SYLLABUS

FOR

B.TECH. PROGRAMME

IN

ELECTRICAL ENGINEERING

INSTITUTE OF TECHNOLOGY
ZAKURA CAMPUS
UNIVERSITY OF KASHMIR
SRINAGAR
J&K
190006

Course Layout

1st Semester
ELECTRICAL

Course No	Subject	Teaching Periods per week			Credits
		Lect	*Tut*	*Prac*	
MTH-1117	**Engineering Mathematics-I**	3	1	0	4
PHY-1217	**Engineering Physics**	2	1	0	3
ELE-1317	**Basic Electrical Engineering**	2	1	0	3
CSE-1417	**Introduction to Computing**	2	1	0	3
HUM-1517	**Communication Skills**	2	0	0	2
MEE-1617	**Engineering Graphics & Drawing**	1	3	0	4
PHY-1217L	**Engineering Physics Lab**	0	0	4	2
ELE-1317L	**Basic Electrical Engineering Lab**	0	0	4	2
CSE-1417L	**Introduction to Computing Lab**	0	0	4	2
	Total	**12**	**7**	**12**	**25**

2nd Semester
ELECTRICAL

Course No	Subject	Teaching Periods per week			Credits
		Lect	*Tut*	*Prac*	
MTH-2117	**Engineering Mathematics-II**	2	1	0	3
CHM-2217	**Engineering Chemistry**	2	1	0	3
ECE-2317	**Basic Electronics Engineering**	2	1	0	3
CSE-2417	**Computer Programming**	2	1	0	3
MEE-2517	**Engineering Mechanics**	2	1	0	3
CHM-2217L	**Engineering Chemistry Lab**	0	0	4	2
ECE- 2317L	**Electronics Engineering-Lab**	0	0	4	2
CSE-2417L	**Computer Programming Lab**	0	0	4	2
MEE-2617W	**Workshop Practice**	0	0	8	4
	Total	**10**	**5**	**20**	**25**

3rd Semester

ELECTRICAL

Course Code	Course Title	Teaching Periods per week			Credits
		L	T	P	
MTH3117	**Engineering Mathematics-III**	3	1	0	4
ELE3217	**Material Science Engineering**	2	1	0	3
ELE3317	**Network Analysis and Synthesis**	3	1	0	4
ELE3417	**Analog Electronic Circuits - I**	2	1	0	3
ELE3517	**Thermal Power Engineering**	2	1	0	3
ELE3617	**Electrical Machines -I**	3	1	0	4
ELE3717L	**EDA Tools Lab**	0	0	2	1
ELE3317L	**Network Analysis and Synthesis Lab**	0	0	2	1
ELE3417L	**Analog Electronic Circuits**	0	0	2	1
ELE3617L	**Electrical Machines Lab – I**	0	0	2	1
	Total	**15**	**6**	**8**	**25**

4th Semester

ELECTRICAL

Course Code	Course Title	Teaching Periods per week			Credits
		L	T	P	
ELE4117	**Electrical Machines- II**	2	1	0	3
ELE4217	**Control Systems –I**	2	1	0	3
ELE4317	**Electrical Measurements and Measuring Instruments**	2	1	0	3
ELE4417	**Analog Electronic Circuits - II**	3	1	0	4
ELE4517	**Electro Magnetic Fields & Waves**	3	1	0	4
MTH4617	**Engineering Mathematics-IV**	3	1	0	4
ELE4117L	**Electrical Machines Lab -II**	0	0	2	1
ELE4317L	**Electrical Measurements Lab**	0	0	2	1
ELE4417L	**Analog Electronic Circuits Lab - II**	0	0	2	1
ELE4717L	**Computer Aided Simulation of Electrical Systems**	0	0	2	1
	Total	**15**	**6**	**8**	**25**

5th Semester

ELECTRICAL

Course Code	Course Title	Teaching Periods per week			Credits
		L	T	P	
ELE5117	Control Systems -II	3	1	0	4
ELE5217	Power System –I	3	1	0	4
ELE5317	Non-Conventional Energy Sources	2	1	0	3
ELE5417	Microprocessors	2	1	0	3
ELE5517	Signals and Systems	3	1	0	4
ELE5617	Digital Electronics and Logic Design	2	1	0	3
ELE5117L	Control Systems Lab	0	0	4	2
ELE5417L	Microprocessors Lab	0	0	2	1
ELE5617L	Digital Electronics and Logic Design Lab	0	0	2	1
	Total	**15**	**6**	**8**	**25**

6th Semester

ELECTRICAL

Course Code	Course Title	Teaching Periods per week			Credits
		L	T	P	
ELE6117	**Power Systems - II**	3	1	0	4
ELE6217	**Digital Signal Processing**	3	1	0	4
ELE6317	**Power Electronics**	2	1	0	3
ELE6417	**Design of Electric Machines**	2	1	0	3
ELE6517	**Hydraulics and Hydraulic Machines**	2	1	0	3
ELE6617	**Communication Systems**	2	1	0	3
ELE6717	**Seminar**	0	0	0	1
ELE6117L	**Power Systems Analysis Lab**	0	0	2	1
ELE6217L	**DSP/ Communication Lab**	0	0	2	1
ELE6317L	**Power Electronics Lab**	0	0	2	1
ELE6817L	**Computer Aided Design of Electric Machines Lab**	0	0	2	1
	Total	**14**	**6**	**8**	**25**

7th Semester

ELECTRICAL

Course Code	Course Title	Teaching Periods per week			Credits
		L	T	P	
ELE7117	**Power System Protection**	3	1	0	4
ELE7217	**Advanced Power Electronics**	2	1	0	3
ELE7*17E	**Elective – I**	2	1	0	3
ELE7317	**Electronic Measurements & Instrumentation**	2	1	0	3
ELE7417	**Power Station Practice**	3	1	0	4
ELE7517	**Industrial Training & Viva**	0	0	0	2
ELE7617	**Pre Project**	0	0	6	3
ELE7117L	**Power System Protection Lab**	0	0	2	1
ELE7317L	**Electronic Measurements and Instrumentation Lab**	0	0	4	2
	Total	**12**	**5**	**12**	**25**

8th Semester

Electrical

Course Code	Course Title	Teaching Periods per week			Credits
		L	T	P	
ELE8117	**Power System III**	3	1	0	4
HUM8217	**General Management & Economics**	3	1	0	4
ELE8317	**Advanced Micro-controllers**	2	1	0	3
ELE8*17E	**Elective -II**	2	1	0	3
ELE8417	**Major Project**	0	6	8	10
ELE8317L	**Advanced Micro-controllers Lab**	0	0	2	1
	Total	**10**	**10**	**10**	**25**

Electives I and II:

ELE-X*17E:

(X= 7 or 8)

*** :serial no of below mentioned subjects**

01. Restructuring of Power Systems
02. Advanced Power System Control
03. High Voltage Engineering
04. Advanced Transformer Engineering
05. Electric Drives
06. Flexible AC Transmission Systems
07. Utilization & Traction

DETAILED SYLLABUS

SEMESTER – 1

Course No: MTH-1117

ENGINEERING MATHEMATICS-I

Calculus: Differential calculus of functions of several variables, Partial differentiation, Homogeneous functions and Eulers theorem, Taylors and Maclaurin"s series, Taylor"s theorem and mean value theorem for functions of two variables, Errors and approximations.

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. Applications of Definite Integrals: Application of definite integrals to area, arc length, surface area and volume, Double integrals, Triple integrals.

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.Application of Vector Calculus: Flux, solenoidal and irrotational vectors, Gauss divergence theorem, Green"s theorem in plane, Stoke"s theorem, Applications to electromagnetics and fluid mechanics.

Books Recommended

1. Kreyszig E, "Advanced Engineering Mathematics", 8th Ed., John Wiley, Singapore (2001).
2. Jain, R K and Iyengar S R K, "Advanced Engineering Mathematics", 2nd Ed., Narosa Publishing House, New Delhi (2003).
3. Das & Mukherjee, "Differential Calculus", U.N. Dhur & Sons Pvt. Ltd.
4. Das & Mukherjee, "Integral Calculus", U.N. Dhur & Sons Pvt. Ltd.

COURSE CODE: PHY-1217

ENGINEERING PHYSICS

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, 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 **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.

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 **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.

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. **Quantum Theory**: The Compton effect, matter waves; group and phase velocities, Uncertainty principle and its application; time independent and time dependent, 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).

Text Books:

1. Griffiths D, "Introduction to Electrodynamics", 2nd Ed., Prentice Hall of India, New Delhi (1998).
2. Beiser, "Perspective of Modern physics" 5th Ed., McGraw-Hill Ltd., NewDelhi (2002).
3. Arya A P "Elementary Modern Physics" Addison-Wesley, Singapore
4. Mani,H S and Mehta G K "Introduction to Modern Physics", Affiliated East West Press, New Delhi.

COURSE CODE: ELE-1317

BASIC ELECTRICAL ENGINEERING

The Circuit Abstraction:
The power of abstraction, The lumped Matter Discipline, The lumped circuit abstraction, Review of basic electrical Signals, Review of electric circuit concepts, Terminology, Electric circuit parameters (Resistance, Conductance, Inductance, Capacitance, Reactance, Impedance), Ideal and practical voltage and current sources and their transformation, Dependent Sources, Power and energy relations, **Batteries:** Basic voltage and current considerations, types of rechargeable and non-rechargeable batteries, Series & Parallel connected Cells, internal resistance of batteries, constant voltage and current sources. **Resistors:** color coding, Types, circuit model, Variable Resistor Types, potentiometers and rheostats, Power Rating, **Ohm's law**: validity of ohms law, Ohmic and non Ohmic conductors, applications of ohms law.

