed. Prentice Hall .
2. Microwave communications: components and circuits: Edgar Hund; 1st ed., McGraw-Hill.
3. Microwave Engineering; David M. Pozar, Wiley India.
4. Foundations for Microwave Engineering ; R.E.Collin;3rd ed, IEEE Press.

Syllabus of Semester VI B.E. (Electronics Engineering)

Course Code : ENP306 **Course : Microwave Engineering**

L : 0 Hrs., P : 02 Hr., Per week **Total Credits : 02**

UHF & Microwave Laboratory:

Course Objectives:

1. To gain an understanding of microwave components and its applications.
2. To assemble microwave test bench for frequency and power measurement.
3. To introduce microwave integrated circuit test bench and associated measurements.

Course Outcomes:

Student will be able to:

1. Identify different Microwave components.
2. Assemble Microwave test bench for frequency and power measurement
3. Analyze and interpret the radiation pattern, directivity of Horn, Parabolic antenna.
4. Verify the different characteristics of MIC components.

Syllabus of Semester VI B.E. (Electronics Engineering)

Course Code : EET315 **Course : Control System Engineering**

L : 03 Hrs., T : 01 Hr., Per week **Total Credits : 07**

Course Objectives:

The course will prepare students

1. To understand the concept of feedback systems and operation of various practical control systems.
2. To understand how to analyze the system by time response and frequency response techniques.
3. To analyze the performance of the system by classical and modern control system techniques

Course outcome:

Upon the completion of this course, the students:

1. Will be able to convert physical models into physical systems and then formulating the appropriate mathematical model and converting mathematical models into the block diagrams/ signal flow graphs and then find the transfer function of the system.
2. Will be able to understand various time response specifications, perform time response analysis and understand techniques of compensation for improving the system response.
3. Will be able to apply various tools to determine the absolute stability of the systems by applying Routh's Criterion and to understand how the same can be applied to evaluate relative stability.
4. Will be able to understand the concept of root locus, Bode plots, Nyquist plots for design and analysis of a system.
5. Will be able to understand the concept of modern control system theory for design and analysis of a system

Syllabus

Unit-I

Introduction to need for automation and automatic control. Use of Feedback, broad spectrum of system application. Mathematical modeling, differential equations, transfer functions, block diagram, signal flow graphs, Application to elementary system simplifications, Effect of feedback on parameter variation, disturbance signal, servomechanisms and regulators. Control system components, Electrical, Electromechanical, hydraulic, pneumatic and other components. Their functional analysis and input output representation.

Unit-II

Time response of systems, First order and second order system, standard inputs concept of gain and time constants. Steady state error, type of control system, approximate methods for higher order system.

Unit-III

Root location and its effect on time response, Elementary idea of Root Locus, effect of adding pole and zero in proximity of imaginary axis.

Unit-IV

Stability control systems , conditions of stability, characteristic equation, Routh Hurwitz criterion, special cases for determining relative stability.

Unit-V

Frequency response method of analyzing linear system. Nyquist and Bode plots, stability and accuracy analysis from frequency responses, open loop and close loop frequency response. Nyquist criterion, effect of variation of gain and addition of pole and zero on response plot, stability margins in frequency response.

Unit-VI

State variable method of analysis, characteristic of system state, choice of state representation in vector matrix, different standard form, relation between transfer function and state variable.

Text Books

1. Control Systems Engineering, I. J. Nagrath, M. Gopal, New Age International Publishers, 2005 Edition.
2. Automatic Control Systems, 9th Edition , Farid Golnaraghi, Benjamin C. Kuo , June 2009.
3. Modern Control Engineering; Katsuhiko Ogata; Prentice Hall. , 2010 - Technology & Engineering

Reference Books

1) Control Systems Engineering, 6th Edition, Norman S. Nise , December 2010, ©2011
2) Control Systems: Principles and Design M. Gopal, Tata McGraw-Hill Education, 2002 - Automatic control - 971 pages

Syllabus of Semester VI B.E. (Electronics Engineering)

Course Code : ENT307 **Course : Microcontroller Based Design**

L : 03 Hrs., T : 01 Hr., Per week **Total Credits : 07**

Course Objective:

The objective of this course is to provide students with

1. Introduction to microcontroller PIC18, its organization and architecture.
2. Understanding assembly language instructions with usages.
3. Knowledge of interfacing microcontroller to external peripherals
4. Familiarization of different protocols required for serial communication

Course Outcomes:

Upon the completion of this course, students will demonstrate the ability to:

1. Understand the architecture and organization of microcontroller and its programming
2. Acquire the knowledge, techniques and skill to integrate microcontroller hardware and software
3. Interface microcontroller based system to real world.

Syllabus

Unit-I

Introduction of Microcontroller, Difference between Microprocessor and Microcontroller, Criteria for selection of Microcontroller, PIC Family Microcontrollers, PIC18 Architecture, Pin diagram & description.

Unit-II

Input & output ports, Memory organization: Program Memory, Data RAM & Data EEPROM, Instruction set and Assembly Language Programming.

Unit-III

Interrupts, Timers, Watch-Dog Timer (WDT), Enhanced capture, Compare & PWM module and programming. Serial port (USART) programming.

Unit-IV

Analog-to-Digital Converter (ADC) module and programming, Interfacing of LED, SSD, LCD, Graphics LCD, 4x4 keyboard interfacing.

Unit-V

Interfacing of Switches & Relays, Stepper motor, DC motor. Power management in PIC controller: Sleep mode, Idle mode, Run Mode.

Unit-VI

Communication protocol used Like SPI, I2C, and USB. In-Circuit Serial Programming, Code protection and fuse bit programming.

Text Books

1. PIC Microcontroller And Embedded Systems: Using Assembly and C for PIC18; M. Mazidi, R. Mckinlay, D. Causey; Pearson Education 1st Ed 2008.
2. Programming and customizing the PIC microcontroller; Myke Predko, McGraw Hill 3rd Ed. 2008.

Reference Books

1. Microchip, "28/40/44-Pin, High-Performance,Enhanced Flash, USB Microcontrollers with nanoWatt Technology" PIC18F2455/2550/4455/4550 Datasheet, DS39632C 2006.
2. Design with PIC Microcontrollers ; John B. Peatman; Pearson Education 1st 1998

Syllabus of Semester VI B.E. (Electronics Engineering)

Course Code: ENT308 **Course: Computer Organization**

L: 03 Hrs. T : 00 Hr., Per week **Total Credits : 06**

Course Objectives:

The objective of this course is to provide students with

1. The ability to understand computer architecture and major design levels.
2. The understanding of processor organization and control unit design methodologies.
3. The knowledge of interconnection network topologies.
4. The ability to understand the concepts of memory and parallel processing.

Course Outcomes:

Upon completion of this course, students will demonstrate the ability to:

1. Understand design levels of a computer system.
2. Analyze hierarchical design of processor and control unit modules.
3. Design different arithmetic algorithms.
4. Identify different interconnection network topologies.
5. Understand the importance of memory organization and management in computer system design.
6. Apply the concepts of pipelining and multiprocessing for computer system design.

Syllabus

Unit-I

Introduction to computer system and its sub modules, different levels of design.

Unit-II

Processor organization, instruction set, instruction formats, IEEE 754 floating point format, Booth's algorithm, restoring and non-restoring division.

Unit-III

Introduction to control unit design, instruction interpretation and execution, hardwired & micro Programmed control CPU design.

Unit-IV

Introduction to RISC and CISC paradigm, interconnection network, DMA controller & vectored interrupts.

Unit-V

Memory organization, concepts of semiconductor memory, memory management, concept of cache and associative memories, virtual memory.

Unit-VI

Parallel processing concepts, multiprocessors and its characteristics, pipelining.

Text Books

1. Computer Architecture and Organization; J. P. Hayes; Third Edition, McGraw Hill, 1998.
2. Computer Organization; Safwat G. Zaky, Zvonko G. Vranesic, Carl Hammacher ; Fifth Edition, McGraw Hill, 2002.

Reference Books

1. Computer System Architecture; M. Morris. Mano;Third Edition, Prentice Hall, 1992.
2. Computer Organization and Programming; C. W. Gear; Third Edition, McGraw Hill, 1980.
3. Structured Computer Organization; Andrew. S. Tanenbum; Fifth Edition, Pearson, 2005.
4. Computer Organization and Microprogramming; Yaohan Chu; First Edition, Prentice Hall, 1972.

Syllabus of Semester VI B.E. (Electronics Engineering)

Course Code: ENT309 **Course: Analog Communication Engineering**

L : 03 Hrs., T : 01 Hr., Per week **Total Credits : 07**

Course Objective:

The objective of this course is to provide students with

1. Concepts of wave propagation.
2. Fundamentals of Analog modulation schemes and their generation.
3. Theoretical foundation of Pulse modulation schemes.
4. Awareness of radio receiver architectures and their current trends.
5. Understanding of effect of noise on different analog modulation schemes.

Course Outcomes:

Upon completion of this course, students will demonstrate the ability to:

1. Analyze and compare various analog modulation schemes.
2. Use super heterodyne principle for the design of radio receiver.
3. Develop and Compare functional blocks of different pulse modulation schemes.
4. Evaluate the effect of noise on communication system.
5. Determine suitable methods of wave propagation.

Syllabus

Unit I

Frequency spectrum of electromagnetic waves, wave propagation: Ground wave, sky wave, space wave. Amplitude modulation, DSB-FC, DSB-SC, SSB-SC modulation, Independent Sideband(ISB) , Vestigial Sideband(VSB), AM demodulators, Square Law detector, Envelope detector, Synchronous detectors for SSB Modulation.

