NIELIT Aurangabad

B.Tech : Electronics Engineering (Electronic System Engineering)

B. Tech 1st Year Course Syllabus

Subject Code	Subject	Theory	Practical
1B1	Engineering Physics	3	1
1B2	Engineering Drawing1	3	1
1B3L	Engineering Mathematics-I	3	0
1B4L	Electrical Science	3	0
1B5L	Communicative English	3	0
1B6P	Professional Ethics	0	3
1B7P	WorkShop	0	2
		15	7
2B1	Digital Electronic Circuits	3	1
2B2	Linear Electrical Networks	3	1
2B3	Analog Electronic Circuits	3	1
2B4L	Engineering Mathematics-II	3	0
2B5L	Engineering Chemistry	3	0
2B6L	Engineering Mechanics	3	0
2B7P	Engineering drawing II	0	2
		18	5

1B1: Engineering Physics **(3 Hours/week)**

Motion of electron in electric and magnetic field, Millikan's oil drop method for determination of electronic charge, e/m by Thomson's method, electron refraction, Principle of electrostatic and magneto static focusing, Electron microscope-principle, construction, working and applications, construction and working of cathode ray tube, cathode ray oscilloscope and it's applications, positive rays-production and properties, q/m by Thomson's parabola method, separation of isotopes by Bain bridge mass spectrograph.

INTERFERENCE-Interference in thin film of uniform thickness and non uniform thickness, Newton's rings, Michel son's interferometer, Fabry-perot interferometer, Interference filters, Engineering applications of interference I)To determine refractive index of liquid 2)Testing of optical flatness 3)Testing of mechanical gauges

DIFFRACTION-Fresnel and Fraunhofer diffraction, Fraunhofer diffraction at circular aperture, plane diffraction grating, determination of wavelength using plane diffraction grating, dispersive power of grating, resolving power of grating.

POLARISATION-optical activity, specific rotation, half wave plate, quarter wave plate, Lorentz half shade polarimeter, photo elasticity

Semiconductors-Position of fermi level in intrinsic and extrinsic semiconductor, conductivity in semiconductor, Hall effect, Hall coefficient, band structure of pn junction under forward bias and reverse bias, junction transistor, operation of PNP and NPN transistor, characteristics of transistor

Magnetic materials-Diamagnetic materials, Paramagnetic materials, Ferromagnetic materials, origin of magnetization, Types of magnetic materials-hard materials and soft materials.

Dielectrics-Introduction, dielectric constant, polarization, induced dipoles, permanent dipoles, polar and non polar dielectrics, polarization-an atomic view, types of polarization.

X-Ray- Production of x rays, origin of x rays-continuous spectra and characteristic spectrum-ray diffraction and Laue spots, Bragg,s law, Bragg's x ray spectrometer, applications of x rays, crystallography by powder method.

LASER- spontaneous and stimulated emission, population inversion, Ruby laser, Helium Neon gas laser, engineering applications of laser.

Fiber optics-Concept, fiber materials, structure and classification of optical fiber, Numerical aperture, advantages of optical fiber communication,

Superconductivity- Introduction, critical temperature, critical field, Meissner effect, type –I, type-II superconductor, BCS theory of superconductivity, applications of superconductivity.

Wave and particle duality of radiation, de-Broglie,s hypothesis, Wavelength of matter waves, Electron diffraction, Davisson and Germer experiment, Heidelberg's uncertainty principle, experimental

illustration of uncertainty principle-diffraction by single slit, Schroedinger time dependent and time independent wave equation, physical significance of wave function

Acoustics- Historical background, reverbaration, reverberation time, Absorption coefficient, Sabine formula, acoustical requirement and planning of building,

Ultrasonic-Production, Magnetostriction method and piezo electric method, Applications of ultrasonic wave.

Text Books:

1. Engineering physics-Gaur and Gupta, S.Chand Publication
2. Engineering physics-Avadhanalu and Kshirsagar, S.Chand Publication

Reference Books:

1. Fiber optic Communication-D.C.Agrwal. Wheeler Publication, New Delhi
2. Solid state electronic devices-Streetman, Prentice Hall India , New Delhi
3. Electronic devices and circuits-Allen Mottershade, Prentice Hall India , New Delhi
4. Fiber optic communication-Keiser. Mc Graw Hill Publication
5. A course in Electrical Engineering Materials – S.P.Seth,P.V.Gupta, Dhanpat Rai Publication,New Delhi

Course Outcomes

SEM: I	**Sub Name: - PHYSICS**
1B1 1.1	Interference, Newton's Rings, Fresnel and Fraunhofer diffraction, Plane Diffraction grating
1B1 1.2	Fermi level, Hall Effect ,Band structure of p-n Junction diode, Solar cell
1B1 1.3	Diamagnetic, Paramagnetic, Ferromagnetic. Types of magnetic materials, Properties, Applications,
1B1 1.4	Classification of fibre optics, Numerical aperture, advantages, Population inversion, ruby laser, engineering applications of laser.

CO-PO matrices of courses

SEM: I	**Sub Name: - PHYSICS**											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1B1 1.1	3	3	2	1	-	-	-	-	-	-	-	1
1B1 1.2	3	2	1	-	-	1	-	-	2	-	-	1
1B1 1.3	3	3	1	2	-	-	1	-	-	-	-	1
1B1 1.4	3	3	2	-	-	-	-	-	-	-	-	1
Total	12	11	6	3	0	1	1	-	2	-	-	4
AVG	3	2.75	1.5	1.5		1	1		2			1

CO - PSO Mapping

SEM: I	**Sub Name: - PHYSICS**		
COs	PSO1	PSO2	PSO3
1B1 1.1	-	-	1
1B1 1.2	3	2	1
1B1 1.3	2	1	1
1B1 1.4	-	-	2
Total	5	3	5
AVG	2.5	1.5	1.25

1B1 : Lab – Engineering Physics **(2 Hours/week)**

List of Experiments : **(Any ten)**

Physics

1. e/m by Thomson's method.
2. Determination of radius of curvature of plano- convex lens by Newton's ring.
3. Determination of wavelength by diffraction grating.
4. Resolving power of telescope.
5. Study of CRO (amplitude, frequency, phase measurement).
6. Specific rotation of sugar solution by Laurent's half shade polarimeter.
7. Determination of electronic charge by Millikan's oil drop experiment.
8. Determination of band gap of a semiconductor.
9. Semiconductor diode characteristics.(Ge Si zener LED)
10. Transistor characteristics-CE configuration
11. Study of solar cell characteristics.
12. Study of photocell characteristics.
13. Hall effect and Hall coefficient.
14. Wavelength of laser by diffraction grating.
15. 'h' by photocell.
16. Transistor as an amplifier.

1B2 : Engineering Drawing I **(3 Hours/week)**

Projections of Straight Lines: Projections of points in four quadrants, projections of points in reference plane, line parallel to both the plane, line parallel to one plane and perpendicular to the other, line inclined to one plane and parallel to the other, line inclined to both the reference planes, traces of line, use of traces of line in obtaining projections (all four quadrants should be considered).

Projections of planes: Plane with surface parallel to one plane and perpendicular to other, plane inclined to one plane and perpendicular to other, projections of planes inclined to both the plane.

Projections of Solids: Introduction to solids: prisms, pyramid, cylinder, cone, cube, tetrahedron, sphere, projections of above solids with axis inclined to one plane, projections of above solids with axis inclined to both the planes, projection of composite solids (different arrangement of spheres with above solids).

Orthographic Projections: Orthographic projections of different machine parts, sectional orthographic projections.

Isometric Views: Introduction to pictorial views, isometric projections and isometric views (Isometric and non isometric planes).

Text Books

1. Bhatt N. D., Panchal V. M., "Engineering Drawing", Charotar Publishing House
2. Dhabhade M. L., "Engineering Graphics", Vol.-I and Vol.-II, Vision Publications, Pune

Reference Books

1. Mathur, Laxminarayan, "Elements of Engineering Drawing", Jain Publications, New Delhi

1B2 : Lab – Engineering Drawing **(2 Hours/week)**

Teaching Scheme Examination Scheme

Practicals:

Laboratory work shall consist of at least five half imperial drawing sheet containing problems on unit – 1 to unit – 5 of Engineering Drawing theory syllabus.

Term Work

Students have to submit all the drawing sheets duly checked by the course coordinator and bound in the folder. The course coordinator will assess the term work.

Course Outcomes (COs)

SEM: I	Sub Name: - Engineering Drawing
1B2 1.1	Get familiar to use the instruments to solve the engineering problem and draw various type of curves used in engineering.
1B21.2	Understand and Implement Orthographic projections and draw projections of simple drawing entities such as points Lines, and Planes.
1B21.3	Draw projections of different types of regular solids in various positions with respect to principal planes of projection.
1B21.4	Draw Sections of various Solids including Cylinders, cones, prisms and pyramids and draw the developments of these solids and their sections.
1B21.5	Construct Isometric Scale, Isometric Projections and Views and convert 3D views to 2D orthographic views

CO-PO matrices of courses

SEM: I	Sub Name: - Engineering Drawing											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1B2 1.1	2	1	2	2	2	2			2			1
1B21.2	2	2	2	2	2	2			2			1
1B21.3	2	2	2	2	2	2			2			1
1B21.4	2	2	2	2	2	2			2			1
1B21.5	2	2	2	2	2	2			2			1
Avg	2	1.8	2	2	2	2	-	-	2	-	-	1

CO - PSO Mapping

SEM: I	Sub Name: - Engineering Drawing		
COs	PSO1	PSO2	PSO3
COs	PSO1	PSO2	PSO3
1	-	2	-
2	-	2	-
3	-	2	-
4	-	2	-
5	-	2	-
Avg		2	

1B3L: Engineering Mathematics – I (3 Hours/week)

Complex Numbers and its Applications:

Complex numbers, Argand diagrams, De'Moivre's theorem and its applications to find the roots of algebric equations, Hyperbolic and inverse hyperbolic functions, Logarithm of complex numbers, Separation into real and imaginary parts, Applications in Engineering.

Differential Calculus:

Successive differentiation, Leibnitz's theorem, Taylor's series, Maclaurin's series, Expansion of standard functions Indeterminate forms, L'Hospitals rule, Evaluation of units.

Partial Differentiation:

Partial derivatives, Euler's theorem on homogenous functions, Implicit functions, Total derivatives, Change of independent variables, Laplace operator, Jacobians and their applications, Maxima and minima for a function of two variables, Lagrange's method of undetermined multipliers.

Matrices:

Rank of matrix, reduction to normal form, consistency of system of linear equations, Eigen values and eigen vectors, Cayley-Hamilton theorem, Applications to problems in Engineering(translation and rotation of matrix).

Probability

Probability: Binomial Poisson & Normal distribution. Solution of algebric & transcendental equations by Newton's Raphson method. Solution of linear simultaneous equations by Gauss elimination method, auss-Seidal method.

Solid Geometry:

Cartesian, Spherical polar and cylindrical coordinate systems, sphere, cone and cylinder.

Text Books:

1. A Text book of Engineering Mathematics (Vol. I & II) – by P.N. Wartikar and J.N. Wartikar, Pune Vidhyarthi Griha Prakashan, Pune.
2. Higher Engineering Mathematics – by B.S. Grewal, Khanna Publications, New Delhi.

Reference Books:

1. Advanced Engineering Mathematics (7th Edition) – by Erwin Kreyszig, Willey Eastern Ltd., Mumbai.
2. Engineering Mathematics – by H. K. Das, S. Chand & Co., New Delhi.
3. Advanced Engineering Mathematics – by C. R. Wylie, Mc Graw Hill pub., New Delhi.

Course Outcomes

SEM: I	**Sub Name: - Engineering Maths -1**
1B3 : 1	Understanding Complex numbers and complex plane with their applications in engineering areas
1B3 : 2	Able to solve the problems of differentiation of functions of two variables and know about the maximization and minimization of functions of several variables.
1B3 : 3	Apply elementary transformations to reduce the matrix into the echelon form and normal form to determine its rank and interpret the various solutions of system of linear equations and finding Eigen values and eigen vectors,
1B3 : 4	Able to understand probability and various distributions(Continuous and discrete) with their applications
1B3: 5	Able to understand various co-ordinate system with applications in various engineering areas

CO-PO matrices

SEM: I	**Sub Name: - Engineering Maths -1**											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1B3 : 1	3	2	3	2	-	-	-	-	-	-	-	-
1B3 : 2	3	2	2	2	-	-	-	-	-	-	-	-
1B3 : 3	3	2	2	2	-	-	-	-	-	-	-	-
1B3 : 4	3	2	2	2	-	-	-	-	-	-	-	-
1B3: 5	3	2	2	2	-	-	-	-	-	-	-	-
Total	15	10	11	10	-	-	-	-	-	-	-	-
Average	3	2	2.2	2	-	-	-	-	-	-	-	-

CO - PSO Mapping

SEM: I	**Sub Name: - Engineering Maths -1**		
COs	PSO1	PSO2	PSO3
1B3 : 1	-	-	-
1B3 : 2	-	-	-
1B3 : 3	-	-	-
1B3 : 4	-	-	-
1B3: 5	-	-	-
Total	-	-	-

1B4L: Electrical Science **(3 Hours/week)**

DC Circuits: Kirchoff's laws, node voltage and mesh current methods, Delta-star and star-delta conversion, Superposition principle, Thevenin's and Norton's theorems.
RC circuit time constant
Single phase AC Circuits: Complex representation of AC quantities namely voltage, current and impedances, phasor diagram, power factor, power in complex notation, solution of parallel and series-parallel circuits.
Three phase AC Circuits: Three phase EMF generation, star and delta connections, line and phase quantities, solution of three phase circuits, balanced supply voltage and balanced load, phasor diagram, measurement of power in three phase circuits and three phase four wire circuits.

* Magnetic Circuits: B–H curve, self and mutual inductance, coefficients of coupling. Solution of series and parallel magnetic circuits, methods to reduce hysteresis and eddy current losses
* Transformers: Constructional details and type of transformer, principle of operation, EMF equation
* Types and Applications of AC, DC Motors

Electrical Measuring Instruments: PMMC instruments, Moving iron ammeters and voltmeters, multimeters, dynamometer type wattmeter, single phase energy meter,
Electric Wiring installations: Different types of insulated wires, types of wiring systems, use of, MCBs, ELCBs, etc. in wiring installations, concept of earthing, energy bill calculations, study of different lamps

Reference Books:
1) Fundamentals of Electrical Engineering ,Leonard Bobrow, Oxford University press
2) Principles of Electrical Engineering by Vincent Del Toro, Printice Hall.
3) Basic Electrical Engineering by D.P. Kothari, I.J Nagrath, TMH
4) Introduction to Electrical Engineering by M.S.Naidu, S.Kamakshaiah
5) Millman & Halkias, Integrated Electronics, Tata McGraw -Hill, 1998.
6) Mano M.M., Digital Design, Prentice Hall of India, 2002.
7) Roth C.H., Fundamentals of Logic Design, Jaico Publishers, 2002.
8) Electrical and Electronics Technology, 8th Edition, Pearson Education, Edward Hughes,

Course Outcomes

SEM: I	Sub Name: - Electrical Science
1B4L 4.1	Understand the basic parameters related to DC and AC circuit
1B4L 4.2	Understanding electrical principle, laws, and working of electrical machines.
1B4L 4.3	Understanding different theorems to analyse DC and AC circuits.
1B4L 4.4	Relate phase and line electrical quantities in polyphase networks, demonstrate the operation of single phase transformer and calculate efficiency and regulation at different loading conditions
1B4L 4.5	Accurate measurement of voltage, current, power and impedance of any circuit

CO-PO matrices

SEM: I	Sub Name: - Electrical Science											
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1B4L 4.1	3	2	-	-	1	2	-	-	-1	-	1	2
1B4L 4.2	3	-	-	-		-	-1	-	-	2	1	2
1B4L 4.3	3	3	1	1	1	-	-	-1	-		1	2
1B4L 4.4	3	3	2	2		-	-	-2		-		1
1B4L 4.5	3	2	2	2	2	-	-	-		2	1	-
Total	15	10	5	5	4	-	-1	-3		-	4	7
Average	3	2.5	1.67	1.67	1.33	2	1	1.5	1	2	1	2.75

CO - PSO Mapping

SEM: I	Sub Name: - Electrical Science		
Cos	PSO1	PSO2	PSO3
1B4L 4.1	2	2	-
1B4L 4.2	2	2	-
1B4L 4.3	2	2	-
1B4L 4.4	2	2	-
1B4L 4.5	2	2	-
Total	10	10	-
Average	2	2	-

1B5L : Communicative English (3 Hours/week)

Communicative Grammar :
Part A: Spotting the errors pertaining to nouns, pronouns, adjective and adverbs; Concord - grammatical concord, notional concord and the principle of proximity between subject and verb.
Part B : Changing the voice : from Active to Passive and Passive to Active.
Lexis: Idioms and phrases; Words often confused; One-Word Substitutes; Formation of words (suffixes, prefixes and derivatives);
Oral Communication :
Part-A: Introduction to principal components of spoken English – Transcription, Word-accent, Intonation, Weak forms in English
Part-B: Developing listening and speaking skills through various activities, such as (a) role play activities, (b) Practising short dialogues (c) Group discussion (d) Debates (e) Speeches (f) Listening to news bulletins (g) Viewing and reviewing T.V. programmes etc.
Written Communication: Developing reading and writing skills through such tasks/activities as developing outlines, key expressions, situations, slogan writing and theme building exercises, dialogue writing, interpreting pictures/cartoons.
(For Internal Evaluation Only):
Book Review– Herein the students will be required to read and submit a review of a book (Literary or non-literary) of their own choice. This will be followed by a presentation of the same in the class
Technical Writing:
(a) Business Letters, Format of Business letters and Business letter writing
(b) E-mail writing
(c) Reports, Types of Reports and Format of Formal Reports
(d) Press Report Writing
SUGGESTED READING:
1. Language in Use (Upper intermediate LeveAl,drian Doff Christopher Jones, Cambridge University Press
2. Common Errors in English, Abul Hashem, Ramesh Publishing House, new Delhi.
3. Objective English , Tata Mc. Graw Hill Publishing Company Ltd., New Delhi.
4. Spoken English for India, R.K. Bansal & J.B. Harrison, Orient Longman, Delhi.
5. The sounds of English, Veena Kumar, Makaav Educational Software, New Delhi.
6. English Phonetics & Phonology , P. Roach, Cambridge University Press, London

Course Outcomes (COs)

SEM: I	**Sub Name: - Communicative English**
1B5L 1.1	Understanding word & its types eg.noun, pronouns, adjective and adverbs etc
1B5L 1.2	Sentence formation and understanding grammar.
1B5L 1.3	Spoken English and its components.
1B5L 1.4	Improving English speaking, writing skills with the help of various medias (newspaper, TV, movies, plays etc.

7.

CO-PO matrices of courses

SEM: I	**Sub Name: - Communicative English**											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1B5L 1.1	-	1	1	-	1	1	1	2	2	3	-	1
1B5L 1.2	-	-	-	-	1	1	2	2	1	3	-	1
1B5L 1.3	-	1	1	1	1	1	1	2	1	1	-	1
1B5L 1.4	1	1	1	1	1	1	1	2	1	2	-	1
Total	1	3	3	2	4	4	5	8	5	9	-	4
Average	1	1	1	1	1	1	1.25	2	1.25	2.25	-	1.00

CO - PSO Mapping

SEM: I	**Sub Name: - Communicative English**		
COs	PSO1	PSO2	PSO3
1B5L1.1	1	1	1
1B5L1.2	1	1	1
1B5L1.3	1	1	2
1B5L1.4	1	1	2
Total	4	4	6
Average	1.00	1.00	1.50

8.

1B6 PROFESSIONAL ETHICS (2 Hours/week)

UNIT I

What is profession? - Engineering and Professionalism - Models of Professionalism - Types of Ethics or Morality.

UNIT II

Engineering Ethics – Variety of moral issues – Responsibility in Engineering - Engineering Standards - The Standard Care --The Positive face of Engineering Ethics - The Negative Face of Engineering Ethics - Blame-Responsibility and Causation types of inquiry moral dilemmas – moral autonomy – The problems of Many Hands – Kohlburg's theory – Gilligan's theory Impediments to Responsible Action

UNIT III

Engineering as social experimentation – Framing the problem – Determining the facts codes of ethics – clarifying Concepts – Application issues – Common Ground –General principles – Utilitarian thinking respect for persons

UNIT IV

Engineer's Responsibility for Safety – Social and Value dimensions of Technology -
Technology Pessimism – The Perils of Technological Optimism – The Promise of Technology – Computer Technology Privacy and Social Policy – Honesty, Integrity & Reliability, Risk, Safety and Liability in Engineering, Risk Benefit Analysis – Collegiality and loyalty.

Recommended Book:

PSR Murthy, "Indian Culture Values and Professional Ethics", BS Publications

Reference Books:

Mike Martin and Roland Schinzinger, "Ethics in Engineering" McGraw Hill

Charles E Harris, Micheal J Rabins, "Engineering Ethics, Cengage Learning

Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers, Oxford University Press

Caroline Whitback Ethics in Engineering Practice and Research, Cambridgs University Press

1B6 PROFESSIONAL ETHICS Practical (2 Hours/week)

Practical based on the subject

Course Outcomes (COs)

SEM: I	Sub Name: - PROFESSIONAL ETHICS
1B6 L1.1	Understanding of Engineering and Professionalism Models of Professionalism Types of Ethics or Morality.
1B6 L1.2	Understanding of Engineering Standards and moral autonomy
1B6 L1.3	Engineering as social experimentation Framing the problem Determining the facts codes of ethics
1B6 L1.4	Understating of methodologies/ debugging process Engineer's Responsibility for Safety Maintenance and risk analysis of system

CO-PO matrices

SEM: I	Sub Name: - PROFESSIONAL ETHICS											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1B6 L1.1	-	-	1	-	1	2	2	2	2	1	-	1
1B6 L1.2	-	-	2	-	1	2	2	2	1	1	-	1
1B6 L1.3	1	1	1	-	1	1	1	2	1	1	-	1
1B6 L1.4	-	1	1	1	1	1	1	2	1	1	1	-
Total	1	2	5	1	4	6	6	8	5	4	1	3
Average	1	1	1.25	1	1	1.5	1.5	2	1.25	1	1	1

CO - PSO Mapping

SEM: I	Sub Name: - PROFESSIONAL ETHICS		
COs	PSO1	PSO2	PSO3
1B6 L1.1	1	1	1
1B6 L1.2	-	1	1
1B6 L1.3	-	1	1
1B6 L1.4	-	1	1
Total	1	4	4
Average	1	1	1

1B7P : Workshop **(4Hours/week)**

Practicals:

The students shall prepare at least one job in each shop namely Plumbing & Tin Smithy, Fitting and Carpentry. The Work Shop Instructor will explain the different tools used in the job. He will demonstrate various operations that can be performed with the tools. The students shall note the progress in the Work Shop diary.

Term Work

The students shall submit a record in the form of file along with the workshop diary at the end of the term. The course coordinator will assess the term work

Course Outcomes

SEM: I	Sub Name: - Workshop
1B7P1.1	Understand and hands on usage of different tools used in the workshop jobs.
1B7P1.2	Make at least one job on y Plumbing & Tin Smithy, Fitting and Carpentry
1B7P1.3	Acquire the knowledge of job works on woekshop
2B6L1.4	Team work in Record keeping of the jobs done in the workshop.

CO-PO matrices

SEM: I	Sub Name: - Workshop											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1B7P1.1	1	-	-	-	-	1	1	1	1	-	-	1
1B7P1.2	2	2	2	-	-	1	2	2	2	1	-	1
1B7P1.3	2	2	2	1	-	2	2	2	2	1	-	2
1B7P1.4	2	2	2	1	1	2	1	2	2	2	1	2
Total	7	6	6	2	1	6	6	7	7	4	1	6
Average	1.75	2	2	1	1	1.5	1.5	1.75	1.75	1.33	1	1.5

CO - PSO Mapping

SEM: I	Sub Name: - Workshop		
COs	PSO1	PSO2	PSO3
1B7P1.1	-	-	1
1B7P1.2	-	-	1
1B7P1.3	-	-	1
1B7P1.4	-	-	1
Total	-	-	4
Average	-	-	1

2B1 : Digital Electronic Circuits **(3 Hours/week)**

Basic wave shaping, switching circuits and technologies:
RC high pass and low pass circuits and their applications, Steady state calculations for RC circuits, Diode switching times and characteristics, Transistor as a switch, Review of Bipolar, MOS and other Switching Technologies

Boolean Algebra and Logic Simplification:
BCD,Octal,Hexadecimal Number systems, Conversions from one to other type, De Morgan's Theorem, 1's compliment 2'compliment of a number, BCD codes, EXCESS-3,Grey code and ASCII codes, Reduction of logic function using Boolean algebra, SOP & POS forms, canonical forms of SOP and POS equation. Karnaugh map up to 4 variables.