D.C. Circuit Analysis:
Basic electric circuit terminology: Nodes, Junctions, Paths, Loops, Branches, Series and Parallel combinations of resistance, Voltage and current Dividers, Kirchhoff's current law (KCL) and Kirchhoff's voltage law (KVL). Analysis of series parallel D.C. Circuits, **Loop and Nodal methods:** Nodal analysis, Mesh analysis, Super node, Super mesh, Delta-Star(Y) Transformation, Super-position theorem, Thevenin's and Norton's theorems, Maximum power transfer theorem, Reciprocity & Millman's theorem.

A.C. Circuit analysis:
Alternating Voltage & Current: (Signal, Parameters, Generation, Applications, non-sinusoidal A.C.'s, EMF Equations, Mean, Average, RMS, Peak, Form Factor).**Capacitors:** Types, Coding, Charging & Discharging, Capacitive Reactance, Capacitors in series and parallels, Capacitive Circuits. **Inductors:** Types, Self Inductance, Mutual Inductance, Inductors in series & Parallels, Inductive Reactance, Inductive Circuits, A.C. power Generation & Transmission, Single and three phase A.C. systems.

Text Books:
1.Annant Aggarwal and Jeffery D Lang, **"**Foundations of analog and Digital electronic circuits"Elsevier.
2. W H Hayt J E Kemmerly S M Durbin "Engineering Circuit Analysis", Tata McGraw Hill
3. Del Torro, "Electrical Engineering Fundamentals", 2nd Edition, Prentice Hall of India Pvt. Ltd., New Delhi (1994).
4. Electric circuit analysis by Johnson,Johnson & Hillburn.
5. Kothari D P and Nagrath I J, "Basic Electrical Engineering", Tata McGraw Hill, New
6. Fundamentals of Electric Circuits, Alexander Sadeker, McGraw- Hill, 3rd Ed.

COURSE CODE: CSE-1417

INTRODUCTION TO COMPUTING

Computer Organization
Computer and processor abstraction, Generations of computers, Hardware Organization of Computer, Central Processing unit, Memory, Types of Primary memory, Secondary Storage Devices and their types, Input Devices and their types, Output Devices and their Types. Various types of ports and their specifications and usage., Review of basic digital and analog signals, Binary number system and Digital Arithmetic, Digital coding Schemes, , Microprocessors, Microcontrollers, CPU, GPU. Various applications of computers in Aerospace, Agriculture, Finance, Medical, Media, Industries and Commerce.

Operating Systems and Networking – Computer Software & its various types, Types of system and application softwares. File and directory operations on Windows, DOS and Linux Operating Systems, Use of various tools and utilities in Windows and Linux., Fundamentals of Networking, Internet, and various services offered through the Internet: LAN,PAN, WAN, MAN, SAN, VPN, WWW, INTERNET, INTRANET, Email, Search engines. Introduction to various networking Devices, OSI model, TCP/IP protocol Stack.

Introduction to Programming and Problem Solving – Types of Programming Languages- Machine Level, Assembly level, and High Level language, Algorithms, Flow-charts, Compilation, Assembling, Linking and Loading, Testing and Debugging, Documentation, Algorithms for GCD (Greatest Common Division) of two numbers, Test whether a number is prime or not, Sorting Numbers, Finding Square root & factorial of a number, Generation of Fibonacci sequence, Finding largest number in an array, Evaluation of a Polynomial.

Text Books:

1. P.K. Sinha and P. Sinha, "Foundation of Computers" BPB Publishers.
2. C.V Rajaramn, "Fundamentals of computers" PHI publishers

COURSE CODE: HUM-1517

COMMUNICATION SKILLS

Communication: Meaning, its types, significance, process, Channels, barriers to Communication, making communication effective, role in society, Communication model. Discussion Meeting and Telephonic Skills: Group discussion, conducting a meeting, attending telephonic calls, oral presentation and role of audio visual aids. Grammar: Transformation of sentences, words used as different parts of speech one word substation, abbreviations, technical terms etc.

Reading Skills: Process of reading, reading purposes, models, strategies, methodologies, reading activities. **Writing Skills:** Elements of effective writing, writing style, scientific and technical writing. **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.

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, Resume writing, Report Writing, Conducting a Meeting, Minutes of Meeting, Oral Presentation, Group Discussion, CV writing, Purchase order, Job Application Letter.

Text Books:

1. Rodriques M V, "Effective Business Communication", Concept Publishing Company New Delhi, 1992, reprint (2000)
2. Bhattacharya. Indrajit, An Approach to Communication Skills. Dhanpat rai Co., (Pvt.) Ltd. New Delhi
3. Wright, Chrissie, Handbook of Practical Communication Skills. Jaico Publishing House. Mumbai
4. Gartside L, Modern Business Correspondence. Pitman Publishing London
5. Day, Robert A., How to Write and Publish a Scientific Paper. Cambridge University Press Cambridge
6. Gimson A C, "An Introduction to the Pronunciation of English", ELBS. (YP) Bansal, R K and Harrison J B "Spoken English", Orient Longman Hyderabad.

COURSE CODE: MEE-1617

ENGINEERING GRAPHICS & DRAWING

Introduction to Engineering drawing: Equipment and drafting tools, symbols and conventions in drawing. Types of lines and their use, material section representation, introduction to dimensioning. Using any available CAD software to draw simple machine parts and blocks. Use of various fundamental commands to edit a drawing, e.g. erase, copy, mirror offset, array, move, trim. Use of features, extrude, extrude cut and revolve. Projection of points: Projection of points in the first, the second, the third and the fourth quadrant. 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 PP, line inclined to both the planes.

Projections: 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, projection of solids in first and third quadrant, axis parallel to one and perpendicular to other. Section of solids: definition of sectioning and its purpose, procedure of sectioning, application to few typical examples. Development of surfaces: Purpose of development, parallel line method. Insertion of new planes and drawing necessary features on the plane. Sectioning and obtaining sectioned views, dimensioning 2d drawing and labeling.

Orthographic projections of simple machine parts: Drawing of blocks and machine parts. Isometric projection: Basic principle of isometric projection, Isometric projection of simple machine parts for which orthographic views are given. Introduction to temporary and permanent fasteners, Representation of screw threads and threaded fasteners. Rivets and riveted joints. Welding symbols.Introduction to shaft couplings and bearings: assembly of various components of universal coupling and Oldham's coupling, types of bearings, assembly of various components of bushed bearing and foot step bearing.

Text Books:

1. Gill P S, "*Engineering Graphics and drafting"* , Katria and Sons, Delhi (2001).
2. Bhat N D, "*Elementary Engineering Drawing-Plane and Solid Geometry*", Chartotar Publishing House, Anand (1988).
3. Naryana K L and Kanaiah P, "*Engineering Graphics*", Tata Mc GrawHill Publishing Company Limited, New Delhi (1992).
4. Luzzadde Warren J, "*Fundamentals of Engineering Drawing*", Prentice Hall of IndiaPrivate Limited, New Delhi (1988).
5. Bertoline G R, Wiebe E N, Miller G L, and Mother J L, "*Technical Graphics Communication*", Irwin McGraw Hill New York (1997).

COURSE CODE: PHY-1217L

ENGINEERING PHYSICS LAB

The students are required to conduct experiments on following practical work:

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 Fresnsel"s biprism/diffraction grating.
10. To Determine Plank"s Constant.

COURSE CODE: ELE-1317L

BASIC ELECTRICAL ENGINEERING LAB

The students are required to conduct experiments on following practical work:

1. To get familiar with the working knowledge of the following instruments:
   - i. Digital Storage Oscilloscope.
   - ii. Cathode Ray Oscilloscope (CRO).
   - iii. Multimeter (Analog and Digital).
   - iv. Function Generator.
   - v. Power supply.
   - vi. Variac
2. i. To set the power supply in constant current and constant voltage mode, study of current limiting in power supplies, series and parallel combination of power supplies.
   ii. Measurement of various parameters (voltage, frequency,)of a signal on DSO/CRO. Hands on with controls like volts/division, time /division, trigger, Xmag, positioning, time and voltage cursor measurements, saving and recalling of waveforms.
   iii. Measurment of resistance, capacitance, voltage, current, continuity, frequency using bench type/handheld Multimeter.
   iv. Hands on with different controls (frequency,type of waveform, D.C. offset, duty cycle) of function generator.
3. Verification of current and power rating of different wattage Resistors.
4. Verification of deviation of ideal parameters of resistance with increase in frequency.
5. Verification of Ohm"s law for D.C. and A.C. circuits.
6. Verification of KVL and KCL.
7. Verification of Thevenin"s and Norton"s theorem.
8. Verification of Maximum Power Transfer Theorem.
9. Calculation of RMS, peak to peak , average value of an A.C. signal using DSO/CRO.
10. To plot the resonance curve for a series and parallel resonance.
11. Measurement of current, voltages and power in R-L-C series circuit excited by (single phase) AC supply

COURSE CODE: CSE-1417L

INTRODUCTION TO COMPUTING LAB

Unit 1: SPREAD SHEETS IN ENGINEERING APPLICATIONS

(a) Getting data into Ms Excel.
(b) Manipulating Data in Ms Excel
(c) Working with Ms excel functions, formulas and charts.
(d) Problem solving using Ms excel
(e) Solving Engineering Problems using Ms Excel

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Unit 2: BASIC DATABASES IN ENGINEERING APPLICATIONS.

Ms Access:
(a) Getting data into Ms Access.
(b) Manipulating Data in Ms Access
(c) Problem solving using Ms excel
(d) Solving Engineering Problems using Ms Excel

Unit 3: ALGORITHMS FOR ENGINERRING APPLICATIONS.