Unit II

Angle modulation: FM and PM, Wide band and narrow band FM, FM generation methods:-

Direct and indirect, FM transmitters with frequency stabilization Methods, pre-emphasis and deemphasis, FM/PM discriminators, Noise Triangle.

Unit III

Analog Pulse modulation and demodulation: Pulse amplitude modulation (PAM), pulse width modulation (PWM), Pulse position modulation (PPM), Pulse code modulation (PCM), Differential PCM, Delta Modulation (DM), Adaptive Delta Modulation (ADM) and Demodulation, FDM & TDM.

Unit IV

Radio receivers: TRF receivers, super heterodyne receivers, Automatic Gain Control (AGC), FMradio receivers. Receiver Measurement: Sensitivity, selectivity, image frequency rejection, intermodulation. Communication receiver: Block schematic.

Unit V

Receiver architecture and design basics, receiver architecture overview; quadrature down conversion, Hartley image rejection receiver, Barber Weaver receiver, direct conversion/zero IF receiver, low IF receiver. Receiver technology trends.

Unit VI

Noise types, sources, Signal to Noise Ratio (SNR) for SSB-SC, DSB-SC, AM/FM, Noise figure calculations, Equivalent Noise temperature.

Text Books

1. Electronics Communication Systems; Kennedy, Davis; Tata McGraw-Hill 4th Edition, 1999
2. Analog Communication; P Ramakrishna Rao; Tata McGraw-Hill.1st edition , 2011
3. Communication Receivers: Principles and Design, U.L Rohde, J. C. Whitaker McGraw- Hill. 2nd edition, 1997

Reference Books

1. Electronic Communication System; Roy Blake; Cenage Learning.1st edition, 2012.
2. Electronics Communication; Dennis Roddy, John Coolen; Prentice Hall India.4th edition, 1977
3. Modern Receiver Front-Ends :Systems, Circuits and Integration; Joy Laskar, Babak Matinpour, Sudipto Chakraborty; Wiley.1st edition ,2004
4. Electronic Communication Systems;Wayne Tomasi; Pearson Education, 5th edition ,2008

Syllabus of Semester VI B.E. (Electronics Engineering)

Course Code: ENP309 **Course: Analog Communication Engineering**

L : 0 Hrs., P : 02 Hr., Per week **Total Credits : 02**

Course Objective:

The objective of this practical course is to provide students with

1. Deep understanding of representation of various forms of amplitude/frequency modulation, pulse modulation and digital modulation
2. Knowledge of S/N ratio in analog communication system and demonstrate the effect of noise in the communication system.
3. Understanding of time division multiplexing process.
4. Opportunity to conduct project requiring understanding of practical aspects of communication.

Course Outcomes:

Upon the completion of this course, students will demonstrate the ability to:

1. Analyze and compare various types of AM/ FM systems.
2. Understand and analyze PAM, PWM, PPM and PCM techniques.
3. Describe the superheterodyne principle used in the design of AM and FM receiver.
4. Compare performance of analog and digital modulation systems.
5. Use modern equipments and software design tools to model, simulate and analyze communication systems.

Syllabus for Semester VI, B.E. (Electronics Engineering)

Course Code: ENP310 **Course : Electronic Product Design Lab**

L: 0Hr, T: 0Hr, P: 2Hrs., Per week **Total Credit : 02**

Objectives:

The objective of this course is to make students

1. Aware of Electronic component and their applications.
2. Understand various lab equipments and their usage.
3. Identify, analyze, formulate and solve the engineering problems associated with Electronics Product Design.
4. Communicate effectively with team as well as professional people.
5. Demonstrate commitment and progress in lifelong learning, professional development and leadership.

Outcomes:

The outcomes of this course is to enhance understanding of practical aspect of electronic design such as

1. Apply knowledge of math, science and engineering.
2. Identify, formulate, and solve engineering problems.
3. Design a system or process.
4. Function in multi-disciplinary teams.
5. Use techniques, skills and modern engineering tools.
6. Engage in Life-long learning.

Syllabus of Semester VI B.E. (Electronics Engineering)

Course Code: ENT 311-1 **Course: Consumer Electronics**

L : 03 Hrs., T : 01 Hr., Per week **Total Credits : 07**

This course is designed for VI Semester undergraduate multidisciplinary students.

Course Objective:

The objective of this course is to provide students with

1. Theoretical foundation and knowledge for understanding of different electronic products.
2. Knowledge of modern electronics systems employed for audio ,video and domestic applications.
3. Practical understanding of the basic building blocks of electronic systems.
4. Understanding of different product compliance, safety standards and techniques.
5. System performance requirements for consumer applications.

Course Outcomes:

Upon the completion of this course, students will demonstrate the ability to:

1. Understand electronics engineering concepts used in consumer electronics systems.
2. Identify the need of preventive maintenance in various electronic appliances.
3. Use different product safety, compliance standards and techniques associated with electronic products.
4. Evaluate and analyze different electronic products and systems based on specifications.
5. Manage multi-faceted and multi-disciplinary projects with significant technical considerations using a broad systems perspective.
6. Foster a desire to continue life-long learning.

Syllabus

Audio System : Microphones, loudspeakers baffle and enclosure, Acoustics, mono, stereo, Quad, Amplifying System, Equalizers and Mixers Synthesizers, Commercial Sound, Theater Sound System.

Video Systems and Displays: Monochrome, Color TV standards, TFT, Plasma, HDTV, LCD,LED TV, Direct-To-Home(DTH- Set Top Box), Video Telephone and Video Conferencing.

Domestic & Consumer Appliances: Washing machines, Microwave ovens, Air-conditioners and Refrigerators, Computers office System, Telephone & Mobile Radio System

Power Supplies SMPS/UPS and Preventive Maintenance and others systems such as Remote controls, Bar codes, RFID

Product Compliance: Product safety and liability issues; standards related to electrical safety and fire hazards, EMI/EMC requirements, design techniques for ESD, RF interference and immunity,line current harmonics and mains voltage surge.

Text Books

1. Consumer Electronics; SP Bali; Pearson Education.
2. Consumer Electronics; J.S. Chitode; Technical Publications, Pune.

Syllabus of Semester VI B.E. (Electronics Engineering)

Course Code : ENT311-2 **Course : IC Design Techniques**

L : 3 Hrs., T: 1 Hrs., Per week **Total Credits : 07**

Course Objective:

The objective of this course is to provide students with

1. Knowledge of IC fabrication techniques and methodologies.
2. Ability to understand and design basic digital circuits using HDL
3. Understanding of Programmable Logic Devices like memories, FPGA and CPLD.
4. Understanding of IC performance tradeoffs like Speed ,Power and Area.

Course Outcomes:

Upon the completion of this course, students will demonstrate the ability to:

1. Understand MOS transistor theory and VLSI processing technology.
2. Build and analyze CMOS digital logic like inverters, basic combinational and sequential blocks with small layouts with understanding of backend VLSI design methodology
3. Analyze digital circuit performance parameters.
4. Develop digital circuits using HDL by understanding specifications and analyzing their complexity.
5. Manage multi-faceted and multi-disciplinary projects with significant technical considerations using a broad systems perspective.
6. Foster a desire to continue life-long learning.

Syllabus

Introduction to IC design flow; System specification to final packaging. IC design methodologies: Full custom and semi- custom design. MOS transistor, CMOS inverter, static and dynamic logic circuits, factors for optimization. IC fabrication technology: Bipolar and MOS processing steps and important process parameters. Hardware description language, behavioral modeling, simulation and testing, Computer aided design. Memories and Programmable Logic Devices: ROM, PROM, EPROM, E2PROM, Static RAM and dynamic RAM, PLA and PAL, FPGA, CPLD.

Text Books

1. Principles of CMOS VLSI Design; N. Weste, K. Eshranghian; Addison Wesley.
2. Digital Integrated Circuits: A Design Perspective; J. Rabaey ; Prentice Hall India.
3. VHDL/ Verilog Primer; J. Bhasker; Pearson.
4. CMOS Digital Integrated Circuits Analysis & Design; Sung Mo Kang, Yusuf Leblebici; McGraw-Hill.
5. VLSI Design and EDA Tools; Angsuman Sarkar, Swapnadip De; Scitech Publication.

Syllabus of Semester VI B.E. (Electronics Engineering)

Course Code: ENT 311-3 **Course: Arduino Playground**

L : 03 Hrs., T : 01 Hr., Per week **Total Credits : 07**

Course Objective:

The objective of this course is to provide students with

1. Familiarization of sketches, libraries and examples inside the Arduino Development Environment.
2. Understanding of sensors for measurement of various physical parameters.
3. Knowledge of communication protocols for wired and wireless communication.

Course Outcomes:

Upon the completion of this course, students will able to demonstrate the ability to:

1. Create sketches, libraries inside the Arduino Development Environment.
2. Measure various physical parameters using sensors.
3. Implement various communication protocols for wired and wireless communication.

Arduino Playground

Syllabus

Unit I :

Arduino Cram Session

Arduino platform, Prototyping environment, Component overview.

Unit II :

Programming Arduino

The Arduino Development Environment, Creating sketches, including Libraries, using example codes, Arduino Playground, Debugging using the Serial Monitor.

Unit III :

Sensing the world

Sensors, Digital Versus Analog, Connecting Digital and Analog Sensors, Temperature sensors, Humidity sensors, Obstacle sensors, Ultrasonic sensor, Real-Time Clock (RTC), Accelerometer and gyro

Case study : Based on sensor interfacing

Unit IV :

Communicating with the world

Wired and Wireless communication, comunication Protocols, Interfacing Communication Modules.

Case Study : Based on communicating Module.

