SYLLABUS

FOR

B.TECH. PROGRAMME

IN

ELECTRICAL ENGINEERING

INSTITUTE OF TECHNOLOGY

ZAKURA CAMPUS
UNIVERSITY OF KASHMIR
SRINAGAR J&K, 190006

As per BOS held in August 2017

COURSE STRUCTURE
B.Tech 1st Semester ELE
University of Kashmir, Zakura Campus

Course Code	Course Title	Teaching Periods Per Week			Credits
		L	T	P	
MTH-1117B	Engineering Mathematics-I	3	1	0	4
PHY-1217B	Engineering Physics	3	1	0	4
ELE-1317B	Basic Electrical Engineering	3	1	0	4
CSE-1417B	Fundamentals of Computer Programming	2	1	0	3
HUM-1517B	Communication Skills	2	1	0	3
MEE-1617B	Engineering Drawing	3	1	0	4
PHY-1217BL	Engineering Physics Lab	0	0	2	1
ELE-1317BL	Basic Electrical Engineering Lab	0	0	2	1
CSE-1417BL	Fundamentals of Computer Programming Lab	0	0	2	1
Total		16	6	6	25

Applicable to batch 2017 & onwards

COURSE STRUCTURE
B.Tech 2nd Semester ELE
University of Kashmir, Zakura Campus

Course Code	Course Title	Teaching Periods Per Week			Credits
		L	T	P	
MTH-2117B	Engineering Mathematics-II	3	1	0	4
CHM-2217B	Engineering Chemistry	3	1	0	4
ECE-2317B	Basic Electronics Engineering	3	1	0	4
MEE-2417B	Computer Aided Drawing	2	1	2	4
MEE-2517B	Fundamentals of Mechanics	3	1	0	4
CHM-2217BL	Engineering Chemistry Lab	0	0	2	1
ECE-2317BL	Basic Electronics Engineering-Lab	0	0	2	1
MEE-2617BW	Workshop Practice	2	0	2	3
Total		16	5	8	25

Applicable to batch 2017 & onwards

COURSE STRUCTURE
B.Tech 3rd Semester ELE
University of Kashmir, Zakura Campus

Course Code	Course Title	Teaching Periods per week			Credits
		L	T	P	
MTH3117B	Engineering Mathematics – III	3	1	0	4
ELE3217B	Electrical Machines – I	3	1	0	4
ELE3317B	Network Analysis and Synthesis	3	1	0	4
ELE3417B	Signals & Systems	2	1	0	3
ELE3517B	Electrical Measurement & Measuring Instruments	3	1	0	4
ELE3617B	Thermal Engineering	2	1	0	3
ELE3517BL	Electrical Measurement & Measuring Instruments Lab	0	0	2	1
ELE3717BL	Basics of MATLAB Programming and Simulation Lab	0	0	4	2
Total		16	6	6	25

Applicable to batch 2016 & onwards

COURSE STRUCTURE
B.Tech 4th Semester ELE
University of Kashmir, Zakura Campus

Course Code	Course Title	Teaching Periods per week			Credits
		L	T	P	
MTH4117B	Engineering Mathematics – IV	3	1	0	4
ELE4217B	Electrical Machines – II	3	1	0	4
ELE4317B	Control Systems – I	3	1	0	4
ELE4417B	Analog Electronic Circuits	3	1	0	4
ELE4517B	Digital Electronics and Logic Design	2	1	0	3
ELE4617B	Fluid Dynamics & Hydraulic Machines	2	1	0	3
ELE4217BL	Electrical Machines Lab	0	0	2	1
ELE4417BL	Analog Electronic Lab	0	0	2	1
ELE4517BL	Digital Electronics and Logic Design Lab	0	0	2	1
Total		16	6	6	25

Applicable to batch 2016 & onwards

COURSE STRUCTURE
B.Tech 5th Semester ELE
University of Kashmir, Zakura Campus

Course Code	Course Title	Teaching Periods per week			Credits
		L	T	P	
ELE5117B	Control Systems -II	3	1	0	4
ELE5217B	Power System –I	3	1	0	4
ELE5317B	Electromagnetic Field Theory	3	1	0	4
ELE5417B	Microprocessors	3	1	0	4
ELE5517B	Digital Signal Processing	3	1	0	4
ELE5117BL	Control Systems Lab	0	0	4	2
ELE5417BL	Microprocessors Lab	0	0	4	2
ELE5517BL	Digital Signal Processing Lab	0	0	2	1
Total		15	5	10	25

Applicable to batch 2016 & onwards

COURSE STRUCTURE
B.Tech 6th Semester ELE
University of Kashmir, Zakura Campus

Course Code	Course Title	Teaching Periods per week			Credits
		L	T	P	
ELE6117B	Power Systems - II	3	1	0	4
ELE6217B	Power Electronics	3	1	0	4
ELE6317B	Non-Conventional Energy Sources	3	1	0	4
ELE6417B	Electronic Measurements & Instrumentation	3	1	0	4
ELE6517B	Communication Systems	3	1	0	4
ELE6617B	Seminar	1	0	2	2
ELE6117BL	Power System Lab	0	0	2	1
ELE6217BL	Power Electronics Lab	0	0	2	1
ELE6517BL	Communication Lab	0	0	2	1
Total		16	5	8	25

Applicable to batch 2016 & onwards

COURSE STRUCTURE
B.Tech 7th Semester ELE
University of Kashmir, Zakura Campus

Course Code	Course Title	Teaching Periods per week			Credits
		L	T	P	
ELE7117B	Power System Protection	2	1	0	3
ELE7217B	Advanced Power Electronics	2	1	0	3
ELE7317B	Power System – III	2	1	0	3
ELE7*17BE	Elective – I	2	1	0	3
ELE7*17BE	Elective – II	2	1	0	3
ELE7417B	Industrial Training & Viva*	0	0	0	1
ELE7517B	Pre - Project	2	2	2	5
ELE7117BL	Power System Protection Lab	0	0	4	2
ELE7617BL	Computer Aided Power System Design Lab	0	0	4	2
Total		12	7	10	25

*** Industrial Training has to be covered up in winter (or summer) vacations. It is a One credit course.**
Applicable to batch 2016 & onwards

ELE7*17BE:
***serial no of below mentioned subjects (e.g. for Utilisation & Traction; code is ELE70117BE)**

Elective – I
01. Utilisation & Traction
02. Power Station Practice
03. High Voltage Engineering
04. Advanced Control System

Elective – II
05. Flexible AC Transmission System (FACTS)
06. SCADA & Energy Management
07. Special Electrical Machines

COURSE STRUCTURE
B.Tech 8th Semester ELE
University of Kashmir, Zakura Campus

Course Code	Course Title	Teaching Periods per week			Credits
		L	T	P	
ELE8117B	Industrial Drives & Control	3	1	0	4
HUM8217B	General Management & Economics	3	1	0	4
ELE8*17BE	Elective – III	3	1	0	4
ELE8417B	Major Project	2	6	10	13
Total		11	9	10	25

Applicable to batch 2016 & onwards

ELE8*17BE:
***serial no of below mentioned subjects (e.g. for Advanced Power System; code is ELE80117BE)**

Elective – I
01. Advanced Power System Analysis
02. Restructuring of Power System
03. HVDC System
04. Power System Dynamics & Stability

FIRST SEMESTER

COURSE CODE: MTH-1117B

ENGINEERING MATHEMATICS - I

Credits: 04

S. No	Topics	Number of Hours
1.	Calculus: Differential calculus of functions of several variables, Partial differentiation, Homogeneous functions and Euler's theorem,	8
2.	Taylors and Maclaurin's series, Taylor's theorem and mean value theorem for functions of two variables, Errors and approximations	8
3.	Applications of Differential Calculus: Maxima and minima of several variables, Lagrange's method of multipliers for maxima and minima Curvature of Cartesian curves, Curvature of parametric & polar curves.	9
4.	Applications of Definite Integrals: Application of definite integrals to area, arc length, surface area and volume, Double integrals, Triple integrals.	8
5.	Vector Calculus: Scalar and vector fields, differentiation of vectors, Velocity and acceleration, Vector differential operator, Del, Gradient and Divergence, Physical interpretation of the above operators, Line, surface and volume integrals	9
6.	Application of Vector Calculus: Flux, solenoidal and irrotational vectors, Green's, Gauss' and Stokes' theorems and their applications.	8
Total number of Hours		50

Text Books:

S. No	Name of Book	Author	Publisher
1.	Advanced Engineering Mathematics	Kreyszig E	John Wiley, Singapore
2.	Advanced Engineering Mathematics	Jain, R K and Iyengar S R K	Narosa Publishing House
3.	Differential Calculus	Das & Mukherjee	U.N. Dhur & Sons Pvt. Ltd
4.	Integral Calculus	Das & Mukherjee	U.N. Dhur & Sons Pvt. Ltd

COURSE CODE: PHY-1217B

ENGINEERING PHYSICS

Credits: 04

S. No	Topics	Number of Hours
1.	Vectors and Electrostatics: Work and energy in electrostatics; dielectrics, Polarization, electric displacement, Susceptibility & permittivity, Clausius Mossotti equation. Transformation of vectors. Spherical and cylindrical coordinates system, Gradient of a scalar	7
2.	Divergence and curl of a vector, Gauss's law and its applications, Electric potential and electric field (in vector form), Potential due to a monopole, Dipole and multipoles (multipole expansion	7
3.	Magneto-statics: Lorentz Force Law; magnetic field of a steady current (Biot-Savart law), Ampere's law and its applications, Ampere's law in magnetized materials.	6
4.	Electrodynamics Electromotive force, Faraday's law, Maxwell's Equations, Wave Equation. Poynting Vector, Poynting Theorm (Statement only), Propagation of EM-Wave in conducting and non-conducting media. Interference due to division of wave front and division of amplitude. Young's double slit experiment	7
5.	Interference and Diffraction: Interference and principle of superposition. Theory of biprism, Interferences from parallel thin film, wedge shaped films, Newton's rings, Michelson Interferometer. Fresnel's Diffraction, Diffraction at straight edges, Fraunhoffer diffraction due to N-Slits, Diffraction grating, dispersive power of grating, resolving power of prism and grating.	6
6.	Theory of Relativity: Invariance of an equation and concept of ether, Michelson Morley experiment, Einstein's postulates and Lorentz transformation equations, length, time and simultaneity in relativity, addition of velocity, variation of mass with velocity, mass-energy relation, energy- momentum relation.	6
7.	Quantum Theory: The Compton effect, matter waves; group and phase velocities, Uncertainty principle and its application; time independent and time dependent	5
8.	Schrodinger wave equation, Eigen values and Eigen functions, Born's interpretation and normalization of wave function, orthogonal wave functions, applications of Schrodinger wave equation (particle in a box and harmonic oscillator).	6
Total number of Hours		50

Text Books:

S. No	Name of Book	Author	Publisher
1.	Introduction to Electrodynamics	Griffiths D	Prentice Hall of India
2.	Perspective of Modern physics	Beiser	McGraw-Hill
3.	Elementary Modern Physics	Arya A P	Addison-Wesley, Singapore
4.	Introduction to Modern Physics	Mani, H S and Mehta G K	Affiliated East West Press, New Delhi

COURSE CODE: ELE-1317B

BASIC ELECTRICAL ENGINEERING

Credits: 04

S. No	Topics	Number of Hours
1.	Review of basic electrical Signals, Review of electric circuit concepts, Terminology, Electric circuit parameters (Resistance, Conductance, Inductance, Capacitance, Reactance, Impedance), Basic electric circuit terminologies: Nodes, Junctions, Paths, Loops, Branches, Series and Parallel combinations of resistance.	3
2.	Ideal and practical voltage and current sources and their transformation, Dependent Sources, Power and energy relations, Ohm's law: validity of ohms law, Ohmic and non Ohmic conductors, applications of ohms law.	5
3.	Introduction to D.C. voltage & Current and D.C. circuits, Voltage and current Divider Laws, Kirchhoff's current law (KCL) and Kirchhoff's voltage law (KVL), Analysis of series & parallel D.C. Circuits: Loop analysis of D.C. Circuits, Nodal methods of analysis, Mesh analysis, Super node, and Super mesh.	8
4.	Super-position theorem, Thevenin's theorem, Norton's theorems, Maximum power transfer theorem, Reciprocity & Millman's theorem, Delta-Star (Y) Transformations.	7
5.	Introduction to Alternating Voltage & Current and A.C. circuits, Basic terminology and definitions (Signal, Parameters, Generation, Applications, non-sinusoidal A.C.'s, EMF Equations, Mean, Average, RMS, Peak, and Form Factor), Complex number representation of A.C. circuits.	7
6.	Phasor representation of A.C. circuits, Solutions of sinusoidally excited RLC circuits, Power and energy relations in A.C. circuits, Concepts of active & reactive powers.	7
7.	Applications of network theorems to A.C. circuits, Resonance in series and parallel circuits.	6
8.	Single and three phase A.C. systems, Analysis of 3 phase systems, Current and voltage relationships in Y-Δ&Δ-Y configurations, Balanced / un-balanced systems.	7
Total number of Hours		50

Text Books:

S. No	Name of Book	Author	Publisher
1.	Fundamentals of Electric Circuits	Alexander & Sadiku	McGraw-Hill
2.	Engineering circuit Analysis	Hayt & Kimberly	McGraw-Hill
3.	Electric Engineering Fundamentals	Vincent Del Toro	PHI
4.	Introduction to Circuit Analysis & Design	Glisson	Springer
5.	Basic Electric Circuit Analysis	Johnson, Hilburn, Johnson	Wiley

COURSE CODE: CSE-1417B

FUNDAMENTALS OF COMPUTER PROGRAMMING

Credits: 03

S. No.	Topic	No. of Hours
1.	Introduction to Programming and Problem Solving – Types of Programming Languages- Machine Level, Assembly level, and High Level language.	2
2.	Introduction to C Language – Brush-up of algorithms and flowcharts. Character set, Variables and Identifiers, Built-in Data Types, Variable Definition, Arithmetic operators and Expressions, Constants and Literals, Simple assignment statement, Basic input/output statement.	5
3.	Simple C programs Conditional Statements and Loops -Decision making within a program, Conditions, Relational Operators, Logical Connectives, if statement, if-else statement.	5
4.	Loops: while loop, do while, for loop, Nested loops, Infinite loops, Switch statement, structured Programming.	4
5.	Arrays - one dimensional array: Array manipulation; Searching, Insertion, Deletion of an element from an array; Finding the largest/smallest element in an array; Two dimensional arrays, Addition/Multiplication of two matrices.	6
6.	Functions- Modular programming and functions, Standard Library of C functions, Prototype of a function: Formal parameter list, Return Type, Function call, Block structure, Passing arguments to a Function: call by reference, call by value, Recursive Functions, arrays as function arguments.	6
7.	Structures and Unions - Structure , nested structure, structures and functions, structures and arrays: arrays of structures, structures containing arrays, unions,	5
8.	Pointers- Address operators, pointer type declaration, pointer assignment, pointer initialization, pointer arithmetic, functions and pointers, Arrays and Pointers, pointer arrays.	6
Total		39