Combinational Logic Design:
Code conversion, Half, Full Adders and sub tractor circuits, Binary Serial and Parallel Adder, IC 7483, BCD Adder,Digital Comparator. Multiplexer, Demultiplexer, Encoder, Decoder, Decoder driver & multiplexed Display, other applications. Design of ALU.

Sequential Logic Design:
S-R, clocked S-R,JK and Master-Slave JK flip-flops ,excitation table of flip-flop, Conversions, design of Algorithmic State Machines (ASM)for simple applications, shift registers their types and applications, Counters, Design of ripple and synchronous counters

Logic Families , Interfacing and Semiconductor Memories:
TTL NAND gate, specifications, tri-state TTL, ECL, MOS, CMOS families and their interfacing, MOSFET as switch, CMOS transmission gate, Static & Dynamic RAM cell, ROM, PROM, EPROM, FLASH, Concept of PLA, PAL.

Text Books:
1. A.P. Malvino, Digital Electronics, Mc-Graw Hill
2. W.H. Gothman, Digital Electronics-An introduction to theory and practice, PHI
3. Douglas V. Hall, Digital Circuits and Systems, McGraw Hill
4. Sergio Franco, Design with Op-Amp. & Analog Integrated Circuits,

2B1 : Lab – Digital Electronic Circuits (2 Hours/week)

List of Practicals:

1. Experimental verification of logic gates such as AND, OR, NOT, NAND, NOR, EXOR, EX-NOR
2. Realization of logic operations using NAND /NOR
3. Encoder 8:3, 16:4
4. Decoder 3:8, 4:16
5. Shift Register
6. Study of Flip-flops D, R-S, J-K etc
7. Decade counter/Ring counter
8. Karnaugh Map reduction SOP/POS
9. Synchronous Counter design using J-K Flip –flops
10. Asynchronous counter design using J-K Flip-flops
11. Pulse Train Generator
12. A.L.U. such as 74181
13. Adder/ Subtractor
14. Multiplexer- Demultiplexer

Term work:

Term work will consist of a record of minimum eight experiments performed and assessed, as per the above list by the candidate

Practical:

The practical examination will be of three hours duration. It will consist of one experiment and viva voce based on the syllabus

Course Outcomes (COs)

SEM: II	Sub Name: - Digital Electronics Circuits
2B1P1.1	Understanding the basics of Digital Electronics and different number systems and conversion between them
2B1P1.2	Understanding the design and construction of the basic and universal logic gates.
2B1P1.3	Understanding, studying the Boolean algebra and simplification of Boolean expression using different methods
2B1L1.4	Understanding the study and construction of sequential logic circuits, understanding various designs of flip-flops.
2B1L1.5	Understanding, studying the programmable logic devices shift registers counters and various memory devices.

CO-PO matrices

SEM: VI	Sub Name: - - Digital Electronics Circuits											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
2B1P1.1	3	2	2	1	3	1	-	-	-	-	1	2
2B1P1.2	3	2	2	1	3	1	-	-	-	-	1	2
2B1P1.3	3	2	2	1	3	1	-	-	-	-	1	2
2B1L1.4	3	2	2	1	3	1	-	-	-	-	1	2
2B1L1.5	3	2	2	1	3		-	-	-	-	1	2
Total	15	10	10	5	15	6	-	-	-	-	5	10
Average	3	2	2	1	3	1.5	-	-	-	-	1	2

CO - PSO Mapping

SEM: VI	Sub Name: - - Digital Electronics Circuits		
COs	PSO1	PSO2	PSO3
2B1P1.1	3	3	1
2B1P1.2	3	3	1
2B1P1.3	3	3	1
2B1L1.4	3	3	1
2B1L1.5	3	3	1
Total	15	15	5
Average	3	3	1

2B2: Linear Electrical Networks **(3 Hours/week)**

A.C. circuits and theorems: Mesh and nodal analysis, Thevenin's, Norton's, Millman's, Reciprocity, and Maximum power transfer theorem. (A.C. analysis)

Graph theory and network equations Introduction, graph, tree, co-tree and loops. Incidence matrix, cutset matrix, tie-set matrix and loop currents, number of possible trees of a graph, analysis of networks, network equilibrium equations.

Resonance: Introduction, Q- factor, series resonance, selectivity and bandwidth, selectivity with variable capacitance and variable inductance, Parallel resonance, selectivity and bandwidth, Maximum impedance condition with C, L and R variable, current in antiresonance. Transfer and mutual inductance, Coupling
coefficient, properties of ideal transformer, impedance matching with transformer

Four Terminal Network and Attenuators - Two port network classification, characteristic impedance and propagation constant for symmetrical network , image and iterative impedance for asymmetrical network, Terminal impedances, reduction of complicated network into its equivalent T and Π networks.
Attenuators - symmetrical T and Π attenuators, ladder type attenuators, asymmetrical T and Π attenuators

Filters and Equalizer: Filter fundamentals, constant k type low pass and high pass filter, m derived filter, low pass and high pass m - derived filters, Band pass and band stop filters, half section , terminating half section, composite filter.
Equalizer: Classification of equalizer, Series and shunt equalizer.

Transmission line: General Equation of a transmission line, infinite line, wavelength, velocity of propagation ,distortion less line, inductance loading, reflection coefficient, reflection factor, reflection loss ,insertion loss, standing wave ratio, Impedance matching**:** quarter wave line, single stub & double stub matching using smith chart.

Text Books:

1. D Roy Choudhary, Networks and Systems, New Age International
2. John D. Ryder, Network Lines and Fields, Prentice Hall of India, 2/e
3. M. E. Van-Valkenburg, Network Analysis, Prentice Hall of India
4. S.Rambhadran, Telecommunication Principles, Circuits and Systems, Khanna publication.

2B2 : Lab - Linear Electrical Networks **(2Hours/week)**

List of Experiments:- Linear Electrical Networks

1. Verification of Thevenins theorem for a two port network
2. Verification of Norton's theorem for a two port network
3. Maximum Power Transfer theorem
4. Series resonance - BW and Q factor
5. Parallel resonance –B.W. and Q- factor
6. Frequency response of constant k filters and find out, cut of frequency
7. Frequency response of m derived filters and find out, cut of frequency
8. Frequency response of band pass filter
9. Design build and test symmetrical T attenuator
10. Measurement of Zo and Parameters for a transmission line

Course Outcomes (COs)

SEM: II	Sub Name: - Linear Electrical Network
2B2L1.1	To understand the basic concepts on RLC circuits
2B2L1.2	To know the behaviour of the steady states and transients states in RLC circuits.
2B2L1.3	To understand the two port network parameters
2B2L1.4	To study the propagation, reflection and transmission of plane waves in bounded and unbounded media.

CO-PO matrices

SEM: II	Sub Name: - Linear Electrical Network											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
2B2L1.1	1	1	-	-	-	-	-	-	-	-	-	-
2B2L1.2	2	1	1	-	-	1	-	-	-	-	-	1
2B2L1.3	1	1	1	1	-	-	-	-	-	-	-	-
2B2L1.4	1	1	2	-	-	1	1	-	-	1	-	-
Total	5	4	4	1	-	2	1	-	-	1	-	1
Average	1.25	1	1	0.25	-	0.5	0.25	-	-	0.25	-	0.25

CO - PSO Mapping

SEM: II	Sub Name: - Linear Electrical Network		
COs	PSO1	PSO2	PSO3
2B2L1.1	1	1	-
2B2L1.2	1	1	-
2B2L1.3	1	1	-
2B2L1.4	1	1	-
Total	4	4	-
Average	1	1	-

2B3 : Analog Electronic Circuits **(3 Hours/week)**

WAVESHAPING CIRCUITS:

Single phase Half wave rectifier, Full wave Rectifier, Full Wave Bridge Rectifier- Calculation with resistive load-Filters-shunt capacitor filter-Series Inductor filter- The choke input of L-C filter-The RC-filter-Pi Filter, Voltage dividers, voltage multipliers-Half Wave voltage doubler-Full Wave voltage doubler-Voltage Tripler and Quadruple, shunt regulator-series regulator-Basic op-amp series regulator, Switching regulator, IC Voltage regulator IC 78xx,79xx, LM337 and IC 78C40

BIPOLAR JUNCTION TRANSISTOR:

Review of transistor configuration-Relation between Transistor current-Leakage current, Thermal runway, Transistor static characteristic, BJT operating region-DC load line-Q-point

TRANSISTOR BIASING :

Need of biasing a Transistor-Factor affecting bias variation-Stability Factor-Beta sensitivity- Stability Factor of CB,CC and CE circuit-Different method of Transistor biasing-Load Line concept, AC-DC load line

FIELD EFFECT TRANSISTORS:

Junction field effect transistor, pinch off voltage, volt-ampere characteristics, small signal model, MOSFET Enhancement & Depletion mode, V-MOSFET

FET CIRCUITS:

Common source amplifier, source follower, biasing of FET, applications of FET as a voltage variable resistor (VVR), uni-junction transistor characteristics and applications

Transistor equivalent circuit and Models-DC and Ac equivalent circuit of CB, CC and CE Amplifier-Effect of Source Resistance Rs, Small Signal low frequency model, H-parameter for CB,CC and CE configuration, Analysis of a Transistor amplifier circuit using h-parameter.-CC Configuration, Darlington emitter follower, Millers Theorem, Necessity of Bootstrapped biasing

TRANSISTOR AT HIGH FREQUENCIES: Hybrid π model, CE short circuit current gain, frequency response, alpha, cutoff frequency, gain bandwidth product, emitter follower at high frequencies

MULTISTAGE AMPLIFIER AND FEEDBACK AMPLIFIER:

Amplifier coupling-Different gain,why gain is expressed in dB? RC-coupled Two stage Amplifier-Impedance coupled-Transformer coupled, direct coupled amplifier and its frequency response, Effect of bandwidth and gain in cascade amplifier. Feedback Amplifier-Effect of negative feedback on amplifier characteristics- Voltage series-voltage shunt –current series –current shunt. Oscillator circuit- Frequency stability of an oscillator- Tuned Oscillator, Hartley, Colpitt, clapp, Crystal Controlled Oscillator-Wien Bridge –RC Oscillator

POWER AMPLIFIER:

Need for a power Amplifier, How a power amplifier differs from voltage amplifier, Classification of power amplification based upon biasing condition-Graphical representation, Class A Amplifier- Power distribution in Class A Amplifier. Amplifier-power rectangle –Power Efficiency-Maximum Ac power in Load- Transformer –coupled Class A Amplifier, Class-B,Power relation for Class B Amplifier, Class B push pull Amplifier-complementary symmetry Push pull Class- B Amplifier- Class C Amplifier-Tuned Amplifier-Distortion in amplifier-Nonlinear Distortion-Intermodulation distortion-Frequency distortion

Text Books:

1. Boylestad & Nashelsky, Electronics Devices & Circuits, Pearson Education
2. D.A.Neamen, Electronic circuit analysis and design, TMH, (Second edition)
3. A.P. Malvino, Electronics Principles, McGrawHill
4. Streetman, Solid State Electronics Devices Pearson Education, (Module I to IV)
5. K.V. Ramanan, Functional Electronics, TMH

Reference Books:

1. Millman & Halkias, Electronic Devices & Circuits, TMH
2. George B Rutkowski, Solid State Electronics, Mc Graw Hill, IVth edition
3. George B Rutkowski, Solid State Electronics, Mc Graw Hill, IVth edition

2B3 : Lab – Analog Electronic Circuits (2 Hours/week)

List of Practicals:

1. Testing of Passive and Active components - Resistors, Capacitors, inductors, Transformers, diodes, Transistors, etc.
2. Characteristics diode: Forward and reverse characteristics of a diode - measurement of forward resistance
3. Characteristics Transistor

a. Common base characteristics of a transistor - measurement of current gain, input resistance and output resistance, maximum ratings of the transistor (Computer simulation as well Practical Performance)

b. Common emitter characteristics of a transistor - measurement of current gain, input resistance and output resistance, relation between and study of the effect of leakage current, maximum ratings of the transistor

c. Common source characteristics of a JFET - measurement of transconductance ‘gm’ and drain to source resistance rds , use of FET as VVR.

4. Rectifying circuits

a. HW rectifier

b. FW rectifier

c. FW Bridge rectifier

d. Filter circuits - Capacitor filter, inductor filter and Pi section filter (Measurement of ripple factor, maximum ratings of the devices)

5. Oscillator: Determine the frequency of oscillator for Hartley, Colpitt oscillator

6. Design of different type of biasing and their comparison
7. Study of Transformer coupled Amplifier
8. Effect of bandwidth and gain in cascaded stage-To study frequency response of RC coupled two stage CE amplifier
9. To study any one of the Negative feedback amplifier (Current series/shunt, Voltage series/ shunt

Term work:

Term work will consist of a record of minimum eight experiments performed and assessed, as per the above list by the candidate.

Practical:

The practical examination will be of three hours duration. It will consist of one experiment and viva voce based on the syllabus

Course Outcomes

SEM: I	**Sub Name: - Analog Electronic Circuits**
2B3 3.1	Describe the principle of operation and working for Rectifiers, filters and Switching Regulators
2B3 3.2	Develop a fundamental understanding of the BJT and transistor biasing.
2B3 3.3	Develop a fundamental understanding of the FET, transistor equivalent circuit and models and Application of FETs.
2B3 3.4	Describe the multistage amplifier and Feedback amplifiers characteristics and applications
2B3 3.5	Describe the type of power amplifiers and its characteristics and applications

CO-PO matrices

SEM: I	**Sub Name: - Analog Electronic Circuits**											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
2B3 3.1	3	2	1	1	2	-	-	-	1	-	-	2
2B3 3.2	3	2	1	1	2	-	-	-	1	-	-	2
2B3 3.3	3	2	1	1	2	-	-	-	1	-	-	2
2B3 3.4	2	2	1	1	2	-	-	-	1	-	-	2
2B3 3.5	2	2	1	1	2	-	-	-	1	-	-	2
Total	13	10	5	5	10	-	-	-	5	-	-	10
Avg	2.6	2	1	1	2	-	-	-	1	-	-	2

CO-PSO matrices

SEM: I	**Sub Name: - Analog Electronic Circuits**		
COs	PSO1	PSO2	PSO3
2B3 3.1	3	2	1
2B3 3.2	3	2	1
2B3 3.3	3	2	1
2B3 3.4	3	2	1
2B3 3.5	3	2	1
Total	15	10	5
Avg	3	2	1

2B4 L: ENGINEERING MATHEMATICS – II (3 Hours/week)

Ordinary Differential Equations with Applications:

First order and first degree differential equations of the type, non homogenous, linear, reducible to linear, exact differential equations. Applications to orthogonal trajectories, Mechanics, Electrical engineering, One dimensional conduction of heat.

Integral Calculus:

Reduction formula for 0∫Π/2 Sinmx Cosnx dx , Beta and Gama functions. Mean value of the function, RMS values, Differentiation under Integral sign.

Multiple integrals with Applications:

Double integrals, change of order of integration, triple integral, area by double integration, volume by triple integration, surface area and volume of solid of revolution.

Fourier Series:

Dirichlet's conditions, expansion of a function as Fourier series, change of interval, Even and Odd function, Half range Fourier series, Harmonic analysis.

Fourier Transform

Fourier Transform. Fourier integral, Fourier sine and cosine integral, complex form of Fourier integratial, Fourier transforms, Fourier sine and cosine transform, Fourier sine and cosine transform and inverse transform

Curve tracing:

Tracing of curves in Cartesian, Polar coordinates and parametric equations. Rectification.

Text Books:

1. A Text book of Engineering Mathematics (Vol. I & II) – by P.N. Wartikar and J.N. Wartikar, Pune Vidhyarthi Griha Prakashan, Pune.
2. Higher Engineering Mathematics – by B.S. Grewal, Khanna Publications, New Delhi.

Reference Books:

1. Advanced Engineering Mathematics (7th Edition) – by Erwin Kreyszig, Willey Eastern Ltd., Mumbai.
2. Engineering Mathematics – by H. K. Das, S. Chand & Co., New Delhi.
3. Advanced Engineering Mathematics – by C. R. Wylie, Mc Graw Hill pub., New Delhi.

Course Outcomes

SEM: II	**Sub Name: -** Engineering Maths -2
2B4 : 1	Demonstrate solutions to first order differential equations by various methods and solve basic application problem related to electrical circuits, orthogonal trajectories and Newtons law of cooling.
2B4 : 2	Familiarize with special functions to evaluate some proper and improper integrals using beta and gamma functions
2B4 : 3	Evaluate double and triple integrals techniques over a region in two dimensional and three dimensional geometry
2B4 : 4	Able to understand Fourier series for various periodic functions and understanding applications in various engineering areas
2B4: 5	Able to understand Fourier Transform for various functions and understanding applications in various engineering areas

CO-PO matrices

SEM: II	**Sub Name: -** Engineering Maths -2											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
2B4 : 1	3	2	3	2	-	-	-	-	-	-	-	-
2B4 : 2	3	2	2	2	-	-	-	-	-	-	-	-
2B4 : 3	3	2	2	2	-	-	-	-	-	-	-	-
2B4 : 4	3	2	3	2	-	-	-	-	-	-	-	-
2B4: 5	3	2	3	2	-	-	-	-	-	-	-	-
Total	15	10	13	10	-	-	-	-	-	-	-	-
Average	3	2	2.6	2	-	-	-	-	-	-	-	-

CO - PSO Mapping

SEM: II	**Sub Name: -** Engineering Maths -2		
COs	PSO1	PSO2	PSO3
2B4 : 1	-	-	-
2B4 : 2	-	-	-
2B4 : 3	-	-	-
2B4 : 4	-	-	-
2B4: 5	-	-	-
Total	-	-	-

2B5L : Engineering Chemistry **(3 Hours/week)**

Solid state chemistry:

Elementary account of crystal structure , crystalline and non-crystalline state Element of symmetry ,space lattice . unit cell ,bravice lattice . crystal system , lattice parameter , lattice planes miller indices, defects in crystal.

Electrochemistry:

Conductivity of electrolytes, Specific conductivity, equivalent conductivity, Molar conductivity, Laboratory determination of conductivity, Conductivity cell and cell constant, effect of dilution on conductivity, Kohlrausch's law & its advantages, numerical, electrode potential, galvanic cells, primary, secondary cells and concentration cell. Conductometric titration's and its applications, fuel cells and solar cell.

Corrosion and its control

Metallic corrosion, definition, types of corrosion, mechanism of chemical and electrochemical corrosion, atmospheric corrosion, factors affecting rate of corrosion, corrosion control, design improvement, use of inhibitors, cathodic protection, protective coatings - anodic, cathodic, inorganic, organic coating paints, galvanizing and tinning.

Phase rule *&* Phase Diagrams:

Gibbs phase rule, one component system, water system, sulphur system. Two component systems, silver lead system, lead tin system, lever rules, iron carbon system. uses and limitations of phase rule.

Water Treatment

Hardness of water, types, scale of hardness, determination of hardness by EDTA, simple numericals, scales and sludge, water softening process, scale formation in boiler, priming and foaming, caustic embrittlement, boiler water treatment.

Environmental Chemistry:

Introduction to environment, segments of environment & types of pollution, chemical aspects of air pollution, particulate matter & its effects, sources of air pollution, automobile exhaust gases, sources of oxides of sulphur, control of air pollution. Ozone layer and its prevention, acid rain, green house effect.

Water pollution: Organic and inorganic pollutants, sewage water characteristics. B.O.D. C.O.D, pollution due to radioactive material, effluent treatment

Polymer:

Types of mechanism of polymerization. structure of polymers, thermoplastics and thermosets. compounding of plastics, preparation, properties and engineering application of polythenes. PVC, Teflon, polyacralics, bakelite. nylons, polysters. urea formaldehydes, epoxy polymers, silicones. natural rubber, vulcanization. synthetic rubber. Buna S.. Buna N. Butyl rubber, polyurethane foam.

Ceramics:

Refractories, requirement of good refractory, classification . applications, Portland cement, chemical composition requirement, setting and hardening.

New Engg. Material:
Organic electric materials, nano materials, fullerenes.

Fuels: Classification, calorific value, its unit and determination by Bomb's calorimeter . gross and net calorific value, numerical, solid fuel coal, proximate and ultimate analysis of coal, gradation of coal, metallurgical coke, its manufacture, liquid fuel petroleum origin, refining and fractional distillation and catalytic cracking, gasoline, its manufacturer, knocking and octane rating, lead Free fuel natural gas LPG. coal gas. Water gas and bio- gas

Lubricants and lubrication: Mechanism of lubrication. thin. thick and extreme pressure lubrication, classification of lubricants, properties of lubricants, viscosity and viscosity index.Flash point and fire point, cloud point and pour point, neutralization number,saponification number, selection of lubricants.

Text Books:

1. A textbook of Engineering Chemistry by S.S. Dara, S.Chand Publication
2. Engineering chemistry by Jain & Jain, Dhanpat Rai And Sons

Reference Books:

1. A solid slate Chemistry and its Application by Anthony R. West, John Wiley & Sons(1989)
2. Applied Chemistry by N. Krishnamurthy. P. Vallinayagam and K. Jeysubramanian TMH Publication. engineering chemistry by S.S. Dara. S.Chand Publication
3. A Textbook on experiment and calculation in engineering chemistry by S.S. Dara. S.Chand Publication
4. Engineering chemistry by R..gopalan , and others , Vikas publications

5.

. **Course Outcomes**

SEM: I	**Sub Name: - Engineering Chemistry**
2B5L 5.1	To describe the Physical parameters and Electrochemical nature of the material.
2B5L 5.2	To describe and develop knowledge of corrosion control in designing and manufacturing new materials.
2B5L 5.3	To describe water management in society and investigate environmental issues.
2B5L 5.4	To gain the fundamental knowledge of polymers and the development of new polymer materials.
2B5L 5.5	To describe and develop the physiochemical properties of Ceramics, organic electric materials, fuels, lubricants, and lubrication.

CO-PO Matrices

SEM: I	**Sub Name: - Engineering Chemistry**											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
2B5L 5.1	2	1	2	2	-	1	1	-	-	-	-	-
2B5L 5.2	3	3	3	3	-	2	2	-	-	-	-	-
2B5L 5.3	2	2	3	3	-	3	3	-	-	1	1	1
2B5L 5.4	3	3	3	3	-	3	3	-	-	1	1	1
2B5L 5.5	3	3	3	3	-	3	3	-	-	1	1	1
Total	13	13	14	14		12	12	-	-	3	3	3
Avg	2.6	2.6	2.8	2.8	-	2.4	2.4	-	-	0.6	0.6	0.6

CO - PSO Mapping

SEM: I	**Sub Name: - Engineering Chemistry**		
COs	PSO1	PSO2	PSO3
2B5L 5.1	1	1	1
2B5L 5.2	-	2	1
2B5L 5.3	-	1	2
2B5L 5.4	1	2	2
2B5L 5.5	1	2	1
Total	3	8	8
AVG	0.6	1.6	1.6

2B6L : Engineering Mechanics **(2 Hours/week)**

Fundamental Concepts and Principles, Types of Force systems, Composition and Resolution of Forces, Moment of force, Couple, Resultant of Planer and Spatial force systems, Analytical and Graphical methods

Free body diagrams, Equations of Equilibrium, Types of Supports and support reactions, Equilibrium of Planer systems, Principle of Virtual work and its application to beams, Equilibrium of Concurrent and Parallel Spatial Force systems,

Theory and Laws of Friction, Cone of friction, wedge friction, rolling friction, Belt friction and their applications. Center of Gravity of plane figures and lines, Centroid of Plane figures, Moment of Inertia of plane sections, Transformation theorems, Radius of gyration, Mass Moment of Inertia.

Kinematics:

Rectilinear Motion, Equations of Motion, Motion curves and their applications, Curvilinear motion in Cartesian and Polar Co-ordinates, Motion of projectile, Relative motion, Fixed axis rotation, General Plane motion, Instantaneous center of rotation.