(a)Writing Algorithms and drawingg flowcharts using Microsoft word for stated problems.

(-) Testing whether number is prime or not.
(-) Swapping numbers
(-) Sorting numbers
(-) Largest number in an array
(-) Factorial of a number
(-) Depicting engineering problems

(b) LINUX and UNIX commands

2ND SEMESTER

COURSE CODE: MTH- 2117

ENGINEERING MATHEMATICS -II

Ordinary and Linear Differential Equations: Formation of ordinary differential equations, Solution of first order differential equations by separation of variables, 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

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 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

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 , Baye"s Theorm.
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

Text Books:

1. E. Kreyszig, "Advanced Engineering Mathematics", John Wiley.
2. R. K. Jain & S. R. K. Iyengar, "Advanced Engineering Mathematics", Narosa Publishing House.
3. Frank Ayres, "Matrices", Mc Graw Hills.
4. Malik & Arrora, "Advanced Mathematical Analysis", S. Chand &Co.

COURSE CODE: CHM-2217

ENGINEERING CHEMISTRY

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. 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 **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.

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. **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.)
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.

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. **Inorganic Systems**: - Transition Metals, fundamental concepts of transition metal complexes, consequences of orbital splitting, color 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.

Text Books:

1. Shriver D F and Atkin A W, "Inorganic Chemistry",3rd Ed., ELBS, Oxford Press, Delhi (1999).
2. Castellan G W "Physical Chemistry" 3rd Ed., Narosa (1995).
3. Puri, Sharma & Kalia "Inorganic chemistry" (2012)
4. Puri, Sharma & Pathania "Principles of Physical chemistry" (2012)
5. Skoog D A, and Holles F J, "Principles of Instrumental Analysis", 5th Ed., Hercaurt Asia PTE Ltd., Singapore (2001).
6. Hill J W "Chemistry for changing times" 6th Ed., Macmillan , Canada (1995).
7. J.C.Kuriacose & J. Rajaraman : Chemistry in engineering and technology, Volume I & II (Tata McGraw Hill Publishing Company Ltd. New Delhi)
8. P.C.Jain : Engineering Chemistry, (Dhanpat Rai & Sons, Nai Sarak, New Delhi)
9. C.V.Agrawal – Chemistry Of Engineering materials (Tata Publishing Works, Varanasi)
10. L.A. Munro – Chemistry In engineering (Prentice Hall, New York)

COURSE CODE: ECE- 2317
BASIC ELECTRONICS ENGINEERING

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: 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- p-n junctions: contact potential- equilibrium Fermi levels- space charge at junctions- current components at a junction: majority and minority carrier currents-

Diodes: volt-ampere characteristics- capacitance of p-n junctions. Diode as circuit element. Half wave- full wave, Rectifiers: Centre Tapped and bridge rectifiers- working- analysis and design- C filter analysis- Zener and avalanche breakdown- Zener diodes: volt-ampere characteristics- regulated power supplies - IC based regulated power supplies. Tunnel diodes: tunneling phenomena- volt-ampere characteristics- Varactor diodes- Photo diodes: detection principle- light emitting diodes- volt-ampere characteristics.

Transistors: Bipolar junction transistors NPN and PNP transistor action- open circuited transistor- biasing in active region- majority and minority carrier distribution- terminal currents- operation- characteristics- 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. MOSFETS n-channel & p-channel. Depletion and enhancement modes.

Text Books:

1. Solid State Electronic Devices by B. G. Streetman, Prentice Hall of India Ltd, N. Delhi, 5th Edition, 2000.
2. Electronic devices and circuits by R. Boylsted and L. Nashelsky, Prentice Hall Publications, 7th Edition.
3. Electronic devices by Floyd, Pearson Education, 7th Edition, 2008.
4. Electronic Principles: Malvino- Tata Mc Graw Hill.

COURSE CODE: CSE-2417
COMPUTER PROGRAMMING

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, Simple „C" programs Conditional Statements and Loops -Decision making within a program, Conditions, Relational Operators, Logical Connectives, *if* statement, *if- else* statement, Loops: *while* loop, do while, *for* loop, Nested loops, Infinite loops, S*witch* statement, structured Programming.

A**rrays** - One dimensional arrays: 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, 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.

Structures and Unions - Structure , nested structure, structures and functions, structures and arrays: arrays of structures, structures containing arrays, unions, **Pointers-** Address operators, pointer type declaration, pointer assignment, pointer initialization, pointer arithmetic, functions and pointers, Arrays and Pointers, pointer arrays. File Processing - Concept of Files, File opening in various modes and closing of a file, Reading from a file, writing onto a file. Introduction to Object Oriented Programming with C++ . Objects and Classes. Object hierarchy. Inheritance, Polymorphism. Introduction to Advanced C/C++ Compilers viz. Ellipse/Netbeans.

Text Book:

1. E. Balaguruswamy, "Programming with ANSI-C"
2. Byron Gottfried "Programming with C"
3. A. Kamthane, "Programming with ANSI & Turbo C"
4. H. Schildt, "C++: The Complete Reference"
5. B. Stroustrup, "The C++ Programming Language"

COURSE CODE:MEE- 2517

ENGINEERING MECHANICS

System of forces: Coplanar concurrent force system, Composition and Resolution of forces, Equilibrium of rigid bodies, Free body diagram, Lami"s Theorem.
Stress and Strain: Concept of Stress and Strain, Simple Stresses, Tensile, Compressive, Shear,Bending and Torsion, Stress-Strain Curves, Elongation of bars, Composite bars, Thermal Stresses, Elastic Constants, Mohr"s Circle

Centre of Gravity and Moment of Inertia: Concept of C.G. and Centroid, Position of Centroid, Theorem of Parallel and Perpendicular Axes, Moment of inertia of simple geometrical figures. Analysis of Framed Structure: Reaction in different types of beams with different end conditions, bending moment and shear stress diagrams. Determination of reactions in members of trusses: a) Analytical Methods b) Graphical Method

Physical Properties of fluids: System, Extensive and intensive properties: specific weight, mass density, specific gravity, viscosity , specific gravity, surface tension and capillarity ,evaporability and vapor pressure, Newtonian and Non-Newtonian fluids.
Fluids Statics : Pressure, Hydrostatic law, Pascal" s law, Different types of manometer and other pressure measuring devices, Determination of metacentric height.
Fluid Kinematics and Dynamics: Classification of fluids, Streamline, Streak line and Path lines, Flow rate and continuity equation, Bernoulli's Theorem, Kinetic energy correction factor and momentum correction factor in Bernoulli's equation.

Books Recommended

1. Bhavikatti S S and Rajashekarappa K G, *"Engineering Mechanics",* New Age International, NewDelhi (1998).
2. TimoshenkoS P and Young D H, "*Engineering Mechanics*", McGraw Hill(International) 4/e, New Delhi (1984).
3. Kumar D S, " *Fluid Mechanics",* S.K.Katira and Sons, Delhi (1998).
4. Modi P N and Seth S N, "*Fluid Mechanics",* Standard Book House, New Delhi (1998),
5. Engineering Mechanics by R.S. Khurmi

COURSE CODE:CHM-2217L

ENGINEERING CHEMISTRY LAB

The students are required to conduct experiments on following practical work:

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:CSE-2417L

COMPUTER PROGRAMMING LAB

List of Experiments

Note: Experiments and programs to be performed on varied platforms like Linux, Windows, Arduino, Raspberry etc.

1. Program on Control Structures and Decision making statements.
2. Program using Loops.
3. Program using Switch case statements with use of break, continue and goto.
4. Programs on array operations.
5. Programs on matrix operations and manipulations.
6. Programs on modular programming and functions.
7. Programs on recursive functions.
8. Programs on structures and unions.
9. Programs on pointers and their manipulations.
10. Programs on files.

COURSE CODE:ECE-2317L

ELECTRONICS ENGINEERING LAB

1.Characterize various commercial diodes on the basis of voltage and current ratings. Study/simulation of their I-V characteristics using multisim/pspice.,

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 performance

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- 2617W

WORKSHOP PRACTICE

1. Machining section

(a) Theoretical Instructions:

Safety Precautions, W orking 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

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 metals materials.

(b)Practical Demonstrations:

Exercise in rating, soldering and brazing of making jobs of various materials such as Trays, Flower vases, photo frame etc. 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.

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 45^0, preparation of stud to cut external threads with the help of dies, drilling, counter sinking, 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 equipments.

Aim: TO ASSEMBLE THE MILD STEEL WORK PIECES WITH RADIUS FITTING.

4. Welding Section:-

(a) Theoretical Instructions:

Safety Precautions, Introduction of all welding processes like Gas welding, MIG W elding, TIG welding, Submerged arc welding and spot welding, Advantages and disadvantages over electric arc welding and their applications. W elding techniques like right ward, left ward and over head, various fluxes and electrodes used in welding. Difference between AC and DC 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 MAKEV-BUTT JOINT, OUT-SIDE CORNER JOINT AND HEAD Tee-JOINT.

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, moulding sand and its composition, Sand preparation, moulding methods, Core 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, alluminuim, waxes etc. by using different types of patterns

Aim: TO PREPARE A GREEN SAND 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.

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, mortoise 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 PREPAREP SCARF JOINT AND PEN STAND AS PER THE DRAWING.

8. Electrical and Electronics Section:-

(a) Theoretical Instructions:

Safety Precautions, Introduction of different types of wiring, circuit breakers, protective relays. power supply, system and its types. various types of circuits, electrification of a workshop. Polarity test, earthing. electrical symbols.