Text Books:

S. No	**Name of Book**	**Author**	**Publisher**
1.	Programming with C	Byron Gottfried	Pearson Education
2.	Programming with ANSI & Turbo C	A. Kamthane	Pearson Education
3.	Programming in C	Pradip Dey, Manas Ghosh	Oxford University Press
4.	Programming Language Concepts and Constructs	Ravi Sethi	Pearson Education

COURSE CODE: HUM-1517B

COMMUNICATION SKILLS

Credits: 03

S. No.	Topic	No. of Hours
1.	Communication: Meaning, its types, significance, process, Channels, barriers to Communication, making communication effective, role in society, Communication model.	5
2.	Discussion Meeting and Telephonic Skills: Group discussions, conducting a meeting, attending telephonic calls, oral presentation and role of audio visual aids.	5
3.	Grammar: Transformation of sentences, words used as different parts of speech one word substation, abbreviations, technical terms etc.	5
4.	Reading Skills: Process of reading, reading purposes, models, strategies, methodologies, reading activities.	4
5.	Writing Skills: Elements of effective writing, writing style, scientific and technical writing.	4
6.	Listening Skills: The process of listening, the barrier to listening, the effective listening skills, feedback skills. Speaking Skills: Speech mechanism, organs of speech, production and classification of speech sound, phonetic transcription, the skills of effective speaking, the components of effective talk.	5
7.	Business Letters: Structure of business letters, language in business letters. Letters of inquiry & their places. Sales Letters, Memorandum, Quotations/tenders, Bank correspondence, Letters of application and appointments,	4
8.	Resume writing, Report Writing,	3
9.	Conducting a Meeting, Minutes of Meeting, Oral Presentation, Group Discussion, CV writing, Purchase order, Job Application Letter.	4
Total		39

Text Books:

S. No	**Name of Book**	**Author**	**Publisher**
1.	Effective Business Communication	Rodriques M V	Concept Publishing Company
2.	Handbook of Practical Communication Skills	Wright, Chrissie	Jaico Publishing
3.	An Approach to Communication Skills	Bhattacharya. Indrajit	Dhanpat rai Co
4.	Modern Business Correspondence	Gartside L	Pitman Publishing London
5.	How to Write and Publish a Scientific Paper	Day, Robert A	Cambridge University
6.	An Introduction to the Pronunciation of English	Gimson A C	ELBS

COURSE CODE: MEE-1617B

ENGINEERING DRAWING

Credits: 04

S. No.	Topic	No. of Hours
1.	Introduction to engineering drawing (equipment, drafting tools, symbols and conventions in drawing), dimensioning, types of lines and their use, dividing a given straight line into any number of equal parts, bisecting a given angle, drawing a regular polygon given one side, special methods of constructing a pentagon and hexagon. Conic sections, ellipse, parabola, hyperbola, cycloid and trochoid.	04
2.	Projection of lines: Line parallel to both the planes, Line parallel to the horizontal plane and perpendicular to the vertical plane, line parallel to HP and inclined to VP, line parallel to HP and inclined to profile plane, line parallel to VP and inclined to HP, line inclined to both the planes.	09
3.	Projection on horizontal and vertical planes, principal views, different system of projections, symbols, notations. Projection of Planes in first and third quadrant. Projection of solids in first and third quadrant, axis parallel to one and perpendicular to other.	09
4.	Section planes perpendicular to one plane and parallel or inclined to other plane.	09
5.	Development of prisms, pyramids and cylindrical & conical surfaces.	09
6.	Isometric projection and isometric views of different planes and simple solids, introduction to perspective projection.	10
Total		50

Text Books:

S. No	**Name of Book**	**Author**	**Publisher**
1.	Engineering Graphics and drafting	GillP, S	Katria and Sons
2.	Elementary Engineering Drawing-Plane and Solid Geometry	Bhat N.D.	Chartotar Publishing House
3.	Fundamentals of Engineering Drawing	Luzzad.W.J	Prentice Hall of India

COURSE CODE: PHY-1217BL

ENGINEERING PHYSICS LAB

Credits: 01

S. No.	Experiment
1.	Measurement of Resistance.
2.	Measurement of e/m by Helical method.
3.	Measurement of Numerical Aperture of Optical Fiber.
4.	Determination of Resistivity of a given wire.
5.	Determination of Band Gap of a semiconductor.
6.	Verify Biot-Savart law.
7.	To determine the refractive index of the prism material using spectrometer.
8.	To verify the laws of vibrating strings by Melde's experiments.
9.	To determine the wavelength using Fresnel's biprism/diffraction grating.
10.	To Determine Plank's Constant.

COURSE CODE: ELE-1317BL

BASIC ELECTRICAL ENGINEERING LAB

Credits: 01

S. No	Experiment
1.	To study the colour coding of resistors
2.	Connection of Ammeters, Voltmeters, Wattmeters and multi-meters in DC and AC circuits and selection of their ranges.
3.	Use of LCRQ meter.
4.	To study the series / parallel operation of resistors and verifying their effective values by LCRQ meter.
5.	To verify the KVL and KCL in DC circuits.
6.	To verify the star delta transformation of networks.
7.	To verify the superposition theorem.
8.	To verify the maximum power transfer theorem
9.	Basic R, L, C circuits excited from A.C
10.	To measure electric power in single-phase AC circuits with resistive load, RL load and RLC load.
11.	To measure the power and power factor in three phase AC circuits.
12.	To study the series resonance.
13.	To study the parallel resonance.
14.	To study the handling of CRO and use it for the study of different voltage waveforms.

COURSE CODE: CSE-1417BL

FUNDAMENTALS OF COMPUTER PROGRAMMING LAB

Credits: 01

S. No.	Experiment
1.	Program to understand basic data types.
2.	Programming on looping and decision statements.
3.	Example of Fibonacci series program.
4.	Finding a factorial for a given number.
5.	Programs using i. Library functions. ii. Built-in math functions.
6.	Programs on i. functions ii. arrays iii. string manipulations iv. Structures and unions. v. Pointers. vi. Basic file operations.

SECOND SEMESTER

COURSE CODE: MTH-2117B

ENGINEERING MATHEMATICS II

Credits: 04

S. No.	Topic	No. of Hours
1.	Matrices: Rank of a matrix, Elementary transformations, Consistency and solutions of a system of linear equations by matrix methods, Eigen values & Eigen vectors, Properties, Cayley-Hamilton's theorem	9
2.	Ordinary and Linear Differential Equations: Formation of ordinary differential equations, Solution of first order differential equations by separation of variables	7
3.	Homogeneous equations, Exact differential equations, Equations reducible to exact form by integrating factors, Linear differential equations with constant coefficients, Cauchy's homogeneous linear equations, Legendre's linear equations	8
4.	Partial Differential Equations: Formulation and classification of PDE's, Solution of first order linear equations, Four standard forms of non-linear equations, Separation of variable method for solution of heat, wave and Laplace equation	9
5.	Probability: Basic concepts of probability, Types of probability: Marginal, joint and conditional, probability rules: Addition, Multiplication, complement; Probability tree, probability under conditions of statistical independence and dependence, Bayes' Theorem.	9
6.	Random Variables and Distribution: Random variables, Probability distribution, Probability density function, Discrete and continuous distributions- Binomial, Poisson, Normal distributions, Measures of central tendency and dispersion, Sampling distribution, standard error, Central limit theorem	8
Total		50

Text Books:

S. No	**Name of Book**	**Author**	**Publisher**
1.	Advanced Engineering Mathematics	E. Kreyszig	John Wiley
2.	Advanced Engineering Mathematics	R. K. Jain & S. R. K. Iyengar	Narosa Publishing House
3.	Matrices	Frank Ayres	Mc Graw Hills
4.	Advanced Mathematical Analysis	Malik & Arrora	S. Chand &Co

COURSE CODE: CHM-2217B

ENGINEERING CHEMISTRY

Credits: 04

S. No.	Topic	No. of Hours
1.	Electrochemistry: Reduction Potentials, Redox stability in water, The diagrammatic presentation of potential data, The effect of complex formation on potentials. Electrolytes and non-electrolyte solutions, Kinds of Electrodes, Concentration Cells, The Lead Storage Cell and Fuel Cell	7
2.	Laws of Photochemistry, Photo physical processes, Fluorescence and Phosphorescence, Photochemical reactions: photolysis of HI, Photochemical reaction between H2 and Br2, Rotational and Vibrational Spectroscopy-Principles and application to simple molecules, magnetic Resonance	7
3.	UV-visible spectrophotometry:- Electronic transitions & electronic spectra, Application to simple systems (Analysis of Fe, Cu, Cr), Bear-lambert's law & its applications. IR spectroscopy – IR spectrum, Application of IR Spectra (Alcohols, Acids, phenols, Concept of Vibrational Spectra.	7
4.	Environmental Chemistry:- Environmental segments, composition of atmosphere , earth's radiation balance, particles, Ions, & radicals in atmosphere, greenhouse effect, ozone layer in stratosphere –Its significance and consequence of depletion.	6
5.	Pollution:- Air Pollution, Natural and man-made pollutants (CoX, NoX, HC, SoX, SpM, Acid rains). Effect of pollutants on human and plant life. Sources and classification of water pollutants (Organic, Inorganic, Sediments, Radioactive materials, heat.)	6
6.	Water and its treatment: Alkalinity of water, Determination of Alkalinity by using phenolphthalein and methyl orange indicators. Hardness of water, its types, methods of estimation. Treatment of water (Municipal treatment, lime soda process, demineralization by ion exchange process.	5
7.	Lubricants:- Introduction, surface roughness, concept of friction and wear, lubrication, Mechanism of hydrodynamics, boundary and extreme pressure lubrication. Classification of lubricants, semi-solid & liquid lubricants, blended oils, synthetic lubricants , Lubricating emulsions. Properties of greases, liquid lubricants with special reference to flash point, viscosity and viscosity index. Criteria for selection of lubricants for specific purposes.	6
8.	Inorganic Systems:- Transition Metals, fundamental concepts of transition metal complexes, consequences of orbital splitting, colour and magnetic properties. Structure and bonding of organo-metallic complexes, the sixteen and eighteen electron rule. Role of trace metals in biological systems, oxygen carrier, electron transfer.	6
Total		50

Text Books:

S. No	**Name of Book**	**Author**	**Publisher**
1.	Inorganic Chemistry	Shriver D F and Atkin A W	Oxford Press, Delhi
2.	Physical Chemistry	Castellan G W	Narosa
3.	Principles of Instrumental Analysis	Skoog D A, and Holles F J	Hercaurt Asia PTE Ltd
4.	Chemistry for changing times	Hill J W	Macmillan, Canada
5.	Engineering Chemistry	P. C. Jain	Dhanpat Rai & Sons
6.	Chemistry In engineering	L.A. Munro	Prentice Hall

COURSE CODE: ECE-2317B

BASIC ELECTRONICS ENGINEERING

Credits: 03

S. No.	Topic	No. of Hours
1.	Solid State Physics: Energy bands and charge carriers in semiconductors: energy bands - metals- semiconductors and insulators direct and indirect semiconductors- charge carriers in semiconductors: electrons and holes-intrinsic and extrinsic material: n-material and p-material-carrier concentration.	6
2.	Fermi level- EHPs- temperature dependence- conductivity and mobility- drift and resistance- effect of temperature and doping on mobility, Hall Effect. Diffusion of carriers – derivation of diffusion constant D-Einstein relation- continuity equation.	6
3.	p-n junctions: contact potential-equilibrium Fermi levels- space charge at junctions- current components at a junction: majority and minority carrier currents.	4
4.	Diodes: volt-ampere characteristics-capacitance of p-n junctions. Diode as circuit element. Half wave - fullwave,Rectifiers:CentreTappedandbridgerectifiers-working-analysisanddesign-Cfilter analysis-	5
5.	Zenerandavalanchebreakdown-Zenerdiodes:volt-amperecharacteristics-regulatedpower supplies - IC based regulated power supplies.	4
6.	Tunnel diodes: tunneling phenomena -volt-ampere characteristics- Varactor diodes- Photo diodes: detection principle- light emitting diodes- volt-ampere characteristics.	4
7.	Transistors: BipolarjunctiontransistorsNPNandPNPtransistoraction-opencircuitedtransistor- biasing in active region-majority and minority carrier distribution- terminal currents- operation- characteristics.	5
8.	Types of Transistor Configurations:-CE, CB and CC configurations. Transistor as Amplifier. Field effect transistors: operation-pinch off and saturation-pinch off voltage - gate control- volt-ampere characteristics.	3
9.	MOSFETS n-channel & p-channel. Depletion and enhancement modes.	2
Total		39

Text Books:

S. No	**Name of Book**	**Author**	**Publisher**
1.	Solid State Electronic Devices	B. G. Streetman	Prentice Hall of India
2.	Electronic devices and circuits	R. Boylsted and L. Nashelsky	Prentice Hall Publications
3.	Electronic devices	Floyd	Pearson Education
4.	Electronic Principles	Malvino	Tata McGraw Hill

COURSE CODE: MEE-2417B

COMPUTER AIDED DRAWING

Credits: 04

S. No.	Topic	No. of Hours
1.	Thread forms: Thread terminology, sectional views of threads. ISO Metric (Internal & External), BSW (Internal and External), square, Acme and Sellers thread, American Standard thread.	5
2.	Hexagonal headed bolt and nut with washer (assembly), square headed bolt and nut with washer (assembly), Flanged nut, slotted nut.	6
3.	Locking arrangement for nuts: taper and split pin for locking Simple assembly using stud bolts with nut and lock nut, countersunk head screw, grub screw, Allen screw.	4
4.	Eye foundation bolt, Rag foundation bolt, Lewis foundation bolt and Cotter foundation bolt.	2
5.	Riveted joints: Forms and proportions of rivet heads, Different views of different types of riveted Lap and Butt joints.	4
6.	Shaft joints: Cotter joint and Knuckle joint, Socket and Spigot joint.	4
7.	Shaft coupling: Muff, Flanged, Flexible, Universal and Oldham's coupling.	4
8.	Shaft bearing: Solid and bush bearing, Plummer block, Footstep bearing.	6
9.	Spur gear in mesh with approximate construction of tooth profile, Rack and pinion.	5
10.	Assembly and detailed drawings of Engine Parts: Piston, Stuffing box, cross head, Vertical & Horizontal engine, Connecting rod, Crank, Eccentric. Valves: Steam stop valves, Feed check valve, Safety valves, Blow off cock.	10
Total		50

Text Books:

S. No	Name of Book	Author	Publisher
1.	Machine Drawing	Bhat. N. D	Charotar Publishing house
2.	Machine Drawing	GillP, S	Katria and Sons