Kinetics:

Newton's laws of Motion, Equations of motion of particle and rigid body, motion of connected bodies, Fixed axis rotation, General plane motion, D'Alembert's Principle Principle of work and Energy, Principle of Impulse and Momentum and their applications to particles, Direct central impact

Text books:

1. Beer and Johnston, Mechanics for Engineers (Statics and Dynamics), McGraw Hill Co.Ltd.
2. A.K.Tayal, Engineering Mechanics , Umesh publications.
3. V.S. Mokashi, Engineering Mechanics Vol. I and II, Tata McGraw Hill Publishing Co. ltd., New Delhi

Reference Books:

1. F.L. Singer, Engineering Mechanics, Harper and Row Publishers, USA
2. Timoshenko and Young, Engineering Mechanics, McGraw Hill Co.Ltd.
3. R.C. Hibbeler, Engineering Mechanics (Statics and Dynamics), McMillan publications
4. Engineering Mechanics by McLean and Nelson, Schaum's Outline Series, McGraw Hill Co.Ltd. New Delhi

Course Outcomes (COs)

SEM: VI	Sub Name: - Engineering Mechanics
2B6L1.1	Understanding of fundamentals, concepts and principles of force systems for rigid bodies & Laws of equilibrium
2B6L1.2	Calculate and resolve resultant & component forces by applying Laws of equilibrium
2B6L1.3	Understand the laws of friction of sliding, rolling o
2B6L1.4	Acquire the knowledge of Kinematics of rigid bodies for rectilinear, polar, projectile motions and rotations
2B6L1.5	Understanding and determine parameters of Kinetics for rigid bodies

CO-PO matrices

SEM: VI	Sub Name: - Engineering Mechanics											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
2B6L1.1	2	2	-	-	-	-	-	-	-	1	-	1
2B6L1.2	2	2	2	1	1	-	1	1	-	1	1	2
2B6L1.3	2	2	2	1	1	-	1	1	-	1	1	2
2B6L1.4	2	2	2	1	1	-	1	1	-	1	1	2
2B6L1.5	2	2	2	1	1	-	1	1	-	1	1	2
Total	10	10	8	4	4	-	4	4	-	5	4	9
Average	2	2	2	1	1		1	1		1	1	1.8

CO - PSO Mapping

SEM: VI	Sub Name: - Engineering Mechanics		
COs	PSO1	PSO2	PSO3
6B5L1.1	-	-	1
6B5L1.2	-	-	1
6B5L1.3	-	-	1
6B5L1.4	-	-	1
6B5L1.5	-	-	1
Total	-	-	5
Average	-	-	1

5.

2B7P Engineering drawing II (4 hours/week)

Theory

Introduction: Review of Engineering Drawing.

Draftsman Practices:
Types, classification of Drawing Tools, Lettering Techniques, Techniques, Technical sketching, Dimensioning, Use of templates.02

Graphic Symbols:
Symbols composition, graphic standards, details of symbol drawing, waveform Symbols. Reference designators for consumer, military and complex equipment/components.02

Components in Electronics:
Drawing of capacitors, resistors, color, connection devices, indicating devices, inductors, Relays, semiconductor devices switches, transformers.

Block Diagrams:
Symbols block, lettering, lines, typical block layout, practices. 02

Logic Diagrams:

Logic symbols, gates, drawings, involving ICs, combining of gates.02

Know-how Diagrams:

Circuit schematic diagrams using almost all types of components used in electronic circuits and systems, PCB fabrication drawings, PCB assembly drawings, types of wires, wiring techniques, wire harness diagrams and wiring diagrams.04

Graphic Drawings:
Charts graph layouts, rectilinear layout, logarithmic graph layout characteristic curves polar graphs, homographs.02.

Reference Books:

1. Electronic Drafting and Design Nicholas M. Raskhodoff.
2. Electronic Drafting & PCB Design – J.M. Kirkpatrick.

Course Outcomes (COs)

SEM: II	**Sub Name: - 2B7P-Engineering Drawing II.**
2B7P 1.1	Understanding of Draftsman practices and Tools & Techniques
2B7P 1.2	Understanding of graphical symbols and its compositions & Drawings
2B7P 1.3	Understanding of Electronics components and its symbols
2B7P 1.4	Electronics & Electricals circuits schematics layouts, Block diagrams and components drawings etc.
2B7P 1.5	Logical symbols, diagrams, PCB Drawings, Graphs ,Wiring diagrams and harness etc.

CO-PO matrices

SEM: II	**Sub Name: - 2B7P-Engineering Drawing II.**											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
2B7P 1.1	1	1	2	-	1	1	1	1	2	2	2	1
2B7P 1.2	1	1	2	-	1	1	1	1	2	2	2	1
2B7P 1.3	1	-	2	-	1	1	1	1	1	2	1	1
2B7P 1.4	1	1	2	-	1	2	1	-	1	2	1	1
2B7P 1.5	1	1	2	1	2	1	1	1	1	2	1	1
Total	5	4	10	1	6	6	5	4	7	10	7	5
Average	1.0	1.0	2.0	1.0	1.2	1.2	1.0	1.0	1.4	2.0	1.4	1.0

CO - PSO Mapping

SEM: II	**Sub Name: - 2B7P-Engineering Drawing II.**		
COs	PSO1	PSO2	PSO3
2B7P 1.1	1	2	2
2B7P 1.2	1	2	2
2B7P 1.3	1	2	2
2B7P 1.4	2	1	2
2B7P 1.5	2	2	1
Total	7	9	9
Average	1.4	1.8	1.8

Subject Code	Subject	Theory	Practical
3B1	Power Electronics-I	3	1
3B2	Measurement &Instrumentation	3	1
3B3	Computer programming C,C++	3	1
3B4	Electronics Systems Engineering	3	1
3B5L	Engineering Mathematics-III	3	0
3B6L1 3B6L2	General Elective- I(Commerce/Management)	3	0
		18	4
4B1	Product Design	3	1
4B2	Power Electronics-II	3	1
4B3	Microprocessor	3	1
4B4	Integrated Circuits and Applications	3	1
4B5L	Control System Engineering	3	0
4B6L	Electronics Design Technology	3	0
		18	5

3B1 : Power Electronics – I **(3 hours/week)**

Power Semiconductor Devices: Power diodes, Power transistors, Thyristors , IGBT, GTO, TRIAC,DIAC, UJT,PUT and other Member of Thyristor Family: Their principles, Characteristics, and Ratings, Firing (triggering circuit) and typical control circuits, Gate triggering circuits. Commutation circuit, Gate drive circuit, Protection and cooling; Series parallel operation of devices.

Power Electronic Converters: Phase controlled (AC/DC), 1-phase/3-Phase, Semi/full/dual; Analysis and performance with passive load, Typical control circuit; Harmonics and power factor; Voltage controllers(AC/DC), Typical control circuits for integral control/phase control strategies ,

Cycloconverter : 1-phase/3-phase; AC regulators

Chopper : Basic chopper classification, Basic chopper operation, Control strategies, Chopper configuration, Thyristor chopper circuit, Source filter.

Inverter : Classification of inverter, Single Phase: Half bridge voltage source inverters, Full bridge inverter, Performance parameter of inverter, Voltage control of inverter, PWM inverter, Three phase inverter, Classification of Resonant Converter : Series resonant inverters, Parallel inverter, Current source Inverter ,Harmonic reduction

Reference Books :

1. P.C. Sen , " Power Electronics ", Tata McGraw Hill
2. M.H. Rashid , " Power Electronics " , John Wiley & Sons
3. General Electric, " SCR manual "
4. G. K. Dubey, S. R Doradle, " Thyristorised Power Controller "
5. J. M. Jalnekar and N. B. Pasalkar, " Power Electronics " Technical Publication
6. Ned Mohan, T.M. Undeland and W.P. Robbins, " Power Electronics: Converters, Applications and Design", John Wiley, Singapore, 1994
7. M D Singh and K. B Khanchandani, " Power Electronics ", Tata McGraw Hill
8. B.K.Bose, " Power Electronics & A.C. Drives ", Prentice Hall, 1986.

3B1 : Lab – Power Electronics I **(2 hours/week)**

List of Experiments:

1. Thyristor V/I characteristics & Measurement of holding current of SCR
2. Firing circuit of SCR
3. Commutation of SCR
4. TRIAC and DIAC characteristics
5. Single phase/Three phase , Thyristor –Bridge converter with R/RL load
6. Series inverter
7. Parallel inverter
8. SCR application
9. DC chopper
10. AC/DC drives

COURSE OUTCOMES

SEM: III	**Sub Name: -** Power Electronics-I
3B1 1.1	Relate basic semiconductor physics to properties of power devices, and combine circuit mathematics and characteristics of linear and non-linear devices.
3B1 1.2	Describe basic operation and compare performance of various power semiconductor devices, passive components and switching circuits.
3B1 1.3	Design and Analyse power converter circuits and learn to select suitable power electronic devices by assessing the requirements of application fields.
3B1 1.4	Identify the critical areas in application levels and derive typical alternative solutions, select suitable power converters to control electrical Motors and other industry grade apparatus
3B1 1.5	Recognize the role power electronics play in the improvement of energy usage efficiency and the applications of power electronics in emerging areas.

Co and Po Mapping

SEM: III	**Sub Name: -** Power Electronics-I											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
3B1 1.1	2	1	2	-	-	-	-	-	-	-	-	-
3B1 1.2	1	1	2	2	-	-	-	-	-	-	-	-
3B1 1.3	1	2	2	1	1	-	-	1	-	-	-	1
3B1 1.4	1	1	2	2	-	1	1	-	1	-	1	1
3B1 1.5	1	2	2	1	-	2	2	-	1	-	1	2
Total	6	7	10	6	1	3	3	1	2	0	2	4
Average	1.2	1.4	2	1.2	0.2	0.6	0.6	0.2	0.4	0	0.4	0.8

Co and PSo Mapping

SEM: III	**Sub Name: -** Power Electronics-I		
COs	PSO1	PSO2	PSO3
3B1 1.1	2	-	2
3B1 1.2	1	-	2
3B1 1.3	1	1	2
3B1 1.4	1	-	2
3B1 1.5	1	-	2
Total	6	1	10
Average	1.2	0.2	2

11.

3B2 : Measurement and Instrumentation (3 hours/week)

Instrumentation Basics

Introduction to measurements: Units and standards of measurement and their classification, Sensing and Transduction, Measurement system, Functional elements of instruments, Errors in measurements, Static performance characteristics of measuring instruments, Classification of Instruments, Transducer elements: Definition, classification, selection criterion. Signal conditioning,

Electrical and Electronic Measurement

Measurement of Voltage, Current, AC /DC Bridges and their applications such as Wheatstone, Kelvin, Maxwell, Hay, Schering, Wein bridge measurement. Resistance, Inductance, Capacitance, Power, Energy, Phase, Frequency, Magnetic, Hall Effect transducer. Analog to Digital converter (ADC) and digital to Analog Converter

Mechanical Measurement

Measurement of Motion, Force, Torque, Power, Temperature, Acoustics, Vibration, Acceleration, Strain Displacement. (Construction, working principle and applications of every transducer)

Chemical and Analytical Measurement

Measurement of Pressure, Flow, Level, Viscocity Humidity, Moisture, Conductivity, Photo devices, Spectroscopy: UV, IR Visible, Chromatography: Gas / Solid, NMR spectroscopy

Miscellaneous Instrumentation Systems: Case studies and Instruments

Typical instrumentation systems: Introduction, categorization of instrumentation systems, level 0 to level 9, optically powered remote instrumentation scheme. Power analyzer. Instrumentation for blast furnace, Display devices and recorders, Data acquisition systems, General Purpose Electronic Testequipments, such as CRO, DVM, Counters, AC milli voltmeters, Wave & Spectrum Analyzers

Text Books:

1. B.C. Nakra and K.K. Chaudhary, Instrumentation Measurement and Analysis, Tata McGraw Hill, Second Edition
2. A.K. Sawhany, Electrical and Electronic Measurements and Instrumentation, Dhanpat Rai & sons
3. T.R. Padmanabhan, Industrial Instrumentation, Springer International Edition
4. T.R. Padmanabhan, Industrial Instrumentation, Springer International Edition

3B2Lab : Measurement and Instrumentation **(2 hours/week)**

List of Experiments:- Instrumentation (Any Five Experiments)

1. LVDT characteristics
2. Temperature Transducer characteristics
3. Pressure Transducer characteristics
4. Flow measurement
5. Strain measurement
6. pH and conductivity measurement
7. Study of spectrophotometer
8. Study of gas chromatography

Course Outcomes

SEM: III	**Sub Name: -** Measurement &Instrumentation
3B2 2.1	To acquire knowledge on Basic functional elements of instrumentation.
3B2 2.2	To understand the concepts of Fundamentals of electrical and electronic instruments.
3B2 2.3	Ability to compare between various measurements techniques.
3B2 2.4	To understand the concepts Various transducers and the data acquisition systems.
3B2 2.5	Ability to model and analyse electrical and electronic Instruments and understand the operational features of display Devices and Data Acquisition System.

CO and PO Mapping

SEM: III	**Sub Name: -** Measurement &Instrumentation											
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
3B2 2.1	3	1	-	-	-	-	-	-	-	-	-	-
3B2 2.2	2	1	2	1	2	-	-	-	-	-	1	-
3B2 2.3	1	2	2	-	2	1	-	-	-	-	1	-
3B2 2.4	3	2	1	1	1	2	-	-	-	-	-	1
3B2 2.5	2	2	2	2	1	2	1	1	1	2	2	2
Total	11	8	7	4	6	5	1	1	1	2	4	3
AVG	2.2	1.6	1.75	1.33	1.5	1.67	1	1	1	2	1.33	1.5

CO and PSO Mapping

SEM: III	**Sub Name: -** Measurement &Instrumentation		
Cos	PSO1	PSO2	PSO3
3B2 2.1	-	1	3
3B2 2.2	-	1	3
3B2 2.3	-	1	3
3B2 2.4	-	1	3
3B2 2.5	1	2	3
Total	1	6	15
AVG	1	1.2	3

3B3 : Computer Programming using C, C++ **(3 Hours/week)**

Fundamental of Language

Introduction to Algorithm & Flowcharts, why we need Algorithms, Flowcharts, Study of Compilers, Interpreters, Assembler, Linkers, Loaders and its Differences in detailed, Introduction to IDE, 'Hello word' using IDE and without IDE, how C Language Works in Details with different platforms(Windows, Linux, etc). Character set, Constants, Variables, Keywords and Comments; Operators and Operator Precedence; Basic Structure of C Program; Preprocessor Directives, Macros; Data Types in C Primary Data Types and Introduction to Secondary Data Types.

Statements in C

Statements; I/O Operations; Control Structures – Conditional and Unconditional Branching Using "if", "switch", "break", "continue", "go to" and "return" Statements; Loop Structures – Creating Pretest Loops using "for" and "while" Statements; Creating Posttest Loops using "do…while" statement;

User Define Data Types

Functions – Creating Subprograms using Functions; Parameter Passing by Value; Parameter Passing by Reference; Main Function, Recursions.

Pointers in C

Pointers- Basic of Pointers, Operators in Pointer, Basic Example of Pointers, Pointer with User Define Data Types (Like Pointers, Array, Unions, Structures)

Programming Language Methodologies

Introduction to methodologies, some drawbacks of POP & advantages of OOP. Characteristics of OOP(Classes, Object, Inheritance, Polymorphism, Message Communication). Basic structure of C++ program, briefly of iostream header file. Applying OOP, extraction and insertion operators, Input and output manipulators, Functions in C++.

Referance Books:

1. Introduction to C by Dennis Ritchie (Bell Labs)
2. C Programming Language (2nd Edition) by Brian W. Kernighan
3. The C Puzzle Book by Alan R. Feuer
4. Expert C Programming: Deep C Secrets by Peter van der Linden
5. C Programming FAQs: Frequently Asked Questions by Steve Summit
6. The C++ Programming Language: Special Edition by Bjarne Stroustrup
7. Effective C++: 55 Specific Ways to Improve Your Programs and Designs (3rd Edition) by Scott Meyers
8. C++ Primer Plus (5th Edition) by Stephen Prata
9. C++ Coding Standards: 101 Rules, Guidelines, and Best Practices by Herb Sutter
10. The C++ Standard Library: A Tutorial and Reference by Nicolai M. Josuttis

3B3 : Lab – Computer Programming using C, C++ **(2 Hours/week)**

Suggestive list of experiments for C programming part

1 Write a program to find area, perimeter of a rectangle by using formula area = p* q and perimeter= 2 * (p+q) where p=6 & q=8

2 Write a program to convert a given temperature in Celsius to Fahrenheit by using formula
F=1.8 * Celsius + 32
Read input Celsius through keyboard.

3 Write a program to find average of ten given numbers

4 If a five digit number is input through keyboard, write a program to reverse the number.

5 Write a program to fine roots of a quadratic equation

6 Write a program to display Fibonacci series.

7 Write a program to find Armstrong number. (Armstrong number is abc, where abc=a*a+ b*b+ c*c)

8 Write a program to find factorial of a given number.

9 Write a program for bubble sort.

10 Write a program for addition subtraction and multiplication of two matrices.

11 Write a program for string operations like strlen, strcompare, strcopy.12 Create a file called student, add the student information in that file. Create function to update, delete and modify student's data

Course Outcomes

SEM: III	Sub Name: - Computer programming C,C++
3B3 3.1	To describe the advantages of a high-level language like C/C++, the programming process, and the compilation process.
3B3 3.2	To describe and use software tools in the programming process.
3B3 3.3	To apply good programming principles to the design and implementation of C/C++ programs.
3B3 3.4	To design, implement, debug and test programs using the fundamental elements of C/C++.
3B3 3.5	Demonstrate the use of various OOPs concepts with the help of programs.

CO-PO matrices

SEM: III	Sub Name: - Computer programming C,C++											
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
3B3 3.1	1	2	3	2	3	-	-	-	1	-	-	3
3B3 3.2	2	2	2	1	3	-	-	-	-	-	-	3
3B3 3.3	3	2	2	1	-	-	-	-	-	-	-	3
3B3 3.4	2	2	2	1	3	-	-	-	-	1	-	2
3B3 3.5	3	2	2	2	2	-	-	-	-	-	-	-
Total	11	10	11	7	11				1	1		11
Average	**2.2**	**2**	**2.2**	**1.4**	**2.75**	**-**	**-**	**-**	**1**	**1**	**-**	**2.75**

CO - PSO Mapping

SEM: III	Sub Name: - Computer programming C,C++		
Cos	PSO1	PSO2	PSO3
3B3 3.1	-	3	-
3B3 3.2	-	3	-
3B3 3.3	-	3	-
3B3 3.4	-	3	-
3B3 3.5	-	3	-
Total	-	15	-
Average	-	3	-

3B4 : Electronic Systems Engineering: (3 Hours/week)

Electronic Systems: Basic amplifiers, basic attenuators, block diagrams. Data Transmission and Signals: Transmission of information, analogue signals, digital signals, bandwidth, modulation, filters, demodulation, amplifying signals.

Introduction to electronics and electronic systems, Semiconductor and devices like diodes, BJT, FET, MOSFET, Rectifier and Filters, Transistor biasing. Small signal transistor amplifiers, Operational amplifiers, Feedback and Oscillators, Digital circuit and combinational logic, Sequential logic and flip-flops, ADC & DAC, Data acquisition systems, Memory systems, Case studies of electronic systems like microprocessors, radio & TV broadcasting, Mobile & cellular telephones, fiber optics & networking.

Reference Books:

1) Millman & Halkias, Integrated Electronics, Tata McGraw -Hill, 1998.
2) Mano M.M., Digital Design, Prentice Hall of India, 2002.
3) Roth C.H., Fundamentals of Logic Design, Jaico Publishers, 2002.
4) Electrical and Electronics Technology, 8th Edition, Pearson Education, Edward Hughes

3B4 : Electronic Systems Engineering: Practical (2 Hours/week)

Practical based on **: Electronic Systems Engineering**

Course Outcomes

SEM: III	**Sub Name: -** Electronics System Engineering
3B4 : 1	Understand , Design and Implement various types of measuring instruments like Amplifiers , Multimeter etc .
3B4 : 2	Understand , Design and Implement various types of Filters and Oscillators .
3B4 : 3	Design and analyze the mathematical techniques various communication circuits including amplitude modulation (AM), frequency modulation (FM) signals.
3B4 : 4	Understand and Designing of AM /FM receiver system, Power Amplifier etc .
3B4 : 5	Understand and Designing of TV receiver system .

CO-PO matrices of courses

SEM: III	**Sub Name: -** Electronics System Engineering											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
3B4 : 1	3	3	1	1	2	-	-	-	-	-	-	-
3B4 : 2	3	1	2	1	2	-	-	-	-	-	-	3
3B4 : 3	3	2	3	1	3	-	-	-	2	1	-	1
3B4 : 4	3	1	2	2	1	-	1	-	-	-	-	-
3B4 : 5	2	2	1	2	1	-	-	-	-	2	-	1
Total	14	9	9	7	9	0	1	0	2	3	0	5
AVG	2.8	1.8	1.8	1.4	1.8		1		2	1.5		1.67

CO - PSO Mapping

SEM: III	**Sub Name: -** Electronics System Engineering		
COs	PSO1	PSO2	PSO3
3B4 : 1	3	1	-
3B4 : 2	3	1	-
3B4 : 3	3	1	-
3B4 : 4	3	1	2
3B4 : 5	3	1	2
Total	15	5	4
AVG	3	1	2

3B5L : Engineering Mathematics III **(3 hours/week)**

Largrange's interpolation formula, Numerical differentiation, solution of ordinary differential equation by Picard's method, Taylor 's series method, Euler's modified method and Runge-Kutta fourth order method.

Laplace Transform, Definition, and Properties, Laplace transform of elementary function, derivatives, integrals. Inverse Laplace transforms convolution theorem solution of LDE by Laplace Transform

Measures of central tendency, Measures of dispersion, Moments, skew ness, Kurtosis. Correlation, Coefficient of Correlation, lines of regression of bivariate data, fitting of curve, least square principle

Function of Complex Variables, Introduction, Analytic function, Cauchy-Riemann Equations, Harmonic function, Taylor's & Laurent's series, Singularities, Residues, Cauchy Residue theorem, Integration along unit circle & along the upper half semi circle, conformal and bilinear transformation

Z- Transform, Z-transform of elementary function & properties. Inverse Ztransdorm. Solution of difference equation by Z- transforms.

Vector calculus, differention, gradient, divergence, curl of vector function. Vector integration. Green's Theorem, stoke's theorem, Gauss divergence theorem. Irrorational & solenoidal fields

Text Books:

1. P.N. Wartikar and J.N.Wartika, A Text Book of Engineering Mathmatics (Vol. I & II)
2. B.S.Grewal, Higher Engineering Mathematics, Khanna Publicatons, New Delhi
3. Erwin Kreyszing, Advanced Engineering Mathematics, Willey Eastern Ltd.,(8th Edition)
4. Erwin Kreyszing, Advanced Engineering Mathematics, Willey Eastern Ltd.,(8th Edition)

Course Outcomes

SEM: III	Sub Name: - Engineering Maths -3
3B5 : 1	Apply various numerical methods to solve linear and non-linear equations
3B5 : 2	Understand Laplace transforms and its properties and finding the solution of ordinary differential equations
3B5 : 3	Understanding Measures of central tendency, Measures of dispersion, Moments, skewness, Kurtosis. Correlation, Coefficient of Correlation, fitting of curve
3B5 : 4	Understanding Function of Complex Variables, Singularities, Residues, Cauchy Residue theorem, Integration along unit circle & along the upper half semi-circle, conformal and bilinear transformation.
3B5: 5	Understanding Z- Transform, Z-transform of elementary function & properties. Inverse Ztransforms. Solution of difference equation by Z- transforms.
3B5: 6	Applying vector differentiation and integration in two and three dimensional spaces and understand their applications in various engineering areas.

. CO-PO matrices of courses

SEM: III	Sub Name: - Engineering Maths -3											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
3B5 : 1	3	2	3	2	-	-	-	-	-	-	-	-
3B5 : 2	3	2	2	2	-	-	-	-	-	-	-	-
3B5 : 3	3	2	2	2	-	-	-	-	-	-	-	-
3B5 : 4	3	2	3	2	-	-	-	-	-	-	-	-
3B5: 5	3	2	3	2	-	-	-	-	-	-	-	-
3B5: 6	3	2	3	2	-	-	-	-	-	-	-	-
Total	18	12	16	12	-	-	-	-	-	-	-	-
Average	3	2	2.7	2	-	-	-	-	-	-	-	-

CO - PSO Mapping

SEM: III	Sub Name: - Engineering Maths -3		
COs	PSO1	PSO2	PSO3
3B5 : 1	-	-	-
3B5 : 2	-	-	-
3B5 : 3	-	-	-
3B5 : 4	-	-	-
3B5: 5	-	-	-
Total	-	-	-

3B6L1 : Commerce (3Hours/week)

Unit 1: Theoretical Framework

Introduction to Accounting

• Accounting- objectives, advantages and limitations, types of accounting information; users of accounting information and their needs.