Soldering technique of a circuit board and soldering joint quality.

(b) Practical Demonstrations:

Demonstration and practice of transformer, extension cord, gyser, electrical motor.

Aim: HOUSE WIRING, STAIRCASE WIRING FOR FLUORESCENT TUBE LIGHT, THREE PHASE WIRING FOR ELECTRICAL MOTORS.

TO MASS SOLDERING OF PRINTED CIRCUIT BOARDS AS PER THE INSTRUCTIONS.

List of books recommended: -

1 **Workshop Technology by Chapman.**
2 **Workshop Technology by Hajra Chowdhary.**
3 **Workshop Technology by Swarn Singh.**
4 **Workshop Technology by Virender Narula.**

3rd Semester

COURSE CODE: MTH3117

Engineering Mathematics-III

Laplace Transforms: Laplace Transform, Shifting Theorem, Laplace transforms of different functions, Heaviside's Unit function, Dirac Delta Function its Laplace transforms. Heavisides Expansion Theorm, Inverse Laplace Transforms. Initial and final value theorems, Convolution theorem and Applications, Use of Laplace Transforms in the solution of linear Differential equations.

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.

Z-Transform: Definition, Linearity property, Z- Transform of elementary functions, Shifting Theorems. Initial and final value Theorem, Convolution theorem, inversion of Z-transforms.

Books Recomended

1. Laplace Transforms by Murray R. Speigal
2. Advanced Engg. Mathematics: Erwin Kreyzing- Wiley Eastern. Pub.
3. Higher Engg. Mathematics: B.S. Grewal - Khanna publishers.
4. Advanced Engineering Mathematics: Michael D Greenberg-PHI.
5. Higher engineering mathematics: H. K. Dass, Rajnish Verma-S. Chand

COURSE CODE: ELE3217

Material Science Engineering

Crystal Structure: Fundamental concepts, Closed packed structures, Crystalsystems, Crystallographic planes and directions, Miller indices, Point defects, Free electron Theory, Classificationofsolidsintoconductors,Semiconductorsandinsulators, Effective mass. **Dielectric Properties**: Dielectric materials, Polarization mechanisms, Dipole moment, Dielectric strength, Methods for producing polarization, Application of dielectric materials.

Magnetic Properties: Basic concepts, Soft and hard magnetic materials, Ferrites, Selection techniques for applications, Magnetic recording, Magnetic memories. **Optical Properties:** Index of refraction, Damping constant, Characteristic penetration depth and absorbance, Reflectivity and transmissivity, Atomic theory of the optical properties, Optical storage devices.

Semiconductor Materials: Intrinsic and extrinsic materials, Electron and hole concentrations at equilibrium, Temperature dependence of carrier concentrations, Conductivity and mobility, Effect of temperature and doping on mobility, Direct and indirect recombination of electron and holes, Diffusion and drift of carriers, Diffusion length, Contact potential. Hall Effect and its Applications. **Device Materials:** Materials for resistors, capacitors and inductors. **Superconductivity:** Properties of superconductors, Applications of superconductors.

References:

1.Hummel R E, "Electronic Properties of Materials", Narosa Publishing House.
2.William D Callister, Jr "Materials Science and Engineering", John Wiley and Sons, Inc.
3.Dekker A J "Solid State Physics", Mac Millan, India Limited, Madras,(2000)
4.PillaiSO"SolidStatePhysics",New Age International Publishers.
5.Van Vlack L H "Elements of Material Science and Engineering", Addison Wesley Publishers
6.Streetman B G and Banerjee S "Solid State Electron Devices", Prentice Hall of India.

COURSE CODE: ELE3317

Network Analysis

And Synthesis

Basic 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. **First order differential equation:** Differential equations as applied in solving networks. Application of initial conditions. Evaluating initial conditions in networks.

Laplace Transformations. Wave form analysis and Synthesis; The unit step, ramp and impulse functions and Laplace transforms. Initial and final value theorem, Convolution integral, convolution as summation..**Network theorems and impedance functions**: Complex frequency, transformer impedance and transform circuits, series and parallel combination of elements. **Network Functions – Poles and Zones:** Ports of terminal pairs. Network functions for one port and two port network. Time domain behaviour from poles zero plot.

Two port parameters: Relationship between two-port parameters. Admittance, impedance, transmission and hybrid parameters. Relationship between parameter sets. Parallel connection of two port Networks. Characteristic impedance of two port networks. **Filters** Filter fundamentals - pass & stop band, filter classification, constant-k and m-derived Filters.

Books Recommended

1. Network Analysis by Van Valkenberg
2. Network Analysis & Synthesis by F. Kuo
3. Network Analysis by G.K.Mittal

COURSE CODE: ELE3417

Analog Electronic Circuits-I

Bipolar Junction Transistors (BJT) fundamentals: transistor configurations, DC operating point, BJT characteristics & parameters, fixed bias, emitter bias with and without emitter resistance, analysis of above circuits and their design, variation of operating point and its stability. **BJT AC Analysis:** BJT Transistor Modeling, The re transistor model, Common emitter fixed bias, Voltage divider bias, Emitter follower configuration. Darlington connection-DC bias; The Hybrid equivalent model, Approximate Hybrid Equivalent Circuit-Fixed bias, Voltage divider, Emitter follower configuration; Complete Hybrid equivalent model, Hybrid π Model.

Multistage Amplifiers: Need for multistage amplifier, Gain of multistage amplifier, Different types of multistage amplifier like RC coupled, transformer coupled, direct coupled, and their frequency response and bandwidth. **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.

Field Effect Transistors: Construction and Characteristics of JFETs, Transfer Characteristics, Depletion type MOSFET, Enhancement type MOSFET. **FET Amplifiers:** JFET small signal model, Fixed bias configuration, Self bias configuration, Voltage divider configuration, Common Gate configuration. Source-Follower Configuration, Cascade configuration.

References:

1. Robert L. Boylestad and Louis Nashelsky, "Electronics devices and Circuit theory", Pearson
2. Adel S. Sedra and Kenneth C. Smith, "Micro Electronic Circuits Theory And Applicatication,"
3. Fundamentals of Microelectronics, Behzad Razavi, John Weily
4. J.Millman & C.C.Halkias—Integrated Electronics, TMH
5. K. A. Navas, "Electronics Lab Manual", Volume I, PHI

COURSE CODE: ELE3517

THERMAL POWER ENGINEERING

System and Surroundings, Zeroth Law, Temperature Scales, Equation of the state, First law, Steady flow, Isochoric, Isobaric, isothermal, adiabatic and polytropic processes. Properties of steam, Second law.

Entropy change, Reversible Irreversible processes, Carnots Cycle, Ranking Cycle, Modified Rankine Cycle, Flow through nozzle. 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.

Otto, Diesel and Duel cycles, Magneto and battery ignition, etonation and pre-ignition, Octane Number, Dropes, Diesel knock, Cetane Number, various I.C engines fuels, Carburation and Injection. Lubrication, Cooling, Governing of I.C. Engines, Fields of Application. Present status and future trends, Basic types and Cycles, Thermal refinements, jet propulsion, fields of Application.

Text Books:

1: Steam Turbine Performance and Economics Bartlett McGraw Hill 1958
2: Steam Turbine Theory and Practice Kearton Pitman CBS Publishers 1985
3: Theory and Design of steam and Gas turbine Loe McGraw Hill 1954
4: Gas Turbines Theory and Practice Cohn and Rogers Pearson

COURSE CODE: ELE3617

Electrical Machines-I

Transformers: Single Phase Transformers: Introduction, classification, construction, electromotive force (e. m. f.) equation, Equivalent circuit model, Phasor diagrams, Losses and efficiency, Voltage regulation, Transformer tests (polarity test, open circuit test and short circuit test), All day efficiency, Frequency response, Parallel operation, Auto-transformers, Excitation phenomenon in transformers Three Phase Transformers Construction, Connections, Open delta, Ratings, Phase Conversions

Special Purpose Transformers Impedance matching transformers, Isolation transformers, constant current and constant voltage Transformers, Instrument Transformers (Introduction) **Principles of Electromechanical Energy Conversion:** Energy conversion via electric and magnetic fields, Field energy and mechanical force, energy balance, co energy

Direct current Machines: Generators and Motors. General introduction, principles of operation of D.C machines, construction of D.C machines (Generators and motors), e.m.f and torque equations, power stages and efficiency, commutation and armature reaction, characteristics of D.C Generators, parallel operation, torque and speed of D.C Motors, characteristics of various types of D.C motors, speed control of D.C motors, starting and electric braking. **Selection of D. C. Motors for various Applications:** Electric drives, characteristics of electric drives, selection of D. C. motors for domestic, commercial and industrial applications.