COURSE CODE: MEE-2517B

FUNDAMENTALS OF MECHANICS

Credits: 04

S. No.	Topic	No. of Hours
1.	Equilibrium of a particle, Condition for the Equilibrium of a Particle, The Free-Body Diagram, Coplanar Force Systems, Three-Dimensional Force Systems	02
2.	Force System Resultants Moment of a Force—Scalar Formulation, Cross Product, Moment of a Force—Vector Formulation, Principle of Moments, Moment of a Force about a Specified Axis, Moment of a Couple, Simplification of a Force and Couple System, Further Simplification of a Force and Couple System, Reduction of a Simple Distributed Loading.	06
3.	Moments of Inertia Definition of Moments of Inertia for Areas, Parallel-Axis Theorem for an Area, Radius of Gyration of an Area, Moments of Inertia for Composite Areas, Product of Inertia for an Area, Moments of Inertia for an Area about Inclined Axes.	05
4.	Planar Kinematics of a Rigid Body, Translation: Rotation about a Fixed Axis, Absolute Motion Analysis, Relative-Motion Analysis (velocity), Instantaneous Centre of Zero Velocity, Relative-Motion Analysis (acceleration),Relative-Motion Analysis using Rotating Axes.	05
5.	Planar Kinetics of a Rigid Body, Force and Acceleration: Mass Moment of Inertia, Planar Kinetic Equations of Motion (translation, rotation about a fixed Axis, General Plane Motion).	07
6.	Planar Kinetics of a Rigid Body, Work and Energy: Kinetic Energy, The Work of a Force, The Work of a Couple Moment, Principle of Work and Energy, Conservation of Energy.	07
7.	Planar Kinetics of a Rigid Body, Impulse and Momentum: Linear and Angular Momentum, Principle of Impulse and Momentum, Conservation of Momentum, Eccentric Impact.	06
8.	Three-Dimensional Kinematics of a Rigid Body: Rotation About a Fixed Point, The Time Derivative of a Vector Measured from Either a Fixed or Translating-Rotating System, General Motion, Relative Motion Analysis Using Translating and Rotating Axes.	06
9.	Three-Dimensional Kinetics of a Rigid Body: Moments and Products of Inertia, Angular Momentum, Kinetic Energy, Equations of Motion, Gyroscopic Motion, Torque-Free Motion.	06
Total		50

Text Books:

S. No	Name of Book	Author	Publisher
1.	Dynamics	Hibbeler, R.C	Prentice Hall
2.	Statics	Hibbeler, R.C	Prentice Hall
3.	Engineering Mechanics: Vol.1, Statics	Meriam, J.L., Kraige, L.G	John Wiley & Sons
4.	Engineering Mechanics: Vol.2, Dynamics	Meriam, J.L., Kraige, L.G	John Wiley & Sons

COURSE CODE: CHM-2217BL

ENGINEERING CHEMISTRY LAB

Credits: 01

S. No.	Experiment
1.	To draw the pH-titration curve of strong acid vs. strong base
2.	Standardization of $KMnO_4$ using sodium oxalate.
3.	Determination of Ferrous iron in Mohr's salt by potassium permanganate.
4.	Determination of partition coefficients of iodine between benzene and water.
5.	Determination of amount of sodium hydroxide and sodium carbonate in a mixture
6.	Determination of total hardness of water by EDTA method.
7.	To verify Bear's law for a colored solution and to determine the concentration of a given unknown solution.
8.	Synthesis of some polymers like Crazy ball.

COURSE CODE: ECE-2317BL

BASIC ELECTRONICS ENGINEERING LAB

Credits: 01

S. No.	Experiment
1.	Characterize various commercial diodes on the basis of voltage and current ratings. Study/simulation of their I-V characteristics using multi-sim/p-spice.,
2.	Characterize various commercial Zener diodes on the basis of voltage and current ratings, Study/simulation of I-V characteristics of Zener Diode
3.	Study of I-V characteristics of a Light emitting Diode. Design of current limiting resistors for different input voltages.
4.	To assemble/simulate a half wave rectifier using power diodes and LEDs and study their performance
5.	To assemble/simulate a center tapped full wave rectifier using power diodes and LEDs and study their
6.	To assemble/simulate a bridge wave rectifier using power diodes and LEDs and study their performance
7.	Study/simulation of diode applications like clippers, clampers, protection circuits.
8.	Study of Zener diodes as voltage regulators.
9.	Design of an IC based Voltage regulator.
10.	Study V-I characteristics of transistor (PNP and NPN). Calculate the performance parameters of transistor.
11.	Use NPN transistor as an inverter switch.

COURSE CODE: MEE-2617BW

WORKSHOP PRACTICE

Credits: 03

S. No.	Topic	Number of Hours
1.	Machining section (a) Theoretical instructions: Safety precautions, working principal of milling, shaper, slotter, grinding, power hacksaw and other related metal-cutting machine, basic operations of various machines, introduction of various types of cutting tools (Nomenclature). (b)Practical demonstrations: Demonstration of knurling thread cutting, boring etc. on lathe machine, simple operations on milling, shaper, slotter/planner and grinding machines, simple jobs involved all the basic operations on shaper, milling and grinding machines. Aim: To prepare a cylindrical job on lathe for manufacturing of a gear on milling machine.	06
2.	Sheet Metal and Spray Painting section (a) Theoretical instructions: Safety precautions, soldering, brazing and shearing, fluxes in use and their applications, study of material used for painting, knowledge of different machines such as shearing, bending, wiring and power presses, method of pattern development in detail, study of air compressor and air guns: its use, care, maintenance and operating instructions, advantages of spray painting, knowledge of different sheet metal materials. (b) Practical demonstrations: Exercise in rating, soldering and brazing of making jobs of various materials such as trays, flower vases, photo frame etc., and preparation of surfaces for painting by using a spray gun with the help of air compressor. Aim: To develop a funnel as per the drawing with soldering.	06
3.	Fitting and Bench work section (a) Theoretical instructions: Safety precautions, introduction of common materials using in fitting shop, description and demonstration of various work holding devices such as surface plate and V-block, introduction and use of measuring tools like vernier caliper, micro-meter, height gauge, profile projector, surface roughness tester and other gauges. (b) Practical demonstrations: Demonstration of angular cutting, practice of 450, preparation of stud to cut external threads with the help of dies, drilling, countersinking, counter boring and internal thread cutting with taps, pipe cutting practice and thread cutting on G.I pipe with pipe dies. Demonstration of tap sets and measuring equipment's. Aim: To assemble the mild steel work pieces with radius fitting.	04
4.	Welding Section (a) Theoretical instructions:Safety precautions, introduction of all welding processes like gas welding, MIG welding, TIG welding, submerged arc welding and spot welding, advantages and disadvantages over electric arc welding and their applications, welding techniques like right ward, left ward and over head, various fluxes and electrode used in welding, difference between A.C. and D.C. welding, characteristics, size and class of electrodes.(b) Practical demonstrations: Demonstration of different types of joints by using gas welding and arc welding etc. Aim: To make V-butt joint, out-side corner joint and head tee-joint	06
5.	Foundry and Casting section (a) Theoretical instructions: Safety precautions, introduction to casting processes, basic steps in casting processes, types of pattern, allowances, risers, runners, gates, mouldings and its composition and preparation, moulding methods, core	06

	sand and core making, mould assembly, casting defects and remedies, introduction of Cupola, various test of moulding sand like, shatter index test, moisture content test, grain fineness test etc. (b) Practical demonstrations: Demonstration and practice of mould making with the use of split patterns and cores, sand preparation and testing, casting practice of various materials like brass, aluminum, waxes etc. by using different types of patterns. Aim: To prepare a greens and moulds by using split and self cored pattern for casting.	
6.	Smithy and Forging section (a) Theoretical instructions: Safety precautions, introduction of various forging methods like hand forging, drop forging, press forging and machine forging and defects, brief description of metal forming processes, comparison of hot and cold working, introduction of forging machines, such as forging hammer and presses. (b)Practical demonstrations: Demonstration and practice of MS rod into forged MS ring and octagonal cross-section. Aim: To prepare a square headed bolt from MS-round.	06
7.	Carpentry and pattern making Section (a)Theoretical instructions: Safety precautions, introduction of wood, different methods of seasoning, quality of good timber, wood working machines like band saw, circular saw, jig saw, lathe, grinder, thickness planning machine, mortise machine and radial saw. (b) Practical demonstrations: Demonstration and practice of different types of joints, technical terms related to joinery their description, identification and application, polishing, putting and material use, their names, ingredients, methods of preparation and use, joining materials like nuts, screws, dovels, hinges, glue, window and roof trusses. Aim: To prepare scarf joint and pen-stand as per the drawing.	05
Total		39

Text Books:

S. No	Name of Book	Author
1.	Workshop Technology Vol. I	Chapman
2.	Workshop Technology Vol. II	Hajra Chowdhary
3.	Workshop Technology Vol. I	Swarn Singh
4.	Workshop Technology Vol. I	Virender Narula

THIRD SEMESTER

COURSE CODE: MTH-3117B

ENGINEERING MATHEMATICS - III

Credits: 04

S. No	Topics	Number of Hours
1.	Laplace Transforms: Laplace transform, shifting theorem, Laplace Transforms of different functions, Heaviside's unit function. Dirac Delta function its Laplace Transforms. Heaviside's Expansion theorem.	12
2.	Inverse Laplace Transforms. Initial and Final value theorems, Convolution theorem and applications, use of Laplace Transforms in the solution of linear Differential equations.	7
3.	Fourier Transform: Fourier series, Harmonic analysis, Definition of Fourier transform. Fourier sine and cosine transform. Fourier integral formula, Applications to solutions of boundary value problems.	12
4.	Z- Transform: Definition, Linearity property, Z- transform of elementary functions, shifting theorems. Initial and Final value theorem. Convolution theorem.	12
5.	Inverse Z-transform	7
Total number of Hours		50

Text Books:

S. No	Name of Book	Author	Publisher
1.	Laplace Transforms	Murray R. Speigal	McGraw Hill
2.	Advanced Engg. Mathematics	Erwin Kreyzing	Wiley Eastern. Pub.
3.	The use of Integral Transform	Ian.N.Snedden	Tata McGraw Hill.
4.	Integral Transform	Loknath Debnath	New York, Press
5.	Higher engineering mathematics	H. K. Dass, Rajnish Verma	S. Chand

COURSE CODE: ELE-3217B

ELECTRICAL MACHINES – I

Credits: 04

S. No	Topics	Number of Hours
1.	**Transformers:** Single Phase Transformers: Introduction, classification, construction, electromotive force (e. m. f.) equation, Equivalent circuit model, Phasor diagrams, Losses and efficiency, Voltage regulation	7
2.	Transformer tests (polarity test, open circuit test and short circuit test), All day efficiency, Frequency response, Parallel operation, Auto-transformers, Excitation phenomenon in transformers	7
3.	**Three Phase Transformers:** Construction, Connections, Open delta, Ratings, Phase Conversions	4
4.	**Special Purpose Transformers:** Impedance matching transformers, Isolation transformers, constant current and constant voltage Transformers, Instrument Transformers (Introduction)	4
5.	**Principles of Electromechanical Energy Conversion:** Energy conversion via electric and magnetic fields, Field energy and mechanical force, energy balance, co energy	4
6.	**D.C. Generator:** Construction, emf equation of D.C. generator, methods of excitation, losses condition for maximum efficiency, Commutation & armature reaction, interpoles and compensating winding, characteristics of D.C. generators	12
7.	**D.C. Motor:** Working principle, voltage equation, torque developed, operating characteristics of D.C. motor, starting ,3 point and 4 point starter, speed control methods, Swinburne's and break test, Application areas of D.C. Motors	12
Total number of Hours		50

Text Books:

S. No	Name of Book	Author	Publisher
1.	Electric Machinery	Fitzgerald, Kingslay, Umans	Tata McGraw-Hill
2.	Electric Machinery Fundamentals	Chapman	McGraw-Hill Higher Education
3.	Electric Machines	Nagrath and Kothari	Tata McGraw-Hill
4.	Electric Machinery and Transformer	Guru, Hiziroglu	Oxford University press
5.	Electric Machinery	P.S.Bimbhra	Khanna Publishers
6.	Basic Electric Machines	Vincent Deltoro	Prentice Hall

COURSE CODE: ELE-3317B

NETWORK ANALYSIS & SYNTHESIS

Credits: 04

S. No	Topics	Number of Hours
1.	Basics circuit concepts: Charge and energy, capacitance, inductance and resistance parameters in the light of field and circuit concepts, approximate realization of a physical system as a circuit, Reference directions for currents and voltages, conventions for magnetically coupled circuits, Circuit topology	7
2.	First order differential equation: Differential equations as applied in solving networks, Application of initial conditions, evaluating initial conditions in networks	7
3.	Laplace Transformations: Solution of Network problems with Laplace transformation, Heaviside's expansion theorem	4
4.	Wave form analysis and synthesis: The unit step, ramp and impulse functions and their Laplace transforms, Initial and final value theorems, convolution integral, convolution as summation	5
5.	Network theorems and impedance functions: Complex frequency, transform impedance and transform circuits, series and parallel combinations of elements, Fosters reactance theorem and reciprocity theorem	6
6.	Network Functions- poles and zeros: Ports or terminal pairs, Network functions for one port and two port networks (ladder and general networks), Poles and Zeros of network functions, Restriction on pole and zero locations for driving point and transfer functions. Time domain behaviour from pole zero plot	7
7.	Two port parameters: Relationship of two port parameters, Admittance, impedance, transmission and hybrid parameters, Relationship between parameter sets, Parallel connection of two port Networks, Characteristics impedance of two port networks.	7
8.	Filters : Filter fundamentals – pass and stop band, filter classification, constant K & m derived filters, Behaviour of characteristic impedance over pass & stop bands, design of filters.	7
Total number of Hours		50

Text Books:

S. No	Name of Book	Author	Publisher
1.	Network Analysis	Van Valkenberg	Prentice Hall of India
2.	Network Analysis and Synthesis	F. F. Kuo	John Wiley & Sons
3.	Network Analysis	G K Mithal	Khanna Publishers