• Basic accounting terms: business transaction, account, capital, drawings, liability (Non - current and current); asset (Non - current; Fixed Assests: tangible and intangible assets and current assets), receipts (capital and revenue), expenditure (capital, revenue and deferred), expense, income, profits, gains and losses, purchases, purchases returns, sales, sales returns, stock, trade receivables (debtors and bills receivable), trade payables (creditors and bills payable), goods, cost, vouchers, discount - trade and cash.

Theory Base of Accounting

• Fundamental accounting assumptions: going concern, consistency, and accrual.

• Accounting principles: accounting entity, money measurement, accounting period, full disclosure,materiality, prudence, cost concept, matching concept and dual aspect.

• Bases of accounting - cash basis and accrual basis.

• Accounting Standards and IFRS (International Financial Reporting Standards): Concept and Objectives

Unit 2: Accounting Process and Special Accounting Treatment

Recording of Transactions

• Accounting equation: analysis of transactions using accounting equation.

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• Rules of debit and credit: for assets, liabilities, capital, revenue and expenses.

• Origin of transactions- source documents (invoice, cash memo, pay in slip, cheque), preparation of vouchers - cash (debit and credit) and non cash (transfer).

• Books of original entry: format and recording - Journal.

• Cash Book: Simple Cash Book, Cash Book with Discount Column and Cash Book with Bank and Discount Columns, Petty Cash Book.

• Other books: purchases book, sales book, purchases returns book, sales returns book and journal proper.

Preparation of Bank Reconciliation Statement, Ledger and Trial Balance

• Bank reconciliation statement- calculating bank balance at an accounting date: need and preparation.

Corrected cash book balance.

• Ledger - format, posting from journal, cash book and other special purpose books, balancing of accounts.

• Trial balance: objectives and preparation

(Scope: Trial Balance with balance method only)

Depreciation, Provisions and Reserves • Depreciation: concept, need and factors affecting depreciation; methods of computation of depreciation:

straight line method, written down value method (excluding change in method)

• Accounting treatment of depreciation: by charging to asset account, by creating provision for depreciation/ accumulated depreciation account, treatment of disposal of asset.

• Provisions and reserves: concept, objectives and difference between provisions and reserves; types of reserves- revenue reserve, capital reserve, general reserve and specific reserves.

Accounting for Bills of Exchange

• Bills of exchange and promissory note: definition, features, parties, specimen and distinction.

• Important terms : term of bill, due date, days of grace, date of maturity, discounting of bill, endorsement of bill, bill sent for collection, dishonour of bill, noting of bill , retirement and renewal of a bill.

• Accounting treatment of bill transactions.

Rectification of Errors

• Errors: types-errors of omission, commission, principles, and compensating; their effect on Trial Balance.

• Detection and rectification of errors; preparation of suspense account.

Part B: Financial Accounting

Unit 3: Financial Statements of Sole Proprietorship: From Complete and Incomplete Records

• Financial Statements: objective and importance.

• Profit and loss account: gross profit, operating profit and net profit.

• Balance Sheet: need, grouping, marshalling of assets and liabilities.

• Adjustments in preparation of financial statements : with respect to closing stock, outstanding expenses, prepaid expenses, accrued income, income received in advance, depreciation, bad debts, provision for 272 doubtful debts, provision for discount on debtors, manager's commission, abnormal loss, goods taken for personal use and goods distributed as free samples.

• Preparation of Trading and Profit and Loss Account and Balance Sheet of sole proprietorship.

• Incomplete records: use and limitations. Ascertainment of profit/loss by statement of affairs method.

Unit 4: Financial Statements of Not-for-Profit Organizations

• Not-for-profit organizations: concept.

• Receipts and Payment account: features.

• Income and Expenditure account: features. Preparation of Income and Expenditure account and Balance Sheet from the given Receipts and Payments account with additional information.

Scope:

(i) Adjustments in a question should not exceed 3 or 4 in number and restricted to subscriptions, consumption of consumables, and sale of assets/ old material.

(ii) Entrance/ admission fees and general donations are to be treated as revenue receipts.

(iii) Trading Account of incidental activities is not to be prepared.

Unit 5: Computers in Accounting

• Introduction to Computer and Accounting Information System {AIS}: Introduction to computers (Elements, Capabilities, Limitations of Computer system),

• Introduction to operating software, utility software and application software. Introduction to Accounting Information System (AIS), as a part of MIS

• Automation of Accounting Process. Meaning

• Stages in automation (a) Accounting process in a computerised environment (Comparison between manual accounting process and Computerised accounting process.) (b) Sourcing of accounting Software

(Kinds of software: readymade software; customised software and tailor-made software; Generic Considerations before sourcing accounting software)(c)· Creation of Account groups and hierarchy (d) Generation of reports - Trial balance, Profit and Loss account and Balance Sheet.

Scope:

• The scope of the unit is to understand accounting as an information system for the generation of

accounting information and preparation of accounting reports.

• It is presumed that the working knowledge of Tally software will be given to the students for the generation of accounting softwaretextbook on Computerized Accounting System.

Part C: Project Work (Any One)

1. Collection of Source Documents, Preparation of Vouchers, Recording of Transactions with the help of vouchers.
2. Preparation of Bank Reconciliation Statement with the given cash book and the pass book with twenty to twenty-five transactions.
3. Comprehensive project starting with journal entries regarding any sole proprietorship business, posting them to the ledger and preparation of Trial balance. The students will then prepare Trading and Profit and Loss Account on the basis of the prepared trial balance. Expenses, incomes and profit (loss) are to be depicted using pie chart / bar diagram

3B6L2 : MANAGEMENT (Humanities)

UNIT–I

Management basics – What is management, types of manager, manager qualities. Management responsibilities, management tasks and functions. The business environment – defining the organization, organization structure, the quality organization, organizational changes, managing changes. Management obligations, social and professional responsibilities, government regulations.

UNIT–II

Management information system (MIS) and its uses, Computer based MIS – Advantages & Disadvantages. Brief introduction to project planning and management and its tools/techniques-Gantt chart, PERT/CPM. Human Resources management: Concepts & functions, Job analysis and role description.

UNIT–III

Management skills Leadership and motivation – The nature of leadership, leadership theories, delegation, motivation and motivation theories, need of motivation, motivation techniques. Effective communication – The communication process, presentation skills. Tools and techniques.

UNIT–IV

Entrepreneurship – Entrepreneur and its role, how to become an entrepreneur, essentials steps to become an entrepreneur, EDP training.

UNIT- V

The basic Financial Accounts, types of accounts, Rules of Entries of transaction, Journal. Cash Book – Types, Format of Cash book, Balancing of Cash Book, Subsidiary books – Purchase, Sales, Purchase return and sales return. Ledger, posting of entries.

UNIT – VI

Trial Balance, Rectification of errors, adjustment entries. Depreciation and Inflation.

RECOMMENDED BOOKS:

Principles & Practices of Management by L.M. Prasad, S.Chand and Sons

Elements of Book Keeping (Financial Accounting I) by Juneja and Chawla, Kalyani Publishers

REFERENCE BOOKS:

Computers Today by S.K. Basandra, Galgotia Publications

Essentials of Management by Herold Koontz, TMH Publications

Accountancy by D.K.Goyal, Arya Publications

Course Outcomes

SEM: III	Sub Name: - Management
3B6L27.1	To understand and apply basic management principles.
3B6L27.2	To explain the Management Information system, project planning and management tools.
3B6L27.3	To understand the importance of management skills leadership, motivation and apply it.
3B6L27.4	To write journal, understand and maintain different types of cashbook.
3B6L27.5	To be able to rectify and manage errors.

CO-PO matrices Mapping:-

SEM: III	Sub Name: - Management											
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
3B6L27.1	2	2	1	1	-	-	-	2	-	-	-	-
3B6L27.2	2	2	2	1	-	-	-	2	-	-	-	2
3B6L27.3	2	2	1	1	-	-	-	1	-	-	-	-
3B6L27.4	2	2	2	1	-	-	-	-	-	-	-	-
3B6L27.5	2	2	1	1	-	-	-	-	-	-	-	-
Total	10	10	7	5	-	-	-	5	-	-	-	2
Average	2	2	1.4	1	-	-	-	1	-	-	-	0.4

CO - PSO Mapping:-

SEM: III	Sub Name: - Management		
Cos	PSO1	PSO2	PSO3
3B6L27.1	-	-	-
3B6L27.2	-	-	-
3B6L27.3	-	-	-
3B6L27.4	-	-	-
3B6L27.5	-	-	-
Total	0	0	0
Average	0	0	0

4B1 : Product Design (3 Hours/week)

VOC– CTQ & its characteristics– Data collection techniques– QFD– System Modeling Techniques – Measurement & Error – Gauge performance– Gauge calibration– R&R study– Benchmarking– Concept Generation Process– Concept Development Techniques - TRIZ– Design Tradeoff Analysis– Design for Reliability – Reliability Analysis– Reliability Testing– Probability Distributions– Performance Standards – Process Capability– Risk Assessment– Design of Experiments– Response Surface Models– Process Capability Modeling– Computation of variation– Probalistic Optimization– Robust Design– Tolerance Analysis– Design verification – Reliability Testing – Control charts.

Central Limit Theorem for a family of reliability measures, modeling and reliability analysis of multi-state systems, Weibull data analysis for few or no failures, Markovian performance evaluation methods, software reliability and testing,

In this course students will design a product using above mentioned techniques.

Text Books

1. Betsterfield D.H. Quality Control, Prentice Hall Publication, 8th Edition, 2008.
2. K.C. Kapur, L.R. Lamberson, Reliability in Engineering Design, John Wiley & Sons, 1st Edition, 1977.

Reference Books

1. A.Birolini, Reliability Engineering, Theory and Practice, Springer, 5th Edition, 2005.
2. Recent Advances in Reliability and Quality in Design, Hoang Pham, Springer Series in Reliability Engineering, ISBN: 978-1-84800-112-1, 2008.
3. Introduction to Statistical Quality Control, Douglas, C. Montgomery, John Wiley & Sons, NY, 2009.

4B1 lab : Electronic Product Design - Design for Quality & Reliability (2Hours/week)

An Industrial design aspect should be reflected in module making and mock ups for products.

Course Outcomes

SEM: IV	Sub Name: - Product Design
4B1 1.1	Students should be able to Design electronic products using user centered design process
4B1.1.2	Students should be able to Develop sketches, virtual and physical appearance models to communicate proposed designs
4B1 1.3	Students should be able to Refine product design considering engineering design & manufacturing requirements and constraints.
4B1.1.4	Students should be able to Make mock-up model and working prototype along with design documentation
4B1 1.5	Students will be able to understand the model making process in industry.

CO-PO Mapping

SEM: V	Sub Name: - Product Design											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
4B1 1.1	1	2	1	1	-	-	2	1	2	2	2	1
4B1.1.2	1	-	1	1	2	2	2	1	2	2	2	1
4B1 1.3	1	-	2	2	2	2	2	1	2	2	2	1
4B1.1.4	1	2	1	1	-	-	1	1	1	-2	1	1
4B1 1.5	1		1	1			2	1	2	3	2	1
Total	5	4	6	6	4	4	9	5	9	11	9	5
Average	1	2	1.2	1.2	2	2	1.8	1	1.8	2.2	1.8	1

CO – PSO Mapping

SEM: V	Sub Name: - Product Design		
Cos	PSO1	PSO2	PSO3
4B1 1.1	2	1	1
4B1.1.2	2	2	1
4B1 1.3	1	2	1
4B1.1.4	2	2	1
	2	2	1
Total	9	9	5
Average	1.8	1.8	1

4B2 : Power Electronics II (3 hours/week)

Control of DC Drives: Criteria for selecting drive components, Basic characteristics of DC and its equivalent circuit, Methods of DC motor control schemes for DC motor speed control, DC drives, adjustable speed DC drive. Single phase drives/Three phase drives, DC-DC converter drives, PLL drives, Closed loop control of DC drives

AC Drives: Basic principles of operation and its characteristics, Speed control method, Closed loop control of induction motor drives, Adjustable AC drives.

Induction Motor Drives & Control

Induction motor characteristics, control strategies like stator voltage control, v/f control, rotor resistance control, use of CSI for induction motor control, PWM control, controlled slip system, slip power recovery system, close loop control, direct vector control & indirect vector control, breaking of induction motor, soft acceleration and deceleration, various protections.

Power Electronics Application:

Battery charging regulator, Flasher circuits, Protective SCR circuits, Ring counter, Time delay circuits, UPS, SMPS, Static relay, Emergency lightening system, Single phase preventer, Servo controlled voltage stabilizer, Temp Controller, Static circuit breaker, Renewable energy sources and energy storage system to the utility grid

Reference Books :

1. P.C. Sen , " Power Electronics ", Tata McGraw Hill
2. M.H. Rashid , " Power Electronics " , John Wiley & Sons
3. General Electric, " SCR manual "
4. G. K. Dubey, S. R Doradle, " Thyristorised Power Controller "
5. J. M. Jalnekar and N. B. Pasalkar, " Power Electronics " Technical Publication
6. Ned Mohan, T.M. Undeland and W.P. Robbins, " Power Electronics: Converters, Applications and Design", John Wiley, Singapore, 1994
7. M D Singh and K. B Khanchandani, " Power Electronics ", Tata McGraw Hill
8. B.K.Bose, " Power Electronics & A.C. Drives ", Prentice Hall, 1986.

4B2 : Lab - Power ElectronicsII **(2 hours/week)**

Term Work: Term work will consist of record of experiments /assignments based on the syllabus.

List of Experiments:

1. Thyristor V/I characteristics & Measurement of holding current of SCR
2. Firing circuit of SCR
3. Commutation of SCR
4. TRIAC and DIAC characteristics
5. Single phase/Three phase , Thyristor –Bridge converter with R/RL load
6. Series inverter
7. Parallel inverter
8. SCR application (Any one)
9. DC chopper
10. AC/DC drives

Course Outcomes

SEM: IV	**Sub Name: -** Power Electronics-II
4B2 2.1	To acquire knowledge on Energy Generations, protection Circuits.
4B2 2.2	To understand the concepts of Fundamentals of electrical and electronic instruments.
4B2 2.3	Ability to compare between various electric drive, their functions & application.
4B2 2.4	To understand the concepts Various Motor & controller.
4B2 2.5	Ability to design & develop the different power electronics applications.

CO-PO Mapping

SEM: IV	**Sub Name: -** Power Electronics-II											
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
4B2 2.1	2	2	1	1	1	1	-	-	-	1	1	-
4B2 2.2	2	1	2	1	2	-	-	-	-	-	1	-
4B2 2.3	1	2	2	-	2	1	-	-	-	-	1	-
4B2 2.4	2	2	1	1	1	2	-	-	-	-	-	1
4B2 2.5	2	2	2	2	1	2	1	1	1	2	2	2
Total	9	9	8	5	7	6	1	1	1	3	5	3
Average	1.8	1.8	1.6	1	1.4	1.2	0.2	0.2	0.2	0.6	1	0.6

CO – PSO Mapping

SEM: IV	**Sub Name: -** Power Electronics-II		
Cos	PSO1	PSO2	PSO3
4B2 2.1	1	-	2
4B2 2.2	2	1	2
4B2 2.3	2	1	2
4B2 2.4	2	1	2
4B2 2.5	1	2	2
Total	8	5	10
Average	1.6	1	2

4B3 : Microprocessor (3 hours/week)

Introduction to Microprocessor: Microprocessor and computer definition, Block diagram, Basic architectures: Von Neuman and Hardvard, Computer generations and classifications, Micro, Mini, Mainframe, super Computers. Different memory devices and their characteristics, Evolutions of Microprocessors, Comparison with microcontroller, Concepts of multiprogramming; time sharing; multitasking; multiprocessing; multi user system; parallel processing, Microprocessor 8085: features, pin-out diagram, pin functions, architecture, direct memory access, instruction and data flow, power on response and working of 8085 based
microcomputer system, Instruction set

Microprocessor 8085: Interrupt Structure, Timing and Assembly Language Programming Interrupt Structure, SIM/RIM formats, State transition diagram, Addressing modes, Instruction fetch and execute, machine cycles, Machine and Assembly Language Programming Concept, Simple arithmetic programs, array manipulation programs, bit manipulation, code conversion, delay routines and stack operations

Memory System Design and I/O Interfacing: Classification of memories, Interface considerations, Memory system design, I/O Interface, Memory and I/O address decoder design : Partial and Exhaustive, Data Transfer Schemes, PPI 8255 chip, its modes, interface, initialization and programming, Interfacing of Key Matrix, L.E.D. Banks, Segment and dot matrix LED&LCD displays, Relays : electromechanical, solid state, reed *etc.*, opto isolators, ADC; DAC; Stepper Motor interface

Peripheral Devices: USART 8251, PIT 8253, PDMAC 8257, PKBDC 8279: features, pin out, pin functions, interface with 8085, initialization and application oriented programming

PIC 8259 and Applications of Microprocessor based system: PIC 8259: features, pin out, pin functions, interface with 8085, initialization and applications. Microprocessor System Design, Comparison with other 8 bit processors such as Z- 80, 6800, 6502 etc , processor selection, applications such as programmable logic controller, Temperature controller, Digital IC tester, Data acquisition system etc, Hardware and software debugging with logic analyzer and emulators

Text Books:

1. Ramesh Gaonkar, Microprocessor Architecture, Programming and Applications, Wiley Eastern Publication
2. B. Ram, Fundamentals of Microprocessors And Microcomputers, Tata McGraw Hill Publication
3. K.L. Short, Microprocessor And Programmed Logic, Pearson Education, 2nd Edition

Reference Books:

1. B. Bray, Microprocessor H/W Interfacing and Applications, CBS
2. Data Manuals, Intel

4B3 : Microprocessor 2Hours/Week

List of Practicals: The Laboratory consists of following experiments (minimum 10) in

1. Microprocessor 8085 based development system
2. Simple arithmetic programs
3. Array manipulation programs
4. Code conversion programs
5. LED Bank interface
6. ADC interface
7. DAC interface
8. Stepper Motor interface

Course Outcomes (COs)

SEM: IV	**Sub Name: - MICROPROCESSORS**
4B3.1	Describe the Architecture & pin functions of the 8085 Microprocessor.
4B3.2	Analyse the different Addressing modes & Instructions of the 8085 Microprocessor.
4B3.3	Write simple Assembly language programs for 8085 & execute them on the 8085 trainer kit. .
4B3.4	Explore the technique of interfacing of I/O devices to the 8085 Microprocessor through IC8255.
4B3.5	Explain the use of Stack , Subroutines & Interrupts in 8085 Microprocessorssss

CO-PO Mapping

SEM: IV	**Sub Name: - MICROPROCESSORS**											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
4B3.1	3	-	2	-	-	-	-	-	2	-	-	3
4B3.2	3	1	2	-	2	-	-	-	2	-	-	3
4B3.3	3	-2	2	-	2	-	-	-	2	-	-	2
4B3.4	3	1	2	-	2	-	-	-	2	-	-	2
4B3.5	3	1	2	-	2	-	-	-	2	-	-	1
Total	15	5	10	-	8	-	-	-	10	-	-	11
Average	3	1.25	2	-	2	-	-	-	2	-	-	2.2

CO - PSO Mapping

SEM: IV	**Sub Name: - MICROPROCESSORs**		
COs	PSO1	PSO2	PSO3
4B3.1	3	-	2
4B3.2	2	2	2
4B3.3	3	2	2
4B3.4	2	2	2
4B3.5	3	2	2
Total	13	8	10
Average	2.6	2	2

4B4 : Integrated Circuits and Applications (3 hours/week)

Op-Amp Fundamentals

Basic building blocks of op-amp, DC level shifter, Output stage. An overview of different types of opamp, their peculiarities and application areas. Review of Opamp parameters, Frequency response, offset nulling techniques, inverting, noninverting configurations.

Op-Amp Applications

Summing amplifier, Difference amplifier, Instrumentation amplifier and applications, Integrator, Differentiator and applications. V to I and I to V converter, Comparators, Limitations of Op-amp as Comparator, Schmitt trigger, Comparator IC such as LM339, Bandwidth and slew rate limitations, Precision rectifiers, Peak detector

Op-Amp Applications Signal Generators

Sine wave generators, Multi vibrators, Triangular wave generators, Saw tooth generators, V to F and F to V converters, function generator IC 8038

Active Filter Design

All types of filter responses, First order active filters LP and HP, BPF, band reject and bi quad filters, sensitivity analysis.

Non-linear Applications and Phase Locked Loops

Introduction to Log/Antilog amplifiers and Analog multipliers, Block diagram of PLL Phase Detector, LPF, VCO Block diagram of PLL IC 565 free running frequency, lock range, capture range, Transfer characteristics of PLL, Applications of PLL - Frequency synthesizer, FM demodulator, AM demodulator, FSK demodulator

Text Books:

1. Sergio Franco, Design with Operational Amplifiers and Analog
Integrated Circuits, TMH, Third Edition
2. G.B.Clayton, Operational Amplifiers, International Edition

Reference Books:

1. D.Roy Choudhary, Shail Jain, Linear Integrated Circuits, New
Age International
2. Ramakant Gaikwad, OP-AMP and Integrated Circuits, PHI
3. Govind Daryanani, Principles of Active Network Synthesis and Design, John Wiley and Sons

4B4 : Lab – Integrated Circuits and Applications (2 hours/week)

List of Experiments:- Any Ten Experiments

1. Inverting amplifier
2. Noninverting amplifier
3. Summing amplifier / subtractor
4. Integrator / Differentiator
5. Log amplifier
6. Voltage to Frequency converter
7. Frequency response of active filter (LP/HP/BP)
8. Digital to Analog converter
9. Analog to Digital converter
10. Voltage regulator ICs LM723 *etc.*
11. Waveform generator 8038 *etc.*
12. PLL 565

Term work:

Term work will consist of a record of minimum eight experiments performed and assessed, as per the above list by the candidate

Practical:

The practical examination will be of three hours duration. It will consist of one experiment and viva voce based on the syllabus

Course Outcomes

SEM: IV	Sub Name: - Integrated circuits & applications
4B4 4.1	Students should be able to understand Design of OPAMPS, Classification of OPAMPs & application of OPAMPs.
4B4 4.2	Students should be able to know about various analog filter design.
4B4 4.3	Students should be able to understand various nonlinear application of OPAMPs.
4B4 4.4	Students should be able to design Regulated and Switched mode power supplies.
4B4 4.5	Students should be able to learn about various ICs such as LM339, LM565.

CO-PO matrices

SEM: IV	Sub Name: - Integrated circuits & applications											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
4B4 4.1	3	2	3	1	2	-	-	-	2	-	-	3
4B4 4.2	2	3	3	2	3	-	-	-	2	-	2	3
4B4 4.3	2	2	2	2	2	-	-	-	2	-	-	2
4B4 4.4	3	3	3	2	2	2	2	-	2	-	-	3
4B4 4.5	2	2	2	-	2	-	-	-	2	-	-	2
Total	12	12	13	9	11	2	2	-	2	-	2	13
Average	2.4	2.4	2.6	1.4	2.2	0.4	0.4	-	2	-	0.4	2.6

CO - PSO Mapping

SEM: IV	Sub Name: - Integrated circuits & applications		
COs	PSO1	PSO2	PSO3
4B4 4.1	3	2	1
4B4 4.2	3	2	1
4B4 4.3	3	2	1
4B4 4.4	3	3	2
4B4 4.5	3	2	1
Total	15	11	6
Average	3	2.2	1.2

4B5 L: Control System Engineering (3 Hours/week)

UNIT I CONTROL SYSTEM MODELING

Basic Elements of Control System – Open loop and Closed loop systems – Differential equation – Transfer function, Modeling of Electric systems, Translational and rotational mechanical systems – Block diagram reduction Techniques – Signal flow graph

UNIT II TIME RESPONSE ANALYSIS

Time response analysis – First Order Systems – Impulse and Step Response analysis of second order systems – Steady state errors – P, PI, PD and PID Compensation, Analysis using MATLAB

UNIT III FREQUENCY RESPONSE ANALYSIS

Frequency Response – Bode Plot, Polar Plot, Nyquist Plot – Frequency Domain specifications from the plots – Constant M and N Circles – Nichol's Chart – Use of Nichol's Chart in Control System Analysis. Series, Parallel, series-parallel Compensators - Lead, Lag, and Lead Lag Compensators, Analysis using MATLAB.