Unit V :

Making Noise

Introduction, Playing Tones, Playing a Simple Melody, Generating more than one simultaneous tone

Case Study : Based on melody generation

Unit VI :

Robotics

How to control Motors, Types of motors - DC, Servo, Stepper, Motor Drivers, Motor Shields

Case Study : Building a robot

Books :

1. Arduino Cookbook by Michael Margolis, O'Reilly Media, Inc., 1st edition.
2. Arduino for Beginners : Essential Skills Every Maker Needs, John Baichtal, Pearson Education, Inc., 1st edition.
3. Beginning C for Arduino By Jack Purdum (ebook).

Syllabus of Semester VI B.E. (Electronics Engineering)

Course Code : EDP313 — **Course : PCB Design**

L : 0 Hrs., P : 02 Hr., Per week — **Audit Course**

Course Objectives:

1. To train the students in designing and generation of artwork of the PCBS for analog, digital, high frequency and power electronics applications.
2. To train the students for fabrication of different types of PCBs such as SSB,DSB,PTH
3. To train the students in fabrication techniques like photo printing ,screen printing and milling
4. To introduce the students with different standards for PCBs.
5. To give the knowledge of different mechanical and electrical operations required for fabrication the students
6. To give knowledge of chemicals and materials used for the pcb fabrications.
7. To train students fabrication of small series of highly reliable, professional quality PCBs with low investment cost.

Course Outcome:

At the end of this course,

1. The student will demonstrate an ability to design electrical and electronic circuits and conduct experiments, analyze and interpret data.
2. The student will have an appropriate mastery of the techniques, skills and modern tools use for designing PCBs.
3. The student will have an ability to apply creativity in the design of systems, components or processes appropriate to program objectives.
4. The student will be able to work in R&D laboratories in telecommunication and biomedical electronics.
5. The student will have an easy understanding of advance technology such as CMOS VLSI and nanotechnology fabrication techniques.

Syllabus

Layout planning, general rules and parameters, resistance, inductance, conductor spacing, supply and ground conductor considerations, component placing and mounting considerations.

Design rules for Digital Circuits.

Design rules for Analog circuit PCBs.

Design rules for PCBs in high frequency and fast pulse applications.

Design rules for PCBs in power electronic applications.

PCB Technology, Photo printing, basic process for double sided PCBs, photo resists, Screen printing. Etching process, Soldering Techniques, Solder alloys Multilayer PCBs. Design and test considerations.

Text Book :

1. Printed Circuit Boards: Design and Technology ; Bosshart; Tata McGraw-Hill Education, 4th edition.

Reference Books :

1. Printed Circuit Boards; R S Khandpur; McGraw-Hill Education, 1st edition.

VII SEMESTER

Syllabus of Semester VII B.E. (Electronics Engineering)

Course Code : ENT401 | **Course : Digital Communication**

L: 3 Hrs, T: 1 Hr, P: 0 Hrs. Per week | **Total Credits : 07**

Course Objectives:

The objective of this course is to provide students with understanding of

1. Digital communication systems.
2. Source coding techniques
3. The knowledge of waveform coding methods, sub band coding.
4. Base band coding, error correction and detection
5. Insight to PN Sequence

Course Outcomes:

Upon completion of this course, students will demonstrate the ability to:

1. Apply digital communication principles for understanding digital communication systems
2. Use mathematical techniques to describe, analyze and synthesize signals.
3. Apply probability theory for signal detection and decision processes in receiver
4. Understand PN sequence Techniques & basics of wireless communication.

Syllabus

UNIT I

Basic signal processing operations in digital communication, Functional description, Channel classification, Performance Measure; Bandwidth, Information theory, Hartley- Shannon Law, Huffman and L – Z encoding algorithm, Rate distortion theory for optimum quantization, vector quantization

UNIT II

Baseband coding techniques, Error Control Codes - Hamming code, Block Codes, Cyclic codes, Convolutional Codes, Concept of Error Free Communication, Trellis code and viterbi algorithm, Error control coding, Syndrome decoding for block codes.

UNIT III

Classification of line codes –NRZ and RZ types signaling format for Uni- Polar, Polar, bipolar(AMI) and Manchester Coding, HDB and B8ZS signaling, Memory less modulation methods and its Representation -ASK, FSK,PSK, DPSK, QPSK.

UNIT IV

Detection and estimation: Gram-Schmidt orthogonalization procedure, Correlator type, Matched Filter type, Equalizing Filter , Signal and system design for ISI elimination and implementation, Eye Pattern analysis

UNIT V

Synchronization; Detector – Maximum Likelihood Detector, Error Probability, Figure-of-Merit for Digital Detection, Error performance: Coherent and Non-coherent detection systems.

UNIT VI

Study of PN sequence, Properties of PN sequence, Synchronization methods for spread spectrum, introduction to wireless communication

TEXT BOOKS:

1. Digital Communications, Simon Haykin, 3rd Edition, John Wiley, 2006.

REFERENCE BOOKS:

1. Digital Communications, Amitabha Bhattacharya , Tata McGraw Hill, 1st Edition,2006.
2. Fundamentals of Communication Systems, John.G. Proakis , Pearson Education, 1st Edition,2006.
3. Introduction to Digital Communication, Michael. B. Purrsley , Pearson Education, 1st Edition,2006.
4. Digital Communication, 2nd Edition, Bernard Sklar, Pearson Education, 2006
5. Principles of Communication Systems (3rd Edition), Herbert Taub & Donald L Schilling ,Tata McGraw Hill, 2008.
6. Digital and Analog Communication Systems, 6th Edition, Leon W. Couch, Pearson Education, 2001.

Syllabus of Semester VII B.E. (Electronics Engineering)

Course Code : ENT402 **Course : CMOS VLSI Design**

L: 3 Hrs, T: 1 Hr, P: 0 Hrs. Per week **Total Crédits : 07**

Course Objectives:

The objective of this course is to provide students with understanding of

1. Mathematical methods and circuit analysis models in analysis of digital CMOS circuits, including logic components and their interconnect.
2. Moderately sized CMOS circuits that realize specified digital functions.
3. CMOS technology specific layout rules in the placement and routing of CMOS transistors and interconnects and to verify the functionality, timing, power, and parasitic effects using simulation/hand calculation.
4. The characteristics of CMOS circuit construction and the comparison between various CMOS process and emerging nanometer-scale electronic circuit technologies and processes.
5. Elements of Data path and Memory Design.

Course Outcome:

Upon the completion of this course, students will demonstrate the ability to:

1. Understand CMOS technology.
2. Estimate area and power dissipation for Digital CMOS circuits.
3. Design small Layouts.
4. Understand circuit construction and the comparison between various CMOS process and emerging nanometer-scale electronic circuit technologies and processes.
5. Understand elements of Data path and Memory Design.

Syllabus

Unit I :

Overview of VLSI Design Methodology, Design Flow & hierarchy, Introduction to MOS Transistors, Threshold voltage, body effect, MOS device design equations, second order effects, MOS Models-Level-1, Level-2, Level-3.

Unit II :

Static Load MOS Inverters, CMOS Inverter: The Static Behavior, Switching threshold, Noise Margins, The Dynamic Behavior, Power, Energy, and Energy-Delay, the Tri State Inverter, Transmission Gate. CMOS fabrication process flow, N-well, P-well, Twin-tub process flow, Silicon on insulator, Latch-up, Layout design rules (DRC).

Unit III :

Circuit Characterization and Performance Estimation: Introduction, Resistance Estimation Capacitance Estimation, CMOS gate transistor sizing, Driving Large capacitive loads, Scaling of MOS transistors.

Unit IV :

Designing combinational logic gates in CMOS: Complementary CMOS, Ratioed Logic, Pass-Transistor Logic, Dynamic CMOS Design, Dynamic Logic: Basic Principles, Issues in Dynamic Design, Cascading of Dynamic Gates, Domino Logic.

Unit V :

Sequential logic design: Timing Metrics for Sequential Circuits, Classification of Memory Elements, Static Latches and Registers, Dynamic Latches and Registers, Clocking Strategies.

Unit VI :

CMOS Sub System Design: Data Path Operations-Addition/Subtraction, Multiplication, Shifters. Memory elements: SRAM, DRAM.

Text Books :

1. CMOS VLSI Design: A circuits and systems perspective: N. Weste and K. Eshranghian, 2nd edition PHI

Reference Books :

1. Digital Integrated Circuits: A Design Perspective: J. Rabaey, 2nd edition PHI
2. CMOS Digital Integrated Circuits Analysis & Design: S M Kang, Yusuf Lablebici, 3rd edition TMH
3. VLSI Design Technique for Analog and Digital Circuit: Randel Geiger, P Allen, N Strader , 2nd edition TMH
4. Introduction to VLSI System : Carver Mead, Lynn Conway, 1st edition Addison-Wesley
5. MOS Integrated Circuits- Theory, Fabrication, Design and System Applications of MOS LSI: William M. Penny, Lillian Lau, Van Nostrand Reihold Company. 1st edition
6. Basic VLSI Systems and Circuits: Dougles Pucknell and K. Eshraghian 3rd edition , PHI

Syllabus of Semester VII B.E. (Electronics Engineering)

Course Code : ENP402 **Course : CMOS VLSI Design**

L: 0 Hrs, T: 0 Hr, P: 2 Hrs. Per week **Total Crédits : 02**

Objectives:

The objective of this course is to provide students with understanding of

1. Simulation of moderately sized CMOS circuits that realize specified digital functions.
2. Various types of analysis methods available for CMOS circuits using design tools.
3. CMOS technology specific layout of CMOS circuits and to verify the functionality, timing, power, and parasitic effects using SPICE simulation/hand calculation

Outcomes:

Upon completion of this course, students will demonstrate the ability to:

1. Simulate moderately sized CMOS circuits that realize specified digital functions.
2. Do various types of analysis methods available for CMOS circuits using design tools.
3. Draw CMOS technology specific layout of CMOS circuits and to verify the functionality, timing, power, and parasitic effects using SPICE simulation/hand calculation.