COURSE CODE: ELE-3417B

SIGNALS & SYSTEMS

Credits: 03

S. No	Topics	Number of Hours
1.	**Introduction:** Continuous-Time and Discrete-Time Signals, Transformations of Independent Variable, Exponential and Sinusoidal Signals, Unit Impulse and Unit Step Functions, Continuous-Time and Discrete-Time Systems, Properties.	5
2.	**Discrete-Time & Continuous-Time LTI Systems:** Properties of Linear Time-Invariant Systems. Causal LTI Systems Described by Differential and Difference Equations. Singularity Functions.	5
3.	**Fourier Series Representation of Periodic Signals:** Response of LTI Systems to Complex Exponentials, Fourier Series Representation of Continuous-Time Periodic Signals, Convergence of the Fourier Series, Properties of Continuous-Time Fourier Series, Fourier Series Representation of Discrete-Time Periodic Signals, Properties of Discrete-Time Fourier Series, Fourier Series and LTI Systems, Filtering, Examples of Continuous-Time Filters Described by Differential Equations, Examples of Discrete-Time Filters Described by Difference Equations.	8
4.	**Discrete-Time Fourier Transform.**	3
5.	**Time- and Frequency Characterization of Signals and Systems:** The Magnitude-Phase Representation of the Fourier Transform, The Magnitude-Phase Representation of the Frequency Response of LTI Systems, Time-Domain Properties of Ideal Frequency-Selective Filters, Time- Domain and Frequency-Domain Aspects of Non-ideal Filters.	5
6.	**Sampling:** Representation of a Continuous-Time Signal by Its Samples: The Sampling Theorem, Reconstruction of a Signal from Its Samples Using Interpolation, The Effect of Under sampling: Aliasing, Discrete-Time Processing of Continuous-Time Signals, Sampling of Discrete-Time Signals.	5
7.	**The Laplace Transform:** Region of Convergence for Laplace Transforms, Analysis and Characterization of LTI Systems Using the Laplace Transform.	3
8.	**The Z-Transform:** Region of Convergence for the z-Transform, Analysis and Characterization of LTI Systems Using z-Transforms.	3
9.	Applications of signal and system theory: modulation for communication, filtering and so on.	2
Total number of Hours		39

Text Books:

S. No	Name of Book	Author	Publisher
1.	Signals and Systems	A.V. Oppenheim, A.S. Willsky and I.T. Young	Prentice hall
2.	Signals and Systems - Continuous and Discrete	R.F. Ziemer, W.H. Tranter and D.R. Fannin	Prentice hall
3.	Signal Processing and Linear Systems	B.P. Lathi	Oxford university press

COURSE CODE: ELE-3517B

ELECTRICAL MEASUREMENT & MEASURING INSTRUMENTS

Credits: 04

S. No	Topics	Number of Hours
1.	Definition of basic terms used in measurements	02
2.	Electro-mechanical indicating instruments: Classification, effects utilized in measuring instruments, errors and their types, various forces in an electro-mechanical indicating instrument, various methods of damping,	04
3.	Galvanometers, Ammeters and Voltmeters (PMMC, Induction, Electrostatic and Dynamometer type), mathematical theory of the D'Arsonval galvanometer	10
4.	Measurement of Power, Energy and Power Factor: Power measurement in three phase a.c. circuits using single phase and 3-phase watt meter, measurement of reactive power (Single phase and 3-phase), Energy measurement using induction type meter	07
5.	Measurement of speed, frequency, and phase difference, Rotational speed measurements-stroboscopic methods, Frequency meters, Phase or power factor meters-Synchroscope	05
6.	Measurement of Resistance: Resistance classification, Measurement of Low resistance, Measurement of medium resistance, Measurement of high resistance, Meggar, Ohmmeter.	06
7.	Measurement of Inductance, Capacitance and Frequency using A.C. bridges.	07
8.	Potentiometers: D.C potentiometers, types & applications, A.C potentiometers, types & applications	04
9.	Magnetic measurements: Introduction, types, measurement of flux density and magnetizing force, Determination of magnetizing curve, hysteresis loop; measurement of Leakage, Magnetic testing with Alternating Current; bridge and potentiometric methods; magnetic shielding	04
10.	Introduction to virtual Instrumentation.	01
Total number of Hours		50

Text Books:

S. No	Name of Book	Author	Publisher
1.	Electrical Measurements and Measuring Instruments	Golding, Widdis	Pitman
2.	Electrical Electronic Measurements	A.K.Sawhney.	Dhanpat Rai

COURSE CODE: ELE-3617B

THERMAL ENGINEERING

Credits: 03

S. No	Topics	Number of Hours
1.	THERMODYNAMICS: System and Surroundings, Zeroth Law, Temperature Scales, Equation of the state, First law, Steady flow, Isochoric, Isobaric, isothermal, adiabatic and polytrophic processes. Properties of steam, Second law, Entropy change, Reversible Irreversible processes, Carnot's Cycle, Rankine Cycle, Modified Rankine Cycle, and Flow through nozzle.	14
2.	STEAM TURBINE: Impulse turbine, velocity and pressure compounding , work output, Losses and efficiency, Reaction turbine, work output, losses and efficiency, degree of reaction, Modern steam power cycles, Regenerative and Reheat cycles, Governing of steam Turbines, Fields of Application.	10
3.	I.C. ENGINES: Otto, Diesel and Dual cycles, Magneto and battery ignition, detonation and pre-ignition, Octane Number, Draught, Diesel knock, Cetane Number, various I.C engines fuels, Carburation and Injection , Lubrication, Cooling, Governing of I.C Engines, Fields of Application.	08
4.	GAS TURBINES: Present status and future trends, Basic types and Cycles, Thermal refinements, jet propulsion, fields of Application.	07
Total number of Hours		39

Text Books:

S. No	Name of Book	Author	Publisher
1.	Steam Turbine Performance and Economics	Bartlett	McGraw Hill
2.	Steam Turbine Theory and Practice	Kearton Pitman	CBS Publishers
3.	Theory and Design of steam and Gas turbine	Loe	McGraw Hill
4.	Gas Turbines Theory and Practice	Cohn and Rogers	Pearson
5.	Turbo machines	Yahya	McGraw Hill

COURSE CODE: ELE-3517BL

ELECTRICAL MEASUREMENT & MEASURING INSTRUMENTS LAB

Credits: 01

S. No.	Experiment
1.	Measurement of power in single phase and three phase circuits using single phase and three phase wattmeters.
2.	Energy Measurement using watt-hour meter as well as using wattmeter and stop watch.
3.	To study the constructional details of an electromechanical indicating instrument with the help of demonstration type of instrument
4.	Measurement of Inductance and capacitance using Bridge techniques (Anderson's Bridge, Wheat Stone's Bridge.)
5.	Measurement of Resistance by different methods (Loss of charge method, substitution Method, Kelvin's Double Bridge)
6.	To Study RC and LC models of a transmission line and observe the variation of voltage magnitude and phase along the line.
7.	Measurement of Electrical and Non Electrical quantities using virtual instrumentation. (Dasylab)

COURSE CODE: ELE-3717BL

BASICS OF MATLAB PROGRAMMING AND SIMULATION LAB

Credits: 02

S. No.	Experiment
1.	Introduction to MATLAB: basic concepts, language, programming and simulation
2.	Programs to study • Basic commands and programs • Loops, conditional statements etc. • Example of Fibonacci series • Solution of differential equations • Functions
3.	Plotting in MATLAB
4.	Use of MATLAB in electrical engineering as in • Transient and steady state analysis of A.C/D.C circuits. • Analysis of Electric Machines and Transformers. Using both programming and simulation knowledge.
5.	Use of MATLAB and SIMULINK Tool boxes.

FOURTH SEMESTER

COURSE CODE: MTH-4117B

ENGINEERING MATHEMATICS - IV

Credits: 04

S. No	Topics	Number of Hours
1.	Finite Difference: Difference Table and its usage. The difference operators Δ,▼ and the operator E	06
2.	Interpolation: Interpolation with equal intervals, Newton's advancing difference formula. Newton's backward difference formula. Interpolation with unequal intervals. Newton's divided difference formula. Lagrange's interpolation formula	08
3.	Central Differences: The central difference operator δ and the over-raging operator μ. Relations between the operators. Gauss forward and backward interpolation formula, Sterling's, Bessel's, Laplace and Everett's formulae	08
4.	Numerical solution of algebraic and Transcendental Equations: Graphic Method, Regula-Fast method, Bolzano's Process of bisection of intervals, Newton-Raphson Method and its geometrical significance	10
5.	Numerical Integration: Numerical Integration, General Quadrature Formula, Simpson's one-third and three-eight rules, Weddle's' rule, Hardy's rule, Trapezoidal rule.	08
6.	Numerical Solution of ordinary differential equations: Numerical solution of ordinary differential equations, Picard's method. Taylors series method, Euler's method, Runge-Kutta Method	10
Total number of Hours		50

Text Books:

S. No	Name of Book	Author	Publisher
1.	Numerical Methods for Scientists and Engineering	M.K.Jain, S.R.Iyengar & R.K. Jain, Wiley Eastern Ltd	New age publishers
2.	Mathematical Numerical Analysis	S.C. Scarborough	CBS Publishers and distributors
3.	Introductory methods in Numerical Analysis	S.S.Sastry	PHI learning Pvt Ltd
4.	Numerical Methods for Mathematics, Sciences and Engg	J. H. Mathews	Prentice hall college division
5.	Fundamentals of Mathematical Statistics	S.C.Gupta and V.K.Kapoor	S. Chand
6.	Statistical Theory and Methodology in Science and Engineering	Brownlee	Krieger publishers co
7.	Introduction to Mathematical Statistics	R.E. Walpole 3rd edition	Prentice hall

COURSE CODE: ELE-4217B

ELECTRICAL MACHINES – II

Credits: 04

S. No	Topics	Number of Hours
1.	Basic Concepts in A.C. Rotating Electrical Machines: The rotating magnetic field, Magneto-motive force and flux distribution, Induced voltage, Production of torque, Leakage fluxes, losses and efficiency	5
2.	Induction Machines: Three Phase Induction Motors: Construction, Types, Principle of operation of an induction motor, Cogging and crawling, Equivalent circuit, Torque/speed characteristics, Induction motor tests, Speed control, Principle of operation of Induction generator.	13
3.	Single-Phase Motors: Types of single phase induction motors, Starting of single phase induction motors, analysis and testing of single phase induction motors, universal motor, Schrage motor, Applications of single phase motors.	6
4.	Synchronous Machines: Construction & Types, working principle, field and armature windings, Equivalent circuit, voltage regulation and its determination, Synchronous reactance, saturation effect, parallel operation, Two-axis theory.	13
5.	Salient type machines, steady-state power-angle characteristics, Excitation systems, V-curves, synchronous capacitors, Hunting, synchronous Machine Transients, Analysis of sudden 3-phase short circuit, Transient power-angle characteristics.	13
Total number of Hours		50

Text Books:

S. No	Name of Book	Author	Publisher
1.	Electric Machinery by Fitzgerald	Kingslay, Umans	Tata Mcgraw hill
2.	Electric Machines	Nagrath and Kothari	Tata Mcgraw hill
3.	Electric Machines	Guru	Oxford university press
4.	Electrical Machines and Transformers	Geroge Mc Pherson	John Wiley
5.	Electric Machinery Fundamentals	Chapman	Tata Mcgraw hill
6.	Electric machinery and Transformers	Irving Kosow	Pearson
7.	Alternating current machinery	Langsdorf	Tata Mcgraw hill

COURSE CODE: ELE-4317B

CONTROL SYSTEMS – I

Credits: 04

S. No	Topics	Number of Hours
1.	Introduction to continuous control systems: Definition of a control system, open-loop, closed loop (automatic and manual) control.	04
2.	Mathematical modeling: Transfer functions, block diagrams, Mason's signal flow graph	09
3.	First and second order system: Example of first and second order systems, responses of these systems to step, ramp, parabolic and sinusoidal inputs, transient, steady state and error analysis	10
4.	Stability studies: Definition of stability, stability and pole locations, Routh Table	09
5.	Frequency response: Bode plot, polar plot, Nyquist's criterion, root locus.	08
6.	Proportional, Integral, Derivative (P.I.D) control. Compensator design Lead – lag compensators . Modelling of dynamic systems in state space (Introduction).	10
Total number of Hours		50

Text Books:

S. No	Name of Book	Author	Publisher
1.	Control Systems Engineering	Norman S. Nise	John wiley
2.	Control systems(Principles and Design)	M. Gopal	Tata McGraw-Hill Publishing
3.	Control systems	A. Anand Kumar	PHI Learning Private limited
4.	Feedback control of dynamic systems	Franklin and Powel.	Prentice Hall
5.	Design of feedback control systems	Stefani	Oxford university press

COURSE CODE: ELE-4417B

ANALOG ELECTRONIC CIRCUITS

Credits: 04

S. No	Topics	Number of Hours
1.	**BJTs** Brief review of BJTs, Analysis and Design of transistor amplifier circuits using h parameters, Low frequency h- parameter model. High frequency hybrid – pi model, analysis and design of transistor amplifier circuits at high frequencies, Multistage amplifiers.	8
2.	**Feedback Basics** Negative feedback, Effect of negative feedback on the performance of amplifiers e.g. on bandwidth. Types of feedback amplifiers, current shunt, current series, voltage shunt and voltage series feedback. Analysis of feedback amplifiers circuits	8
3.	**Sinusoidal Oscillators** Basic operations, analysis of general oscillator circuit, Barkhausen's criteria, various types of oscillator circuits and their analysis, Design of practical oscillator circuits.	7
4.	**Power Amplifiers and Power Supplies** Classification of power amplifiers, Class A, Class B, Class AB and Class C power amplifiers; analysis and design. Power supplies and IC regulators	8
5.	**Operational Amplifiers** Operational amplifiers stages, Differential amplifier, CMRR, Cascade amplifier, Ideal and practical operational amplifier characteristics and properties Op-amp applications, inverting and non-inverting amplifiers, difference amplifier, summer, differentiator and integrator, rectifiers etc. Op-amp in analog computation. Frequency response, Gain Bandwidth product, Signal to noise ratio.	12
6.	**Multivibrators and Wave Form Generators** Bistable multivibrators, Bistable circuit as a memory element, Generation of Square & Triangular waves using Astable multivibrators, Generation of the standard Pulse-The Monostable multivibrators, Integrated circuit Timers, Implementation of Astable, Monostable and Bistable multivibrators using 555 Timer, Various practical applications of 555 Timer.	7
Total number of Hours		50

Text Books:

S. No	Name of Book	Author	Publisher
1.	Integrated circuits	Millman & Halkias	Tata Mc-Graw Hill
2.	Microelectronic circuits	Sedra and Smith	Oxford university Press
3.	Introduction to Electronic Circuit Design	Spencer and Ghausi	Pearson
4.	Op-Amps and Linear Integrated Circuits	Ramakant Gaekwad	Pearson

COURSE CODE: ELE-4517B

DIGITAL ELECTRONICS AND LOGIC DESIGN

Credits: 03

S. No	Topics	Number of Hours
1.	Review of Number systems, Radix conversion Complements 9's & 10's, Subtraction using 1's & 2's complements	04
2.	Binary codes, Error detecting and Correcting codes, Theorems of Boolean algebra, Canonical forms,	04
3.	Logic gates and implementation of Boolean functions with various types of logic gates. Circuit equivalence.	06
4.	Digital Logic Families: Introduction to bipolar Logic families: RTL, DCTL, DTL, TTL, ECL and MOS Logic families (NMOS, PMOS, CMOS), Details of TTL logic family-Totem pole, Open collector outputs, TTL subfamilies, Comparison of different logic families.	06
5.	Simplification techniques and minimization by map methods. Tabular method.	04
6.	Combination logic and arithmetic circuits. Encoders and Decoders, multiplexes & de-multiplexes.	04
7.	Sequential circuits –state diagrams and state tables, design and analysis of flip-flops, registers, counters. Synchronous and asynchronous operation of sequential circuits. Analog to digital convertor, digital to analog convertor.	06
8.	Latches and memory organisation. ROM's, EPROM's and RAM's –Dynamic and static.	04
9.	Introduction to PLA's	01
Total number of Hours		39