References:

1. Electric Machinery, Fitzgerald, Kingslay,Umans Tata McGraw-Hill 6th Edition
2. Electric Machinery Fundamentals, Chapman, McGraw-Hill Higher Education
3. Electric Machines, Nagrath and Kothari, Tata McGraw-Hill 3rd Edition
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 H

COURSE CODE:ELE3717L

EDA Tools
Lab

A: MULTISIM/PROTEUS/ORCAD/PSPICE

1. a)To Simulate a half wave and a full wave rectifiers (bridge and center-tapped) and to study their performance.
   b)Tosuppresstheripple of half wave rectifier, bridge and center-tapped rectifiers usingRCfilter.
2. ToSimulate Zenerdiodeasavoltage regulator
3. To Design & simulate Zener diode based voltage regulated powersupply with short circuit protection.
4. To Design & simulate an IC voltage regulator based power supply of 5v, 9V& 12V.
5. To Simulateandobservetheperformanceofclippingandclampingcircuits.
6. ToSimulate a CBamplifierandobserve their performance.
7. To Simulate a CE amplifiers with various biasing configurations.
8. To Simulate a CC amplifiers with various biasing configurations.
9. To Design & Simulate a two stage RC-coupled amplifier and observe its output.
10. Simulation &Verificationof the truth tables of TTL gates(7400, 7402, 7404, 7408, 7432, 7486….).
11. Simulation & Verification ofNANDandNORgatesasuniversallogicgates and implement all other gates using these universal gates.
12. Simulation and verification of truth tables of various combinational circuits like encoders,decoders,multiplexers,demultiplexers,priority encoders,magnitude comparators,display decoders,adders,subtractors, etc.
13. Design and Simulation of basic NOT,OR,AND,NAND,NOR gates using DDL,RTL,DTL,TTL & CMOS integrated circuits.
14. Design & Simulation of various flip-flops like SR,JK,D andT, WITH VARIOUS SYNCHRONOUS AND ASYNCHRONOUS INPUTS AND CONFIGURATIONS.

B: MATLAB/SIMULINK:

1.Basic Array Operations
2.2D plotting and 3D plotting.
3. Control structure programming.
4. Working with audio and pictures.

C: LAB VIEW:

1. Computing expressions using graphical programming.
2.Creating a VI to find the decimal equivalent of a binary number.
3. Creating a sub VI to find Grey Code Equivalent ofa BCD number.
4. Create a VI to display a waveform chart.
5. Build a VI to generate a sine waveform with options to vary amplitude,frequency and offset.

COURSE CODE:ELE3317L

Network Analysis
And
Synthesis Lab

1. Study of CRO - Measurement of Voltage frequency and Phase of a given waveform.
2. To assemble RC circuits and observe its performance in low pass and high pass mode.

3. To measure image & characteristic impedance of a symmetrical Tee and Pi networks.
4. For a given two port network measure:
   i) ABCD parameters.
   ii) h - parameters.
5. To experimentally determine the characteristic impedance and to plot the attenuation characteristics of the following circuits.
   i) Prototype low pass filter.
   ii) Prototype high pass filter.
   iii) Prototype band-pass filter.
   iv) m-derived LPF.
   v) m-derived HPF

COURSE CODE: ELE3417L

Analog Electronic Circuits Lab-I

1. Study I-V characteristics of:
    a. PN junction diode
    b. zener diode
    c. varactor diode
    d. lightemiting diode
    e. tunnel diode

    Calculation of DC and dynamic resistance in each case.

2. Study I/O characteristics of photodiode.
3. Study V-I characteristics of transistor (PNP and NPN) and calculate the performance parameters of a transistor in CB, CE and CC Configurations.
4. To assemble a CB amplifier with various biasing configurations and observe its performance.
5. To assemble a CE amplifier with various biasing configurations and observe its performance.
6. To assemble a CC amplifier and observe its performance.
7. To assemble a two stage RC-coupled amplifier and observe its output.
8. To assemble a two stage transformer-coupled amplifier and observe its output.
9. To design a practical amplifier using transistors with given specifications and parameters
10. To Study V-I characteristics of JFET and MOSFET. Determination of their performance parameters.
11. To Study various FET and MOSFET configurations and their practical application. circuits
12. To do the following:
    a. To assemble current series feedback amplifier and study its performance.
    b. To assemble current shunt feedback amplifier and study its performance.
    c. To assemble a voltage shunt feedback amplifier and study its performance.
    d. To assemble a voltage series feedback amplifier and study its performance.

COURSE CODE: ELE3617L

Electrical Machines Lab – I

1	To study various parts of a dc machine and draw sketches of the same.
2	To plot the saturation curve of a dc machine.
3	To plot the external characteristic of a dc shunt generator and compare the characteristics with that
4	To plot the external characteristics of a dc series generator
5	To perform open circuit and short circuit tests on a single-phase transformer
6	To perform polarity test on a single phase transformer
7	To determine the efficiency and voltage regulation of a single phase
8	Study of the construction of a synchronous machine,
9	To obtain the OCC and SCC of a synchronous machine
10	To synchronize an alternator with bus bars using bright / dark lamp method.
11	To determine the equivalent–circuit parameters of a 3 -□ Induction motor by
12	To determine the Torque / speed characteristics of a 3-□ Induction motor
13	To study different methods of starting of single – phase induction motor.

4th Semester

COURSE CODE: ELE4117

Electrical Machines- II

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

Induction Machines: Three Phase Induction Motors: Principle of operation of an induction motor, Construction, Types, Equivalent circuit, Torque/speed characteristics, Induction motor tests, Starting, Sp control, Induction generator, Schrage Motor, Circle Diagram, Applications selection **Single-Phase Induction Motors:** Types of 1-phase induction motors, analysis and testing of 1-phase induction motors, universal motor

Synchronous Machines: Constructional features, Types and working principle, windings, Equivalent circuit voltage regulation and its determination, saturation effect, parallel operation, Two axis theory, 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.

References:

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: ELE4217

Control Systems-I

Introduction to continuous control systems: Definition of a control system, open-loop, closed loop (automatic and manual) control. Mathematical modeling: Transfer functions, block diagrams, signal flow graphs

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 Stability studies:

Definition of stability, stability and pole locations, stability and Routh Table, stability and frequency response bode plot, polar plot, Nyquist's criterion , root locus. Proportional, Integral, Derivative (P.I.D) control. Compensator design Lead – lag compensators.

References:

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: ELE4317

Electrical Measurements And Measuring Instruments

Definition of basic terms used in measurements: Electro-mechanical indicating instruments. Classification, efforts utilized in measuring instruments, various forces in an electro-mechanical indicating instrument, errors and their types, various methods of damping, galvanometers (D' Arsonal and Ballistic) Ammeters and Voltmeters (PMMC, Induction, Electrostatic and Dynamometer type), errors in voltmeters and ammeters, extension of instrument range, ammeter shunts, voltmeter multipliers.

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, Energy meter testing, Power factor meter.Measurement of Resistance: Resistance classification, Measurement of Low resistance using potentiometer method and Kelvin double bridge, Measurement of medium resistance using ammeter-voltmeter method, substitution method, Wheatstone bridge, Measurement of high resistance using loss of charge method, Meggar.

Measurement of Inductance, Capacitance and Frequency using a.c bridges. Potentiometers; D.C potentiometers, Crompton potentiometer, application of D.C potentiometer, A.C potentiometers, Drysdale Tinsley and Cambell larsen Potentiometers, Applications of A.C Potentiometers. Virtual Instrumentation: Introduction to virtual Instrumentation. Measurement of Electrical and non-electrical quantities using virtual instruments.

References:

1	Electrical Measurements and	Golding, Widdis	Pitman
2	Electrical Electronic Measurements	A.K.Sawhney.	Dhanpat Rai

COURSE CODE: ELE4417

Analog Electronic Circuits-II

Introduction to OPAMP: Block diagram representation of a typical op-amp, Analysis op-amp ICC circuits, types, designations, packages, pin configurations and power supplies. Ideal op-amp, equivalent circuit, open loop op amp configurations of differential, inverting and non-inverting amplifiers, op amp feedback amplifier analysis, differential amplifier with one, two and three op amps.Op amp parameters - offset voltages and currents, bias current, drift, PSRR, CMRR, SNR, offset nulling methods.. AC performance of O-amp: Bandwidth, slew rate and frequency response. DC and AC amplifiers, peaking, summing scaling and averaging amplifiers, instrumentation amplifier, differential input and differential, output amplifier, V to I and I to V converters, integrator, differentiator comparator, non-linear amplifier.

Sinusoidal oscillators: Basic Operations, analysis, Barkhausen's Criteria, Various types of oscillator circuits and their analysis, Design of Practical Oscillator Circuits. OPAMP based design of Phase shift oscillator, Wien bridge oscillator, square, triangular and sawtooth wave generator, voltage controlled oscillator, zero crossing detector, window detector. **Non linear IC applications using OPAMP:** OPAMP Comparator, Schimtt Trigger, Sample and Hold Circuit, Active Filters, Effect of slew rate on waveform generation- monostable circuits-Principles of VCO circuits. Comparator Circuits: Zero Crossing Detector- Regenerative comparator circuits.

Multivibrators and Wave Form Generators: Bistable multivibrators, Bistable circuit as a memory element, Generation of Square & Triangular waves using Astable multivibrator, Generation of the standard Pulse-The Monostable multivibrator, Integrated circuit Timers, Implementation of Astable, Monostable and Bistable multivibrators using 555 Timer, Various practical applications of 555 Timer. **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.

Books Recommended

1. Operational Amplifiers by Ramakant Gaekwad
2. Integrated Electronics by J. Millman & C. Halkias
3. Microelectronics by Sedra & Smith
4. Electronic Circuits by D. Schelling & Belove.
5. Electronic Devices & Circuits by R. Boylestad

COURSE CODE: ELE4517

Electro Magnetic Fields
&
Waves

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**. 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.

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. **Electromagnetic Waves:** Electromagnetic wave in one Dimension, Sinusoidal waves, Polorization, 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.

Electrodynamics: Electrodynamics before Maxwell, Maxwell's equations and magnetic charge, Maxwell's equation inside matter, Boundary conditions, Scaler and vector potentials, Gauge Transformations, Coloub Gauge and Lorentz Gauge, Lorentz Gauge, Lorentz force law in potencial 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.