Syllabus of Semester VII B.E. (Electronics Engineering)

Course Code : ENT403 **Course : Digital Signal Processing**

L: 3 Hrs, T: 1 Hr, P: 0 Hrs. Per week **Total Crédits : 07**

Course objectives:

The objective of this course is to provide students with understanding of

1. Discrete time signal processing in z domain. Its relationship with other domain and analysis.
2. Representation of discrete time systems in different forms.
3. Concepts of frequency domain analysis using different FFT architectures.
4. Design aspects of FIR and IIR digital filters.
5. Various finite word length effects in discrete time signal processing.

Course Outcome:

Upon the completion of this course, students will demonstrate the ability to:

1. Process the signal in z domain for various discrete time systems.
2. Draw the structures of various discrete time systems in DFI, DFII, cascade and parallel form.
3. Analyze the discrete time systems in frequency domain.
4. Understand the filter design techniques for discrete time, IIR and FIR filter and will be able to determine parameters affecting its response.
5. Analyze the various finite world length effects while rounding and truncating the signal.

Syllabus

UNIT I

Z-transform, Unilateral Z- transform, ROC, properties, analysis of LTI discrete time system using z transform, Relation between Laplace and Z transform, Inverse Z-transform.

UNIT II

Block diagram and signal flow graph representation of linear constant coefficient difference equations, Structures for IIR and FIR systems- DFI, DFII, Cascade and Parallel

UNIT III

Introduction to DTFT, Frequency Domain sampling: DFT, concepts of FFT, Architectures radix 2, radix 4

UNIT IV

FIR filters Design techniques: Fourier series, windowing using: Rectangular, Bartlett, Hanning, Hamming, Blackman, Kaiser, Optimal Frequency sampling

UNIT V

Digital filter concepts, Frequency Response, Design of IIR filter: Impulse invariance transformation, Bilinear Transformation, Design of Butterworth and Chebyshev filters

UNIT VI

Finite word length effects: Quantization by truncation and Rounding, Quantization of Input data and filter coefficients, limit cycles in recursive systems, Introduction to multirate signal processing.

TEXT BOOKS:

1. Digital Signal Processing: Principles, Algorithms & Applications, Proakis & Monalkis, PHI,4th Edition

REFERENCE BOOKS:

1. Digital Signal Processing A Computer based Approach, Mitra S,4th edition Mc-Graw Hill
2. Digital Signal Processing , A Nagoor Kani, 2nd Edition Mc-Graw Hill
3. Discrete Time Signal Processing, Oppenheim & Schafer, 2nd Edition PHI
4. Digital Signal Processing, Cavicchi Thomas J., Wille Publication, 2000

Syllabus of Semester VII B.E. (Electronics Engineering)

Course Code : ENP403 **Course : Digital Signal Processing**

L: 0 Hrs, T: 0 Hr, P: 2 Hrs. Per week **Total Crédits : 02**

Course Objectives:

The objective of this course is to provide students with understanding of

1. Analyzing the signals in time/Frequency domain.
2. Analyzing the stability of discrete time system.
3. Designing FIR and IIR filters.
4. The DSP processor.

Course Outcomes:

Upon the completion of this course, students will demonstrate the ability to:

1. Generate or classify different types of signals in Discrete Time domain
2. Plot and analyze frequency spectrum of a signal.
3. Design and plot response of FIR and IIR filters.
4. Determine the stability of the given system using transfer function.

Syllabus of Semester VII B.E. (Electronics Engineering)

Course Code : ENT404-1 **Course : Electronic System Design**

L: 4 Hrs, T: 0 Hr, P: 0 Hrs. Per week **Total Credits: 08**

Course Objectives:

1. Electronic system design specifications
2. Techniques for analyzing and designing variety of analog circuits like power supplies, amplifiers and oscillators.
3. Design of electronic circuits/systems using discrete components & IC's meeting realistic constraints.

Course Outcomes:

Upon the completion of this course, students will demonstrate the ability to:

1. Interpret the data using data manuals related to the specification of circuit/system
2. Apply knowledge of basic electronics devices in electronic circuit/systems to meet the needs with realistic constraints.

Syllabus

UNIT I

Design aspects of regulators: Linear Design aspects of integrated regulators LM78xx, LM79xx, LM317, LM723, Protection circuits.

UNIT II

Design aspects of Switching regulators, Design of boost type SMPS, Buck Type SMPS, LM78S40 , DC-DC Converters

UNIT III

Power amplifier fundamentals and Classification based on application, Design aspects of Audio Power Amplifiers, Design aspects of class D switching amplifier, Design aspects of integrated power amplifier TBA810, TDA 2005.

UNIT IV

Design fundamentals of sinusoidal oscillators, Performance specification, Design aspects of VCO, PLL-Introduction, Concept of Synchronization, Basic Structure of PLL, Transfer function, PLL Applications.

UNIT V

Architecture of Isolation amplifier, Grounding and shielding, Architecture of DAC and ADC, Design aspects of Data acquisition system.

UNIT VI

Design of active Butterworth filters upto sixth order, Infinite Gain Multiple Feedback filter, Sallen Key filters.

TEXT BOOKS:

1. A Monograph on Electronic Design Principles, N.C. Goyal , R.K. Khetan, Khanna Publications, 5th Edition.

REFERENCE BOOKS:

1. TI - Design considerations for class D audio Power Amplifiers, Application report
2. Texas Instruments Datasheets Catalog
3. TI - Op amps for Everyone, Ron Mancini, Design reference manual.
4. Regulated Power supply Handbook, Texas Instruments.

Syllabus of Semester VII B.E. (Electronics Engineering)

Course Code : ENT404-2 **Course : Wireless Communication**

L: 4 Hrs, T: 0 Hr, P: 0 Hrs. Per week **Total Credits : 08**

Course Objectives:

The objective of this course is to provide students with the understanding of

1. The concept of cellular telephone system.
2. Mobile radio environment, equalization and diversity.
3. Different modulation and different multiple access technologies for mobile communication.
4. Insight to different wireless communication systems

Course Outcomes:

Upon the completion of this course, students will demonstrate the ability to:

1. Understand the concepts of cellular telephone system.
2. Use equalization and diversity techniques to improve the performance of mobile communication systems.
3. Understand the concept of modulation and multiple access techniques for mobile communication.
4. Understand the working of global system for mobile(GSM),GPRS,WCDMA & MIMO.

Syllabus

UNIT I

Cellular concept: Evolution of Mobile radio communication. Cellular telephone system, frequency reuse, channel assignment and handoff strategies, Interference and system capacity, trunking and grade of service, improving capacity in cellular system.

UNIT II

Mobile radio environment: causes of propagation path loss, causes of fading- long term and short term, level crossing rate and average duration of fade, delay spread, and coherence bandwidth.

UNIT III

Modulation techniques for mobile communication: Linear Modulation techniques-QPSK Transmission and detection techniques, Offset QPSK, Π/4 QPSK transmission and detection techniques .GMSK (Gaussian Minimum Shift Keying), QAM, OFDM.

UNIT IV

Equalization & diversity: Fundamentals of equalization, space polarization, frequency and time diversity techniques, Space diversity, polarization diversity, fundamentals of channel coding.

UNIT V

Multiple access techniques: Introduction to Multiple Access, FDMA, TDMA, Spread spectrum multiple access, frequency hopped multiple access (FHMA), code division multiple access (CDMA), Space division multiple access.

UNIT VI

Introduction to Wireless systems: GSM, GPRS, WCDMA, MIMO- service and features, system architecture, radio subsystem, channel types, frame structure.

TEXT BOOKS:

1. Wireless Communication, Principles and Practice; T.S. Rappaport, Pearson Education, 2nd Edition.

REFERENCE BOOK:

1. Wireless and Digital Communications; Modulation and Spectrum Applications Kamilo Feher, PHI, 1st Edition.
2. Mobile Cellular Communications, William C. Y. Lee, Mc Graw Hill, 2nd Edition.
3. Mobile Communication, Jochen Schiller, 2nd Edition, Adsison Wesley, 2nd Edition.
4. GSM, GPRS, and EDGE Performance: Evolution Towards 3G UMTS, Timo Halonen, Javier Romero, Juan, Malero, Wiley, 2nd addition
5. Mobile Communication Design Fundaments, William C.Y. Lee, John Willey & Sons, 2nd Edition
6. Fundamentals of Wireless Communication, David Tse and P.Viswanath, Cambridge University Press, 2005,1st Edition.

Syllabus of Semester VII B.E. (Electronics Engineering)

Course Code : ENT404-3 **Course : Medical Electronics**

L: 4 Hrs, T: 0 Hr, P: 0 Hrs. Per week **Total Credits : 08**

Course Objectives:

The objective of this course is to provide students with the understanding of

1. The physiology of cardiovascular system, respiratory system and nervous system
2. Biomedical sensing and measuring devices.
3. Electrical safety of medical equipments.
4. Latest knowledge of medical assistance/ techniques and therapeutic equipments.
5. Importance of modern methods of imaging techniques.

Course Outcomes:

Upon the completion of this course, students will demonstrate the ability to:

1. Understand the physiology of various systems in human body.
2. Understand application of electronics in Medical field.
3. Identify various sensing devices and their applications in medical field
4. Understand working of bioelectronics systems such as EEG, ECG, MRI etc. and various imagining techniques.

Syllabus

UNIT I

Introduction: Medical Instrumentation, classification of bio-medical Instruments, Scope for Biomedical Engineers.