Text Books:

S. No	Name of Book	Author	Publisher
1.	Digital logic	M. Moris Mano	Pearson
2.	Digital principles and applications	A.P. Malvino	Tata Mcgraw hill
3.	Switching circuits	Marcus	Prentice hall
4.	Digital Electronics	Anil K. Maini	Wiley

COURSE CODE: ELE-4617B

FLUID DYNAMICS AND HYDRAULIC MACHINES

Credits: 03

S. No	Topics	Number of Hours
1.	INTRODUCTION: PHYSICAL Properties of Fluids.	03
2.	Fluid Statics: Pressure Intensity, Pascal's law, pressure-density height relationships, manometers, pressure on plain and curved surfaces, centre of pressure.	05
3.	Kinematics of Fluid Flow: Types of flows, stream line, streak line and path line, continuity equation.	04
4.	Dynamics of fluid Flow: Euler's equation of motion along a stream line and its integration to yield Bernoulli's equation, Flow measurement, pitot tube, prandtl tube, Venturimeter, orifice meter, orifices and mouthpieces, Weirs and Notches.	07
5.	Flow through Pipes: Hydraulic grade line, Darcey-Weisbachh formula, Design of pipes, Equivalent diameter of pipes, Transmission of power through pipes.	06
6.	Flow in open Channels: Chezy's formula, Maining's formula. Design of Cannels, Economic section.	05
7.	Hydraulic Machines: Types of turbines, description and principles of Impulse and reaction turbines, unit quantities and specific speed, run a ay speed, turbine characteristics, selection of turbines, governing of turbines, centrifugal pumps, specific speed, Power requirement, Reciprocating pumps.	07
8.	Layout of power House: General layout and arrangement of Hydropower units.	02
Total number of Hours		39

Text Books:

S. No	Name of Book	Author	Publisher
1.	Fluid Mechanics & Fluid Power Engineering	Dr D.S.Kumar	S.K.Kataria & Sons
2.	Engineering Fluid Mechanics	R.J.Garde & A.G.Miraj	Scitech Publication
3.	A textbook of Fluid & Hydraulic Machines	Dr R.K Bansal	Laxmi Publication

COURSE CODE: ELE-4217BL

ELECTRICAL MACHINES LAB

Credits: 01

S. No.	Experiment
1.	To perform open circuit and short circuit tests on a single-phase transformer
2.	To perform polarity test on a single phase transformer
3.	To determine the efficiency and voltage regulation of a single phase transformer
4.	To study three phase connections on a bank of three single phase transformers
5.	To study various parts of a dc machine and draw sketches of the same
6.	To plot the saturation curve of a dc machine
7.	To plot the external characteristics of a separately excited dc generator.
8.	To study the voltage build-up of a dc shunt generator
9.	To plot the external characteristic of a dc shunt generator.
10.	To plot the external characteristics of a dc series generator.
11.	To plot the external characteristic of a dc compound generator.
12.	To study the different parts of an Induction motor.
13.	To determine the equivalent–circuit parameters of a 3 -ϕ Induction motor by (i) No load test (ii) Blocked rotor test
14.	To determine the Torque / speed characteristics of a 3-ϕ Induction motor
15.	To study the speed control of an Induction motor by pole-changing method
16.	To study the speed control of an Induction motor by varying voltage
17.	To study the speed control of an Induction motor by changing rotor resistance
18.	To Study of the construction of a synchronous machine
19.	To obtain the OCC and SCC of a synchronous machine by Synchronous impedance method
20.	To find voltage regulation of an alternator by actual loading
21.	To obtain the V-curves and inverted V-curves of a synchronous motor
22.	To conduct slip-test on a salient-pole synchronous machine and hence determine its direct and quadrature – axis reactances

COURSE CODE: ELE-4417BL

ANALOG ELECTRONIC LAB

Credits: 01

S. No.	Experiment
1.	Study V-I characteristics of transistor (PNP and NPN) and calculate the performance parameters of a transistor in CB, CE and CC Configurations.
2.	To assemble a CE amplifier and observe its performance.
3.	To obtain frequency response of a RC coupled CE amplifier.
4.	To assemble an emitter follower circuits and observe its performance.
5.	To assemble a differential amplifier and obtain its CMRR
6.	To study different applications of OP AMPS. inverting amplifier, non-inverting amplifier, integrator, differentiator
7.	To assemble an RC phase shift oscillator.
8.	Study performance of multivibrator circuits using 555 chip in following Modes: Bistable, Astable, Monostable, Use of 555 chip as a timer circuit.
9.	To assemble a Schmitt trigger circuit. And to obtain its characteristics and to use it as Squaring circuit.
10.	To assemble a Class A power amplifier and to determine its power gain.
11.	To study different applications of OP-AMPS. i. OP- AMP as an inverting amplifier. ii. OP-AMP as a non-inverting amplifier. iii. OP-AMP as an integrator. iv. OP-AMP as a differentiator.
12.	To study the performance of a voltage regulator IC chip.
13.	To measure the following parameters of a typical OP-AMP. i. I/P Impedance ii. O/P Impedance iii. Slew rate iv. CMRR v. Freq. response.

COURSE CODE: ELE-4517BL

DIGITAL ELECTRONICS AND LOGIC DESIGN LAB

Credits: 01

S. No.	Experiment
1.	To verify the truth table of following logic gates: AND, OR and NOT NAND, NOR, XOR and XNOR
2.	To realize the above gates using discrete active and passive components
3.	To implement XOR and XNOR using universal logic gates
4.	To verify DE Morgan's law using logic gates
5.	To implement certain Boolean expressions and check their equality
6.	To design and realize a) Half adder and verify its truth table. b) Full adder and verify its truth table. c) Half subtractor and verify its truth table. d) Full subtractor and verify its truth table
7.	To design a multiplexer/ demultiplexer using two input NAND gates
8.	To design a 4-bit binary to decimal convertor
9.	To design a modulo 10 counter
10.	Given the frequency f obtain the waveforms with frequencies f/2, f/5 & f/10
11.	Design and realize the following flip-flops using logic gates. a) RS flip flop b) JK flip flop. c) D flip flop d) T flip flop.
12.	Use PLL as a) Frequency multiplier, b) Frequency demodulator

FIFTH SEMESTER

COURSE CODE: ELE-5117B

CONTROL SYSTEMS -II

Credits: 04

S. No	Topics	Number of Hours
1.	**State variable modeling:** Block diagram, transfer function and signal flow graphs in state space	7
2.	State variable Analysis and design solution of state vector equations, design using state – variable feedback.	10
3.	**Concepts of Controllability and Observability:** state estimation, pole allocation, stability and reproducibility, Design of full State Observers, Design by separation principle.	9
4.	**Digital control system:** Hardware elements of a digital control system, Advantages of Digital control systems Practical aspects of the choice of sampling rate and multirate sampling, Basic discrete time signals, Quantization & Sampling	7
5.	Mathematical modeling, Data reconstruction and filtering of sampled signals, zero order hold. Pulse transfer function. Difference equations, Design of Discrete Data System, Digital P, PI, PID controller	11
6.	**Introduction to Advanced Controllers:** Fuzzy logic control, Neural Network, Predictive Controller	6
Total number of Hours		50

Text Books:

S. No	Name of Book	Author	Publisher
1.	State variable methods and digital control	M. Gopal	Tata Mcgraw Hill
2.	Control system engineering	Norman .S. Nise	John Wiley
3.	Discrete Time Control Systems	K Ogata	Wesley longman
4.	Control systems	A. Anand Kumar	PHI Learning Pvt. Ltd
5.	Feedback control of dynamic systems	Franklin and powel	Prentice hall

COURSE CODE: ELE-5217B

POWER SYSTEM - I

Credits: 04

S. No	Topics	Number of Hours
1.	Introduction to Power Systems generation, transmission & distribution. Per unit representation of power system variables, Single line diagram, impedance and reactance diagram of a system, per unit calculations	04
2.	Overhead line insulator types; pin, suspension, strain, shackle, guy etc. String efficiency & methods of equalizing potential drop over string of suspension insulators.	05
3.	Transmission line parameters and their evaluations, types of overhead conductors with calculations of inductance and capacitance.	10
4.	Models of short, medium and long transmission lines. Lossless transmission lines; electrical length of a line and its importance, Equivalent circuits of a transmission line, Applications of ABCD representation of Power System components, Power transfer capability of a transmission line, Skin, proximity and Ferranti effect.	10
5.	Mechanical Design of transmission line: Sag, span and tension calculations. Electric Power Transmission Towers.	05
6.	Classification of cables, Cable conductors, insulating materials, insulation resistance, electrostatic stress, grading of cables, capacitance calculation of single & mult-core cable, losses and current carrying capacity, cross bonding of cables.. Location of faults, methods of laying of underground cables.	09
7.	Corona, Visual & critical voltages, corona loss, effect of corona on line design practical considerations	04
8.	Element of AC distribution. Single fed, double fed and ring main distributor.	03
Total number of Hours		50

Text Books:

S. No	Name of Book	Author	Publisher
1.	Power System Analysis	J.J. Grainger and W.D Stevenson	Mcgraw hill
2.	Electric Power Systems	B.W. Weedy and B.J. Cory	John Wiley and sons
3.	Electric Power Systems	C.L. Wadhwa	New age international
4.	Power System Engineering	Nagrath and Kothari	Tata Mcgraw hill
5.	Power System Analysis	Hadi Saadat	Mc Graw Hill

COURSE CODE: ELE-5317B

ELECTRO-MAGNETIC FIELD THEORY

Credits: 04

S. No	Topics	Number of Hours
1.	**Electrostatics:** Curvilinear Coordinates, The Dirac-Delta Function, Helmholtz Theorem, Scalar and Vector Potentials, The Electrostatics field, Divergence and Curl of electrostatics fields, Applications of Gauss law, Introduction to potential, Poisson equation and Laplace equation, The potential of a localized charge distribution, Electrostatic boundary conditions, Work and Energy in electrostatics, Basic properties of conductor, The surface charge on a conductor.	08
2.	**Special Techniques for Calculating Potentials:** Laplace equation in one, two & three Dimensions, Boundary conditions and uniqueness theorem, Conductors and the 2nd uniqueness theorem, The classic image problem, The induced surface charge, Force and energy other image problems, Separation of variables, Approximate Potentials at large distance, the monopole and dipole terms, The Electric field of a dipole.	10
3.	**Magnetostatic Fields:** The Lorentz force law, The Biot-Savarts law, Divergence and curl of B, Magnetic Vector potential, Magnetostatic Boundary conditions, Multipole expansion of the Vector Potential, Magnetization, Torque and force on magnetic dipoles, Effect of magnetic field on atomic orbits, Amperes law in magnetized material, Magnetic Susceptibility and permeability.	08
4.	**Electromagnetic Waves:** Electromagnetic wave in one Dimension, Sinusoidal waves, Polarization, Boundary condition, Reflection and transmission, Energy and momentum of electromagnetic waves, Propagation through linear media, Reflection and refraction at oblique incidence, electromagnetic waves in conductors, Rectangular Wave guides, TE and TM modes.	12
5.	**Electrodynamics:** Electrodynamics before Maxwell, Maxwell's equations and magnetic charge, Maxwell's equation inside matter, Boundary conditions, Scalar and vector potentials, Gauge Transformations, Coulomb Gauge and Lorentz Gauge, Lorentz Gauge, Lorentz force law in potential form, Newton's third law in electrodynamics, Poynting theorem, Maxwell's Stress tensor, Conservation of momentum, Electromagnetic waves in non-conducting media, Monochromatic plane waves in conducting media.	12
Total number of Hours		50

Text Books:

S. No	Name of Book	Author	Publisher
1.	Introduction to electro-dynamics	David J. Griffiths	Prentice hall india
2.	Electrodynamics	J.D. Jacson	Pearson
3.	Mathematical method for Physicists	Arfken Weber	Harcourt (INDIA)
4.	Classical Theory & Fields	L.D. Landau, E.M. Lypshitz	Pergman

COURSE CODE: ELE-5417B

MICROPROCESSORS

Credits: 04

S. No	Topics	Number of Hours
1.	**Microcomputer Structure and Operations:** Basic Microcomputer Elements, Typical Microcomputer Structure, CPU, Memory System,	2
2.	**Overview of Microprocessor:** Basic Terminology, evolution of Microprocessors, Typical 8, 16 and 32 bit Microprocessors, State of Art of μ P, why we study 8085 μ P.	4
3.	**8085 μp Architecture:** Pin diagram, detailed internal architecture, state transition Diagrams, T-states (clock cycles), machine cycles, instruction cycles, instruction formats.	6
4.	**Instruction Set and Programming Techniques:** Different addressing modes, complete description of all instructions with macro and micro RTL (Register Transfer language), programming examples, simulation of time delays.	12
5.	**Interrupts:** Concept of interrupts, priority of interrupts signals, software generated interrupts and hardware generated interrupts.	6
6.	**Serial I/O:** Introduction with reference to 8085, general concepts.	6
7.	**Interfacing:** Concept of fold back addresses, memory maps, memory mapped I/O isolated I/o, interfacing of seven segment LED display, toggle switches, keyboard interfacing, memory interfacing, simplification of interfacing circuitry with the help of decoders, general purpose programmable peripheral devices, interfacing of A/D and D/A conversion devices.	8
8.	Introduction to 8086 μp	6
Total number of Hours		50

Text Books:

S. No	Name of Book	Author	Publisher
1.	Microprocessor Architecture Programming and Applications with the 8085	Ramesh S. Gaonkar.	Prentice hall
2.	Microprocessors and Programmed Logic	K.L. Short	Prentice hall
3.	Microprocessors: Theory and Applications (Intel and Motorola)	M. Rafiquzzaman	Prentice hall