UNIT IV STABILITY ANALYSIS

Stability, Routh-Hurwitz Criterion, Root Locus Technique, Construction of Root Locus, Stability, Dominant Poles, Application of Root Locus Diagram – Nyquist Stability Criterion - Relative Stability, Analysis using MATLAB

UNIT V STATE VARIABLE ANALYSIS & DIGITAL CONTROL SYSTEMS

State space representation of Continuous Time systems – State equations – Transfer function from State Variable Representation – Solutions of the state equations - Concepts of Controllability and Observability – State space representation for Discrete time systems. Sampled Data control systems – Sampling Theorem – Sample & Hold – Open loop & Closed loop sampled data systems.

TEXTBOOK

1. J.Nagrath and M.Gopal," Control System Engineering", New Age International Publishers, 5th Edition, 2007.
2. M.Gopal, "Control System – Principles and Design", Tata McGraw Hill, 2nd Edition, 2002.

REFERENCES

1. Benjamin.C.Kuo, "Automatic control systems", Prentice Hall of India, 7th Edition,1995.
2. M.Gopal, Digital Control and State Variable Methods, 2nd Edition, TMH, 2007. Schaum's Outline Series,'Feedback and Control Systems' Tata McGraw- Hill, 2007.
3. John J.D'azzo & Constantine H.Houpis, 'Linear control system analysis and design', Tata McGrow-Hill, Inc., 1995.
4. Richard C. Dorf & Robert H. Bishop, " Modern Control Systems", Addidon – Wesley, 1999.

Course Outcomes

SEM: IV	Sub Name: - Control system Engineering
4B5L 5.1	Students should be able toStudy about the modelling of the linear dynamic systems.
4B5L 5.2	Students should be able to Understand the concept of stability of system.
4B5L 5.3	Students should be able to Analyse the systems in time and frequency domain.
4B5L 5.4	Students should be able to Gain the knowledge of state space modelling of system and its analysis.
4B5L 5.5	Use the concept of feedback to improve the system performance.

CO-PO matrices

SEM: IV	Sub Name: - Control system Engineering											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
4B5L 5.1	3	3	1	-	-	-	-	-	-	-	-	1
4B5L 5.2	3	1	-	-	1	-	-	-	-	-	-	2
4B5L 5.3	2	3	-	-	2	-	-	-	-	-	-	-
4B5L 5.4	3	2	-	-	1	-	-	-	-	-	-	1
4B5L 5.5	1	3	3	-	-	-	-	-	-	-	-	1
Total	12	12	4	-	4	-	-	-	-	-	-	5
Avg	2.4	2.4	2		1.33							1.25

CO - PSO Mapping

SEM: IV	Sub Name: - Control system Engineering		
COs	PSO1	PSO2	PSO3
4B5L 5.1	2	3	3
4B5L 5.2	2	2	3
4B5L 5.3	2	2	3
4B5L 5.4	1	2	3
4B5L 5.5	1	2	3
Total	8	11	15
	1.6	2.2	3

4B6L : Electronics and Design Technology **(3 Hours/week)**

Design of Analog Systems: Review of selection parameters of analog passive and active components; Design of Power Supplies: Regulated and Switched mode.

Design of Audio Systems: Design of Preamplifier circuits using IC, Design of transistorized class A/B/C power amplifier and IC based P.A., Design of Tone Control Circuits: Active tone control, GraphiceEqualizers, Design of AM/FM detectors

Design and Synthesis of Digital Systems: Introduction to Finite State Machines, State diagrams; Design of Mealy FSM; Design of Moore FSM, Design of IC based counter circuits using 7490.7492,74192,74190 etc, Multiplexers, De- multiplexer trees.

Design of Instrumentation Systems: Selection criteria of transducers, DAC, ADC display devices; Design of Data Acquisition System for parameters like : Temperature, Pressure, Humidity, Light.

Electronics System Design Considerations: Selection/Design of heat sinks; Assembly of components on heat sinks, Electrical analogue of thermal circuits; Enclosure design of electronic equipments and thermal considerations, Design Guidelines for Ventilations: Forced cooling, Heat pipes for electronic cooling applications, Thermal considerations in PCB design, Electric field interference, Magnetic field interference, Conducted noise etc. in electronic equipment, Sources of EMI, Cabling, Shielding and Grounding - EMI standards

Reference books:

1. Ramakant Gaikwad, “Op-amps and Linear integrated circuits”, PHI
2. K. R. Botkar, “Linear Integrated Circuits”, Khanna Publication, New Delhi
3. Bowans, “Digital Instrumentation”, TMH Publications
4. William Flecther, “ An Engineering Approch to Digital Design”, PHI
5. Monogram by CEDT, IISc. Bangalore, “Thermal Design of Electronic Equipment”
6. Waller C. Bosshart , “PCB Design & Technology”, TMH
7. Bert Haskell, “Portable Electronics Product Design and Development”, MGH Publication
8. Mohammed H. Rasheed, “Spice for circuits & Electronics using Pspice”, PHI

Course Outcomes (COs) (05)

SEM: IV	**Sub Name: -** Electronics and Design Technology
4B6L : 1	Understand and Design Analog Systems .
4B6L : 2	Understand and Design Audio Systems and AM/FM detectors .
4B6L : 3	Understand , Design and able to do Synthesis of Digital Systems.
4B6L : 4	Understand and Design Instrumentation Systems.
4B6L : 5	Understand Electronics System Design Considerations.

CO-PO matrices of courses

SEM: IV	**Sub Name: -** Electronics and Design Technology											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
4B6L: 1	3	2	3	2	-	-	-	-	2	-	-	2
4B6L : 2	3	2	3	2	-	-	-	-	1	-	-	1
4B6L : 3	3	2	3	-	-	-	-	-	2	-	-	2
4B6L: 4	3	3	3	3	-	-	-	-	2	-	-	2
4B6L : 5	3	2	2	2	-	-	-	-	3	-	-	3
Total	15	11	14	9	-	-	-	-	10	-	-	10
AVG	3	2.2	2.8	2.25					2			2

CO - PSO Mapping

SEM: IV	**Sub Name: -** Electronics and Design Technology		
COs	PSO1	PSO2	PSO3
4B6L: 1	3	2	2
4B6L : 2	3	1	1
4B6L : 3	3	3	2
4B6L: 4	2	2	3
4B6L : 5	3	3	3
Total	14	11	11
Average	2.8	2.2	2.2

Subject Code	Subject	Theory	Practical
5B1	Industrial Design of Electronic Equipment	3	1
5B2	Microcontroller &Peripherals	3	1
5B3	Digital System Design	3	1
5B4	Printed Circuit Board Technology-I	3	1
5B5L	Signal and Systems	3	0
5B6L1 5B6L2	Elective-II(ObjC++ Programming/Embedded c)	3	0
5B7P	Industrial training/visit/internship	0	2
		18	6
6B1	Sensors & Transducers	3	1
6B2	Analog System Design	3	1
6B3	Printed Circuit Board Technology-II	3	1
6B4	Ind. & Environmental instrumentation	3	2
6B5L	Software Engineering	3	0
6B6P	Mini Project	0	2
		15	7

5B1 : Industrial Design for Electronic Equipment – I (2 hours/week)

An introduction to Elements of Design and Forms

* basic elements: Line, texture, colour, form, symmetry, balance, scale, mass, unity and variety.
* Concept of visual language and visual design.
* Introduction to Gestalt laws, composition and figure and ground relationships.
* Introduction to concept of negative space.
* Use of symmetry. Generation of patterns and textures using simple elements.
* Introduction to typography and fonts.
* Use of grids in graphic composition.
* Colour circle, colour combinations and its dimensions: hue, value and chroma.
* Colour meanings in traditions and psychological use of colours.
* Regular and semi regular geometric grids, symmetry operations, order, structure relationships.
* Introduction to Tessellation
* Introduction to Studies in light and shadow

Industrial Design

*History of industrial design, The significance and value of industrial design, Basic characteristics of industrial design, The wide spectrum of design practice and terminology, Industrial design methodology, Creation of a product, Factors concerning the product in use, Capturing insights of users, Creative idea generation, Form generation of products, Design for manufacture, Appearance of the product, Case studies on wide variety of products to showcase the above.

*Introduction to Product development process and the role of product designer therein.

*Design methodology,

*Sketching, Rendening and Drawing.

*Documentation: Role of Product Documentation in product development process. Preparation of following documents: Product concept – Sketching, Product Perspective, Product Assembly, Individual Part Drawing Sheet Layout. Control panel layout, wiring Harness Drawing, Any other necessary document.

References Books:

1. Gail Greet Hannah, Elements of Design, Princeton Architectural Press, 2002
2. Itten, Johannes; The Art of Color: The Subjective Experience and Objective Rationale of Color, Wiley Publications,1997
3. Kepes, Gyorgy; Language of Vision, Dover Publications, 1995
4. Elam, Kimberly; Geometry of Design: Studies in Proportion and Composition, Princeton Architectural Press, 2001
5. Lawlor, Robert; Sacred Geometry: Philosophy and Practice (Art and Imagination), Publisher: Thames & Hudson, 1989
6. Hall, Edward Twitchell; The Hidden Dimension, Publisher: Anchor; Reissue edition, 1990
7. Bachelard, Gaston; Jolas, Maria (Translator); The Poetics of Space, Publisher: Beacon Press; Reprint edition, 1994
8. Powell, Dick; Design Rendering Techniques: A Guide to Drawing and Presenting Design
9. M.M Andereasen, Integrated Product Development, IFS Publications Ltd. / Springer Verlag, Berlin, 1987.

10. Asimow Morris; Introduction to Design, Prentice Hall, Englewood Cliffs, N.J., 1962.
11. Pulos, Arthur, The American Design Ethic, MIT, USA, 1983.
12. Roozenburg and Eekels, Product Design: Fundamentals and Methods, Publisher: John Wiley & Sons Inc; New Ed edition, 1995
13. Ulrich, Karl T., Eppinger, Steven D.; Product Design and Development, McGraw-Hill 1995, 2000, 2004
14. Goodrich, Kristina; Design Secrets: Products: 50 Real- Life Projects Uncovered - Industrial Designers Society of America, Publisher: Rockport Publishers June 2001
15. K. Critchlow, Order in Space: A design Source Book, Thames and Hudson,1969
16. C. Akner-Koler, Three Dimensional Visual Analysis, Institutionen for Industridesign, Konftfack, Sweden, 1994
17. R. Beech, Origami: The complete guide to the art of paper folding, Lorenz Books, 2001

5B1 : Lab – Industrial Design for Electronic Equipment – I (2 hours/week)

The practical shall consist of a case study based on following exercises.

Sketching, Rendering, Exploded view, Control Panel, Design and Layout, Mount Board Model Making.

Course Outcomes (COs)

SEM: VI	Sub Name: - Industrial Design for Electronics Equipment
5B1 1.1	Understanding of basic concepts of industrial design
5B11.2	Acquire the knowledge of product development process
5B11.3	Analyse design methodology case studies for real life industrial products
5B11.4	Usage of Aesthetic and Ergonomics principle for design of electronics products

3.1.2. CO-PO matrices of courses selected in 3.1.1 (05)

SEM: VI	Sub Name: - Industrial Design for Electronics Equipment											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
5B1 1.1	1	1	2	-	-	-	1	1	-	-	-	1
5B11.2	2	2	2	1	1	1	2	2	1	1	2	2
5B11.3	2	2	2	2	2	2	2	2	1	1	2	2
5B11.4	1	2	2	1	2	1	1	2	1	2	2	2
Total	6	7	8	4	5	4	7	7	3	4	6	7
Average	1.5	1.75	2	1.33	1.67	1.33	1.75	1.75	1	1.33	2	1.75

CO - PSO Mapping

SEM: VI	Sub Name: - Industrial Design for Electronics Equipment		
COs	PSO1	PSO2	PSO3
5B1 1.1	-	1	1
5B11.2	-	1	1
5B11.3	-	2	2
5B11.4	-	2	2
Total	-	6	6
Average	-	1.5	1.5

5B2 : Microprocessor and Microcontroller (3 Hours/week)

8086 Architecture

Introduction to advanced microprocessors, 8086 internal architecture, Memory, Organization, Addressing modes, Accessing immediate & Register data, Memory accessing. 8086 minimum/maximum mode system, Real and Protected modes of operation, Address translation, Memory organization, Paging.

8086 Instruction Set

8086 data transfer instructions, Arithmetic instructions, Bit manipulation instructions, String instructions, Conditional & Unconditional branch instructions, Processor control instructions, Overview of 8086 interrupts responses, 8086 interrupt types, Examples, Hardware interrupt applications, Multiple interrupts, 8259 a interrupt controller, Examples using 8259 A with 8088.

Keyboard & Display interfacing

Keyboard interfacing, interfacing LED displays, 8279 keyboard/ display controller, Block diagram, Pin description, Functional description, Software operation, Interface considerations, Circuit connections with 8086.

Advanced Microprocessors

Introduction to Pentium and Pentium pro architectures: RISC concepts, BUS operation, Super scalar architecture, Pipelining Introduction to Pentium II, Pentium III and Pentium 4 processors. RISC Architecture : Properties of RISC Systems Comparison with CISC architecture

Introduction to Microcontrollers

Study of micro controller (MCS 51 family- 8051) - Architecture - Comparison of various families of 8 bit micro controllers. System design techniques interfacing of LCD, Stepper motor, Keyboard and ADC /DAC using microcontrollers. Study of micro controller 8096 - Architecture, Typical application in automotive and other industries, Introduction to super pipelined super scalar architectures of microcontrollers.

Reference Books

1. D. Hall, " Microprocessor and Interfacing (8086), 2nd ed,TMH
2. Gibson, " Microprocessor and Interfacing", 2nd edition, PHI
3. Triebel and Singh, " The 8088 and 8086 Microprocessors : Programming, Interfacing, software, Hardware and Applicatios ", PHI
4. Brey, " Intel Microprocessors, 8086 to Pentium and Pentium pro processor: Architecture, Programming and interfacing", 4th edition, PHI / Pearson
5. Ajay Deshmukh, "Microcontrollers (Theory and Applications) –TMH
6. M.A. Mazidi & J.G.Mazidi, The 8051 Microcontroller and Embedded systems 3rd Indian reprint, Pearson Education.

5B2 Lab : Microprocessor and Microcontroller (2 Hours/week)

Programming exercises in c and assembly language covering program and data memory
i/o port,Peripheral and external interrupt, power saving modes.
Interfacing of devices like keys,relays,leads,seven segment,LCD Module,Matrix keyboard etc.

Course Outcomes

SEM: V	Sub Name: - Microcontroller & Peripherals
5B2 2.1	Understand the architecture, features and basic instructions of 8086
5B2 2.2	Apply 8086 assembly language code to solve problems for arithmetic operations, code conversion and handle interrupts
5B2 2.3	Apply 8086 assembly language code to handle strings and overflow conditions and I/O programming interface
5B2 2.4	Understand the advanced microprocessors, features of Pentium and Pentium pro architectures and RISC and CISC architectures.
5B2 2.5	Understand the architecture, features and system design techniques for MCS 51 family- 8051(Microcontroller)

CO-PO matrices

SEM: V	Sub Name: - Microcontroller & Peripherals											
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
5B2 2.1	1	1	1	-	-	-	-	-	-	-	-	2
5B2 2.2	2	2	2	-	-	-	-	-	-	-	-	2
5B2 2.3	2	2	2	-	-	-	-	-	-	-	-	2
5B2 2.4	2	2	2	-	-	-	-	-	-	-	-	2
5B2 2.5	2	2	2	-	-	-	-	-	-	-	-	2
Total	9	9	9									10
Average	1.8	1.8	1.8	-	-	-	-	-	-	-	-	2

CO - PSO Mapping

SEM: V	Sub Name: - Microcontroller &Peripherals		
COs	PSO1	PSO2	PSO3
5B2 2.1	-	-	2
5B2 2.2	-	-	2
5B2 2.3	-	-	2
5B2 2.4	-	-	2
5B2 2.5	2	2	2
Total	2	2	2
Average	2	2	2

5B3 **: Digital System Design** **(3 Hours/week)**

Sequential Circuit Design: Synchronous and asynchronous FSM design, Basic design steps, State encoding techniques, Analysis of sequential circuits, Algorithmic state machines (ASM) charts

Introduction to HDL, VHDL, Language Constructs, Library, Entity, Architecture, Modeling styles, Signals and variables, Sequential and concurrent statements, Synthesis and simulation concept implementation of logic function

Fundamental of simulation, Simulation process, Types of simulation, Simulation process types, Simulation and simulators. Introduction to synthesis, Design flow, Tools, Optimization, Synchronous and asynchronous circuits. Mapping of statements to gates, Model optimizations

Introduction to Programmable Logic Devices: PAL, PLA, PLD, CPLD,FPGA. Case Studies: Xilinx 9500 CPLD series, SPARTAN FPGA,VIRTEX Series, Review of Multi FPGA boards for real time application development

Case Studies: Design, Simulation, Synthesis and Implementation of Sequential Designs like- ALU design, CPU design:, Code converters.

Reference Books:

1. Charles Roth, “Digital Design with VHDL”, Thomson Learning , India Edition
2. John Wakerly, “Digital Design: Principal and Practices” , Pearson Education
3. Douglus Perry, “VHDL”, TMH
4. J. Bhasker , “VHDL Primer”, PHI
5. J. Bhasker, “ A VHDL synthesis Primer”, BSP , New Delhi

6. Online documentation of Xilinx PLDs: http"//www.xilinx.com

5B3 : Lab - Digital System Design (2 Hours/week)

Term Work: Term work will consist of record of experiments/assignments based on the syllabus. The experiments will comprise of Modeling, Simulation, Synthesis and Hardware verification using PLD Target boards.

- **Platforms**
- Xilinx ISE/ ModelSim / Xilinx Simulator/ Xilinx XST

List of Experiments

01 Design of Mux/ Demux
02 Design of Comparator
03 Design of Sequence detectors
04 Designs of Synchronous Counters
05 Design of Asynchronous Counters
06 Design of ALU
07 Design of Code Converters
08 Design of a Simple 8 bit CPU
09 Design of MAC
10 Design of Stepper Motor driver unit

Course Outcomes (COs) (05)

SEM: V	**Sub Name: - Digital System Design**
5B3 3.1	Students should be able toUse the basic logic gates and various reduction techniques of digital logic circuit in detail
5B3 3.2	Students should be able to Design combinational and sequential circuits
5B3 3.3	Students should be able to Design and implement hardware circuit to test performance and application
5B3 3.4	Design & analyze modular combinational circuits with MUX/DEMUX, Decoder, Encoder
5B3 3.5	Students should be able to Use HDL & appropriate EDA tools for digital logic design and simulation

CO-PO matrices

SEM: V	**Sub Name: - Digital System Design**											
COs	PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
5B3.3.1	3	2	2	1	3	1	-	-	-	-	1	2
5B3.3.2	3	2	2	1	3	1	-	-	-	-	1	2
5B3.3.3	3	2	2	1	3	1	-	-	-	-	1	2
5B3.3.4	3	2	2	1	3	1	-	-	-	-	1	2
5B3.3.5	3	2	2	1	3	1	-	-	-	-	1	2
Total	15	10	10	5	15	5					5	10
Average	3	2	2	1	3	1	-	-	-	-	1	2

CO - PSO Mapping

SEM: V	**Sub Name: - Digital System Design**		
COs	PSO1	PSO2	PSO3
5B3 3.1	3	3	1
5B3 3.2	3	3	1
5B3 3.3	3	3	1
5B3 3.4	3	3	1
5B3 3.5	3	3	1
Total	15	15	5
Average	3	3	1

5B4 : Printed Circuit Board Technology I (3 Hours/week)

Introduction to printed circuit board design: History & Defination of printed circuit board design, Classification of PCBS– SSB, DSB (PTH & Non PTH) , Multilayer PCB. Application are Various PCBs, Useful standards on PCBs

Overview of the PCB design: Introduction to Semiconductor Packing Technology, Role of scale & Grid in PCB design, PCB mounting method and PCB standards, Layout considerations- Land Requirement, Layout Methodology,Design Elements & Performance Parameters, Manufacturing Documentation like role of Block Diagram,Schematic drawing Netlist generation Assembly Drawing, Mechanical Drawing.

Layout Planning and Design : Electrical Design Consider – Resistance in general, Capacitance in general, Inductance of Conductor and Conductor Pattern,Component placement approach with respect to conductor with, conductor shapes,Thermal Consideration, Mounting consideration, requirement of heat sink, Layout check with respect to mechanical and electrical consideration,Layout Methodology,Layout Design Checklist and inspection, Useful standards.

Design rule for Analog circuit PCBS: Design rule for High frequency amplifiers/ oscillator, Design rule for Multistage amplifiers with high power o/p stage,Design rule for feed-back amplifier,Design rule for differential amplifier,Supply and ground line conductors considerations.

Art Work Generation: Artwork approach and design guidelines for SSB & DSB design, Artwork Preparation methods-Taping UP: Laying down the tapes and drafting , material using appropriate methods,Design Guidelines for Artwork Preparation – Conductor Orientation, Conductor ,Routing, Spacing Importance of hole diameter and solder Paid diameter ,Advance methods of Artwork generation,Artwork Inspection and checks.

Film Master Generation: Introduction ,Parameters of Photographic film like film emulsions, dimensional, Stability of film master, types of film, Types of Reprographic Cameras, Dark- Room setup and procedure of film processing, Film Registration, Faults related to film processing and remedies.

Properties of Copper Clad Laminates: Anatomy of Laminates, Types of Laminates with application,Manufacturing Process of copper Clad,Physical and Electrical properties of Laminates, Evaluation of Laminates and test methods like peel strength, flexural strength.

Surface Preparation: Need of Surface Preparation, Manual Cleaning Process, Mechanical Cleaning Process,Trends in cleaning process,Test for Cleanliness.

Screen Printing in PCB Fabrication : Introduction, Material required for screen printing – screen Frames, Screen fabrics Squeegees, Printing Inks and curing methods, Direct and Indirect Methods of Pattern transfer, Manual Screen printing and Automatic Screen Printing process, Trouble – Shooting.

Photoprinting: Photo resist in general, Characteristic of photo resist, Types of Photoresist and coating/Iamination methods, Manufacturing process of SSB and DSB using wait film process, Dry film Resist – Features & catagaries. Processing of Dry – Film Resisst, Trouble shooting.

Component Assembly Techniques: Classification of component assembly Techniques, Formation and mounting Techniques,PCB cleaning methods, PCB Protection methods, Repair and rework.

Soldering Techniques: Introduction, Theory of Soldering, Types of solder alloys and fluxes, Solder Paste

for SMDS, Tools. Soldering Techniques – Manual soldering, Mass soldering, Role of solder mask, Solder mask application methods, Quality Control of solder Joints, Solder Joint Defect & cause, Re-Work and Reaping of PCBs.

Reference Books:

1) PCB Technology- Design,Fabrication. Walter C.Booshart
2) Printed Circuits, their Application and Design. Dukes J.N.C.
3) Printed Circuits Handbook. C.F.Coomb

5B4 : Lab – Printed Circuit Board Technology I (2 Hours/week)

Practical is based on above syllabus.

Course Outcomes (COs)

SEM: V	Sub Name:- Printed Circuit Board Technology-I
5B4 1.1	Describe the concepts of PCB, its history, characteristics, applications and important parameters.
5B4 1.2	Understand the fundamentals of PCB Layout planning and design & Design rules for analog electronic circuits.
5B4 1.3	Perform Artwork Generation & film master operation.
5B4 1.4	Explore about various copper clad laminates and their surface preparation methods.
5B4 1.5	Analyse screen printing and photo printing methods in PCB manufacturing.