UNIT II

Physiology and Bio-potential Transducer: Physiology of cardiovascular system, respiratory system, nervous system, Resting and Action Potential, Electrode electrolyte interface, half-cell potential, Electrodes Limb electrodes, floating electrodes, pregelled disposable electrodes, needle and surface electrodes

UNIT III

Cardiovascular Measurements: Blood Flow, Blood Pressure, Blood volume, Cardiac Output and Heart sound measurement. Oxymeter.

UNIT IV

Diagnostic Instruments: EMG, EEG, ECG. Therapeutic Instruments: Pacemaker, Defibrillator and Incubator. Life support systems: Heart Lung Machine, haemodialysers, and ventilators.

UNIT V

Imaging Techniques: X-Ray Generation and X-Ray Machine, CT – Scanning, Ultrasound Imaging, Magnetic Resonance Imaging, Nuclear Medicine (Gamma Camera) and their applications.

UNIT VI

Significance of Electrical Safety: Physiological effects of electrical current, Shock Hazards from electrical equipments and methods of accident prevention.

TEXT BOOKS:

1. Hand book of Biomedical Instrumentation, Khandpur R. S., 2nd, edition, Prentice Hall of India Pvt. Ltd, New Delhi, India, 2003.

REFERENCE BOOKS:

1. Biomedical Instrumentation, Webster J. G., John Wiley and Sons, Hoboken, NJ, 2004.
2. Biomedical Digital Signal Processing, Willis J. Tompkins, Prentice Hall of India, 2nd Print, 2000
3. Principles of Biomedical Instrumentation and Instruments, Richard Aston, 1991.
4. Medical Instrumentation, John G. Webster, John Wiley and Sons, 1999.
5. Biomedical Instrumentation and measurement, Leslie Cromwell, 3rd edition, Prentice Hall of India, New Delhi, 1997.
6. Joseph J. Carr and John M. Brown, "Introduction to Biomedical Equipment Technology", PHI/Pearson Education, 4th edition, 2001.

Syllabus of Semester VII B.E. (Electronics Engineering)

Course Code : ENT405-1 **Course : Power Electronics & Industrial automation**

L: 4 Hrs, T: 0 Hr, P: 0 Hrs. Per week **Total Credits : 08**

Course Objectives:

The objective of this course is to provide students with the understanding of

1. The course shall make students aware about the necessity of different electronic switches, their operation and role in power conversion and conditioning.
2. The course shall prepare the students to carry out different analysis for power electronic converters.
3. The course will give an insight to the students about all the power electronic controllers and their power conversion mechanism.
4. The course shall prepare the students to understand motor drives
5. The course shall prepare the students to understand industrial automation
6. The course shall make students aware of PLC, SCADA

Course Outcomes:

Upon the completion of this course, students will demonstrate the ability to:

1. Draw the symbolic representation for various power electronic switches and sketch their static and dynamic V-I characteristics.
2. Design and draw the control circuit to turn on and turn off the device in controller.
3. Select proper converter for converting the available source to the source required for drive that is driving the load.
4. Carry out analysis of output waveform of inverter and choppers.
5. Understand sensors , it's applications in industrial automation
6. Understand and apply the knowledge of PLC, SCADA for automation.

Syllabus

UNIT- I

Power Electronics devices :Thyristor, Triac, IGBT, Power MOSFET, their characteristics, internal structure, Static and dynamic characteristics of these devices, firing circuits, phase control & Turn off methods, protection scheme including snubber.

UNIT- II

Single phase half control (one quadratic operation, midpoint two pulse, bridge two pulse of resistive, inductive and motor loads. Three-phase midpoint three pulse, midpoint six pulse for resistive, inductive and motor loads.

UNIT- III

Choppers: -Types A, B, C, D,E,, multiphase , one, two, and four quadrant operation of choppers, Commutation methods: voltage, current, load ,SMPS,Introduction to DC drives

UNIT- IV

Single phase bridge inverter, three phase bridge inverter, 120 and 180 degree mode of operation, voltage and frequency control in inverters, different methods of PWM, Introduction to UPS, performance parameters.

UNIT -V

Industrial automations sensors: Temperature Sensor, Flow sensor, liquid level sensor, pressure sensor, Touch screen sensor.

Introduction to AC/DC drives, Stepper Motor Drives, Servo Motor Drives: types of servo motor, closed loop position and speed control with servo motors.

UNIT -VI

History of PLC, PLC architecture, PLC interfacing, PLC programming, ladder diagram, Introduction to SCADA, HMI.

TEXT BOOKS:

1. Modern Power Electronics, Sen P. C. , Wheeler Publishers,1998

REFERENCE BOOKS:

1. Thyristors and their Applications, M. Ramamoorthy, East West Press ,1977
2. Industrial and power electronics, Deodatta Shingare, 1st edition Electrotech Publication Pune
3. Introduction to programmable logic controllers, Gary Dunning ,3rd edition ,Thomson
4. Power Electronics; Singh. M. G., K.B. Khanchandani, Tata McGraw Hill, 2000
5. Modern Power Electronics and AC Drives, Bose. B. K., Pearson education India, Indian Reprint, 2003
6. Power Electronics Circuits Devices and Applications, M.H. Rashid, Prentice Hall 1993, 2nd Edition
7. Programmable Logic Controllers, W. Boltan, Newens Publishers, 3rd Edition.

Syllabus of Semester VII B.E. (Electronics Engineering)

Course Code : ENT405-2 **Course : Optical Communication**

L: 4 Hrs, T: 0 Hr, P: 0 Hrs. Per week **Total Crédits : 08**

Course Objective:

The objective of this course is to provide students with the understanding of

1. The fundamental principles and components of optical communications.
2. Wave propagation in optical fibers.
3. Signal degradation mechanisms.
4. Optical sources and detectors.
5. Introduction to measurements in optical fiber.

Course Outcome:

Upon the completion of this course, students will demonstrate the ability to:

1. Understand light propagation using ray and wave model.
2. Understand various types of dispersions and attenuation in optical media
3. Understand concept of wave propagation in step index, graded index and multi-mode fibers.
4. Understand the working principles of optical sources and detectors.
5. Understand the elements of optical fiber link & optical networks.

Syllabus

UNIT I

Basic optical communication system, Advantages of optical communication system, introduction to vector nature of light , propagation of light in dielectric waveguides, step index and graded index fibers, modes and power flow in fibers.

UNIT II

Composition of Optical fiber cables, fiber joints, splices and connectors, couplers, optical isolators and circulators, Signal degradation in fibers: Attenuation, absorption losses, scattering losses, fiber bend loss. Dispersion: chromatic and intermodal.

UNIT III

Measurement Techniques: OTDR, Eye Diagram., Parameter measurements in Optical fiber: Attenuation, dispersion, Numerical aperture and Refractive Index.

UNIT IV

Optical sources and detectors: LED, LASER, PIN and Avalanche photo detector structures and properties. Sources launching and coupling.

UNIT V

Optical amplifiers: EDFA, Raman amplifier, Wideband optical amplifiers, Receiver structures: low impedance front end, high impedance front end, the transimpedance front end.

UNIT VI

Optical Networks: concepts, optical terminology, optical network node and switching elements, FDDI, SONET/SDH, Recent trends in optical communication.

TEXT BOOKS:

1. Optical fiber communication, principles and practice: John M Senior PH International, 3rd edition 2009

REFERENCE BOOK:

1. Optical communication system: J Gower, 1st edition, prentice Hall of India
2. Optical fiber systems: technology, design, and applications: Charles K. Kao (Tata McGraw Hill) 1984.
   Optical fiber communication: B Keiser, 4th edition, McGraw Hill ,2000

Syllabus of Semester VII B.E. (Electronics Engineering)

Course Code : ENT405-3 **Course : Micro Electromechanical systems**

L: 4 Hrs, T: 0 Hr, P: 0 Hrs. Per week **Total Crédits: 08**

Course Objectives:

The objective of this course is to provide students with the understanding of

1. Standard microfabrication techniques and the issues surrounding them.
2. Major classes, components, and applications of MEMS devices/systems and to demonstrate an understanding of the fundamental principles behind the operation of these devices/systems.
3. Microfabrication techniques and applications to the design and Manufacturing of an MEMS device or a microsystem.
4. Foster interest for further study.

Course Outcomes:

Upon the completion of this course, students will demonstrate the ability to:

1. Understand working principles of currently available microsensors, actuators used in Microsystems.
2. Apply scaling laws that are used extensively in the conceptual design of micro devices and systems.
3. Understand the basic principles and applications of micro-fabrication processes, such as photolithography, ion implantation, diffusion, oxidation, CVD, PVD, and etching.
4. Choose a micromachining technique, such as bulk micromachining and surface micromachining for a specific MEMS fabrication process
5. Consider recent advancements in the field of MEMS and devices.

Syllabus

UNIT I

Introduction to MEMS: Benefits of Miniaturization, Types of MEMS: Optical MEMS, Bio- MEMS, RF- MEMS, Microfludics, Success Stories, Pressure sensor, Accelerometer, Micro-mirror TV Projector.

UNIT II

Microfabrication and Micromachining: Integrated Circuit Processes, Bulk Micromachining, Isotropic Etching and Anisotropic Etching, Wafer Bonding, High Aspect-Ratio Processes (LIGA), MEMS Device fabrication using Bulk Micromachining.

UNIT III

Surface Micromachining: One or two sacrificial layer processes, Surface micromachining requirements, Device fabrication using Surface Micromachining example, Microcantilever fabrication.

UNIT IV

RF MEMS Devices: Capacitor, Inductor, Switches, and antennas, RF MEMS components in communications, space and defense applications.