COURSE CODE: ELE-5517B

DIGITAL SIGNAL PROCESSING

Credits: 04

S. No	Topics	Number of Hours
1.	**Discrete Time Signals & Systems:** Sequences, & sequence operations, Discrete-time systems. Linear Time – Invariant systems, impulse response, causality, stability. Frequency-Domain Representation of Discrete-Time signals and systems, Fourier Transforms, properties, theorems.	8
2.	**Sampling of Continuous – Time Signals:** Periodic sampling, frequency- domain representation of sampling, reconstruction of signals, discrete-time processing of continuous –time signals, continuous –time processing of Discrete-time signals, changing the sampling rate.	10
3.	**Transform Analysis of Linear time Invariant Systems:** Z- Transform, Region of Convergence, properties, Inverse Z-Transform, Frequency Response of LTI systems, system functions, linear constant coefficient, difference equations FIR and IIR systems, Frequency Response.	12
4.	**Structure of Discrete-Time Systems:** Block Diagram Representation of linear constant-coefficient Difference equations, signal flow graph representation. Basic structures for IIR systems, Transposed forms, Basic network structures for FIR systems.	10
5.	**Filter Design Techniques:** Design of Discrete-Time IIR filters from continuous – Time filters. Impulse invariance, bilinear transformation. Butterworth Chebyshev, Eliptic Approximation, low pass, high pass, band-pass and Band-stop filters, design of FIR filters by windowing. Kaiser, Hamming, Hamming windows.	10
Total number of Hours		50

Text Books:

S. No	Name of Book	Author	Publisher
1.	Discrete Time Signal Processing.	A.V Oppenheim and R. W Schafer	Prentice hall international
2.	Digital Signal Processing Principles, Algorthims and Applications.	John G. Proakis and D.G Manolavis:	Prentice hall
3.	Introduction To Digital Signal Processing.	J.R Johnson	Prentice hall
4.	Theory and Application of Digital Signal Processing.	L.R Rabinder and B. Gold	Prentice hall

COURSE CODE: ELE-5117BL

CONTROL SYSTEMS LAB

Credits: 02

S. No.	Experiment
1.	Use of MATLAB / SIMULINK /Control System tool boxes, neural & fuzzy toolboxes.
2.	Analysis of Control System in MATLAB.
3.	To study the computer simulation of a number of systems
4.	To study the torque-speed characteristics of an AC servomotor.
5.	To study the time response of a variety of simulated linear systems.
6.	To study the role of feedback in a DC speed control system.
7.	To study the role of feedback in a DC position control system.
8.	To study the role of a combination of P,I and D control actions in a variety of simulated linear systems
9.	System identification using frequency domain techniques
10.	Lead/ lag compensator design
11.	Computer control of systems
12.	Control of stepper motor
13.	Control system (State Space) study

COURSE CODE: ELE-5417BL

MICROPROCESSORS LAB

Credits: 02

S. No.	Experiment
1.	Microprocessors (8085) training kit and its working.
2.	Programs related to data transfer between registers, between registers and memory.
3.	Programs related to logic instructions.
4.	Programming techniques with additional instructions, looping, counting and indexing.
5.	i) To develop a program to add two double byte numbers. ii) To develop a subroutine to add two floating point quantities.
6.	i) To develop program to multiply two single byte unsigned numbers, giving a 16 bit product ii) To develop subroutine which will multiply two positive floating point numbers
7.	To write program to evaluate P* Q*+R* & S are 8 bit binary numbers.
8.	To write a program to divide a 4 byte number by another 4 byte number.
9.	To write a program to divide an 8 bit number by another 8 bit number upto a fractional quotient of 16 bit.
10.	Write a program for adding first N natural numbers and store the results in memory location X.
11.	Write a program which decrements a hex number stored in register C. The Program should half when the program register reads zero.
12.	Write a program to introduce a time delay of 100 ms using this program as a subroutine display numbers from 01H to OAH with the above calculated time delay between every two numbers.
13.	N hex numbers are stored at consecutive memory locations starting from X. Find the largest number and store it at location Y.
14.	Interfacing concepts. Switch and LED interfacing. Square wave generation.
15.	ADC interfacing.
16.	Interface a display circuit with the microprocessor either directly with the bus or by using I/O ports. Write a programme by which the data stored in a RAM table is displayed.

COURSE CODE: ELE-5517BL

DIGITAL SIGNAL PROCESSING LAB

Credits: 01

S. No.	Experiment
1.	Write a program to generate a sine/triangular/square wave.
2.	Write a program to generate a sine/triangular/square wave of variable. amplitude and frequency.
3.	Write a program to generate AM signal
4.	Write a program to generate an echo of an audio signal.
5.	Write a program to perform convolution of two signals
6.	Write a program to perform DFT & IDFT of a signal
7.	Write a program to design a low pass audio digital filter

SIXTH SEMESTER

COURSE CODE: ELE-6117B

POWER SYSTEMS II

Credits: 04

S. No.	Topic	No. of Hours
1.	**Review of Per Unit Representation of Power Systems:** Single line diagram, impedance and reactance diagram of a system, per unit calculations, per unit representation of a power system.	6
2.	**Fault Analysis (Balanced Faults):** Faults, types of faults, symmetrical 3-phase balanced faults – calculation of fault currents, current limiting reactors.	8
3.	**Fault Analysis (Un-symmetrical Faults):** Symmetrical components, sequence impedances, sequence networks, unsymmetrical faults –single line to ground, line-to-line, double line to ground faults on unloaded alternators and on power systems.	8
4.	**Insulation Co-ordination:** Generation of over-voltages in a power system, lightning phenomena, lightning surges, switching surges-interruption of short circuits and switching operations, switching surges – interruption of capacitive circuits, resonance over voltages, protection of power system components against over voltages – ground wires, lightning arrestors. Concept of insulation coordination, Basic impulse insulation level, standard impulse test wave, volt-time curve, location and rating of lightning arrestors.	13
5.	**Surge Performance of Transmission Lines:** Traveling waves on transmission lines, open-end line, short-circuited line, line terminated through a resistance, line connected to a cable, reflection and refraction at a T-junction, line terminated through a capacitance, line terminated through an inductance, Attenuation of traveling waves.	10
6.	Interference of Power Lines with communication Circuit Electrostatic and Electromagnetic effects.	3
7.	**High Voltage Direct Current Transmission:** Comparison of HVAC and HVDC transmission lines.	2
Total		50

Text Books:

S. No	Name of Book	Author	Publisher
1.	Power System Analysis	J.J. Grainger and W.D Stevenson	Tata McGraw Hill
2.	Electrical Power Systems.	C.L. Wadhwa	New age Publication
3.	Power Systems Engineering	Nagrath and Kothari	Tata McGraw hill

COURSE CODE: ELE-6217B

POWER ELECTRONICS

Credits: 04

S. No.	Topic	No. of Hours
1.	Review of power semiconductor switching devices, Diode, Thyristors, MOSFET, IGBT and modern devices, characteristics and applications	6
2.	Introduction to Turn-ON/Turn-OFF mechanism of switching devices, Gate-drive circuits, Switching-aid circuits,protection, Heat sink design	6
3.	Single phase rectifiers (uncontrolled, semicontrolled, controlled) with passive loads, performance analysis.	8
4.	Three-phase rectifiers (uncontrolled, semicontrolled, controlled) with passive loads, performance analysis, Introduction to multi-pulse converters	6
5.	Single -phase inverter : principle of operation, single phase bridge inverter, voltage control in inverters and harmonic reduction using PWM strategies.	7
6.	Three-phase inverters: 180 degree conduction and 120 degree conduction, voltage control in inverters and harmonic reduction using PWM strategies, Introduction to Multilevel converter	7
7.	AC-AC voltage controllers, configurations, performance analysis, harmonics, cyclo-converters, introduction to matrix converters	6
8.	Introduction to DC-DC converters; buck, boost and buck-boost converters	4
Total		50

Text Books:

S. No	**Name of Book**	**Author**	**Publisher**
1.	Fundamental of Power Electronics	Robert Erickson, D. Maksimovic	Springer
2.	Power Electronics, Circuits, Devices and Applications	Muhammad H. Rashid	Pearson education India
3.	Power Electronic, Devices, Applications, and Passive Components	Barry W. Williams	McGraw Hill Higher Education
4.	Power Electronics - converters, Applications, and Design	Ned Mohan, Tore. M. Undeland, William P. Robbins	Wiley

COURSE CODE: ELE-6317B

NON-CONVENTIONAL ENERGY SOURCES

Credits: 04

S. No.	Topic	No. of Hours
1.	Classification of energy resources, Importance of non-conventional energy sources, present status and growth of energy sector, Various aspects of energy conservation	3
2.	Energy Storage: Necessity and methods, Pumped storage, flywheel storage, Battery storage, Superconducting magnetic energy storages, super/ultra-capacitor storage, applications	6
3.	Solar thermal systems: Introduction, Solar energy basics, classification, solar water heater, solar refrigeration and air-conditioning systems, solar cookers, solar pond electric-power plant, central receiver power plant	7
4.	Solar Photovoltaic (PV) systems: introduction, solar cell characteristics and equivalent circuit, design of solar PV module and array in solar PV system, MPPT, standalone and grid connected solar PV system, Other Applications	7
5.	Wind Energy: Introduction, Applications of wind power, power extraction from wind, torque developed by the wind turbine, wind turbine classifications, wind generators, wind energy conversion systems, Hybrid standalone and grid connected systems	7
6.	Small hydro resources: introduction, classification, Essential components of hydroelectric system, water turbines and their selections, generators, latest trends in micro hydro systems.	6
7.	Biomass: Generation, Characterization, biomass plants	5
8.	Ocean Energy: tidal energy, wave energy and ocean thermal energy	3
9.	Geothermal Energy: Geothermal regions, Types of geothermal resources, Analysis of geothermal resources, Geothermal energy conversion Technologies	3
10.	Latest trends in smart grid and microgrid systems	3
Total		50

Text Books:

S. No	**Name of Book**	**Author**	**Publisher**
1.	Non-conventional energy resources	B. H. Khan	Mc Graw Hill
2.	Renewable Energy Resources	J.Twidell and T.Weir	Taylor and Francis Group
3.	Renewable Energy Resources Basic Principles and Application	G.N.Tiwari and MK Ghosal	Narosa Publishing House
4.	Non-Conventional Energy Resources	R.K Singal	Dhanpat Rai publication
5.	Energy Technology	S. Rao, B.B Parlekar	Khanna Publications
6.	Wind & Solar Power System	M.Patel	CRC Press
7.	Principle of Energy Conversion	A. W. Culp	Mc Graw Hill Publication

COURSE CODE: ELE-6417B

ELECTRONIC MEASUREMENTS & INSTRUMENTATION

Credits: 04

S. No.	Topic	No. of Hours
1.	INSTRUMENTATION SYSTEM: Classification of instrumentation errors. Basic features of instrumentation system. Dynamic response and accuracy of an instrumentation system.	07
2.	TRANSDUCERS: Transducers of following types: Resistance, Inductance, Capacitance, Piezoelectric, Optical and Digital. Measurement of various electrical and non-electrical quantities.(Temp., torque, speed, stress, strain, etc.)	08
3.	INSTRUMENTATION AMPLIFIERS	07
4.	WAVE ANALYSERS: Analysers for Audio and radio frequency waves, Measurement of distortion. Spectrum analysis.	06
5.	PHASE AND FREQUENCY MEASUREMENT: Analog and Digital Measurement of frequency and time.	07
6.	DATA ACQUISITION SYSTEM: Comments of data acquisition, system, Sample and Hold circuits, Recorders: Strip Chart recorders, Magnetic tape recorder, Digital recorder, Ultraviolet recorder, Heat sensitive recorder, Single channel and Multi-channel data acquisition system. Using DAC, ADC and Multiplexing	10
7.	Microprocessor based Measurement techniques	05
Total		50

Text Books:

S. No	**Name of Book**	**Author**	**Publisher**
1.	Electronic measurements and instrumentation	Cooper	Prentice-Hall
2.	Electrical and Electronic measurements & instrumentation	A.K. Sawhney.	Khanna
3.	Electrical and Electronic measurements & instrumentation	J.B Guptha	S.K Kataria

COURSE CODE: ELE-6517B

COMMUNICATION SYSTEMS

Credits: 04

S. No.	Topic	No. of Hours
1.	**Spectral analysis of Signals:** Fourier series of repetitive signals, Fourier transform of non-repetitive signals, amplitude spectrum of special signals viz. Pulse train and pulse waveform	10
2.	**Modulation:** AM, DSB/SC, SSB, VSB, Angle modulation, NBFM, WBFM, Diode detector, Frequency discriminator, AM & FM, Transmitter	10
3.	**Demodulation:** AM and FM signals, Radio Receivers – AM & FM, (Block diagram)	08
4.	**Noise Analysis:** Performance of AM & FM Systems in presence of noise, Threshold in AM & FM Demodulations, Pre- emphasis, and De-emphasis in FM Systems	08
5.	**Digital Communication:** Sampling, Quantization, Quantization noise, Coding, Pulse code Modulation; Differential PCM, ADPCM, Relative advantages and dis-advantages. Delta modulation. PWM & PPM	08
6.	**Digital Modulation Techniques:** ESK, FSK, PSK, M-FSK, DPSK, GPSK schemes	06
Total		50

Text Books:

S. No	**Name of Book**	**Author**	**Publisher**
1.	Electronics communication System	G. Kennedy	Mcgraw hill education (India) Ltd
2.	Principles of Communication system	Taub and Shelling	Tata Mcgraw hill education Pvt Ltd
3.	Communication system	S. Haykins	Willey India Pvt Ltd

COURSE CODE: ELE-6617B

SEMINAR

Credits: 02

The students are required to prepare a seminar report and presentation based on the latest trends and technologies in their respective fields of study. The work is to be carried out in the 6^{th} semester of their course individually. Each student will have to select a topic of study duly approved by the faculty incharge of conducting seminar. The student will have to prepare a seminar report and deliver a presentation before a panel of experts based on the seminar work carried by him/her.

COURSE CODE: ELE-6117BL

POWER SYSTEM LAB

Credits: 01

S. No.	Experiment
1.	A.C distribution
2.	D.C. distribution
3.	Efficiency, Regulation & ABCD parameters of Transmission line
4.	Study of cables & find charging current
5.	Study of different types of insulators
6.	Per unit representation of a power system.
7.	Measurement of positive, negative and zero sequence impedance and currents.
8.	Measurement of earth resistance.
9.	Measurement of insulation resistance of insulators
10.	Transmission line fault analysis
11.	Computer Simulation of Power System

COURSE CODE: ELE-6217BL

POWER ELECTRONICS LAB

Credits: 01

S. No.	Experiment
1.	To obtain the VI characteristics of an i. SCR ii. Triac
2.	To study various triggering circuits
3.	To obtain the UJT characteristics
4.	To study the operation of a Line Synchronised UJT Relaxation Oscillator.
5.	To study the illumination control using SCR.
6.	To study half wave gate controlled rectifier using one SCR.
7.	To study single phase half controlled, full wave rectifier.
8.	To study various techniques of forced commutation of an SCR.
9.	To study the speed control of a DC shunt motor using single phase bridge converter.
10.	To study generation of SPWM modulation
11.	To study following choppers i. Buck converter ii. Boost converter iii. Buck-Boost converter

COURSE CODE: ELE-6517BL

COMMUNICATION LAB

Credits: 01

S. No.	Experiment
1.	Generation and detection of amplitude modulated signals.
2.	Generation and detection of frequency modulated signals.
3.	To measure sensitivity, selectivity, and fidelity of a radio receiver.
4.	To generate PAM and PDM signals using IC 555.
5.	To test a pulse code modulator.
6.	To measure the noise figure of the following systems: i. A.M. system. ii. F.M. System.