CO-PO matrices Mapping:-

SEM: V	Sub Name: - Printed Circuit Board Technology-I											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
5B4 1.1	3	-	-	-	-	-	-	-	-	-	-	2
5B4 1.2	3	2	-	-	2	-	-	-	2	-	-	2
5B4 1.3	2	-	-	-	2	-	-	-	2	-	-	2
5B4 1.4	2	-	-	-	-	-	-	-	-	-	-	2
5B4 1.5	3	-	-	-	2	-	-	-	2	-	-	2
Total	13	2			6				6			6
Average	**2.6**	**2**			**2**				**2**			**2**

CO - PSO Mapping

SEM: V	Sub Name: - Printed Circuit Board Technology-I		
COs	PSO1	PSO2	PSO3
5B4 1.1	2	-	-
5B4 1.2	3	2	-
5B4 1.3	2	2	-
5B4 1.4	1	-	-
5B4 1.5	2	2	-
Total	10	6	
Average	**2**	**2**	**-**

5B5L :SIGNAL AND SYSTEM **(3 hours/week)**

Mathematical description, System modeling, Analysis of signals and systems: Classification ,Properties, Energy and power of signal, System characteristics, Eigen functions of LTI systems, Convolution integral and sum, Impulse, Step response of system, Time response (Transient and steady state),Stability analysis, Block diagram representation of systems such as Electrical, Electronics, Mechanical etc.

Differential equations, Laplace transform analysis of signals and systems: Dynamic models and dynamic response, Open loop/ closed loop control systems, Transfer function, Root locus, Frequency response (Bode, Nyquist) of electronics passive and active circuits, Application to electronics and communication systems.

Z- Transform Analysis of Signals and Systems: Dynamic models and dynamic response, Correlation: Cross and Auto correlation, Energy and Power spectral density, Z transform analysis of discrete time signals and systems,. Stability, Jurie's Stability test, Application to digital electronics and communication control systems.

State space, State variable model, Impulse response model, Transfer function model, Root locus, Routh Hurwitz criteria , Stability analysis of control systems, Solution to state equations, State transition matrix, Transfer matrix, Controllability and Observability. Adaptive control systems.

Frequency domain analysis of signals and systems, Fourier Series & Transform: Properties,Theorems and applications, Ideal filters, Sampling and reconstruction of signals in time and frequency domain, DFT

Reference Books

1. Simon Hykin , " Signals and Systems", John Wiley
2. M.J.Roberts,"Signals and Systems" TMH Ed 2003
3. I.J.Nagrath,S.N.Sharan,R Ranjan,S Kumar, "Signals and Systems" TMH First Ed.
4. Harish Parthasarathy,"Signals and Systems" JK International Second Edition.
5. Proakis and Salehi,'Communication Systems Engg" Pearson Education Second edition.
6. Simon Haykin , "Communication Systems " Wiley ,3rd Edition.
7. M. Gopal, "Control Systems" TMH.
8. I.J. Nagrath and M.Gopal, "Control Systems Engineering" New Age International Fourth Ed.
9. Ogata, " Modern Cotrol Systems", TMH
10. HWEI P.HSU Schaum's, " Signals and Systems" TMH

Course Outcomes (COs)

SEM: V	**Sub Name: -Signal and Systems**
5B5L 4.1	Students should be able to analyze mathematical description and representation of continuous and discrete time signals and systems
5B5L 4.2	Students should be able to Develop input output relationship for linear shift invariant system and understand the convolution operator for continuous and discrete time system
5B5L 4.3	Students should be able to resolve the signals in frequency domain using Fourier series and Fourier transforms.
5B5L 4.4	Students should be able to describe the limitations of Fourier transform and need for Laplace transform and develop the ability to analyze the system in s- domain
5B5L 4.5	Students should be able to explore the basic concept of probability, random variables & random signals and develop the ability to find correlation, CDF, PDF and probability of a given event.

CO-PO matrices Mapping:-

SEM: V	**Sub Name: - Signal and Systems**											
COs	PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
5B5L 4.1	3	2	2	1	3	1	-	-	-	1	1	2
5B5L 4.2	3	2	2	1	3	1	-	-	-	1	1	2
5B5L 4.3	3	2	2	1	3	1	-	-	-	1	1	2
5B5L 4.4	3	2	2	1	3	1	-	-	-	1	1	2
5B5L 4.5	3	2	2	1	3	1	-	-	-	1	1	2
Total	15	10	10	5	15	5	-	-	-	5	5	10
	3	2	2	1	3	1				1	1	2

CO - PSO Mapping

SEM: V	**Sub Name: - Signal and Systems**		
COs	PSO1	PSO2	PSO3
5B5L 4.1	2	2	2
5B5L 4.2	2	2	2
5B5L 4.3	2	2	2
5B5L 4.4	2	2	2
5B5L 4.5	2	2	2
Total	10	10	10
	2	2	2

5B6L2 Embedded C **(3 Hours/week)**

PROGRAMMING EMBEDDED SYSTEMS

Embedded Program – Role of Infinite loop – Compiling, Linking and locating – downloading and debugging –

Emulators and simulators processor – External peripherals – Memory testing – Flash Memory.

OPERATING SYSTEM

Embedded operating system – Real time characteristics – Selection process – Flashing the LED – serial ports – Zilog

85230 serial controlled code efficiency – Code size – Reducing memory usage – Impact of C++.

HARDWARE FUNDAMENTALS

Buses – DMA – interrupts – Built-ins on the microprocessor – Conventions used on schematics – Microprocessor

Architectures – Software Architectures – RTOS Architectures – Selecting and Architecture.

RTOS

Tasks and Task states – Semaphores – Shared data – Message queues, Mail boxes and pipes – Memory management

– Interrupt routines – Encapsulating semaphore and queues – Hard Real-time scheduling – Power saving.

EMBEDDED SOFTWARE DEVELOPMENT TOOLS

Host and target machines – Linkers / Locators for Embedded Software – Debugging techniques – Instruction set

simulators Laboratory tools – Practical example – Source code.

REFERENCE BOOKS

1. David E.Simon, “An Embedded Software Primer”, Perason Education, 2003.

2. Michael Bass, “Programming Embedded Systems in C and C++”, Oreilly, 2003

Course Outcomes

SEM: V	Sub Name: -Embedded c
5B6L2 7.1	Students should be able to program embedded systems.
5B6L2 7.2	Students should be able to perform programming operation in operating system.
5B6L2 7.3	Students should be able to develop the concept of Real time operating system.
5B6L2 7.4	Students should be able to perform operation on Embedded software development tools.
5B6L2 7.5	Students should be able to perform operation on Emulator and simulator for embedded processors.

CO-PO matrices

SEM: V	Sub Name: - Embedded C											
COs	PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
5B6L2 7.1	3	2	2	1	3	1	-	-	-	-	1	2
5B6L2 7.2	3	2	2	1	3	1	-	-	-	-	1	2
5B6L2 7.3	3	2	2	1	3	1	-	-	-	-	1	2
5B6L2 7.4	3	2	2	1	3	1	-	-	-	-	1	2
5B6L2 7.5	3	2	2	1	3	1	-	-	-	-	1	2
Total	15	10	10	5	15	5	-	-	-	-	5	10
Avg	**3**	**2**	**2**	**1-**	**3**	1	**-**	**-**	**-**	**-**	**1**	**2**

CO - PSO Mapping

SEM: V	Sub Name: - Embedded C		
COs	PSO1	PSO2	PSO3
5B6L2 7.1	3	3	1
5B6L2 7.2	3	3	1
5B6L2 7.3	3	3	1
5B6L2 7.4	3	3	1
5B6L2 7.5	3	3	1
Total	15	15	5
Average	**3**	**3**	**1**

5B6L2 : Elective I : Object Oriented Programming **(3 Hours/week)**

Object Oriented Paradigm: Structured versus Object oriented development, Elements of OOP, Objects, Classes, Encapsulation, Inheritance, Polymorphism, Message communication

Classes and Objects: Class specification, Class objects, Member access, Defining member functions, Constructors and Destructors, Passing and returning objects as arguments, Friend functions

Introduction to Iteration Statements: Objects, Expressions, Design definition of methods, Passing by value, Class definitions, Memory diagrams, Instance variables, State, Public/private, Interface, More design

Polymorphism and Inheritance: Method, Function and operator overloading; Derived class declaration, Forms of inheritance, Inheritance and member accessibility

Applications : Sample problems in engineering, Science, Text processing and numerical methods,.GUI Design

Reference Books

1. K.R. Venugopal et al., "*Mastering C++"* , Tata McGraw Hill Pub.
2. Herbert Schildt, "Teach Yourself C++ ", Tata McGraw Hill Pub.
3. B. Stroustrup, " C++ Programming Language ", 3rd Edition, Pearson Education.
4. Cohoon and Davidson, " C++ Program Design: An introduction to Programming and Object- Oriented Design " 3rd Edition, Tata McGraw Hill. 2003.
5. Bruce Eckel Thinking " In C++ " 2nd Edition (available online)
6. Addison-Wesley " The Java Tutorial " Sun Microsystems.

Course Outcomes

SEM: V	Sub Name: -Object oriented Programming
5B6L1 6.1	Students should be able to Describe the essential features of an object-oriented programming language
5B6L1 6.2	Students should be able to Produce and/or debug code fragments that illustrate principles of object-oriented software development
5B6L1 6.3	Students should be able to Describe the principles for testing object-oriented software and derive sets of test data given a specification
5B6L1 6.4	Students should be able to.Produce class diagrams, object interaction diagrams and object state transition diagrams for a given problem.
5B6L1 6.5	Students should be able to differentiate between functions, classes and objects

CO-PO matrices

SEM: V	Sub Name: - Object Oriented Programming											
COs	PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
5B6L1 6.1	2	-	-	-	3	-	-	-	-	-	-	1
5B6L1 6.2	2	-	-	-	3	-	-	-	-	-	-	1
5B6L1 6.3	2	-	-	-	3	-	-	-	-	-	-	1
5B6L1 6.4	2	-	-	-	3	-	-	-	-	-	-	1
5B6L1 6.5	2	-	-	-	3	-	-	-	-	-	-	1
Average	**2**	**-**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

CO - PSO Mapping

SEM: V	Sub Name: - Object oriented Programming		
COs	PO1	PO2	PO3
5B6L1 6.1	-	-	3
5B6L1 6.2	-	-	3
5B6L1 6.3	-	-	3
5B6L1 6.4	-	-	3
5B6L1 6.5	-	-	3
Average	-	-	**3**

5B7P Industrial training /visit/internship (1 credit)

3.1.1. Course Outcomes (COs) (05)

SEM: V	Sub Name: - Industrial training/visit/internship
5B7P 5.1	Participate in the projects in industries during his or her industrial training.
5B7P 5.2	Describe use of advanced tools and techniques encountered during industrial training and visit.
5B7P 5.3	Interact with industrial personnel and follow engineering practices and discipline prescribed in industry.
5B7P 5.4	Develop awareness about general workplace behavior and build interpersonal and team skills.
5B7P 5.5	Prepare professional work reports and presentations.

3.1.2. CO-PO matrices of courses selected in 3.1.1 (05)

SEM: V	Sub Name: - Industrial training/visit/internship											
COs	PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
5B7P 5.1	2	-	-	-	2	-	3	3	3	2	-	2
5B7P 5.2	2	-	-	-	2	-	3	3	3	2	-	2
5B7P 5.3	2	-	-	-	2	-	3	3	3	2	-	2
5B7P 5.4	2	-	-	-	2	-	3	3	3	2	-	2
5B7P 5.5	2	-	-	-	2	-	3	3	3	2	-	2
Total	10	-	-	-	10	-	15	15	15	10	-	10
Avg	**2**	**-**	**-**	**-**	**2**	**-**	**3**	**3**	**3**	**2**	**-**	**2**

CO - PSO Mapping

SEM: V	Sub Name: - Industrial training/visit/internship		
COs	PSO1	PSO2	PSO3
5B7P 5.1	-	-	-
5B7P 5.2	-	-	-
5B7P 5.3	-	-	-
5B7P 5.4	-	-	-
5B7P 5.5	-	-	-
Total	-	-	-
Avg	-	-	-

6B1 : SENSORS & TRANSDUCERS (3 Hours/week)

Definition, principle of sensing & transduction , classification Mechanical and Electromechanical sensor • Resistive (potentiometric type): Forms, material, resolution, accuracy, sensitivity. • Strain gauge: Theory, type, materials, design consideration, sensitivity, gauge factor, variation with temperature, adhesive, rosettes. • Inductive sensor: common types- Reluctance change type, Mutual inductance change type, transformer action type, Magnetostrictive type, brief discussion with respect to material, construction and input output variable, Ferromagnetic plunger type, short analysis. • LVDT: Construction, material, output input relationship, I/O curve, discussion. • Proximity sensor.

• Capacitive sensors: variable distance-parallel plate type, variable area- parallel plate, serrated plate/teeth type and cylindrical type, variable dielectric constant type, calculation of sensitivity. • Stretched diaphragm type: microphone, response characteristics. • Piezoelectric element: piezoelectric effect, charge and voltage co-efficient, crystal model, materials, natural & synthetic type, their comparison, force & stress sensing, ultrasonic sensors. Thermal sensors: • Material expansion type: solid, liquid, gas & vapor • Resistance change type: RTD materials, tip sensitive & stem sensitive type, Thermister material, shape, ranges and accuracy specification. • Thermoemf sensor: types, thermoelectric power, general consideration, • Junction semiconductor type IC and PTAT type. • Radiation sensors: types, characteristics and comparison. • Pyroelectric type Magnetic sensors: • Sensor based on Villari effect for assessment of force, torque, proximity, Wiedemann effect for yoke coil sensors, Thomson effect, Hall effect, and Hall drive, performance characteristics. • Radiation sensors: LDR, Photovoltaic cells, photodiodes, photo emissive celltypes, materials, construction, response. • Geiger counters, Scintillation detectors. Introduction to smart sensors

Text books: 1. Sensor & transducers, D. Patranabis, 2nd edition, PHI 2. Instrument transducers, H.K.P. Neubert, Oxford University press. 3. Measurement systems: application & design, E.A.Doebelin, Mc Graw Hill.

Lab

Laboratory Practical's will be based on above syllabus.

Course Outcomes

SEM: VI	**Sub Name: -** Sensors and Transducers
6B1 : 1	Able to Understand Principles of sensing and transduction and classification of Various sensors like resistive, inductive and capacitive sensors
6B1 : 2	Able to understand working of various resistive and inductive sensors with their applications
6B1 : 3	Able to understand working of capacitive sensors and active transducers like Piezo electric sensors with their applications
6B1 : 4	Able to understand working of various Temperature sensors
6B1: 5	Able to understand working of various Digital sensors, Optical sensors and semiconductor sensors

CO-PO matrices

SEM: VI	**Sub Name: -** Sensors and Transducers											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
6B1 : 1	3	2	3	3	-	-	-	-	-	-	-	1
6B1 : 2	3	2	3	2	2	-	-	-	-	-	-	1
6B1 : 3	3	2	3	3	2	-	-	-	-	-	-	1
6B1 : 4	3	2	3	2	2	-	-	-	-	-	-	1
6B1: 5	3	2	3	3	2	-	-	-	-	-	-	1
Total	15	10	15	13	8	-	-	-	-	-	-	5
Average	3	2	3	2.6	2							1

CO - PSO Mapping

SEM: VI	**Sub Name: -** Sensors and Transducers		
COs	PSO1	PSO2	PSO3
6B1 : 1	3	-	-
6B1 : 2	3	2	1
6B1 : 3	3	2	1
6B1 : 4	3	2	1
6B1: 5	3	2	1
Total	15	8	4
Average	3	2	1

6B2: Analog System Design **(3 Hours/week)**

Design of D.C.amplifiers**,** Operational amplifier, Analog annunciators, Analog Voltmeter, Multimeter, Microvoltmeter, Power Meter , L-R-C-Q meter

Design of : Passive and active filters using RC and RL networks, Oscillators: Colpitts, Hartley, Clapp, Wein Bridge, Phase Shift, Crystal oscillator, PLL Design, Frequency synthesizer

Design of Communication Circuits: Tuned amplifiers, RF Amplifier, Mixers, AM modulators and FM modulators , Sound IF amplifier, Video amplifiers, Video IF amplifiers

Design of AM receiver system, FM receiver system, AF amplifier system, Hi-Fi amplifier system: Equalizers, Pre-amplifiers, Power Amplifier, Active Tone control circuits

Design of TV receiver system : Tuner, Sync separator, Deflection Circuit Horizontal and Vertical Linearity Circuits, Remote Control, Design of Process controllers : Temperature, Humidity, Flow and Level measurements

Reference Books:

1. Milliman Halkies, “Integrated Electronics”, McGraw Hill International
2. K.C.Botkar, “Integrated Circuits”, Khanna Publication
3.Van Valkenburg, “Modern Network Synthesis”, PHI, EEE edition
4. Govind Daryanani “Principles of Active Network Synthesis and Design”, John Wiley & Sons
5.A.M.Dhake, “Video and Television Engineering”, TMC
6. Landforth Smith, “ Design of AM Radio Receiver ” PHI
7. Data sheets of Analog Devices

6B2 : Lab- Analog System Design **(2 Hours/week)**

Term Work: Term work will consist a record of designs based on the syllabus

List of Designs

01 Design and Implementation of Multimeter
02 Design and Implementation of Second Order active filters
03 Design and implementation of RF Oscillator
04 Design and Implementation of AM modulator
05 Design and Implementation of AM demodulator
06 Design and Implementation of FM modulator
07 Design and Implementation of FM demodulator
08 Design and Implementation of Video Amplifier
09 Design and Implementation of Video IF Amplifier
10 Design and Implementation of Signal Recovery Circuits
11 Design and Implementation of Analog Annunciators
12 Study of Process Controllers

Practical Examination:

The practical examination will be of three hours duration. It will consist of performing one of Experiments conducted during the course and an oral examination based on the syllabus.

Course Outcomes

SEM: VI	**Sub Name: -** Analog System Design
6B2 : 1	Understand , Design and Implement various types of measuring instruments like Amplifiers , Multimeter etc .
6B2 : 2	Understand , Design and Implement various types of Filters and Oscillators .
6B2 : 3	Design and analyze the mathematical techniques various communication circuits including amplitude modulation (AM), frequency modulation (FM) signals.
6B2 : 4	Understand & Designing of AM /FM receiver system, Power Amplifier etc .
6B2 : 5	Understand and Designing of TV receiver system .

CO-PO matrices

SEM: VI	**Sub Name: -** Analog System Design											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
6B2 : 1	3	2	3	2	-	1	1	-	-	2	1	1
6B2 : 2	3	2	3	2	-	1	1	-	-	2	1	1
6B2 : 3	3	2	3	2	-	1	1	-	-	-	1	1
6B2 : 4	3	2	3	2	-	1	1	-	-	-	1	1
6B2 : 5	3	2	2	2	-	1	1	-	-	-	1	1
Total	15	10	14	10	-	5	5	-	-	4	5	5
Average	3	2	2.8	2		1	1			2	1	1

CO - PSO Mapping

SEM: VI	**Sub Name: -** Analog System Design		
COs	PSO1	PSO2	PSO3
6B2 : 1	3	2	2
6B2 : 2	3	2	2
6B2 : 3	3	2	2
6B2 : 4	3	2	2
6B2 : 5	3	2	2
Total	15	10	10
Average	3	2	2

6B3 : **Printed Circuit Board Technology II** **(3 Hours/week)**

Design Consideration for digital circuits:
Design rules for TTL, CMOS ECL circuits,
Reflection and Crosstalk**,** Ground to supply noise**,** E.M. Interference**,** Problems in design & Recommendations and summary .

Design Consideration for Power Electronics Circuits: Introduction , Dividing Circuit into High and Low Power Part, Copper Clad Laminates, PCB Terminal Connections & their Assembly, Conductor Width & Thermal Consideration

Automation in PCB Design : Limitation of Manual Designing**,** Introduction to various EDA tools, CAD operation**,** Schematic Capture, Layout, Automation in component Placements, Routing Assignments and routing Procedures, Post process and Gerber datageneration**,** Design rules check**,** Generation of film master using photoplotter, data transfer mechanisms.

Plating Process : Introduction **,** Need for Plating , Types of Plating, Platting Techniques : Immersion Plating for Tin and Gold, Electroless Copper plating & Electroplating in detail, Special Platting Techniques , Alternative Finishes ,Plating Defects & Plating Quality Control, Consideration for shop floor, Useful for Standers

Etching Techniques: Introduction**,** Etching Solution and Chemistry, Equipments for etching,Problems in Etching, Facilities for Etching Area, Problems in Etching Electrochemical Etching, Mechanical Etching

Mechanical Operation : Need for Mechanical Operations,Cutting Methods – Shearing, Sawing, Blanking, Milling & Routing, Hole Punching , Drilling – Classification of drill bits, Drill details, Drilling M/Cs, Drilling Problems, Micro vias, Use of UV laser for Drilling PCB, Hybrid Laser Drilling Process, Useful Standards

Multi- layer Boards : Introduction,Introduction Techniques – PTH, Buried and blind via, Materials for Multi – Layer boards ,Mechanical & Electrical Design Consideration of Multi- Layer Boards,Fabrication Process for Multi – Layer Board, Useful Standards

Flexible Printed Circuits Boards : Introduction ,Construction of Flexible PCBs – Types of films, foils & Adhesives,Design considerations in Flexible Circuits, Manufacture of Flexible Circuits, Rigid Flex Printed Circuits Boards,Terminations, Advantages of Flexible Circuits ,Special Applications of Flexible Circuits, Useful Standards

PCB Technology Trends: Fine Line Conductor with Ultra – Thin Copper Foil,Multi Wire Board , Metal Core PCBs,Additive and Semi additive Process, Mechanical Milling of PCBs.

Design with Surface Mounting Technology: Stencil Printing of SMDs, Industrial SMT Assembly Process,SMD Soldering – Manual and Reflow Soldering Techniques,Repair and Rework of SMDs , Advantages and Limitations of SMT

Quality, Reliability and Acceptability Aspects: Quality Assurance in PCB, Testing for Quality Control Methods ,Testing for Printed Circuits Boards,Reliability Testing, Acceptability of PCBs, Useful Standards

Environmental Concerns in PCB Industry: Pollution Control in PCB Industry, Polluting Agents, Recycling of water ,Recovery Techniques, Air pollution , Recycling of Printed Circuit Board,Environmental Standards ,Safely Precaution for the Personal,Toxic Chemicals in PCB Fabrication, Lead – free Soldering,Useful Standards.

Wire Harnessing of Electronic boards and Systems

Reference Books:

1) PCB Technology- Design,Fabrication. Walter C.Booshart
2) Printed Circuits, their Application and Design. Dukes J.N.C.
3) Printed Circuits Handbook. C.F.Coomb

Course Outcomes (COs)

SEM: VI	Sub Name: - Printed Circuit Board Technology-II
6B3 1.1	Describe the concepts of Design rules of digital and power electronic circuits, classification of PCB.
6B3 1.2	Develop the fundamentals of schematics design, PCB layout design, PCB CAM file generation for SSBs &DSBs using EDA/CAD Tool & perform film-master generation using PCB photoplotter.
6B3 1.3	Perform CNC Drilling and Milling machine operation along with UV exposure, Developing, Etching and Stripping machine operation for SSBs & DSBs manufacturing.
6B3 1.4	Analyse operation of electro-plating & apply it for through hole plating of PCBs for DSBs.
6B3 1.5	Explore various methods of soldering & de-soldering of through hole & SMD based components on PCB.

CO-PO matrices Mapping:-

SEM: VI	Sub Name: - Printed Circuit Board Technology-II											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
6B3 1.1	3	2	-	-	-	-	-	-	-	-	-	2
6B3 1.2	3	2	2	2	3	-	-	-	2	-	-	3
6B3 1.3	3	-	-	-	3	-	-	-	2	-	-	2
6B3 1.4	2	-	-	-	2	-	-	-	2	-	-	2
6B3 1.5	2	-	-	-	2	-	-	-	2	-	-	2
Total	13	4	2	2	10				8			11
Average	**2.6**	**2**	**2**	**2**	**2.5**	**-**	**-**	**-**	**2**	**-**	**-**	**2.2**

CO - PSO Mapping:-

SEM: VI	Sub Name: - Printed Circuit Board Technology-II		
COs	PSO1	PSO2	PSO3
6B3 1.1	3	-	-
6B3 1.2	3	3	2
6B3 1.3	2	2	-
6B3 1.4	1	1	-
6B3 1.5	1	1	-
Total	10	7	2
Average	**2**	**1.75**	**2**

6B4: Ind. & Environmental instrumentation (3 Hours/week)

Measurement: Basic concept and block diagrams of instrumentation schemes, Static & dynamic characteristics, Accuracy, Precision, Fidelity, Speed of response, Dynamic calibrations, Errors in measurement, Classification of errors, Data quality, Statistical Analysis:- Mean, Mode, Median, Measures of dispersions, Probable error-distribution functions and tables, Confidence level, Significance test. Introduction to reliability, Units and standards of physical quantities, Documentation standards

Modern Transducers: Velocity, Acceleration, Force and torque, Piezoelectric accelerometers, IR, UV and laser detectors, LVDT transducers, Pyrometers, Ultrasonic devices, Magneto-strictive device, Photo-detectors, Photo-multipliers, Inductive and capacitive proximity devices, Gas detectors, Hall effect sensors

Design of Signal Conditioning Systems: Transmitters, Receivers, Voltage and current loop (4-20mA), Networking protocols

Process Control system principles, Mathematical modeling, Variables & degrees of freedom, Control modes and controllers on-off, P, PI, PD, PID controllers, Tuning of controllers

Programmable logic controllers (PLC), Programming techniques, SCADA, Distributed Control Systems (DCS).