References:

1	Introduction to electro-dynamics	David J. Griffiths	[PHI-Pvt Ltd, New Delhi –
2	Electrodynamics	J.D. Jacson	Pearson
3	Mathematical method for Physicists	Arfken Weber	Harcourt (INDIA)
4	Classical Theory & Fields	L.D. Landau, E.M.	Pergman

COURSE CODE: MTH4617

Engineering Mathematics-IV

Complex Variables: Analytic functions, Cauchy Riemann equations, complex integration, Cauchy's fundamental theorem, Cauchy's integral theorem, Cauchy's inequality and Liouville's theorem on integral function, Taylor's and Laurent's expansions, Zeroes and poles of analytic functions, Residues and contour integration.

Special Functions: Solution of series, Legendres functions, Rodriguess formula, generating functions for Legendres Polynomials and recurrence formulae. Bessel's functions, Recurrence formulae and Bessel's functions of integral order.

Wavelet Transform: Continuous wavelet transform, Basic properties of wavelet transform, Discrete wavelet transform, Orthonormal wavelets, multi Resolution analysis, Construction of Orthonormal wavelets, Daubchies wavelets and algorithms. Band limited wavelets, Balian low theorem.

References:

1. Complex Variables & Applications by R. V. Churchill
2. Theory of Functions of Complex Variables by E. I. Copson

COURSE CODE: ELE4117L

Electrical Machines Lab –II

S.No.	Experiments
1	To study the different parts of an Induction motor. To determine the equivalent–circuit parameters of a 3 -□ Induction motor by (i) No load test (ii) Blocked rotor test
2	To determine the Torque / speed characteristics of a 3-□ Induction motor
3	To determine the speed characteristics of a schrage motor
4	To study the speed control of an Induction motor by pole-changing method
5	To determine the speed / Torque characteristics of an AC series motor (Universal motor)
6	To determine the equivalent circuit parameters of a 1-□ Induction motor by (i) No load test (ii) Blocked rotor test
8	Study of the construction of a synchronous machine
9	To obtain the OCC and SCC of a synchronous machine by Synchronous impedance method
10	To synchronize an alternator with bus bars using bright / dark lump method
11	. To find voltage regulation of an alternator by actual loading
12	To obtain the V-curves and inverted V-curves of a synchronous motor
13	To conduct slip-test on a salient-pole synchronous machine and hence determine its direct and quadrature – axis reactances

COURSE CODE: ELE4317L

Electrical Measurements Lab

S.No.	Experiments
1	Measurement 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, WheatStone'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. (Daisylab)

COURSE CODE: ELE4417L

Analog Electronics Circuits – II Lab

1. To assemble an RC phase shift oscillator.
2. To assemble a differential amplifier and obtain its CMRR.
3. To study different applications of OP AMPS.
    a. OP-AMP as an inverting amplifier.
    b. OP AMP as a non inverting amplifier
    c. OP AMP as an integrator
    d. OP AMP as a differentiator
4. To measure the following parameters of a typical OP-AMP.
    a. I/P Impedance
    b. O/P Impedance
    c. Slew rate
    d. CMRR
5. Obtain frequency response of an OP-AMP & hence find its bandwidth.
6. Study performance of multivibrator circuits using 555 chip in following modes:
    a. Bistable
    b. Astable
    c. Monostable
    d. Use of 555 chip as a timer circuit.
7. To assemble a Schmitt trigger Circuit and to obtain its characteristics and to use it as squaring circuit.
8. To assemble a Class A Power amplifier and to determine its power gain
9. To study the performance of a voltage regulator IC Chip.

COURSE CODE: ELE4717L

Computer Aided Simulation of Electrical Systems

S.No	Experiments
1	Use of MATLAB in: 1. Analysis of D.C Circuits 2. Transient and steady state analysis of a.c/d.c circuits. 3. Analysis of control systems 4. Analysis of Electric Machines and Transformers
2	Use of MATLAB and SIMULINK Tool boxes
3	Use of Control System (State Space), Fuzzy Logic & Neural Network Tool Boxes

5th Semester

COURSE CODE: ELE5117

Control Systems –II

Introduction of digital control systems :
Sampling theorem, Mathematical modeling of sampling process, Practical aspects of the choice of sampling rate, Quantization and coding, Data reconstruction, Zero order hold circuit,Multi-rate sampling, Basic elements of discrete time control system, Advantages of digital control systems,

Modeling of discrete time systems :
Z- Transform, Solution of difference equation by Z transform, Relationship between 'S' and 'Z' plane, Stability analysis in Z plane- Jury stability criterion, Inverse Z transform, properties of Z transform, Applications of Z transform, Bilinear transformation

State space analysis of digital control system :
State space representation of discrete time systems, Solution of discrete time space equation, Pulse transfer function matrix, Eigen values and Eigen vector, Matrix diagonalization, Similarity transformation, Controllability and Observability

References:
1. DIGITAL CONTROL AND STATE VARIABLE METHODS, by GOPAL,, MCGRAW HILL EDUCATION
2. DISCRETE TIME CONTROL SYSTEMS by K. OGATA, WESLEY PUBLISHING CO.
3. DIGITAL CONTROL SYSTEMS, by B.C KUO,, OXFORD UNIVERSITY PRESS

COURSE CODE: ELE5217

Power System-I

Introduction to Power Systems generation, transmission & distribution. Element of AC distribution. Single fed, double fed and ring main distributor. Overhead line insulator types; pin, suspension, strain, schackle, guy etc. String efficiency & methods of equalizing potential drop over string of suspension insulators.

Transmission line parameters and their evaluations, types of overhead conductors with calculations of inductance and capacitance. Models of short, medium and long transmission lines. Skin, proximity and Ferranti effect. Power transfer capability of a transmission line. Mechanical Design of transmission line. Electric Power Transmission Towers, Overhead Line Insulators.

Classification of cables, Cable conductors, insulating materials, insulation resistance, electrostatic stress, grading of cables, capacitance calculation, losses and current carrying capacity. Location of faults. Location of faults, methods of laying of underground cables. Corona, Visual & critical voltages, corona loss, effect of corona on line design practical considerations

References

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	Transmission and Distribution of Electrical Energy	H.Cotton	Hodder Arnold

COURSE CODE: ELE5317

Non-Conventional Energy Sources

Review of conventional & Non-conventional Energy resources, Energy problem, Energy & environment , Need for renewable Energy Sources. Relevant energy conversion systems & Technologies, Electricity generation, Rural Energy. Wind & Solar Energy, Principles of power Gen. From wind, site selection, wind speed & power duration curves, wind power system components, Wind-Diesel Hybrid systems & recent developments. Solar radiation, solar collectors – flat plate & concentrating collectors, Solar water heaters & solar thermal power plants.

Miscellaneous Applications: Electric Power Generation from Tidal, OTEC & Geothermal energy. Simple power plant based on Tidal / OTEC / Geothermal Direct Energy Conversion techniques, Why Direct Energy Conversion, Solar cell, principle and operation. Solar module & array, solar photovoltaic power system / solar wind Diesel system – operation & design. MHD & Thermo-Electric power generation.

Energy conservation. Energy conservation in Transport sector, rural energy, urban energy, Industrial energy, power generation & distribution, Energy efficient buildings. Energy audit. Typical case studies. Future Energy Sources. Nuclear Fusion Energy – Tokamak reactor, Hydrogen Energy An introduction to power generation, advantages and limitations. Exploring new energy sources. Economic evaluation of energy systems.

Refernces

1	Non-Conventional Energy Resources	R.K Singal	Dhanpat Rai publication
2	Energy Technology	S. Rao, B.B Parlekar	Khanna Publications
3	Wind & Solar Power System	M.Patel	CRC Press
4	Principle of Energy Conversion		Culp-Mc Graw Hill Publication

COURSE CODE: ELE5417

Microprocessors

Microcomputer Structure and Operations: Basic Microcomputer Elements, Typical Microcomputer Structure, CPU, Memory System, Input Output. **Microprocessors and Memory:** Typical 8, 16 and 32 bit Microprocessors, 8085 Microprocessor Specification, Memory Technologies

Assembly Language Programming I: Programming Model of 8085, Registers, Fetch, Execute Operation of CPU, Instruction Set. **Assembly Language Programming II:** Addressing Modes, Basic Operations, Microprocessor Arithmetic, Program Flow Control Using Looping and Branching. **Assembly Language Programming III:** Stack, Subroutines, Interrupts, Resets.

Bus System: System Bus Structure, Bus Operations, Cycle by Cycle Operations, Timing and Control, Priority Management, Address Decoding. **Microprocessors Interfacing:** Interfacing concepts, Parallel Input Output, Memory Interfacing, Direct Memory Access, The Serial Subsystems, Peripheral Interface, Analog Converter Subsystem.

References:-

1. Microprocessor Architecture, Programming & Applications by Ramesh Goankar
2. Microprocessor & Applications by Leventhal.
3. Microprocessors by Mathur.

COURSE CODE: ELE5517

Signals and Systems

Introduction to Signals & Systems: Definition of a signal & System, Classification of Signals, Basic operations on Signals, Elementary Signals, Systems viewed as interconnection of operations, Properties of Systems, Sampling theorem, Graphical & Analytical proof of Band-limited signals, Impulse Sampling, Aliasing. **Linear Time Invariant (LTI) Systems:** Time-Domain representation & Characterization of LTI systems, Impulse response representation, Convolution integral & Convolution sum, properties of LTI systems, Stability criteria for LTI systems, Elements of Continuous time & Discrete-time LTI systems.

Fourier Representation of Signals Fourier representation of Signals, Continuous -time Fourier series and their properties, Application of Fourier series to LTI systems, Fourier Transform & its properties, Applications of Fourier Transform to LTI systems, Discrete-time Fourier Transform & its properties. Circular Convolution, Relationship to other transforms.