SEVENTH SEMESTER

COURSE CODE: ELE-7117B

POWER SYSTEM PROTECTION

Credits: 03

S. No.	Topic	No. of Hours
1.	**PROTECTIVE RELAYING:** Function, fundamental principle, primary and backup relaying, characteristics	02
2.	**CLASSIFICATION OF RELAYS:** Operating principles and characteristics of the following electromechanical relays: Current, voltage, directional, current balance, voltage balance, differential relays, and distance relays.	06
3.	**PROTECTION OF GENERATORS:** Short- circuit protection of stator windings, protection against turn-to-turn fault, stator ground-fault protection, stator open circuit protection.	06
4.	**TRANSFORMER PROTECTION:** Short circuit protection, over current and earth-fault protection differential protection. Use of biased relay for differential protection, Buchholz relay, protection of parallel transformer banks	05
5.	**PROTECTION OF FEEDERS, BUSBARS AND TRANSMISSION LINES:** Protection of feeders, time limit fuse, over current protection for radial feeders, protection of parallel feeders, differential protection for parallel feeders, protection of ring mains, differential pilot wire protection, Circulating current protection, protection for bus-bars, frame leakage protection, differential protection, for bus bars, protection for double bus-bar system, transmission line protection, using over-current relays, using distance relays. Setting of over-current and distance relays, coordination of relays. Phase fault and earth fault protection.	07
6.	**FUSES:** Fusing element, classification of fuses, current carrying capacity of fuses, high rupturing capacity, characteristics of H.R.C. fuses, selection of HRC fuses.	04
7.	**CIRCUIT BREAKERS:** Types of circuit breakers , basic principle of operation, phenomena of arc, initiation, maintenance & arc extinction, d. c. circuit breaking, a.c. circuit breaking, arc voltage and current waveforms in a.c. circuit breaking, restriking and recovery voltages, de-ionization and current chopping, ratings of circuit breakers, oil circuit breakers, air blast circuit breakers, SF6 Circuit breakers , Vacuum breakers.	09
Total		39

Text Books:

S. No	Name of Book	Author	Publisher
1.	Art and Science of Protective Relaying	Mason	John Wiley & Sons
2.	Protective relaying, Principles and Applications	J. L Black Burn	CRC Press
3.	Computer Relaying for Power Systems	A.G. Phadke and J.S Thorp	John Wiley and sons New York

COURSE CODE: ELE-7217B

ADVANCED POWER ELECTRONICS

Credits: 03

S. No.	Topic	No. of Hours
1.	dc-dc switched mode converters: introduction, control of dc-dc converters, Continuous and discontinuous conditions of buck, boost and buck-boost converters, Cuk dc-dc converter, full bridge dc-dc converter	6
2.	Introduction to switched dc power supplies, Flyback converter, forward and push-pull converter	4
3.	Cascaded H-Bridge Multilevel Inverters: Introduction, Bipolar and unipolar for H-Bridge Inverter, Multilevel Inverter Topologies, Carrier-Based PWM Schemes, Staircase Modulation, Applications	7
4.	Diode-Clamped Multilevel Inverter: Introduction, Three-Level Inverter, Neutral-Point Voltage Control, Carrier-Based PWM Scheme, other modulation schemes, Applications	6
5.	Other Multilevel Voltage Source Inverters: Introduction, Multilevel Flying-Capacitor Inverter, Modular Multilevel Converter, Applications	4
6.	Grid synchronization of single phase power converters: grid synchronization using Fourier analysis and PLL, phase detection based on in-quadrature signals, Enhanced PLL, second order generalized integrator PLL, introduction to grid synchronization of three phase power converters.	6
7.	Power quality problems and Custom power devices (DSTATCOM, DVR, UPQC): principle of operation, classification, controls and applications	6
Total		39

Text Books:

S. No	Name of Book	Author	Publisher
1.	High-Power Converters and AC Drives	Bin Wu	Wiley
2.	Power Electronics - converters, Applications, and Design	Ned Mohan, Tore. M. Undeland, William P. Robbins	Wiley
3.	Power Quality: Problems and Mitigation Techniques	Bhim Singh, Ambrish Chandra and Kamal Al-Haddad	John Wiley & Sons
4.	Grid converters for photovoltaic and wind power systems,	Remus Teodorescu, Marco Liserre and Pedro Rodríguez,	John Wiley & Sons

COURSE CODE: ELE-7317B

POWER SYSTEM – III

Credits: 03

S. No.	Topic	No. of Hours
1.	**Load Flows:** Nature and importance of the problem, Network model formulation, algorithm for the formulation of Y-bus matrix, formulation of Y-bus by singular transformation, primitive network, Bus incidence matrix, load flow problem, load flow equations, bus classification – List of variables in load flow equations, Gauss - Seidel & Newton-Raphson method for solving load flow problem, comparison of load flow methods, De-coupled & Fast de-coupled power flow method, Modeling of tap-changing transformers and phase-shifters	10
2.	**Power System Stability:** The stability problem, steady state, dynamic and transient stability, rotor dynamics and swing equation, power- angle curve, equal-area criterion of stability, Numerical solution of swing equation, Factors affecting transient stability.	07
3.	**Automatic Generation Control:** Real power balance and its effect on system frequency, load frequency control of single area system – Models of speed governing system, turbine and generator load, steady state analysis and dynamic response, proportional plus integral control, two area load frequency control, economic dispatch control.	08
4.	**Control of voltage and Reactive Power:** Generation and absorption of reactive power, Relation between voltage and reactive power, Need for voltage control at various system buses, Methods of voltage control – injection of reactive power, tap changing transformers, booster transformers, phase – shift transformers	08
5.	**Economic Operation of Power System:** Introduction, system constraints, economic dispatch neglecting losses, penalty factor, economic dispatch with losses, transmission loss equation, automatic load dispatching.	06
Total		39

Text Books:

S. No	Name of Book	Author	Publisher
1.	Power System Analysis	J.J. Grainger and W.D Stevenson	Tata McGraw-Hill
2.	Electrical Power Systems	B.M. Weedy and Cory	John Wiley & sons.
3.	Power Systems Engineering	Nagrath and Kothari	McGraw-Hill Education
4.	Electric Power Systems	C.L. Wadlhwa	New Age Publications
5.	Electric Energy System Theory	O. I Elgard	McGraw-Hill

COURSE CODE: ELE-7*17BE

ELECTIVE – I

Credits: 03

S. No.	Topic	No. of Hours
1.	Syllabi shown in Annexure-I	
Total		39

COURSE CODE: ELE-7*17BE

ELECTIVE – II

Credits: 03

S. No.	Topic	No. of Hours
1.	Syllabi shown in Annexure-II	
Total		39

COURSE CODE: ELE-7417B

INDUSTRIAL TRAINING & VIVA

Credits: 01

Practical /Industrial Training/Internship:

The students have to undergo a minimum four week practical training/internship/industrial training at 7^{th} semester level in any relevant industrial organization. The students will be asked to submit a Practical training report (one copy per student) in a group. These reports will be evaluated in partial fulfilment for the award of the degree of Bachelors of Technology in their respective branches of study.

COURSE CODE: ELE-7517B

PRE-PROJECT

Credits: 05

Pre-project description

The pre-project work is carried out by students in a group. The group comprises of a minimum of three and a maximum of five students. The number of students in a group depends on the type and scale of project being undertaken. In the pre project work students shall choose a specific topic/area for the project. The selected areas shall encompass recent and emerging trends in technologies that prove beneficial for society in general and humanity in particular. Supervisors will be assigned to each group in the beginning of the 7^{th} semester of their course. Each student at the end of the course will submit a Project report and a working prototype or simulation regarding the project and the same will be evaluated for final award of the course. The pre-project can be a full-fledged project or a part of major project.

COURSE CODE: ELE-7117BL

POWER SYSTEM PROTECTION LAB

Credits: 02

S. No.	Experiment
1.	Study of various types of relays.
2.	Characteristics of fuses.
3.	Characteristics of inverse time over current relays
4.	Time graded protection using inverse time O/C relay
5.	Study of circuit breakers.
6.	Study of differential protection scheme.
7.	Study of an oil circuit breaker.
8.	Operating quantity versus polarizing quantity characteristic of a directional attracted Armature relay.

COURSE CODE: ELE-7617BL

COMPUTER AIDED POWER SYSTEM DESIGN LAB

Credits: 02

S. No.	Experiment
1.	Introduction, Modeling of Power System Components,
2.	Power Flow Equations,
3.	Formation of Ybus Matrix
4.	Power Flow Solution Algorithms,
5.	Newton Raphson Load Flow Method,
6.	Fast Decoupled Load Flow Method
7.	DC Load Flow Method,
8.	AC-DC System Power Flow Analysis-
9.	Sequential and Simultaneous Solution Algorithms

EIGHT SEMESTER

COURSE CODE: ELE-8117B

INDUSTRIAL DRIVES & CONTROL

Credits: 04

S. No.	Topic	No. of Hours
1.	Electrical Drives: Introduction, AC & DC Drives, Advantages, components, General applications	04
2.	Modelling of DC Machines: Theory of operation, Torque-speed characteristics revision, State-Space Modelling, Block Diagram & Transfer Function	06
3.	Control of DC Drives: Revision of speed control methods of DC motors, Controlled rectifier based drives, Modes of operation, Speed control & Drive classification, Closed Loop speed control of Drives	06
4.	Chopper Controlled DC Motor Drive: Introduction, Principle of operation of the Chopper, Four-quadrant Chopper Circuit, and Closed Loop Operation.	08
5.	Modelling of Induction Motor: Introduction, equivalent circuit of IM, Park's transformation, stator, rotor and synchronously rotating reference frame models, state space equations.	08
6.	Induction motor drive control: Introduction to scalar and vector control, direct and indirect vector control, principle of operation and control strategy (VSI, VSI fed drive, block diagram, controllers, etc.),	10
7.	Direct torque control, Sensorless control of AC drives	08
Total		50

Text Books:

S. No	Name of Book	Author	Publisher
1.	Modern power electronics & AC drives	B K Bose	Pearson
2.	Vector Control and Dynamics of AC Drives	D W Novotny and T A Lipo	Oxford university press
3.	Sensorless Vector and Direct Torque Control	P Vas	Oxford university press
4.	Electric Motor Drives	R Krishnan	Prentice Hall India

COURSE CODE: HUM-8217B

GENERAL MANAGEMENT & ECONOMICS

Credits: 04

S. No.	Topic	No. of Hours
1.	Industrial Economics: Meaning & Importance of Industrialization. Organizations – Various types of organizations. Division of Economics: Micro and Macro Economics.	3
2.	Consumption and Market Structure: Law and Elasticity of demand – Consumer's surplus, Utility and its measurement. Types of market structure – Perfect, Monopoly, Monopolistic and Oligopoly. Demand Forecasting Techniques. Meaning and factors influencing location of Industrial Units, Scale of Production Large Vs Small Industrial Units.	6
3.	Management: Introduction of Management, Nature, purpose and definitions. Process and functions of Management Planning, Organizing, Actuating and Controlling, Functional Areas of management, Skills and role of Management.	5
4.	Planning: Nature and purpose of planning, Types of Plans, Steps in Planning Process. Objectives: The Nature and importance of objectives; Types of objectives, primary, Secondary, individual and personal Objectives, Guidelines for setting objectives.	5
5.	Decision Making Importance and limitations of Rational Decision Making, types of decisions – Programmed and non-programmed decisions – process of Decision Making under certainty, uncertainty and Risk.	4
6.	Organizing: Nature and Purpose of Organizing: Steps in Organizing/Process of Organizing; Formal and informal organization; Span of Control & factors determining effective span. Decentralization of Authority; The nature of decentralization- Degree of decentralization. Decentralization as philosophy & Policy.	6
7.	Delegation of Authority: Meaning of Authority/delegation steps in the process of delegation, Factors determining the degree of delegation. Art of delegation.	3
8.	Line/Staff Organization: Line organization, Staff organization, Line and Staff organization, Functional and Committee Organization, the nature of line and staff relationship. Line/Staff Organization: Line organization, Staff organization, Line and Staff organization, Functional and Committee Organization, the nature of line and staff relationship.	6
9.	Essentials of Human Resource management. Importance and functions of Human Resource Management. Importance of Human Resource planning, Recruitment, Selection, training and Development, Performance Appraisal, Compensation packages, promotions, Transfers, demotion and Separation etc.	6
10.	Leadership: Meaning and importance, Leadership qualities. Motivation: The Need – want – Satisfaction chain. Controlling: Nature and purpose of controlling, Steps in controlling/process of controlling, Types of controls, Recruitments of effective controls.	6
Total		50

Text Books:

S. No	Name of Book	Author	Publisher
1.	Industrial Organization and Management	Y. K. Bushan.	Sultan chand
2.	Principles of Management	A.K. Chatterjee.	-
3.	Principles of Management	George Terry.	R. D. Irwin
4.	Industrial Organization and Management	V.D. Sinha and Gad Gill.	-
5.	Principles of Management	Kroontz & O' Donnell	McGraw-Hill,
6.	Elementary Economics Theory	K.K. Dewett and J.D. Verma	S. Chand & Company
7.	An Introduction to Economics	M.L. Sethi	Sultan chand

COURSE CODE: ELE-8*17BE

ELECTIVE – III

Credits: 04

S. No.	Topic	No. of Hours
2.	Syllabi shown in Annexure-III	
Total		50

COURSE CODE: ELE-8417B

MAJOR PROJECT

Credits: 13

Pre-project description

In the final project the students are required to extend the pre-project work for the final submission of the course. The final project work is to be carried out in the last semester of their respective fields of study. The supervisors will guide the students from the beginning of the pre-project in 7^{th} semester to its accomplishment as a final project in the 8^{th} semester.