Reference Books:

1. B.G. Liptik, Instrumentation Engineer's Hand Book,CRC Press
2. H.S.Kalsi, Electronic Instrumentation, TMH
3. I.J.Nagrath &M.Gopal,Control System Engineering, Third edition, New Age International Publication
4. Ranagan and Sarma, Instrumentation Systems, TMH
5. Helfric A.D & Cooper W.D, Modern Electronic Instrumentation & Measurement Techniques, Pearson Education
6. Curtis D Johnson, Process Control; Instrumentation Technology, Pearson Eduction, 2008
7. PLC manuals from Siemens, Messons etc
8. G.C. Goodwin, S.R.Graebe , M.E. Salgado; Control System Design, Pearson Education

6B4 Lab: Ind. & Environmental instrumentation (3 Hours/week)

Practical base on the syllabus

Course outcomes

SEM: VI	Sub Name:- Ind. & Environmental Instrumentation
6B4 4.1	Interpret concepts and characteristics of measuring instrument
6B4 4.2	Apply knowledge of various electronics instruments/ transducers to measure the physical quantities in the field of science, engineering and technology
6B4 4.3	Design of signal conditioning circuit for measurement systems
6B4 4.4	Demonstrate an understanding of concepts related with PLC and SCADA
6B4 4.5	Test the performance of various types of controllers in process control systems.

CO-PO matrices Mapping:-

SEM: VI	Sub Name:- Ind. & Environmental Instrumentation											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
6B4 4.1	3	-	1	1	-	1	1	-	-	-	1	1
6B4 4.2	3	2	1	1	-	1	1	-	-	-	1	1
6B4 4.3	3	2	1	1	-	1	1	-	-	-	1	1
6B4 4.4	3	-	1	1	3	1	1	-	-	-	1	1
6B4 4.5	3	-	1	1	3	1	1	-	-	-	1	1
Total	15	4	5	5	6	5	5	-	-	-	5	5
Avg	3	2	1	1	3	1	1				1	1

CO - PSO Mapping:-

SEM: VI	Sub Name:- Ind. & Environmental Instrumentation		
COs	PSO1	PSO2	PSO3
6B4 4.1	1	-	-
6B4 4.2	2	-	1
6B4 4.3	2	3	1
6B4 4.4	-	3	-
6B4 4.5	-	1	-
Total	5	7	2
Avg	1.67	2.33	1

6B5L :SOFTWARE ENGINEERING (3 Hours/week)

Unit-I: Introduction

Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes.Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

Unit-II: Software Requirement Specifications (SRS)

Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS. Software Quality Assurance (SQA):
Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.

Unit-III: Software Design

Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts,Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.

Unit-IV: Software TestingTesting Objectives, Unit Testing, Integration Testi
ng, Acceptance Testing, Regression Testing,Testing for Functionality and Testing for Performan
ce, Top-Down and Bottom-Up Testing
Strategies: Test Drivers and Test Stubs, Structural
Testing (White Box Testing), FunctionalTesting (Black Box Testing), Test Data Suit Prepara
tion, Alpha and Beta Testing of Products.
Static Testing Strategies: Formal Technical Reviews
(Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Stand
ards.

Unit-V: Software Maintenance and Software Project Management Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance:
Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.

Text and Reference Books:

1.R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2.Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
3.K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.
4.Carlo Ghezzi, M. Jarayeri, D. Manodrioli, Fundamentals of Software Engineering, PHI Publication.
5.Ian Sommerville, Software Engineering, Addison Wesley.
6.Pankaj Jalote, Software Engineering, Narosa Publication
7.Pfleeger, Software Engineering, Macmillan Publication.
8.A. Leon and M. Leon, Fundamentals of Software Engin
eering, Vikas Publication

Course Outcomes (COs)

SEM: VI	**Sub Name: - Software Engineering**
6B5L1.1	Understanding of software process and different types of design models
6B5L1.2	Feasibility study, analysis of requirements for designing of system/process
6B5L1.3	Understanding of design concepts and various models working principle of design methods
6B5L1.4	Understating of testing methodologies/ debugging process using various testing techniques usage of tools
6B5L1.5	Maintenance and risk analysis of system/ software, configuration tools for management process

CO-PO matrices

SEM: VI	**Sub Name: - Software Engineering**											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
6B5L1.1	1	1	1	1	-	-	1	1	1	1	-	1
6B5L1.2	2	2	2	2	1	-	1	1	-	1	2	2
6B5L1.3	2	2	1	-	1	-	1	2	-	1	2	2
6B5L1.4	2	2	1	1	2	-	1	2	1	2	2	2
6B5L1.5	2	1	-	2	2	1	1	2	1	2	2	2
Total	9	8	5	6	6	1	5	8	3	7	8	9
Average	1.8	1.6	1.0	1.2	1.2	0.2	1.0	1.6	0.6	1.4	1.6	1.8

CO - PSO Mapping

SEM: VI	**Sub Name: - Software Engineering**		
COs	PSO1	PSO2	PSO3
6B5L1.1	-	1	1
6B5L1.2	-	1	1
6B5L1.3	-	1	1
6B5L1.4	-	1	1
6B5L1.5	-	1	1
Total	-	5	5
Average	-	1	1

6B6P Mini project:

Course Outcomes

SEM: V	Sub Name: -Mini Project
6B6P 6.1	Demonstrate a depth of knowledge of Electronics System Engineering.
6B6P 6.2	Interpret the problem statement clearly.
6B6P 6.3	Demonstrate knowledge of contemporary issues in their chosen field of research.
6B6P 6.4	Demonstrate an ability to present and defend their research work to a panel of experts.
6B6P 6.5	Complete an independent research project, resulting in a publication in journals/conferences

CO-PO matrices

SEM: V	Sub Name: - Mini Project											
COs	PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
6B6P 6.1	3	2	-	-	3	-	-	-	-	-	-	2
6B6P 6.2	-	-	3	2	-	-	-	3	-	-	-	-
6B6P 6.3	-	-	-	-	-	-	-	-	3	2	-	-
6B6P 6.4	-	-	-	-	-	-	-	-	-	-	-	-
6B6P 6.5	3	-	-	-	-	2	2	-	-	-	1	2
Total	6	2	3	2	3	2	2	3	3	2	1	4
Avg	**3**	**2**	**3**	**2**	**3**	**2**	**2**	**3**	**3**	**2**	**1**	**2**

CO - PSO Mapping

SEM: V	Sub Name: - Mini Project		
COs	PSO1	PSO2	PSO3
6B6P 6.1	3	3	1
6B6P 6.2	3	3	1
6B6P 6.3	3	3	1
6B6P 6.4	3	3	1
6B6P 6.5	3	3	1
Total	15	15	5
Avg	**3**	**3**	**1**

7B1	Digital Signal Processing	3	1
7B2	Embedded Systems	3	1
7B3	PLD and FPGA Design	3	1
7B4	Data Communication Network	3	1
7B5P	Project Part I	0	3
7B5L1 7B5L2	Elective III (Opto Electronics/Digital image processing)	3	0
		15	7
8B1	VLSI System	3	1
8B2	System Engineering	3	1
8B3	Network security	3	1
8B4L1 8B4L2	Elective –IV(MEMS/Linux OS)	3	0
8B5P	Project Part II	0	5
		12	8

7B1: DIGITAL SIGNAL PROCESSING

Review

Review of continuous and discrete-time signals and systems: Discrete-time signals, Signal classification, Discrete-time systems and analysis of discrete-time LTI systems, Discrete –time system described by difference equation, Frequency domain of discrete time signal and system, Sampling and reconstruction

Discrete Fourier Transform & Fast Fourier Transform

Frequency domain sampling of Fourier transform, DFT, Properties of the DFT, Relationship of DFT to other transform, , Linear filtering using DFT, Fast convolution, FFT algorithms, Direct computation of the DFT, Divide –and –conquer approach of computation of DFT, Radix-2/Radix-4 FFT algorithm

Design of FIR FILTERS

Consideration about digital filter, Characteristics of FIR filter, Design of linear-phase FIR filters Using windows, Design of Linear-Phase FIR Filters : Fourier series method, Frequency sampling method, Symmetric and Anti symmetric FIR filters. Structure for the realization of FIR filter

Design of IIR Filters

Comparison between FIR and IIR filter, Infinite Impulse Response Filters: Introduction, Filter types, Design of digital filters from analog filters by approximation of derivatives, Impulse invariance, Bilinear transformation, Matched Z-transformation, Frequency transformation, IIR filter Design Based on Analog Low Pass Filter Design: Butterworth filter and Chebyshev filters. Structure for the realization of IIR filter

DSP Processors

Introduction to Digital Signal Processors: Characteristics of DSP algorithms and hardware requirements, Von Neumann architecture, Harvard architecture, Parallelism and hardware units of typical digital signal processor, Study of DSP processor, Adaptive Filtering: Introduction, Examples of Adaptive Filtering, Minimum mean square error criterion, Windrow LMS algorithm, Recursive Least Square algorithm and FIR Wiener filter and linear prediction, Steepest descent algorithm and LMS algorithm.

Reference Books :

1. John G. Proakis and D.G. Manolakis, “Digital Signal Processing: Principles, Algorithms and Applications”, Prentice Hall, 1997.
2. S.K.Mitra , “Digital Signal Processing, A Computer Based Approach”, Tata Mcgraw Hill.
3. S. Salivahanan A. Vallavaraj, “Digital Signal Processing” ,Tata Mcgraw Hill.
4. A.V. Oppenheim and Schafer, “ Discrete Time Signal Processing”, Prentice Hall, 1989.
5. L.R.Rabiner and B.Gold,“Theory and Application of Digital Signal Processing”,PrenticeHall, 1992.
6. Antanio, “DigitalFilter Design “, Prentice Hall

7B1 : Lab- Digital Signal Processing (3 Hours/week)

Term Work: Term work will consist of record of minimum 08 experiments based on the syllabus using the available development Platforms : MATLAB/ DSP Processor(any)/TMS 320C54X/ TMS 320C67XX DSP starter kits

List of Experiments

(Using TMS 320C54X/ TMS 320C67XX DSP starter kits)

1. Perform Basic Program : Accessing data, Arithmetic /Logic program, Multiplication, Addition, Subtraction, LED Display Program
2. Perform Basic DSP operation : i) Convolution: Linear and Circular ii) Correlation
3. Perform : Discrete Fourier Transform and Inverse Discrete Fourier Transform
4. Perform Fast Fourier Transform
5. Design of digital filter : (Butterworth and Chebyshev type I and type II) IIR Filter : Low Pass, High Pass, Band Pass, Band Stop
6. Design of digital filter: FIR Filter : Low Pass, High Pass, Band Pass, Band Stop
7. ADC/DAC Interfacing Program using DSP Processor
8. Adaptive Filtering Program
9. CODAC Interfacing Program or Audio Signal Processing

7.

Course Outcomes (COs) (05)

SEM: VII	**Sub Name: -** Digital Signal Processing
7B1 : 1	Analyse continuous and discrete-time signals and systems, Discrete –time system described by difference equation, Frequency domain of discrete time signal and system, Sampling and reconstruction
7B1 : 2	Describe Frequency domain sampling of Fourier transform, DFT, Properties of the DFT, Relationship of DFT to other transform, FFT algorithms, Direct computation of the DFT, Radix-2/Radix-4 FFT algorithm
7B1 : 3	Explore digital filter, Characteristics of FIR filter, Design of linear-phase FIR filters and able to Design Linear-Phase FIR Filters
7B1 : 4	Design FIR and IIR filter using various methods as approximation of derivatives, Impulse invariance, Bilinear transformation, Matched Z-transformation etc.
7B1: 5	Explore about DSP processors and adaptive filtering

CO-PO matrices

SEM: VII	**Sub Name: -** Digital Signal Processing											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
7B1 : 1	3	2	3	3	-	-	-	-	-	-	-	1
7B1 : 2	3	2	2	2	2	-	-	-	-	-	-	1
7B1 : 3	3	2	2	3	2	-	-	-	-	-	-	1
7B1 : 4	3	2	3	2	2	-	-	-	-	-	-	1
7B1: 5	3	2	3	3	2	-	-	-	-	-	-	1
Total	15	10	13	13	8	-	-	-	-	-	-	5
Average	3	2	2.6	2.6	2							1

CO - PSO Mapping

SEM: VII	**Sub Name: -** Digital Signal Processing		
COs	PSO1	PSO2	PSO3
7B1 : 1	2	3	1
7B1 : 2	2	3	-
7B1 : 3	2	3	-
7B1 : 4	2	3	-
7B1: 5	2	3	1
Total	10	15	2
Average	2	3	1

7B2: Embedded Systems **(3 Hours/week)**

Introduction To Embedded Systems

Definition and Classification: Overview of Processors and hardware units in an embedded system – Software embedded into the system, Processor and memory organization, Structural units in processor, Processor selection, Memory devices , DMA, and interfacing

Devices and Buses for Device Network :I/O Devices, Timer and counting devices, Serial communication, Synchronous and asynchronous communications, I2C, USB, CAN, Advanced I/O Serial High Speed Buses : ISA, PCI, PCI,X

Programming Concepts and Embedded Programming In C, C++ Programming in Assembly Language (ALP) vs. High Level Language: C Program Elements, Macros and functions, Pointers, Function calls in a cyclic order, Main function pointers, Function Queues and Interrupt Service Routines, Queues Pointers , Concepts of EMBEDDED PROGRAMMING in C++ , Objected Oriented Programming , Embedded Programming in C++, 'C' Program compilers , Cross compiler , Optimization of memory codes

Real Time Operating Systems

Operating system services, I/O subsystems, Network operating systems, Real-time and embedded system operating system,, Interrupt routines and interrupt handling in RTOS, Task scheduling models, Performance metric in scheduling models, OS security issues

Hardware-Software Co-design in an Embedded System Embedded system project design and management, Design issues in system development process, Design cycle in development phase, Use of target system, Emulators and development boards, Software development and debugging tools, Integrated development environment, Case studies of embedded system development and programming with real time operating systems for industrial applications

Reference Books

1. Raj Kamal, Embedded Systems, Architecture, Programming and Design, TATA McGrawHill
2.Steve Heath, Embedded Systems Design, Second Edition, 2003, Newness
3.David E. Simon, An Embedded Software Primer, Pearson Education Asia,

7B2 : Lab – Embedded System **(3 Hours/week)**

List of Experiments

01 Study of Embedded System hardware board, its configurations and programming features

02 Study of Real Time Operating System and programming methodology

03 Develop, test and execute C language program for LCD interfacing using embedded development system board

04 Develop, test and execute C language program for 4x4 keyboard interfacing using embedded development system board

05 Develop, test and execute C language program for timers and event counter application using embedded system board

06 Develop, test and execute C language program using embedded development system board to implement simple digital calculator using keyboard and LCD interface

07 Develop, test and execute C language program for I/O applications

Course Outcome

SEM: VII	Sub Name: - Embedded Systems
7B2 2.1	Define basic concepts of embedded system
7B2 2.2	Describe ARM cortex-m microcontroller.
7B2 2.3	Illustrate the design of M2M IoT application.
7B2 2.4	Test developed IoT protocols for requirements validation.
7B2 2.5	Test embedded application using Linux Operating system

CO-PO matrices

SEM: VII	Sub Name: - Embedded Systems											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
7B2 2.1	3	2	2	-	-	-	-	-	2	-	-	1
7B2 2.2	3	2	2	-	-	-	-	-	2	-	-	1
7B2 2.3	3	2	2	-	-	-	-	-	2	-	-	1
7B2 2.4	3	2	2	-	-	-	-	-	2	-	-	2
7B2 2.5	3	2	2	-	-	-	-	-	2	-	-	2
Average	03	02	02	-	-	-	-	-	02	-	-	1.4

CO - PSO Mapping

SEM: VII	Sub Name: - Embedded Systems		
COs	PSO1	PSO2	PSO3
7B2 2.1	2	3	1
7B2 2.2	2	3	1
7B2 2.3	2	3	1
7B2 2.4	2	3	1
7B2 2.5	2	3	1
Average	02	03	1

7B3: PLD's and FPGA Design **(3 Hours/week)**

Programmable logic : ROM, PLA, PAL PLD, PGA – Features, programming and applications using complex programmable logic devices Altera series – Max 5000/7000 series and Altera FLEX logic-10000 series CPLD, AMD's- CPLD (Mach 1to 5), Cypres FLASH 370 Device technology, Lattice PLST's architectures – 3000 series – Speed performance and in system programmability.

FPGAs: Field Programmable gate arrays- Logic blocks, routing architecture, design flow technology mapping jfor FPGAs, Case studies Xitir x XC4000 & ALTERA's FLEX 8000/10000 FPGAs: AT &T ORCA's (Optimized Reconfigurable Cell Array): ACTEL's ACT-1,2,3 and their speed performance

Alternative realization for state machine chat suing microprogramming linked state machine one –hot state machine, petrinetes for state machines-basic concepts, properties, extended petrinetes for parallel controllers.

Digital front end digital design tools for FPGAs& ASICs: Using mentor graphics EDA tool ("FPGA Advantage") – Design flow using FPGAs

Case studies of paraller adder cell paraller adder sequential circuits, counters, multiplexers, parallel controllers.

TEXT BOOKS:

1. Field Programmable Gate Array Technology - S. Trimberger, Edr, 1994, Kluwer Academic publications.
2. Field Programmable Gate Arrays, John V.Oldfield, Richard C Dore, Wiley Publications.

REFERENCES :

1. Digital Design Using Field Programmable Gate Array, P.K.Chan & S. Mourad, 1994, Prentice Hall.
2. Digital System Design using Programmable Logic Devices – Parag.K.Lala, 2003, BSP.
3. Field programmable gate array, S. Brown, R.J.Francis, J.Rose ,Z.G.Vranesic, 2007, BSP.
4. Digital Systems Design with FPGA's and CPLDs – Ian Grout, 2009, Elsevier.

7B3 Lab: PLD's and FPGA Design **(3 Hours/week)**

Practical is based on above syllabus.

Course Outcomes (COs) (05)

SEM: VII	Sub Name: - PLD and FPGA Design
7B3 3.1	Understand the concepts of VHDL and Verilog Language.
7B3 3.2	Design the digital systems as an activity in a larger system design context.
7B3 3.3	Study the design and operation of semiconductor memories frequently used in application specific digital system.
7B3 3.4	Inspect how effectively ICs are embedded in package and assembled in PCBs for different application.
7B3 3.5	Design and diagnosis of processors and I/O controllers used in embedded systems.

CO-PO matrices

SEM: VII	Sub Name: - PLD and FPGA Design											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
7B3 3.1	3	3	3	3	2	1	-	-	3	1	-	3
7B3 3.2	3	3	3	3	2	1	-	-	3	1	-	3
7B3 3.3	3	3	3	3	2	1	-	-	3	2	-	3
7B3 3.4	3	3	2	3	2	1	-	-	3	2	-	3
7B3 3.5	3	3	3	3	2	1	-	-	3	2	-	3
Average	3	3	2.8	3	2	1	-	-	3	1.6	-	3

CO - PSO Mapping

SEM: VII	Sub Name: - PLD and FPGA Design		
COs	PSO1	PSO2	PSO3
7B3 3.1	3	3	1
7B3 3.2	3	3	1
7B3 3.3	3	3	1
7B3 3.4	3	3	1
7B3 3.5	3	3	1
Average	3	3	1

7B4 :**Data Communication Networks** **(3 Hours/week)**

Introduction to computer networks, Protocols, Layering, RFCs, Network design issues like protocol hierarchies, Layered architecture, Interfaces and services, Service primitives and relationship of services to protocols, Network topology design & algorithms, Reference models OSI, TCP/IP and their comparison , Brief Overview of Physical Layers : Transmission media like twisted pair coaxial cable, Fiber optics

Data Link Layer Design Issues : Framing, Error control, Flow control, Simplex stop & wait protocol, Sliding window protocol, Medium Access Technique : Static & dynamic channel allocation in LANs & WAN,CSMA /CD protocol ,WDMA protocol, High speed LAN's like FDDI, Ethernet

Network Layer & Design Issues: Internet organization, Virtual circuit protocol & datagram, Routing & congestion control algorithms, Internet IP protocol & address, ICMP, ARP,RARP, IP on demand OSPF & BGP, CIDR & IPV6 Transport Layer: Transport Protocols, Addressing, Establishing & releasing a connection ,Transport protocol for Internet TCP & UDP

Application Layer Protocols. Client-server as a key model, Web, HTTP, FTP, SMTP, POP3, and DNS, Peer-to-peer file sharing networks, Networking simulation and modeling techniques, Security & Management Security issues, Cryptography secrete key and public key algorithms, Authentication protocol

Sockets Programming and Implementation. A simple client-server implementation, A simple web server implementation, Managing network devices such as switch, Router, Firewall & modems

Reference Books :

1. William Stallings, Data and Computer Communications, 7th edition, Prentice Hall, 2004.
2. Andrew S. Tanenbaum, Computer Networks, 4th edition, Prentice-Hall, Inc., 2003
3. Larry L. Peterson and Bruce S. Davie, Computer Networks: A Systems Approach, 3rd edition (2003),Morgan Kaufmann Publishers.
4. Behrouz Forouzan, Data Communication, McGraw-Hill.

7B4 : Lab - Data Communication Networks **(3 Hours/week)**

List of Experiments

01 Installation and configuration of Network interface card

02 Configuration of LAN for Internet connectivity

03 Study of network components

04 Wiring Tutorial for 10BaseT Unshielded Twisted Pair (UTP) CAT5, CAT6 cables

05 Configuration of network operating system

06 Study of Proxy & Web Server Settings

07 Web server implementation

Practical Examination:

The practical examination will be of three hours duration. It will consist of performing one of experiments conducted during the course and an oral examination based on the syllabus.

Course Outcomes

SEM: VII	Sub Name: - Data Communication Network
7B4 4.1	Introduction to network topology and transmission media, OSI, and TCP/IP model.
7B4 4.2	Data link layer, Error control and Flow control protocols
7B4 4.3	IPv4 and IPv6 addressing, IP Routing protocols, TCP,UDP
7B4 4.4	Application Layer Protocols, Security, Cryptography
7B4 4.5	Configuration of Switch, Router, Modem and Firewall, Web Server implementation.

CO-PO matrices

SEM: VII	Sub Name: - Data Communication Network											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
7B4 4.1	3	3	2	-	1	1	-	-	2	-	-	1
7B4 4.2	3	2	1	-	1	-	-	-	2	-	-	1
7B4 4.3	3	3	3	-	3	2	-	-	2	-	2	1
7B4 4.4	3	3	2	-	3	2	-	3	2	-	2	2
7B4 4.5	3	3	2	-	3	2	-	-	2	-	2	2
Total	15	14	10	-	11	7	-	3	10	-	6	7
Avg	3	2.8	2		2.2	1.75		3	2		2	1.4

CO - PSO Mapping

SEM: VII	Sub Name: - Data Communication Network		
COs	PSO1	PSO2	PSO3
7B4 4.1	1	-	3
7B4 4.2	-	-	3
7B4 4.3	2	-	3
7B4 4.4	1	-	3
7B4 4.5	2	1	3
Total	6	1	15
	1.5	1	3

7B5P: Project Part I **(2 Hours/week)**

The project work will be carried out by a batch of at the most 3 students (Preferably 2 students) workingon topic related to the electronics, telecommunications, computer science and allied fields. The batch will select the topic, by consulting the guide from above mentioned topic. They have to design and fabricate the system, which will be submitted at the end of second term of current academic year.

The batch has to prepare a typed report of not less than 25 pages. This should include the literature survey, technical details, design, related data etc. It should be in the proper format. Every candidate has to give a talk on the selected topic in presence of staff members and students. The Principal, of the institute will appoint two internal examiners to assess the term work; guide shall be one of the examiners.