UNIT V

Physical Micro sensors: Classification of physical sensors, Integrated, Intelligent, or Smart sensors, Sensor Principles and Examples: Thermal sensors, Electrical Sensors, Mechanical Sensors, Chemical and Biosensors.

UNIT VI

Microactuators : Classification of microactuators, Electrostatic, Electromagnetic and Thermal microactuation, Mechanical design of microactuators, Microactuator examples, microvalves, micropumps, micromotors.

TEXT BOOKS:

1. Micro and Smart Systems: Ananthasuresh, G. K., Vinoy, K. J., Gopalakrishnan, S., Bhat, K. N., and Aatre, V. K., Wiley-India, New Delhi, 2010. 1st Edition.
2. RF MEMS and Their Applications: Vijay Varadan, K. J. Vinoy, K. A. Jose, Wiley, 2002, 1st Edition.

REFERENCE BOOKS:

1. Microsensors, MEMS and Smart Devices , Julian W. Gardner , Vijay K. Varadan, Osama O. Awadelkarim, Wiley ,2001 by Edition: 1st Edition.
2. VLSI Technology, Sze S.M., Mc Graw Hill, 2nd Edition.

Syllabus of Semester VII B.E. (Electronics Engineering)

Course Code : ENP406 **Course : Project Phase-I**

L: 0 Hrs, T: 0 Hr, P: 4 Hrs. Per week **Total Credits: 08**

Project Objectives

The objective of this course is

1. To prepare students to synthesize knowledge from various areas of learning.
2. To prepare students to critically and creatively apply knowledge to engineering problems
3. To prepare students to undertake team responsibility
4. To instill self learning ,lifetime learning and prepare for future challenges

Project outcome

Upon the completion of this course, students will demonstrate the ability to:

1. analyze, synthesize and design system to cater real world problems
2. present precise reports, design documentation and demonstrate for engineering activities
3. function effectively as an individual or as a team leader in diverse teams in multidisciplinary fields engage in independent and lifelong learning in context of technological change.

Syllabus of Semester VII B.E. (Electronics Engineering)

Course Code: HUT401 **Course: Technical Communication**

L: 2 Hrs, T: 0 Hr, P: 0 Hrs. Per week **Audit Course**

Course Objectives

1. The course aims at providing the importance and objective of technical communication to engineers, including ethics in writing.
2. It aims to provide an exposure to undergraduate engineers to effectively carryout research and Produce effective research and work place documents.
3. It aims to orient and provide practical exposure to undergraduate engineers in employability skills And public speaking.
4. It aims to give basic exposure to engineers in grammar with specific focus on effective writing.

Course Outcome

1. Engineers understand the importance and objectives of technical communication.
2. Undergraduate engineers understand the role of audience in effective communication.
3. They develop skills to carryout research and produce effective research and workplace document.
4. They develop skills to enhance visual appeal of the documents and learn basic grammar rules / mechanics to bring accuracy in writing.
5. As undergraduate engineers they develop skills that would make them effective communicators in the placement processes.

Syllabus

- **Foundation of Technical Communication:** Defining technical communication, Objectives of technical communication, Process of producing a technical communication product, Audience recognition and involvement.
- **Research and writing strategies** - Preparation of abstract, proposals, research reports, professional reports, articles for journals, papers for conferences, Document design (graphics and visual appeal), Memos, Letters, Grammar rules, Punctuations, Mechanics, Spellings
- **Speaking strategies and employability skills** - Effective professional presentations, Group discussions, Resume making, Interviews

TEXT BOOKS

1. Technical Writing: Process and Product: S. J. Gerson and S. M. Gerson, Pearson Education Inc., (printed in India by Anubha Printers)

REFERENCE BOOKS

1. Basic Communication Skills for Technology: A. J. Rutherfoord, Dorling Kindersley (India) Pvt. Ltd, India (Printed in India by Saurabh Printers Pvt. Ltd).
2. Effective Technical Communication: Rizvi. M. Ashraf, Tata McGraw-Hill Publishing Company Limited, India. Communication Skills: Sanjay Kumar and Pushp Lata, Oxford University Press.
3. Communication Skills : Sanjay Kumar and Pushp lata, Oxford University Press.

VIII SEMESTER

Syllabus of Semester VIII B.E. (Electronics Engineering)

Course Code : ENT407 **Course : Computer Communication Networks**

L: 3 Hrs, T: 1 Hr, P: 0 Hrs. Per week **Total Credits : 07**

Course Objective:

The objective of this course is to provide students with the understanding of

1. The concepts of networking, LAN, MAN structure, IEEE 802 protocols.
2. Network architecture i.e. OSI & TCP/IP, packets and addressing.
3. Functional details of protocols related to Physical, data link, network, transmission and application layer.
4. Computer network security concepts.

Course Outcome:

Upon the completion of this course, students will demonstrate the ability to:

1. Understand the basic principles behind internet and networking technologies.
2. Understand protocols and technologies used in computer networking.
3. Understand modern communication trends in computer communication networking

Syllabus

UNIT I

Introduction to Computer Network, types of Network, Concept of layered network architecture: OSI reference model, TCP/IP model, Difference between OSI and TCP/IP model, introduction to circuit, packet and message switching, brief review on various types of transmission medium.

UNIT II

Data link layer design issues, peer to peer protocol, ARQ protocol, sliding window protocol, flow control, error detection and correction, piggy backing, data link control: HDLC, Point to Point Protocol

UNIT III

Media Access Control: multiple access, random access, ALOHA, CSMA, Local Area Network, LAN topologies, FDDI, switches, bridges, hubs, Ethernet, fast Ethernet, gigabyte Ethernet, Wide area network.

UNIT IV

Network layer design issues, routing algorithms, congestion control algorithms, quality of service, internetworking routing techniques, ip addressing, IPV4, IPV6, routing protocols Elements of transport protocol, congestion control TCP, UDP real time transport protocol, DHCP, Socket programming.

UNIT V

Application layer, HTTP, DNS, electronic mail, FTP, SNMP, TELNET, VOIP

UNIT VI

Principles of cryptography, security and cryptography algorithms, authentication, key distribution and certification, symmetric key algorithm, public key algorithm, digital signature, management of public keys, communication security, email security

TEXT BOOKS:

1. Computer Networking: A top down Approach; James F. Kurose , Keith W. Ross; Pearson Education, 5th edition.

REFERENCE BOOK:

1. Computer Networks: A system's approach, Peterson and Davie, Morgan Kauffmann series in Networking, Third edition
2. Data Communications and Networking; Behrouz A. Forouzan, TMH, 4th edition
3. Communication Networks by Leon- Garcia, Indra Widjaja; Tata Mc-graw Hill Publication, 4th edition Computer Networks; Andrew S. Tanenbaum; Pearson Education, 6th edition.

Syllabus of Semester VIII B.E. (Electronics Engineering)

Course Code : ENP407 **Course : Communication & Networking Lab**

L: 0 Hrs, T: 0 Hr, P: 2 Hrs. Per week **Total Credits : 02**

Objectives:

The objective of this course is to provide students with understanding of

1. Various physical equipments used for networking
2. Various types of protocols working on various layers of OSI reference model
3. Connecting computers in Local Area Network

Outcomes:

Upon completion of this course, students will demonstrate the ability to:

1. Demonstrate various cables and connectors used for networking
2. Establish peer to peer computers as well as Local Area Network connectivity
   Effectively use available networking tools in Computer Communication Network

Syllabus of Semester VIII B.E. (Electronics Engineering)

Course Code : ENT408 **Course : Advanced Processors & Embedded Systems**

L: 4 Hrs, T: 1 Hr, P: 0Hrs. Per week **Total Credits : 09**

Course Objectives:

The objective of this course is to provide students with understanding of

1. Microcontroller ARM, its organization and architecture.
2. Assembly language instructions as well as interfacing peripherals
3. Real Time Operating System and its concept.
4. Familiarization of µ COS/II RTOS/Linux.

Course Outcomes:

Upon the completion of this course, students will demonstrate the ability to:

1. Understand the architecture and organization of ARM microcontroller and its programming
2. Acquire the knowledge, techniques and skill to integrate microcontroller hardware and software
3. Understand the concept of real time operating system architecture.
4. Interface microcontroller based system to real world.

Syllabus

UNIT I

ARM Architecture: Processor modes, Register organization, Exceptions and its handling, Pipelining, ARM Processor Families.

UNIT II

AMBA Bus: APB,AHB, ASB; ARM7TDMI and THUMB instruction sets, Assembly Language Programming

UNIT III

ARM7TDMI Core microcontroller like LPC2148, programming of internal peripherals ADC, RTC, DAC, UART, I2C,SPI and external I/O interfacing.

UNIT IV

Introduction to embedded systems, Embedded System Design Constraints, Types of Embedded System, Embedded Software Architectures, Scheduling Algorithms

UNIT V

RTOS Concepts-Critical section, Shared Resources, Context Switching, Pre-emptive and non pre-emptive Schedulers, Priority Inversion, Mutual exclusion, Synchronization, Inter task communication mechanisms, Interrupt Latency

UNIT VI

Introduction to μCOS-II-Kernel/ linux kernel.

TEXT BOOKS:

1. ARM System Developer's Guide: Designing and Optimizing System Software, A. Sloss, D. Symes, C. Wright, Morgan Kaufman Publication, 1st Edition.

REFERENCE BOOKS:

1. ARM Assembly Language: Fundamentals and Techniques by William Hohl, CRC Press, 2nd Edition.
2. ARM Microcontroller Interfacing: Hardware and Software, Warwick A. Smith, Elektor Electronics Publishing, 5th edition.
3. ARM System-on-Chip Architecture, S. Furber, A. Wesley, 2nd Edition.
4. An Embedded Software Primer By David E. Simon Pearson Education, 1st Edition.
5. MicroC/OS-II The Real Time Kernel, Jean Labrosse,CMPBooks, 2nd Edition.