Laplace Transform: Introduction & Definition, Region-of- convergence, Properties of Laplace transform, Inverse Laplace Transform, Applications of Laplace Transform in analysis of LTI systems, Unilateral Laplace transform & its applications to solve differential equations, Analysis of Electric circuits. **Z-Transform** The Z-Transform, Region-of-convergence, properties of Z-Transform, Inverse Z-Transform, Transform Analysis of Discrete-time LTI systems, Unilateral Z-Transform & its applications to LTI systems described by difference equations

Books Recommended

1. Signals & Systems by Haykins
2. Signals & Systems by Ziemer and Tranter
3. Signals & Systems by Oppenhiem

COURSE CODE: ELE5617

Digital Electronics and Logic Design

Number Systems And Boolean Algebra: Review of Number systems, Radix conversion Complements 9's & 10's, Subtraction using 1's & 2's complements, Binary codes, Error detecting and Correcting codes, Theorems of Boolean algebra, Canonical forms, Logic gates.**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.

CombinationalLogic: RepresentationoflogicfunctionsSimplificationusingKarnaugh map, Tabulation method, Implementation of combinational logic using standard logic gates, Multiplexers and Demultiplexers, Encoders and Decoders, Code Converters, Adders, Serial adders, Parallel adders, Subtractors, Multipliers, Parity Checker and Magnitude Comparator.

SequentialLogicConceptsAndComponents: Flipflops-SR,JK,DandTflipflops- Level triggering and edge triggering, Excitation tables-Counters-Asynchronous and synchronous Type Modulo counters, design with state equation state diagram, Shift registers, type of registers, Circuit diagrams. **Semiconductor Memories:** Memory organization, Classification, and characteristics of memories, Sequential memories, ROMs, R/W memories, Content Addressable memories, CCD memory, PLA, PAL and GateArray.

References:

1. Anil K. Maini, "Digital Electronics", Wiley.
2. MalvinoandLeach,"DigitalprinciplesandApplications"TataMcGrawHill.
3. JainRP"ModernDigitalElectronics",TataMcGraw-Hill,ThirdEdition,(2003)
4. ManoMMorris,"DigitalDesign"PearsonEducation,ThirdEdition,(2006)
5. Flecther,"AnEngineeringApproachtoDigitalDesign",PrenticeHallofIndia, NewDelhi.
6. TocciRonaldJ,"DigitalSystems-PrinciplesandApplications"PrenticeHallofIndia,NewDelhi

COURSE CODE: ELE5117L

Control Systems Lab

1	To study the performance of Relay control Combination of P, I and D control schemes in a typical thermal system (Oven).
2	To study the torque-speed characteristics of an AC servomotor
3	To study the time response of a variety of simulated linear systems
4	To study the role of feedback in a DC speed control system
5	To study the role of feedback in a DC position control system
6	Use of MATLAB / SIMULINK /Control System tool boxes
7	To study the role of a combination of P,I and D control actions in a variety of simulated linear systems
8	To study the computer simulation of a number of systems
9	System identification using frequency domain techniques
10	Lead/ lag compensator design
11	Microprocessor based PID control
12	Computer control of systems
13	Control of stepper motor
14	Control system (State Space)
`15	Fuzzy logic and neural network tool boxes

COURSE CODE: ELE5417L

Microprocessors Lab

1. i) To develop a program to add two double byte numbers.
   ii) To develop a subroutine to add two floating point quantities.
2. 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.
3. To write program to evaluate P* Q*+R* & S are 8 bit binary numbers.
4. To write a program to divide a 4 byte number by another 4 byte number.
5. To write a program to divide an 8 bit number by another 8 bit number upto a fractional quotient of 16 bit.
6. Write a program for adding first N natural numbers and store the results in memory location X.
7. Write a program which decrements a hex number stored in register C. The Program should half when the program register reads zero.
8. 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.
9. N hex numbers are stored at consecutive memory locations starting from X. Find the largest number and store it at location Y.
10. 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.
11. To design and interface a circuit to read data from an A/D converter, using the 8255 A in the memory mapped I/O.
12. To design and interface a circuit to convert digital data into analog signal using the 8255 A in the memory mapped I/O.
13. To interface a keyboard with the microprocessor using 8279 chip and transfer the output to the printer.
14. To design a circuit to interface a memory chip with microprocessor with given memory map.

COURSE CODE: ELE5617L

Digital Electronics and Logic Design Lab

1. To do the following:

A.To verify the truth table of following logic gates:

I. AND OR and NOT
II. NAND, NOR, XOR and XNOR

B. Design of Basic NOT, OR, AND, NAND, NOR Gates using DDL, RTL, DTL, TTL, and CMOS integrated circuits.Study of Open Collector, Open Drain and Totem-Pole Logic Family Configurations.

2. To implement XOR and XNOR using universal logic gates.
3.
A. To verify De Morgans law using logic gates.
B. To implement certain Boolean expressions and check their equality.
4. 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.

5. To design a multiplexer/demultiplexer using two input NAND gates

6. To design a 4 bit binary to decimal converter.

7. To design a modulo-10 counter.

8. Given a frequency f obtain the waveforms with frequencies f/2,f/5 & f/10.

9. 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

10. Use PLL as:

a. Frequency multiplier.
b. Frequency demodulator.

6th Semester

COURSE CODE: ELE6117

Power Systems - II

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. Fault Analysis (Balanced Faults: Faults, types of faults, symmetrical 3-phase balanced faults – calculation of fault currents, current limiting reactors. 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.

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.

Surge Performance of Transmission Lines: Travelling 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 travelling waves .Interference of Power Lines with communication Circuit Electrostatic and Electromagnetic effects. High Voltage Direct Current Transmission & FACTS Technology: Comparison of HVAC and HVDC transmission lines. Thyristors (brief revision). Basic converter and D.C system operation – rectification, inversion. Complete direction current link. Objective of FACTS. Basic types of FACTS controllers. Introduction to FACTS Devices.

References

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: ECE6217E

Digital Signal Processing

Introduction: Limitations of analog signal processing, Advantages of digital signal processing and its applications; Some elementary discrete time sequences and systems; Basic elements of digital signal processing such as convolution, correlation and auto correlation, Concepts of stability, causality, linearity, difference equations. **Frequency Domain Representation of Discrete Time Signal and Systems:** Complex exponentials as Eigen functions of LTI systems; Fourier Transform of sequences. Fourier Transform theorems and symmetry properties of Fourier Transform. **Sampling of Continuous Time Signals:** Sampling and aliasing problem, Reconstruction of a continuous time signal from its samples; Discrete Time Processing of Continuous time signals and vice-versa. Decimation & Interpolation; changing the sampling rate by integer and non-integer factors using discrete time processing.

Z-Transform: Z-Transform, Region of convergence; Properties of the Z-transform; convolution theorem; Parseval's relation; Unilateral Z-transform and its application to difference equations with non zero initial condition. **Discrete Fourier Transform:** DFT and its properties; Linear Periodic and Circular convolution; Linear Filtering Methods based on DFT; Filtering of long data sequences; Fast Fourier Transform algorithm using decimation in time and decimation frequency techniques; Linear filtering approaches to computation of DFT.

Design of Digital Filters: Linear Phase FIR filters; Design methods for FIR filters; IIR filter design by Impulse Invariance, Bilinear Transformation, Matched Z-Transformation, Frequency Transformation in the Analog and Digital Domain, Applications of DSP Processing. Architecture of a Real time Signal Processing System, Digital Signal Processor Architecture, comparative study between a General Purpose Processor and Digital Signal Processor, Evolution of Digital Signal Processors, Different types of Digital Signal Processors, Various practical DSP's.

Books:

1. A textbook of DSP Techniques by Steven W. Smith
2. Digital Signal Processing using John. G. Proakis and Dimitry G. Manolakis.
3. Digital Signal Processors, B. Venkataramani & M. Bhaskar, Tata McGrawHill

COURSE CODE: ELE6317

Power Electronics

Introduction of Power Electronics, Power Semi-conductor Devices: Power Diodes, power Transistors, power MOSFETs, IGBTs, GTOs, Thyristors, Basic theory of operation, characteristics, Ratings, Protection and cooling, Recent Advances in Power Semi-conductor Devices. Driving and control circuits: series and parallel operation of devices, commutation of power switching devices.

Power Electronic converters: 1-phase / 3 phase phase-controlled converters (Semi-converters, full–converters and Dual converters). Analysis and performance with passive load, Harmonics and power factor, PWM Rectifiers. D.C-to-D.C converters (choppers) :Buck, Boost and Buck-Boost type and various chopper configurations.

A.C voltage controllers. D.C –to-A.C converters (Inverters): 1-phase / 3-phase, VSI, PWM VSI, CSI, Frequency and voltage control, Line-commutated inverters (LCIs). Cyclo-converters (1-phase and 3-phase).Power quality issues and present status of improved power quality converters (IPQCs). Some typical applications of power Electronics.

References

1.	Power Electronics: Circuits, Devices and Applications	M. H. Rashid	Pearson education india
2.	Power Electronics	C.W Lander.	McGraw-Hill
3.	Power semi-conductor controlled Drives	G.K.Dubey	Prentice Hall
4.	Thyristorized Power controllers	G.K. Dubey, Doradla, Joshi and Sinha	New age international publishers
5.	Power Electronics and Variable Frequency Drives	B.K Bose	IEEE press
6.	Modern power Electronics	B.K Bose	IEEE press
7.	Power Electronic control of AC Motor	Murphy and Turnbull	Pergamon press

COURSE CODE: ELE6417

Design of Electric Machines

Principles of Electrical Machine Design: Considerations in design, design factors, limitations in design, modern trends in design. **Magnetic Circuit Calculations:** Magnetization curves, Magnetic leakage, calculation of mmf for air gap and teeth, effect of saliency. **Armature Winding Design:** Winding design, Integrated approach for windings, A.C armature windings, production of emf in windings, Mmf distribution of armature windings, eddy current losses in conductors.