Course Outcomes

SEM: VII	**Sub Name: -Project Phase 1**
7B5P 7.1	Students will get an opportunity to apply knowledge of several courses in developing a new algorithm or circuit or a larger system.
7B5P 7.2	Students will implement innovative ideas and publish them as a research paper or file a patent.
7B5P 7.3	Students will learn working as a team.
7B5P 7.4	Students will acquire additional skills otherwise not covered in the curriculum
7B5P 7.5	Students will gain practical knowledge about the topic including social, commercial, manufacturing, testing, measurements, simulation, marketing and legal issues (as applicable).

CO-PO matrices

SEM: VII	**Sub Name: - Project Phase 1**											
COs	PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
7B5P 7.1	3	2	-	-	3	-	-	-	-	-	-	2
7B5P 7.2	-	-	3	2	-	-	-	3	-	-	-	-
7B5P 7.3	-	-	-	-	-	-	-	-	3	2	-	-
7B5P 7.4	-	-	-	-	-	-	-	-	-	-	-	-
7B5P 7.5	3	-	-	-	-	2	2	-	-	-	1	2
Total	6	2	3	2	3	2	2	3	3	2	1	4
Avg	**3**	**2**	**3**	**2**	**3**	**2**	**2**	**3**	**3**	**2**	**1**	**2**

CO - PSO Mapping

SEM: VII	**Sub Name: - Project Phase 1**		
COs	PSO1	PSO2	PSO3
7B5P 7.1	3	3	1
7B5P 7.2	3	3	1
7B5P 7.3	3	3	1
7B5P 7.4	3	3	1
7B5P 7.5	3	3	1
Total	15	15	5
Avg	**3**	**3**	**1**

7B5L1: OPTO ELECTRONICS **(3 Hours/week)**

Nature of light, light sources, black body, colour temperature, units of light, radio metric and photometric units, basic semi conductors, PN junction, carrier recombination and diffusion,' injection efficiency, heterojunction, internal quantum efficiency, External quantum efficiency, double hetero junction, fabrication of heterojunction, quantum wells and super lattices.

Opto electronic devices, Optical modulators, modulation methods and modulators, transmitters, optical transmitter circuits, LED and laser drive circuits, LED-Power and efficiency, double hereostructure LED, LED structures, LED characteristics, laser modes, strip geometry, gain guided lasers, index guided lasers.

Modulation of light, birefringence, electrooptic effect, EO materials, Kerr modulators, scanning and switching, self electro optic devices, MO devices, AO devices, AO modulators.

Display devices, Photoluminescence, cathodo luminescence, EL display, LED display, drive circuitary, plasma panel display, liquid crystals, properties, LCD displays, numeric displays.

Photo detectors, thermal detectors, photoconductors, detectors, photon devices, PMT, photodiodes, photo transistors, noise characteristics of photo-detectors, PIN diode, APD characteristics, APD Design of detector arrays, CCD, Solar cells. .

REFERENCES:

1. Opto electronics - An introduction - J Wilson and J F B J iS Hawkers. (Prentics-Hall India, 1996) (Text)
2. Optical fibre communication - J M Senior (Prentice Hall India (1985)
3. Optical fibre communication systems - J Gowar (Prentice Hall 1995).
4. Introduction to optical electronics - J Palais (Prentice Hall, 1988)
5. Semiconductor opto electronics - Jasprit Singh (McGraw-Hill, Inc, 1995)
6. Semiconductor optoelectronic devices - P Bhattacharya (Prentice Hall of India, 1995) (Text)
7. Fibre Optics and Opto-electronics, R P Khare (Oxford University Press, 2004)

Course Outcomes

SEM: VII	Sub Name: - Optoelectronics
7B5L1 1.1	Describe the concepts of Nature of light & fundamentals of semiconductors.
7B5L1 1.2	Understand the fundamentals of Optoelectronic devices their characteristics, parameters and applications.
7B5L1 1.3	Explain the usage of Display device in optoelectronics along with their characteristics and applications.
7B5L1 1.4	Explore about various photodetector devices and their characteristics.

CO-PO matrices

SEM: VII	Sub Name: - Optoelectronics											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
7B5L1 1.1	3	-	-	-	-	-	-	-	-	-	-	2
7B5L1 1.2	3	2	1	-	-	-	-	-	-	-	-	2
7B5L1 1.3	3	2	1	-	1	-	-	-	-	-	-	2
7B5L1 1.4	2	1	1	-	-	-	-	-	-	-	-	2
Average	**2.75**	**1.67**	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**2**

CO - PSO Mapping:-

SEM: VII	Sub Name: - Optoelectronics		
COs	PSO1	PSO2	PSO3
7B5L1 1.1	1	-	-
7B5L1 1.2	1	-	1
7B5L1 1.3	1	1	1
7B5L1 1.4	1	-	-
Average	**1**	**1**	**1**

7B5L2:Digital image processing **(3 Hours/week)**

UNIT-I:

INTRODUCTION : Image Processing Fourier Transform and Z-transform Causality and stability Toeplit and Circulate Metrics orthogonal and unitary Matrices and Kronecker product, Markov Processes KI Transform Mean square Estimates and orthogonal Principles.

IMAGE SAMPLING QUANTIZATION: Band Limited Image , Sampling Versus Replication, Reconstruction of Image from samples, Sampling Theorem, Sampling Theorem for Random Fields, Optimal Sampling, Non-rectangular Grid Sampling, Sampling Aperture, Display Aperture/Interpolation Function, lagrange Interpolation Moire Effect. Image Quantization Uniform Optimal Quantizer, Properties of mean Square Quantizer, Commander Design Visual Quantization.

UNIT-II:

IMAGE TRANSFORMS: Two Dimensional Orthogonal and Unitary Transforms and their properties. One Dimensional and two Dimensional DFT. Cosine and Sine Transform. Hadarnard, Slant, Harr and KL, Transform and their properties, Approximation to KI Transform.

IMAGE REPERESENTATION BY STOCHASTIC MODELS: One Dimensional Casual Models, AR and ARMA models, Non Casual Representation Spectral factorization, Image Decomposition.

UNIT-III:

IMAGE ENHANCEMENT AND RESTORATION : point Operation, Histogram Modeling, Spatial Operations, Transform Operations, Multispectral Image Enhancement, Image Observation Models, Inverse and Wiener filtering, FIR Wiener Filters, Filtering using Image Transform Casual Models and recursive filtering Maximum entropy restoration . Extrapolation of band limited signal.

UNIT-IV:

IMAGE ANALYSIS AND IMAGE COMPRESSION: spatial feature extraction, Edge detection and boundary extraction Boundary, region and moment representation structure, Texture, Image Segmentation, Reconstruction from Projections, Pixel Coding, Productive Technique, Transform Coding theory, Coding of Image, Coding of Two-tone image.

NOTE:

The question paper shall have eight questions in all organized into four sections, each section having two questions from each four units. The candidate shall have attempt five questions in all selecting latest one question from each unit

Suggested Books:

1 Jain A , digital Image Processing , PHI

2 Gonzalez and woods , Image Processing , Addison Wesley.

Course Outcomes

SEM: I	**Sub Name: - Digital Image Processing**
7B5L2 3.1	To understand and explore importance of Digital Image Processing.
7B5L2 3.2	To extend the theory concepts of Digital Signal Processing further to Digital Image Processing.
7B5L2 3.3	To physically understand concepts of digital image enhancement and filtering in spatial domain.
7B5L2 3.4	To implement frequency domain filters for image processing applications.
7B5L2 3.5	To visualize basic computer vision algorithms using the learned Image Processing concepts.

CO-PO Matrices

SEM: I	**Sub Name: - Digital Image Processing**											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
7B5L2 1.1	3	2	3	-	-	-	-	-	-	-	-	1
7B5L2 1.2	3	2	2	-	2	-	-	-	-	-	-	1
7B5L2 1.3	3	2	2	1	2	-	-	-	-	-	-	2
7B5L2 1.4	3	2	2	2	-	-	-	-	-	-	-	2
7B5L2 1.5	3	2	3	2	2	-	-	-	-	-	-	1
AVG	3	2	2.4	1.67	2	-	-	-	-	-	-	1.4

CO - PSO Mapping

SEM: I	**Sub Name: - Digital Image Processing**		
COs	PSO1	PSO2	PSO3
7B5L2 1.1	3	2	2
7B5L2 1.2	3	2	2
7B5L2 1.3	3	2	2
7B5L2 1.4	3	2	2
7B5L2 1.5	3	2	2
Total	3	2	2

8B1: VLSI System **(3 Hours/week)**

Review of Microelectronics and Introduction to MOS Technologies: MOS, CMOS, BiCMOS Technology, Trends And Projections. Basic Electrical Properties of MOS, CMOS & BiCMOS Circuits: Ids-Vds relationships, Threshold Voltage Vt, Gm, Gds and o, Pass Transistor, MOS, CMOS & Bi CMOS Inverters, Zpu/Zpd, MOS Transistor circuit model, Latch-up in CMOS circuits.

LAYOUT DESIGN AND TOOLS: Transistor structures, Wires and Vias, Scalable Design rules, Layout Design tools.

LOGIC GATES & LAYOUTS: Static Complementary Gates, Switch Logic, Alternative Gate circuits, Low power gates, Resistive and Inductive interconnect delays.

COMBINATIONAL LOGIC NETWORKS: Layouts, Simulation, Network delay, Interconnect design, Power optimization, Switch logic networks, Gate and Network testing.

SEQUENTIAL SYSTEMS: Memory cells and Arrays, Clocking disciplines, Design, Power optimization, Design validation and testing.

FLOOR PLANNING & ARCHITECTURE DESIGN: Floor planning methods, off-chip connections, High-level synthesis, Architecture for low power, SOCs and Embedded CPUs, Architecture testing.

TEXT BOOKS:

1. Essentials of VLSI Circuits and Systems, K. Eshraghian Eshraghian. D, A.Pucknell, 2005, PHI.
2. Modern VLSI Design - Wayne Wolf, 3rd ed., 1997, Pearson Education.

REFERENCES:

1. Principals of CMOS VLSI Design – N.H.E Weste, K.Eshraghian, 2nd ed., Adisson Wesley.

8B1 : Lab – VLSI **(3 Hours/week)**

A)

1. Digital Circuits Description using Verilog.
2. Verification of the functionality of designed Circuits using function simulator.
3. Timing Simulation for critical Path time calculation.
4. Synthesis of Digital Circuits.
5. Place and route techniques for major FPGA Vendors using Xilinx, Altera, Cypress etc.,
6. Implementation of Designed Digital Circuits Using FPGA and CPLD devices.

B)

1. MoS inverter DC Characteristics, AC Characteristics, Transient Analysis.
2. NMOS, PMOS Characteristics.
3. Layout basics- INV, NAND, NOR, EXOR, EXNOR.
4. Layout of adder, subtractor, multiplexer.
5. Layout Comparator.

For Experiments in cycle 2: 3,4,5: Draw the Schematics Perform Simulation, Extract the Layout, Run Physical

Verification (DRC, LVS, PEX) and post layout simulation

Course Outcomes

SEM: VIII	Sub Name: - VLSI System
8B1 1.1	Students should be able to explore various MOS technologies, their electrical properties and various MOS inverters.
8B1 1.2	Students should be able to explore transistor design and tools, transistors gates and layouts.
8B1 1.3	Students should be able to design and implement Combinational logic networks, Layouts and perform simulations.
8B1 1.4	Students should be able to design and implement Sequential logic networks, Memory cells, arrays.
8B1 1.5	Students should be able to design and implement floor planning and architecture.

CO-PO matrices

SEM: VIII	Sub Name: - VLSI System											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
8B1 1.1	3	2	-	2	2	-	-	-	2	-	-	1
8B1 1.2	3	2	-	2	2	-	-	-	2	-	-	1
8B1 1.3	3	1	3	-	-	-	-	-	3	-	-	-
8B1 1.4	3	1	3	-	-	-	-	-	3	-	-	-
8B1 1.5	3	1	3	-	-	-	-	-	3	-	-	-
Average	3	1.4	3	2	2	-	-	-	2.6	-	-	1

CO - PSO Mapping

SEM: VIII	Sub Name: - VLSI System		
COs	PSO1	PSO2	PSO3
8B1 1.1	3	2	1
8B1 1.2	3	2	1
8B1 1.3	3	2	1
8B1 1.4	3	2	1
8B1 1.5	3	2	1
Average	3	2	1

8B2 : System Engineering **(3 Hours/week)**

This course intends to help you develop the capability of systems thinking by introducing classical and advanced systems engineering theory, methods, and tools. This subject focuses on:

- Develop a systems engineering plan for a realistic project.
- Judge the applicability of any proposed process, strategy, or methodology for systems engineering using the fundamental concepts from disciplines such as probability, economics, and cognitive science.
- Understand system engineers' role and responsibilities. Understand the role of organizations.
- Apply systems engineering tools (e.g., requirements development and management, robust design, Design Structure Matrix) to realistic problems.
- Recognize the value and limitations of modeling and simulation.
- Formulate an effective plan for gathering and using data.
- Know how to proactively design for and manage system lifecycle targets.
- Case Study

Systems Engineering Overview

Introduction, Definition of systems engineering, Origins of systems engineering, Systems of systems, Use of systems engineering, Value of systems engineering

Generic Life Cycle Stages

Life Cycle Characteristics, Life Cycle Stages, Development Stage Approaches

Technical Processes

Stakeholder Requirements Definition Process, Requirements Analysis Process, Architectural Design Process, Operation Process, Integration Process, Verification Process, Transition Process. Validation Process, Maintenance Process, Disposal Process, PPC (Project Planning and Control Process), Risk and opportunity management Process, Decision-Making Process

Reference books

INCOSE Systems Engineering Handbook, v3.2. San Diego, CA: INCOSE, 2010.

Course Outcomes

SEM: VIII	Sub Name: - System Engineering
8B2.1.1	Understand system engineers' role and responsibilities. Understand the role of organizations.
8B2.1.2	Apply systems engineering tools (e.g., requirements development and management, robust Design, Design Structure Matrix) to realistic problems.
8B2.1.3	Judge the applicability of any proposed process, strategy, or methodology for systems engineering using the fundamental concepts from disciplines such as probability, economics, and cognitive science.
8B2.1.4	Formulate an effective plan for gathering and using data.
8B2.1.5	Recognize the value and limitations of modeling and simulation.

CO-PO matrices

SEM: VIII	Sub Name: - System Engineering											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
8B2.1.1	1	1	1	1	-	-	-	-	-	-	-	-
8B2.1.2	1	1	1	1	1	-	-	-	-	-	-	-
8B2.1.3	1	1	1	1	-	-	-	-	-	-	1	-
8B2.1.4	1	2	1	2	-	-	-	-	1	-	-	-
8B2.1.5	1	2	1	1	-	-	-	-	-	-	-	-
Total	5	7	5	6	1	0	0	0	1	0	1	0
Average	1	1.4	1	1.2	1	-	-	-	1	-	1	-

CO – PSO Mapping

SEM: VIII	Sub Name: - System Engineering		
Cos	PSO1	PSO2	PSO3
8B2.1.1	1	-	-
8B2.1.2	1	-	-
8B2.1.3	1	-	-
8B2.1.4	1	-	-
8B2.1.5	1	-	-
Total	5	0	0
Average	1	-	-

8B3 Network Security **(3 Hours/week)**

Foundations of Cryptography and security, Encryption schemes, Pseudorandom generators, Mathematical tools for Cryptography, Goals, Attacks, Services and mechanisms

Design principle of Block Ciphers & Block Cipher algorithms, Modern symmetric key ciphers, Data encryption standard and Advanced encryption standard, Public Key Cryptography RSA, Rabin ELGAMAL & elliptic curve cryptosystems

Message integrity and authentication, Hash function, Digital signature, Entity authentication key management

Electronic mail security applied to mail server and mail clients, PGP and S/MIME, IP and Web Security Protocols, SSL (Secure Sockets Layer), HTTPS (Hyper Text Transport Protocol Secure)

System Security: Computer virus, Firewall and Intrusion detection, Electronic commerce security introduction to web based bio authentication, Smart card, RF ID, Cyber laws related to E – commerce, IT Act-2005

Reference Books :

1. William Stallings, Data and Computer Communications, 7th edition, PH, 2004.
2. Andrew S. Tanenbaum, Computer Networks, 4th edition, PH, Inc., 2003
3. Behrouz Forouzan, Cryptography and Network Security, McGraw-Hill.
4. H. Bidgoli, Handbook of Information Security, Vols. 1-3, John Wiley & Sons, January 2006.
5. H. Bidgoli, The Internet Encyclopedia, Vols. 1-3, John Wiley & Sons, Jan. 2004

Course Outcomes

SEM: VII	Sub Name: - Network Security
8B3 3.1	Foundations of cryptography and security
8B3 3.2	Public and Private key cryptography, data encryption standard, advanced encryption standard.
8B3 3.3	Message integrity and authentication, Hash function, Digital Signature
8B3 3.4	IP and Web security Protocol, SSL, HTTPS
8B3 3.5	Computer virus types, Firewall, IDS, IPS, Cyber laws related to E-commerce

CO-PO matrices

SEM: VII	Sub Name: - Network Security											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
8B3 3.1	3	3	2	-	2	1	-	-	2	-	-	1
8B3 3.2	3	2	2	-	2	2	-	-	2	-	-	1
8B3 3.3	3	3	3	-	2	2	-	-	2	-	-	1
8B3 3.4	3	2	2	-	2	-	-	-	2	-	-	1
8B3 3.5	3	2	2	-	2	2	-	2	2	-	-	3
Total	15	12	11	-	10	7	-	2	10	-	-	7
Avg	3	2.4	2.2		2	1.75		2	2			1.75

CO - PSO Mapping

SEM: VII	Sub Name: - Network Security		
COs	PSO1	PSO2	PSO3
8B3 3.1	-	-	3
8B3 3.2	-	-	3
8B3 3.3	-	-	3
8B3 3.4	-	-	3
8B3 3.5	1	-	3
Total	1	-	15
Avg	1		3

8B4L2

Unit -I: Linux Utilities: File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking commands, Filters, Text processing utilities, Backup utilities Sed - Scripts, Operations, Addresses, Commands,,awk - Execution, Fields and Records, Scripts, Operations, Actions, Assocoative Array, Strings and Mathematical functions, System commands in awk, Applications. Shell programming with Bourne Again Shell (bash): Introduction, Shell responsibilities, Pipes and redirection, here documents, Running a shell script, Shell as a programming language, Shell meta characters, File-name substitution, Shell variables, Command substitution, Shell commands, The environment, Quoting, test command, Control structures, Arithmetic in shell, Shell script examples, Interrupt processing functions, Debugging shell scripts

Unit-II: Files and Directories: File concepts, File types File system structure,file metadata - Inodes, kernel support for files, System calls for the file I/O operations- open,create,read,wrirte,close,lseek,dup2,file status information-stat family, file and record locking-fcntl function, file permissions- chmod, fchmod, file ownership-chown, lchown, fchown, links-soft links and hard links- symlink, link, unlink. Directories: Creating,,removing and changing Directories-mkdir,rmdir,chdir,obtaining current working directory-getcwd,directory contents,scanning directories- opendir, readdir, rewin functions.

Unit- III: Process: Process concept, Layout of a C program image in main memory, Process environment – environment list, environment variables, getenv, setenv, Kernel support for process, Process identification, Process control - Process creation, replacing a process image, waiting for process, Process termination, Zombie process, Orphan process, ,system call interface for process management – fork, vfork, exit, wait, waitpid, exec family, process groups, sessions and controlling Terminal, differences between threads and processes. Signals: Introduction to signals, Signal generation, Signal handling, Kernel support for signals, signal function, Unreliable signals, Reliable signals, Signal functions: kill, raise, alarm, pause, abort, sleep.

Unit- IV: Inter process Communication: Introduction to IPC,IPC between processes on a single computer system, IPC between processes on different systems, Pipes-creationIPC between related processes using FIFOs(Named pipes), differences between unnamed and named pipes, popen and pclose library functions. Message Queues: Kernel support for messages, APIs for message queues, Client/Server example Semaphores: Kernel support for semaphores, APIs for semaphores, file locking with semaphores.

Unit-V: Shared Memory: Kernel support for Shared Memory, APIs for Shared Memory, Shared Memory example

Sockets: Introduction to Berkley Sockets, IPC over a network, client – server model, Socket address structures (Unix domain and internet domain) , Socket system calls for connection oriented protocol and connectionless protocol, example- client/server programs- single server- client connection, multiple simultaneous clients, socket options- setsockopt and fcntl system calls, comparison of IPC mechanisms.

Course Outcomes

SEM: VIII	**Sub Name: - Linux OS**
8B4L2 4.1	Students should be able to to use various Linux commands that are used to manipulate system operations at admin level and a prerequisite to pursue job as a Network administrator.
8B4L2 4.2	Students should be able to write Shell Programming using Linux commands
8B4L2 4.3	Students should be able to to design and write application to manipulate internal kernel level Linux File System.
8B4L2 4.4	Students should be able to effectively operate a Linux system inside of a network environment to integrate with existing service solutions and/or provide its own such as DHCP, DNS, Routing, Network Address Translation, and NTP.
8B4L2 4.5	Students should be able to write programs which employs advanced concepts like multithreading and also develop applications where several processes need to communicate with each other to complete a task.

CO-PO matrices

SEM: VIII	**Sub Name: - Linux OS**											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
8B4L24.1	3	-	3	-	-	-	-	-	3	-	-	-
8B4L24.2	3	1	3	-	2	-	-	-	2	-	-	1
8B4L24.3	3	1	3	-	-	-	-		3	-	-	1
8B4L24.4	3	-	3	-	-	-	-	-	3	-	-	-
8B4L24.5	3	1	3	-	2	-	-	-	2	-	-	1
Average	**3**	**1**	**3**	**-**	**2**	**-**	**-**	**-**	**2.6**	**-**	**-**	**1**

CO - PSO Mapping

SEM: VIII	**Sub Name: - Linux OS**		
COs	PSO1	PSO2	PSO3
8B4L2 4.1	-	1	2
8B4L2 4.2	-	1	2
8B4L2 4.3	-	1	2
8B4L2 4.4	-	1	2
8B4L2 4.5	-	1	2
Average	**-**	**1**	**2**

8B5P: Project Part II **(10 Hours/week)**

Term Work:

Project Part-II, is in continuation of Project Part-I undertaken by the candidates in first term. The term work shall consist of a typed report of about 7 0 pages or more, on the work carried out by the batch of students in respect of the project assigned, during first term and second term. It should be in the proper format.

Practical Examination:

It shall consist of demonstration of designed, fabricated project and oral based on it. The said examination will be conducted by a panel of two examiners; one of them will be a guide and another will be an external examiner. The external examiner will be either from the allied industry or a senior faculty member from other institute.

Course Outcomes

SEM: VIII	Sub Name: -Project Phase II
8B5P 8.1	Get an opportunity to apply knowledge of several courses in developing a new algorithm or circuit or a larger system.
8B5P 8.2	Implement innovative ideas and publish them as a research paper or file a patent.
8B5P 8.3	Learn working as a team.
8B5P 8.4	Acquire additional skills otherwise not covered in the curriculum
8B5P 8.5	Gain practical knowledge about the topic including social, commercial, manufacturing, testing, measurements, simulation, marketing and legal issues (as applicable).

CO-PO matrices

SEM: VIII	Sub Name: - Project Phase II											
COs	PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
8B5P 8.1	3	2	-	-	3	-	-	-	-	-	-	2
8B5P 8.2	-	-	3	2	-	-	-	3	-	-	-	-
8B5P 8.3	-	-	-	-	-	-	-	-	3	2	-	-
8B5P 8.4	-	-	-	-	-	-	-	-	-	-	-	-
8B5P 8.5	3	-	-	-	-	2	2	-	-	-	1	2
Total	6	2	3	2	3	2	2	3	3	2	1	4
Avg	**3**	**2**	**3**	**2**	**3**	**2**	**2**	**3**	**3**	**2**	**1**	**2**

CO - PSO Mapping

SEM: VIII	Sub Name: - Project Phase II		
COs	PSO1	PSO2	PSO3
8B5P 8.1	3	3	1
8B5P 8.2	3	3	1
8B5P 8.3	3	3	1
8B5P 8.4	3	3	1
8B5P 8.5	3	3	1
Total	15	15	5
Avg	**3**	**3**	**1**