Syllabus of Semester VIII B.E. (Electronics Engineering)

Course Code : ENP408 **Course : Advanced Processors & Embedded Systems Lab**

L: 0 Hrs, T: 0 Hr, P: 2 Hrs. Per week **Total Credits : 02**

Course Objective

The objective of this course is to provide students with understanding of

1. ARM Processor Architecture.
2. The programming of ARM Processor.
3. The interface Internal as well as External peripheral with LPC 2148.
4. The skills, techniques using EDA tool for designing embedded systems for real life application.

Course Outcome:

Upon the completion of this course, students will demonstrate the ability to:

1. Develop skill of programming for ARM Processors.
2. Design ARM Microcontroller Embedded Systems.
3. Realize Embedded based system to solve engineering problem.

Syllabus of Semester VIII B.E. (Electronics Engineering)

Course Code : ENT409-1 **Course : Advanced Digital Signal Processing**

L: 4 Hrs, T: 0 Hr, P: 0 Hrs. Per week **Total Credits : 08**

Course objective:

The objective of this course is to provide students with understanding of

1. The concepts of multi rate signal processing, decimation and interpolation.
2. Design aspects of multi rate FIR Filters.
3. Fundamentals of digital filter banks.
4. Various transform techniques.
5. Various Digital signal processor architectures.
6. Techniques of numerical strength reduction using various algorithms

Course Outcome:

Upon the completion of this course, students will demonstrate the ability to:

1. Analyze the Decimation and interpolation effects in multi rate signal processing.
2. Design and analyze the poly phase filter structure.
3. Implement various digital filter bank structures.
4. Convert the signal in different domain using various transform.
5. Differentiate the fixed and floating point architectures of digital signal processors.
6. Reduce the numerical strength of convolution using various algorithms

Syllabus

UNIT I

Multi rate Signal Processing, Sampling rate conversion, Decimation, Interpolation, sampling rate conversion by rational factor.

UNIT II

Design and Implementation of sampling rate conversion: Direct form and poly phase filter structure, interchanging down sampler and up sampler

UNIT III

Filter bank implementation, Polyphase structures of uniform filter banks, Two-channel Quadrature Mirror Filter bank, M-channel Quadrature Mirror Filter bank

UNIT IV

Discrete cosine transform, Walsh transform, Hadamard transform, Haar transform, Discrete wavelet transform, Multiresolution analysis and signal representation by wavelet method.

UNIT V

Digital signal processing architectures: Harvard, pipelining, Hardware multiplier accumulator, Special instructions, Extended parallelism, SIMD, VLIW and static superscalar processing, fixed point and floating point, Processor Selection, Special purpose DSP Hardware.

UNIT VI

Fast convolution: concepts of numerical strength reduction, Cook-Toom algorithm, Winograd algorithm, integrated convolution, cyclic convolution.

TEXT BOOKS:

1. Digital Signal Processing: Principles, Algorithms & Applications, Proakis & Monalkis, PHI,4th Edition, 2007

REFERENCE BOOKS:

1. Discrete Time Signal Processing, Oppenheim & Schafer, 2nd edition ,PHI
2. Digital Signal Processing, Thomas J. Cavicchi, Publisher: John Wiley & Sons (30 November 1999)
3. Digital Signal Processing A Practical Approach, E. C. Ifeachor, B. W. Jervis, 2nd Edition, Pearson Education, 2002
4. Digital Signal Processing , A Nagoor Kani, 2nd Edition ,Mc-Graw Hill,2012

Syllabus of Semester VIII B.E. (Electronics Engineering)

Course Code : ENT409-2 **Course : CMOS & RF Design**

L: 4 Hrs, T: 0 Hr, P: 0 Hrs. Per week **Total Crédits: 08**

Course Objectives:

The objective of this course is to provide students with understanding of

1. Complementary metal-oxide-semiconductor field-effect transistor operation and the relationship of process technology to valid models for analysis and design.
2. Analysis, up to and including second-order effects caused by low supply voltages, short channel lengths and modeling deficiencies.
3. Techniques for analyzing and designing a variety of analog circuit such as; amplifiers, oscillators, current sources.
4. Issues encountered in high-frequency circuits, such as impedance matching, realization of passive components and bandwidth enhancement.
5. Designing the active components of radio-frequency systems, including low noise amplifiers, oscillators, mixers and power amplifiers.
6. The effect of individual component's performance on overall radio- frequency transmitter and receiver design and performance.

Course Outcomes:

Upon completion of this course, students should demonstrate the ability to:

1. Use mathematical models for the operation of complementary CMOS transistors in order to perform hand calculations and that predict their behavior in analog and RF circuits/systems.
2. Develop an understanding of design approaches suitable for individual components and then learn to relate these results to overall system performance to realize specific objectives while trading off conflicting requirements.
3. Understand and analyze various analog/RF performance parameters.

Syllabus

UNIT I

Introduction to analog VLSI and mixed signal issues in CMOS technologies.MOS Models, Basic Building Blocks for IC: Switches. Current sources and sinks, Current mirrors, Bandgap references.

UNIT II

Amplifiers: MOS amplifiers-Single stage amplifiers- Common Source Stage with resistive, diode connected, current source, triode load, source degeneration, source follower, Cascode amplifiers.

UNIT III

Differential Amplifier- single ended & differential operation, Qualitative and quantitative analysis, common mode response, Gilbert cell. Amplifier Frequency Response, stability and noise issues in amplifier design.

UNIT IV

Characteristics of passive components for RF circuits. Passive RLC networks, Impedance transformation, S-parameters. The Smith Chart and its applications.

UNIT V

Low Noise Amplifier design, LNA topologies. Linearity and large-signal performance.

UNIT VI

RF Power amplifiers: General properties. Class A, B, AB, C, D, E and F amplifiers. Modulation of power amplifiers.Analog communication circuits: Mixers, oscillators, Transceiver Architecture and Performance Specification

TEXT BOOKS:

1. Design of Analog CMOS Integrated circuits : B Razavi, Tata Mcgrw Hill, fourteenth reprint 2008

REFERENCE BOOKS:

1. CMOS Circuit Design, Layout and simulation: J. Baker, D.E. Boyce., IEEE press.3rd edition 2010
2. Analysis And Design Of Analog ICs 5th ed.: Paul, Grey, and R Mayer, J Willy and Sons.
3. The Design of CMOS Radio Frequency Integrated Circuits: Thomas H. Lee- Cambridge University Press. 2nd edition 2004
4. RF Microelectronics, B Razavi, Tata Mcgrw Hill 2nd edition 2011

Syllabus of Semester VIII B.E. (Electronics Engineering)

Course Code : ENT409-3 **Course : Switching Theory & Finite Automata**

L: 4 Hrs, T: 0 Hr, P: 0 Hrs. Per week **Total Crédits: 08**

Course Objectives:

The objective of this course is to provide students with the understanding of

1. Mathematical background related to switching algebra, set theory and Boolean algebra and K-map for circuit reduction.
2. Concept of threshold logic and fault diagnosis of logic circuits.
3. Design of Finite State Machines.
4. Design of asynchronous circuits.

Course Outcomes:

Upon the completion of this course, students will demonstrate the ability to:

1. Design combinational logic circuits using advanced minimization techniques.
2. Analyze fault detection and diagnosis in combinational and sequential circuits.
3. Design and optimize Mealy and Moore FSM
4. Understand the basics of asynchronous circuit design.

Syllabus

UNIT I

Switching Algebra and function Boolean algebra, Minimization of Boolean functions using Tabulation Method, and implementation with PAL, PLA Functional Decomposition, and symmetric functions.

UNIT II

Reliable Designs and fault Diagnosis, Hazards, Fault Detection in combinational circuits, Fault location experiments, Fault Detection by Boolean Differences & Path sensitizing method, Fault tolerant Design.

UNIT III

Threshold logic, threshold elements, synthesis of threshold networks, capabilities and limitations of threshold element, Unate function, cascading of threshold elements.

UNIT IV

Finite state Machines- Mealy and Moore synchronous sequential circuits, Design, Capabilities, Minimization and Transformation of sequential Machine, Case study of processor design.

UNIT V

Asynchronous Sequential circuits: Advantages of Asynchronous circuits over synchronous, fundamental mode, pulse mode, primitive flow table, synthesis, state assignment in Asynchronous Sequential circuits, analysis of essential hazards with the primitive flow table, Incompletely specified machines.

UNIT VI

Homing sequence, Synchronizing sequence, Adaptive Distinguishing experiment.Memory, Definiteness and losslessness of finite automata: Memory span w.r.t Input output sequences, Information lossless machine.

TEXT BOOKS:

1. Switching & Finite Automata Theory- ZVI Kohavi , Tata Mc Graw Hill 2nd Edition.

REFERENCE BOOKS:

1. Switching theory and Logic design, D.A.Godse and A.P.Godse, Technical publications pune, 1st edition.
2. Logical design of switching circuits, Douglas Lewin, American Elsevier, 2nd edition, ELBS & Nelson publisher.
3. Switching Theory and logic Design– A.Anand Kumar, PHI 6th Edition.

Syllabus of Semester VIII B.E. (Electronics Engineering)

Course Code : ENT410-1 **Course : Design for Testability**

L: 4 Hrs, T: 0 Hr, P: 0 Hrs. Per week **Total Crédits: 08**

Course Objectives:

The objective of this course is to provide students with understanding of

1. VLSI design verification and testing issues.
2. Test economy of today's modern designs.
3. Modeling & simulating faults in a digital system design
4. Generation of test patterns for faults in a system and how to design a system for testability.