The students will be asked to submit a project report (one copy per student) in a group. These reports will be evaluated in partial fulfilment for the award of the degree of bachelors of Technology in their respective branches of study

ANNEXURE I

UTILISATION & TRACTION

S. No.	Topic	No. of Hours
1.	Electric Drive: Factors governing selection of Electric drive. Control devices for industrial motors. Motors for particular services. Applications of Electric Drive.	06
2.	ELECTRIC TRACTION: Introduction, requirements of an ideal traction, systems of traction, speed time curve, tractive effort, co-efficient of adhesion, selection of traction motors, method of speed control, energy saving by series parallel control, ac traction equipment. Breaking methods used in Traction Motor, specific energy consumption and factors affecting it.	11
3.	INTRODUCTION TO ELECTRIC AND HYBRID VEHICLES: Configuration and performance of electrical vehicles, traction motor characteristics, tractive effort, transmission requirement, vehicle performance and energy consumption.	08
4.	ILLUMINATION: Laws of illumination, lighting calculation, factory lighting, flood lighting, street lighting, different types of lamps-incandescent, fluorescent, CFL and LED lamps and their working, comparison, Glare and its remedy	06
5.	HEATING AND WELDING: Advantages and methods of electric of heating, resistance ovens, induction heating, dielectric heating, the arc furnace, heating of building. Electric welding, resistance and arc welding, control devices and welding equipment.	08
Total		39

Text Books:

S. No	Name of Book	Author	Publisher
1.	Utilization Of Electric Energy,	E Openshaw Taylor	12th Impression, 2009, Universities Press
2.	Modern Electric, Hybrid Electric and Fuel Cell Vehicles,	E. Gay, Mehrdad, Ehsani, Yimin Gao, Sabastien.	Ali Emadi- CRC Press.
3.	Art & utilization of Electric Energy	H. Partab	Bhandari Benevolent & Educational Society
4.	Utilization of Electric Power & Electric Traction	J.B Gupta	S. K. Kataria & Sons

POWER STATION PRACTICE

S. No.	Topic	No. of Hours
1.	Economic Aspects and power factor improvement: Economics of generation, factors affecting the cost of generation, reduction of costs by interconnection of stations, curves useful in system operation, choice of size and number of generating units. Power factor, disadvantages of low power factor, methods of improving power factor, location of power factor improvement apparatus, and economics of power factor improvement.	10
2.	Power Tariff: Cost of generating station, fixed capital, running capital, annual cost, running charges, fixed charges, factors influencing the rate of tariff, designing tariff, different types of tariff, flat rate tariff, block rate tariff, two part tariff, maximum demand tariff, power factor tariff.	10
3.	Neutral Grounding: Neutral grounding, solid grounding, resistance grounding, reactance grounding, arc suppression coil grounding, earthing transformers, choice of methods of neutral grounding equipment, grounding for safety.	07
4.	Overview of different types of power stations and their auxiliaries: Thermal power plants, hydroelectric stations, nuclear power stations, diesel power stations, gas turbine plants	07
5.	Overview of substations and substation equipment	05
Total		39

Text Books:

S. No	Name of Book	Author	Publisher
1.	Elements of Electrical Power Station Design	Deshpande	PHI learning
2.	The Art and Science of Utilisation of Electric Energy	H. Pratab	Dhanpat Rai & Co
3.	Substation Design and Equipment	Satnam	Dhanpat Rai
4.	A Course in Electrical Power	Soni, Gupta and Batnagar	Dhanpat Rai & Co

HIGH VOLTAGE ENGINEERING

S. No.	Topic	No. of Hours
1.	CONDUCTION AND BREAKDOWN IN GASES: Gases as insulators, ionization, current growth, Townsend's criterion for breakdown, electro-negative gases, Paschen's Law, Streamer breakdown mechanism, corona discharges, post breakdown phenomena, practical considerations in using gases for insulating materials.	08
2.	CONDUCTION AND BREAKDOWN IN LIQUID DIELECTRICS: Classification of liquid dielectrics, conduction and breakdown in pure liquids and in commercial liquids.	04
3.	BREAKDOWN IN SOLID DIELECTRICS: Intrinsic breakdown, electromechanical breakdown, thermal breakdown, breakdown of solid dielectrics in practice, breakdown of composite insulation, solid dielectric used in practice.	05
4.	APPLICATIONS OF INSULATING MATERIALS IN DIFFERENT ELECTRICAL APPARATUS: Applications in power transformers, rotating machines, circuit breakers, cables, power capacitors, electronic equipment.	03
5.	GENERATION OF HIGH VOLTAGES AND CURRENTS: Generation of high d.c. and a.c. voltages, generation of impulse voltages and currents.	07
6.	MEASUREMENT OF HIGH VOLTAGES AND CURRENTS: Measurement of high d.c., a c. and impulse voltages, Measurement of high d.c., a.c and impulse currents.	05
7.	NON DESTRUCTIVE TESTING: Measurement of d.c. resistivity, dielectric constant and loss factor, partial discharge measurement.	04
8.	TESTING OF ELECTRICAL APPARATUS: Testing of insulators, bushings, isolators, circuit breakers, cables, transformers and surge diverters.	03
Total		39

Text Books:

S. No	Name of Book	Author	Publisher
1.	High Voltage Engineering Fundamentals	E. Kuffel, W.S Zaengl	Newnes
2.	High Voltage Engineering	M.S. Naidu, V. Karamraju	Tata McGraw-Hill
3.	High voltage test techniques	Dieter kind, Kurt Feser.	Newnes
4.	An Introduction to High Voltage Engineering	Subir Ray.	Prentice Hall of India

ADVANCED CONTROL SYSTEM

S. No.	Topic	No. of Hours
1.	Introduction: State-space representation of nonlinear systems, Basic characteristics of nonlinear systems, methods of analysis of non-linear systems and comparison	5
2.	Concept of phase plane, singular points, phase trajectory, phase portraits, methods of plotting phase plane trajectories Vander Pol's equation, stability from phase portrait, time response from trajectories, Isocline method, Delta method of phase trajectory construction,	7
3.	Describing function analysis, The principle of harmonic balance. Describing functions for various nonlinearities, Stability of limit cycles by describing function method, Limit cycle analysis of control systems.	12
4.	Lyapunov's Stability Theorem, Mathematical preliminaries, Lyapunov's direct method, Definite functions, Lyapunov's equation for time-invariant systems, Stability conditions for time varying systems, Lyapunov's linearization (indirect) method	15
Total		39

Text Books:

S. No	Name of Book	Author	Publisher
1.	Nonlinear Control Systems: Analysis and Design	H. J. Marquez	John Wiley Inter-science
2.	Nonlinear Systems Analysis	M. Vidyasagar	SIAM
3.	Nonlinear Systems	H. K. Khalil	Prentice Hall

ANNEXURE II

FLEXIBLE AC TRANSMISSION SYSTEM

S. No.	Topic	No. of Hours
1.	Introduction to FACTS	3
2.	Voltage-Sourced Converters: Single-Phase Full-Wave Bridge Converter Operation, Square-Wave Voltage Harmonics for a Single-Phase Bridge, Three-Phase Full-Wave Bridge Converter , Multipulse converters, Transformer Connections for 12-Pulse, 24-pulse and 48 pulse Operation, Fundamental and Harmonic Voltages for a Three-Level Converter, Pulse-Width Modulation (PWM) Converter	6
3.	Voltage stability and voltage collapse	2
4.	Static Shunt Compensators: Objectives of Shunt Compensation, Methods of Controllable VAR Generation, Static VAR Compensators: SVC and STATCOM, Comparison Between STATCOM and SVC	6
5.	Static Series Compensators (GCSC, TSSC, TCSC, and SSSC): Objectives of Series Compensation, Variable Impedance Type Series Compensators, Switching Converter Type Series Compensators	7
6.	Static Voltage and Phase Angle Regulators (TCVR and TCPAR): Objectives of Voltage and Phase Angle Regulators, Approaches to Thyristor-Controlled Voltage and Phase Angle Regulators, Switching Converter-Based Voltage and Phase Angle Regulators, Hybrid Phase Angle Regulators	6
7.	Combined Compensators (Unified Power Flow Controller (UPFC) and Interline Power Flow Controller (IPFC)): Introduction, basic principle operation, control structure and applications.	7
8.	Introduction to Special Purpose Facts Controllers: NGH-SSR Damping Scheme and Thyristor-Controlled Braking Resistor	2
Total		39

Text Books:

S. No	Name of Book	Author	Publisher
1.	Understanding FACTS	Narain G. Hingorani, Laszlo Gyugyi,	Wiley
2.	FACTS Controllers In Power Transmission And Distribution	K R Padiyar	New Age International Publishers

SCADA & ENERGY MANAGEMENT

S. No.	Topic	No. of Hours
1.	Introduction to SCADA, advantages, general structure, data acquisition, transmission & monitoring. General power system hierarchical Structure. Overview of the methods of data acquisition systems, commonly acquired data, transducers, RTUs, data concentrators, various communication channels- cables, telephone lines, power line carrier, microwaves, fibre optical channels and satellites.	8
2.	Supervisory and Control Functions: Data acquisitions, status indications, majored values, energy values, monitoring alarm and event application processing. Control Function: ON/ OFF control of lines, transformers, capacitors and applications in process in industry - valve, opening, closing etc. Regulatory functions: Set points and feedback loops, time tagged data, disturbance data collection and analysis. Calculation and report preparation.	9
3.	MAN- Machine Communication: Operator consoles and VDUs, displays, operator dialogues, alarm and event loggers, mimic diagrams, report and printing facilities.	7
4.	Data basis- SCADA, EMS and network data basis. SCADA system structure - local system, communication system and central system. Configuration- NON-redundant- single processor, redundant dual processor. Multi-control centers, system configuration. Performance considerations: real time operation system requirements, modularization of software programming languages.	8
5.	Energy Management Center: Functions performed at a centralized management center, production control and load management economic dispatch, distributed centers and power pool management	7
6.		
Total		39

Text Books:

S. No	Name of Book	Author	Publisher
1.	Power System Control Technology.	Torsten Cergrell	Prentice Hall International
2.	Computer Aided Power System Analysis	George L Kusic	Prentice Hall of India
3.	Power Generation Operation and Control	A. J. Wood and B. Woolenberg	John Wiley & Sons
4.	Switchgear Protection & Control System	Sunil S Rao	Khanna Publishers

SPECIAL ELECTRICAL MACHINES

S. No.	Topic	No. of Hours
1.	SYNCHRONOUS RELUCTANCE MOTORS: Constructional features – Types – Axial and Radial flux motors – Operating principles – Variable Reluctance Motors – Voltage and Torque Equations - Phasor diagram - performance characteristics – Applications	09
2.	STEPPER MOTORS: Constructional features – Principle of operation – Variable reluctance motor – Hybrid motor – Single and multi-stack configurations – Torque equations – Modes of excitation – Characteristics – Drive circuits – Microprocessor control of stepper motors – Closed loop control-Concept of lead angle – Applications	10
3.	PERMANENT MAGNET BRUSHLESS D.C. MOTORS: Permanent Magnet materials – Minor hysteresis loop and recoil line-Magnetic Characteristics – Permeance coefficient -Principle of operation – Types – Magnetic circuit analysis – EMF and torque equations –Commutation - Power Converter Circuits and their controllers – Motor characteristics and control– Applications.	10
4.	PERMANENT MAGNET SYNCHRONOUS MOTORS (PMSM): Principle of operation – Ideal PMSM – EMF and Torque equations – Armature MMF – Synchronous Reactance – Sine wave motor with practical windings - Phasor diagram – Torque/speed characteristics - Power controllers - Converter Volt-ampere requirements– Applications.	10
Total		39

Text Books:

S. No	Name of Book	Author	Publisher
1.	Electric Machinery	Fitzgerald, Kingslay, Umans	Tata McGraw-Hill
2.	Electric Machinery Fundamentals	Chapman	McGraw-Hill Higher Education
3.	Electric Machines	Nagrath and Kothari	Tata McGraw-Hill

ANNEXURE III

ADVANCED POWER SYSTEM ANALYSIS

S. No.	Topic	No. of Hours
1.	Revision of Newton Raphson, Gauss Siedel method, Fast decoupled load flow.	06
2.	DC power flow : Single phase and three phase, AC-DC load flow, DC system model, Sequential Solution Techniques, Extension to Multiple and Multi-terminal DC systems, DC convergence tolerance, Test System and results.	12
3.	Fault Studies, Analysis of balanced and unbalanced three phase faults, fault calculations.	08
4.	System optimization, strategy for two generator systems, generalized strategies, effect of transmission losses, Sensitivity of the objective function, Formulation of optimal power flow, solution by Gradient method-Newton's method.	12
5.	State Estimation, method of least squares, statistics, errors, estimates, test for bad data, structure and formation of Hessian matrix, power system state estimation.	12
Total		50

Text Books:

S. No	Name of Book	Author	Publisher
1.	Power System Analysis	Grainger, J.J. and Stevenson, W.D.	Tata McGraw hill
2.	Computer analysis of power systems	Arrillaga, J and Arnold, C.P.	John Wiley and Sons
3.	Computer Techniques in Power System Analysis	Pai, M.A.	Tata McGraw hill

RESTRUCTURING OF POWER SYSTEM

S. No.	Topic	No. of Hours
1.	Introduction to restructuring of power industry.	02
2.	Fundamentals of Economics.	05
3.	The Philosophy of Market Models.	06
4.	Transmission Congestion Management.	07
5.	Locational Marginal Prices (LMP) and Financial Transmission Rights (FTR).	07
6.	Ancillary Service Management.	06
7.	Pricing of transmission network usage and loss allocation.	07
8.	Market power and generators bidding.	06
9.	Reforms in Indian power sector.	04
Total		50

Text Books:

S. No	Name of Book	Author	Publisher
1.	Fundamentals of Power System economics	Daniel Kirschen and Goran Strbac	John Wiley & Sons
2.	Operation of restructured power systems	Kankar Bhattacharya, Jaap E. Daadler, Math H.J Bollen, Kluwer	Academic Pub.

HVDC SYSTEM

S. No.	Topic	No. of Hours
1.	Introduction to HVDC and comparison with AC transmission	2
2.	HVDC Operation-Converters and Inverters	5
3.	HVDC- different control schemes	6
4.	AC-DC interaction	6
5.	Harmonics Analysis and elimination	4
6.	Filter Design	5
7.	Multi-Terminal HVDC	4
8.	HVDC protection methods	6
9.	Modeling of HVDC links	4
10.	AC-DC Power flow solution	4
11.	HVDC light	4
Total		50

Text Books:

S. No	Name of Book	Author	Publisher
1.	HVDC Power Transmission Systems,	K.R. Padiyar	New Age International
2.	Power System Stability and control	Prabha Kundur	Tata McGraw-Hill

POWER SYSTEM DYNAMICS & STABILITY

S. No.	Topic	No. of Hours
1.	Introduction to Power System Stability	04
2.	Analysis of Dynamical Systems	08
3.	Modeling of a Synchronous Machine	10
4.	Modeling of Excitation and Prime Mover Systems	05
5.	Modeling of Transmission Lines and Loads	05
6.	Stability Issues in Interconnected Power Systems	08
7.	Power System Stability Analysis Tools	05
8.	Enhancing System Stability	05
Total		50

Text Books:

S. No	Name of Book	Author	Publisher
1.	Power System Stability and Control,	P.Kundur	McGraw Hill Inc
2.	Power System Dynamics & Stability	P.Sauer & M.A.Pai	Prentice Hall
3.	Power System Dynamics, Stability & Control	K.R.Padiyar	B.S. Publications,