Course Outcomes:

Upon the completion of this course, students will demonstrate the ability to:

1. Develop an understanding of VLSI design verification and testing issues.
2. Learn test economy of today's modern designs.
3. Model & simulate faults in a digital system design
4. Generate test patterns for faults in a system and how to design a system for testability.

Syllabus

UNIT I

Fundamentals of VLSI testing, Test economics and product quality, Yield, Fault modeling, Functional Versus Structural Testing, Levels of Fault Models, Single Stuck-at Fault, Fault Equivalence, Fault Collapsing, Fault Dominance and Checkpoint Theorem.

UNIT II

Logic and fault simulation, Algorithms for Fault Simulation, Serial Fault Simulation, Parallel Fault Simulation, Deductive Fault Simulation, Concurrent Fault Simulation, Roth's TEST-DETECT Algorithm, Testability measures, SCOAP Controllability and Observability, Combinational Circuit Example.

UNIT III

Combinational Circuit Test Generation, Significant Combinational ATPG Algorithms, D-Calculus and D-Algorithm (Roth), PODEM (Goel), FAN (Fujiwara and Shimino), Test Compaction.

UNIT IV

Design for testability, digital dft and scan design, Ad-Hoc DFT Methods, Scan Design, Partial-Scan Design.

UNIT V

Built-in self-test, Random Logic BIST, Definitions, BIST Process, BIST Pattern Generation, BIST Response Compaction, Built-in Logic Block Observers Boundary scan standard, TAP Controller and Port.

UNIT VI

Test automation, Memory testing, IDDQ testing, MCM Testing.

TEXT BOOKS:

1. Essentials of Electronic Testing for Digital, Memory and Mixed-Signal VLSI Circuits: M. Bushnell and V. D. Agrawal, Kluwer Academic Publishers, 1st edition 2000.

REFERENCE BOOKS:

1. Introduction to Formal Hardware Verification: T.Kropf, Springer Verlag, 1st 2000.
2. System-on-a-Chip Verification-Methodology and Techniques: P. Rashinkar, Paterson and L. Singh, Kluwer Academic Publishers, 1st edition 2001.
3. Digital Systems Testing and Testable Design: M. Abramovici, M. A. Breuer and A. D. Friedman, IEEE Press, 1990.

Syllabus of Semester VIII B.E. (Electronics Engineering)

Course Code : ENT410-2 **Course : Mechatronics**

L: 4 Hrs, T: 0 Hr, P: 0 Hrs. Per week **Total Crédits: 08**

Course Objectives:

The objective of this course is to provide students with understanding of

1. Design, analyze, and test "intelligent" products and processes that incorporate appropriate computing tools, sensors, and actuators.
2. Efficient work in multidisciplinary teams.
3. Practice professional and ethical responsibility and be aware of the impact of their designs on human-kind and the environment.
4. Apply mechanical engineering and electrical engineering knowledge and skills to problems and challenges in the areas of mechatronic engineering.
5. Integrate and use systems or devices incorporating modern microelectronics, information technologies and modern engineering tools for product design, development and manufacturing.

Course Outcomes

Upon the completion of this course, students will demonstrate the ability to:

1. Employ the knowledge of mathematics, science, and engineering.
2. Design and conduct experiments to evaluate the performance of a mechatronics system or component with respect to specifications, as well as to analyze and interpret data.
3. Design mechatronics component, system or process to meet desired needs.
4. Demonstrate knowledge of statics, dynamics and solid mechanics relevant to Mechatronics.

Syllabus

UNIT-I

Introduction: Mechatronics key elements, design processes and issues, Modeling and simulation of physical system, electrical system, Mechanical translation- rotation system, electromechanical coupling

UNIT-II

Sensor and transducer: Introduction to sensor and transducer, sensor for motion, position measurement, force, torque, tactile sensor and flow sensor, temperature sensing device, ultrasonic sensor, range sensor, Load Cell, Hall effect transducer, Accelerometer, Gyroscope, Inclinometer, Transducer signal conditioning and device for data conversion.

UNIT-III

Actuating device: Direct current motor, Motor driver and speed control, permanent magnet stepper motor, Power computations and criteria for selection of actuator, piezoelectric actuators. Magneto-strictive actuator, fluid power actuation, Pneumatic actuation, fluid power design element

UNIT-IV

Need of industrial automation, Basic Components of Automation, Hardware & Architecture of PLC, Programming Language of a PLC, ladder logic programming, Introduction to SCADA , SCADA Functional requirements and Components, General features, Functions and Benefits , Configurations and Applications of SCADA

UNIT-V

Closed loop controllers: Continuous and discrete process, control modes, two step mode, proportion mode, derivative control, integral control, PID controller, control system performance,

UNIT-VI

Automotive Electronics: Wire control , Controller Area Network,Electronic Fuel Injection, Collision avoidance systems, Braking (anti-lock brakes), Safety systems,Security systems

Case studies in mechatronics system design

TEXT BOOKS:

1. Devdas Shetty and Richard A. Kolk, Mechatronics System Design, CENGAGE Learning, Second Edition, Indian reprint, 2012

REFERENCE BOOKS:

1. W. Bolton, Mechatronics, Pearson Education Asia, Third Indian reprint 2001
2. David G. Alciatore and Michael B.Hisland, Introduction to Mechatronics and measurement Systems, Tata McGraw hill, Third Edition, 2007
3. NitaigourMahalik, Mechatronics, Principles, Concepts and application, McGraw Hill Publication, Indian seventeenth reprint 2014.

Syllabus of Semester VIII B.E. (Electronics Engineering)

Course Code : ENT410-3 **Course : Digital Image Processing**

L: 4 Hrs, T: 0 Hr, P: 0 Hrs. Per week **Total Crédits: 08**

Course Objective:

The objective of this course is to provide students with the understanding of

1. Basic theory and algorithms used in Digital Image Processing.
2. Techniques for image enhancement, compression and segmentation.
3. Current technologies and issues that are specific to Digital Image Processing.

Course Outcome:

Upon the completion of this course, students will demonstrate the ability to:

1. Apply knowledge of basic theory and algorithms for processing different images.
2. Design, analyze and interpret the processed image.
3. Understand digital image processing fundamentals: Enhancement and restoration, encoding, segmentation, feature detection.
4. Apply image processing techniques in both the spatial and frequency (Fourier) domains.

Syllabus

UNIT I

Monochrome image representation and processing system (block diagram), Basic relationship between pixels, Distance measure, Arithmetic and logical operation, Application of image processing

UNIT II

Image Transforms: DFT, FFT, Other separable image transforms- DCT, Walsh Transform, Haar Transform, DST, Hadmard, KL, Wavelet Transform:CWT,DWT

UNIT III

Image Enhancement in spatial domain: Basic gray level transformations, Histogram Processing, Enhancement using Arithmetic/ Logic operations, spatial filtering, smoothing and sharpening filters, Image Enhancement in Frequency domain

UNIT IV

Image Compression: fundamentals, image compression models, information theory, image compression standards: JPEG and MPEG.

UNIT V

Image segmentation: detection of discontinuities, edge and boundary detection, thresholding, region based segmentation

UNIT VI

Color image processing, fundamentals, color model, boundary & regional descriptor, Introduction to video signal processing.

TEXT BOOKS:

1. Digital Image Processing, R. C. Gonzalez & R. E. Woods, Pearson Education, 2nd Edition

REFERENCE BOOKS:

1. Fundamentals of Digital Image Processing, A. K. Jain, 1st edition PHI
2. Digital Image Processing, Jayaraman, S. Esakkirajan, T. Veerakumar, Tata McGraw-Hill Education, 1st edition.

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Course Code : ENP411 **Course : Project phase-II**

L: 0 Hrs, T: 0 Hr, P: 4 Hrs. Per week **Total Crédits: 08**

Project Objectives

The objective of this course is

1. To prepare students to synthesize knowledge from various areas of learning.
2. To prepare students to critically and creatively apply knowledge to engineering problems
3. To prepare students to undertake team responsibility
4. To instill self learning , lifetime learning and prepare for future challenges

Project outcome

Upon the completion of this course, students will demonstrate the ability to:

1. analyze, synthesize and design system to cater real world problems
2. present precise reports, design documentation and demonstrate for engineering activities
3. function effectively as an individual or as a team leader in diverse teams in multidisciplinary fields engage in independent and lifelong learning in context of technological change

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Course Code: EDT 413 **Course : Industrial Design & Reliability of Electronic Equipments**

L: 2 Hrs, T: 0 Hr., P: 00 Hr Per week **Audit Course**

Course objectives

The objective of this course is to provide students with the concept of:

1. Industrial Design process for electronic equipments.
2. Electronic Product designs methodology.
3. Ergonomics & aesthetics in product design.
4. Reliability and quality of electronic product
5. EMI/EMC in product design.

Course outcomes

After completion of this course, students will demonstrate the ability to understand the:

1. Concept of electronic product design with respect to ergonomics and aesthetics.
2. Concept of visual communication techniques in product design.
3. Process of value analysis of existing product.
4. Concept of calculation of reliability of electronic product.
5. Need of EMI/EMC in product design.

Syllabus:

Introduction to industrial design, Role of industrial design in the domain of electronic industry, Generic product development process, ID process, tools and methods. Electronic product design and development Methodology. Ergonomics and Aesthetics in product design, Product prototypes. Product innovations.

Introduction to the concept of reliability, Reliability modeling, Reliability improvement techniques. Electromagnetic Compatibility, Designing for Electromagnetic Compatibility. EMC regulations.

Text Books:

1. Carl T. Ulrich, Steven. D. Eppinger," "Product Design and Development", McGraw Hill Fifth Edition
2. Srinath L.S, "Concept in Reliability" By East West Press, Fourth Edition