Design of D.C Machines: Output equation, Main dimensions, Armature design, Armature windings, Design of commutator and brushes, Design of Field systems, Design of interpoles. **Design of single-phase and three-phase Transformers:** Output equation, core design, winding design, yoke design, Design of transformer tank with tubes, design of insulation.

Design of Induction Motors (1-phase and 3-phase): Output equation, main dimensions, Stator winding, stator conductors, shape of stator slots, number of stator slots, stator core, rotor design (squirrel cage and wound rotor). **Design of Synchronous Machines:** Main dimensions, length of air gap, stator.

References:

1	Electric Machine Design	A.K. Sawhney	Dhanpat rai and sons
2	Design of Electrical Machines	Mittle and Mittal	Standard publishers and distributers
3	Electrical machine Design	R.K. Agarwal	S.S.Kataria and sons

COURSE CODE: ELE6517E

Hydraulics
and
Hydraulic Machines

INTRODUCTION: PHYSICAL Properties of Fluids. Fluid Statics: Pressure Intensity, Pascal's law, pressure density height relationships, manometers, pressure on plain and curved surfaces, centre of pressure. Kinematics of Fluid Flow: Types of flows, stream lines, streak lines and oath lines, continuity equation.

Dynamics of fluid Flow:Euler's equation of motion along a stream line and its integration to yield Bernouli's equation flow measurement, pitot tube, prandtl tube, Venturimeter, orifice meter, orifices, Weirs and Matchces.Flow through Pipes: Hydraulic grade line, Darcey-weisbachh formulla, Design of pipes, Equivallent diameter of pipes, Transmission of power through pipes.Flow in open Channels:Chezy's formula, Mannings formula. Design of Cannels, Economic seciton.

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. Layout of power House:General layout and arrangement of Hydropower units.

References:

1	Fluid Mechanics & Fluid Power Engineering	Dr D.S.Kumar	S.K.Kataria & ons
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: ELE6617

Communication Systems

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 Modulation: AM, DSB/SC, SSB, VSB, Angle modulation, NBFM, WBFM, Diode detector, Frequency discriminator, AM & FM, Transmitter.

Demodulation:AM and FM signals, Radio Receivers – AM & FM, (Block diagram) Noise Analysis:Performance of AM & FM Systems, in presence of noise Threshold in AM & FM Demodulations, Pre- emphasis, and De-emphasis, in FM Systems

Digital Communication: Sampling, Quantization, Quantization noise, Coding, Pulse code Modulation; Differential PCM, ADPCM, Relative advantages and dis-advantages. Delta modulation. PWM & PPM. Digital Modulation Techniques: ESK, FSK, PSK, M-FSK, DPSK, GPSK schemes.

References:

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: ELE6717

Seminar

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 6th semester of their course individually. Each student will have to select a topic of study duly approved by the respective guide/incharge.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:ELE6117L

Power Systems Analysis Lab

1 Per unit representation of a power system.

2 Measurement of positive, negative and zero sequence impedance and currents.

3 Measurement of earth resistance.

4 Measurement of insulation resistance of insulators

5 Transmission line fault analysis

6 Application of software packages in power systems.

COURSE CODE: ELE6317L

Power Electronics Lab

1 To obtain the V-I static characteristics of an SCR, Triac and Diac,.

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 the light operated SCR Alarm circuit.

7 To study half wave gate controlled rectifier using one SCR.

8 To study single phase half controlled,full wave rectifier.

9 To study various techniques of forced commutation of an SCR.

10 To study the DC circuit breaker action of an SCR.

11 To study the speed control of a DC shunt motor using single phase bridge converter.

`12 To study the speed control of a single phase induction motor using single phase voltage controller.

COURSE CODE: ELE6817L

Computer Aided Design
Of
Electric Machines Lab

1 Design of Single-phase Transformers.

2 Design of Three-phase Transformers.

3 Design of Autotransformers.

4 Design of Direct current Machines.

5 Design of Induction Machines.

6 Design of Synchronous Machines.

COURSE CODE: ELE6217L

DSP/Communication Lab

DSP Lab:

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.

Communication Lab:

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:

a. A.M. System.
b. F.M. System.

7th Semester

COURSE CODE: ELE7117

Power System Protection

PROTECTIVE RELAYING: Function of protective relaying, fundamental principles, primary and backup relaying, functional characteristics. **CLASSIFICATION OF RELAYS:** Operating principles and characteristics of the following electromechanical relays: Current, voltage, directional, current balance, voltage balance, differential relays, and distance relays. **PROTECTION OF GENERATORS:** Short-circuit protection of stator windings, protection against turn-to-turn fault, stator ground-fault protection, stator open circuit protection, Overheating protection, Over voltage protection, Loss of excitation protection, rotor overheating protection, Protection against vibration, protection against motoring over speed protection, etc.

TRANSFORMER PROTECTION: Short circuit protection, over current and earth-fault protection differential protection. Use of biased relay for differential protection, self balance system protection, differential magnetic balance protection, Buchholz relay, protection of parallel transformer banks, etc. **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.

DIGITAL PROTECTION: Introduction, Review of DSP techniques, sampling, aliasing, DFT & FFT. Numerical algorithms. Simulations of transients and electromagnetic transient programme (EMTP). **FUSES:** Fusing element, classification of fuses, current carrying capacity of fuses, high rupturing capacity (H.R.C.) cartridge fuses, characteristics of H.R.C. fuses, selection of HRC fuses. **CIRCUIT BREAKERS:** Types of circuit breakers , basic principle of operation, phenomena of arc, initiation of a arc, maintenance of arc, 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 choppings, ratings of circuit breakers, oil circuit breakers, air blast circuit breakers, SF6 Circuit breakers , Vacuum breakers.

References:

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

COURSE CODE: ELE7217

Advanced Power Electronics

Over view of semiconductor devices: principle of operation and characteristics of modern power semiconducting devices like POWER MOSFET, IGBT, GTO, BJT.

Introduction to SMPS, basic schematic diagram and requirements of SMPS **DC-DC Converters**: non isolated dc-dc converters like buck converter, Boost converter, buck- boost converter and Cuk Converter in CCM and DCM, isolated dc-dc converters like Fly back Converter, forward, push-pull, half-bridge, and full bridge dc-dc converters in CCM and DCM.

Chopper control of dc motors. Offline and online UPS system. Introduction to improved power quality AC/DC converters.

References

1. POWER ELECTRONICS- CIRCUITS, DEVICES AND APPLICATIONS by RASHID M.,PEARSON EDUCATION, 3rd Edition, (2008)
2. THYRISTORISED POWER CONTROLLERS by DUBEY G. K., DORADLA S. R., JOSHIAND SINHA R. M. K.,, NEW AGE INTERNATIONAL LTD., 4th Edition, (2008)
3. POWER ELECTRONICS – CONVERTERS, APPLICATIONS AND DESIGN by MOHAN N., UNDERLAND T.M. AND ROBBINS W.P.,, WILEY, 3rd Edition, (2008)
4. POWER ELECTRONICS AND VARIABLE FREQUENCY DRIVES – TECHNOLOGY AND APPLICATIONS by BOSE B.K., STANDARD PUBLISHERS, 1st Edition, (2001)
5. POWER ELECTRONICS by LANDER C. W., M. G.HILLS, 3rd Edition, (2007)
6. POWER ELECTRONICS BY P. S BIMBHRA, KHANA PUBLICATION.

COURSE CODE: ELE7317

Electronic Measurements & Instrumentation

INSTRUMENTATION SYSTEM: Classification of instrumentation errors. Basic features of instrumentation system. Dynamic response and accuracy of an instrumentation system. **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

INSTRUMENTATION AMPLIFIERS WAVE ANALYSERS: Analyzers for Audio and radio frequency waves,. Measurement of distortion. Spectrum analysis. **PHASE AND FREQUENCY MEASUREMENT:** Analog and Digital Measurement of frequency and time.

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 acquision system. Using DAC, ADC and Multiplexing **Microprocessor based Measurement techniques.**

References

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: ELE7417

Power Station Practice

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, economics of power factor improvement. **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.

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. **Overview of different types of power stations and their auxiliaries:** Thermal power plants, hydroelectric stations, nuclear power stations, diesel power stations, gas turbine plants. **Overview of substations and substation equipment: Illumination:** Principle of production of light, sources of light, filament lumps, halogen lamps, discharge lamps, sodium discharge lamps, mercury discharge lamp, dual lamp, flourscent lamps, planned maintenance of lighting installations, arc lamps, laws of illumination, various lamp fittings, design of lighting systems, street lighting, recent trends in lighting systems.

Electric Heating: Advantages, various heating methods (resistance and dielectric heating) **Electric Traction:** Traction systems, choice of traction systems, tram ways, trolley bus, systems of track electrification, D.C system, single phase low frequency A.C system, three phase A.C system, composite system, traction mechanics, types of services, speed-time curves, tractive effort, power of traction motor, specific energy consumption, mechanics of train movement, power supply arrangements, overhead equipment, current collection systems, selection of traction motors. Construction, Testing and Commissioning of Overhead Distribution lines.

References

1	Elements of Power Station	Deshpande
2	The Art and Science of Utilisation of Electric Energy	H. Pratab
3	Substation Design and Equipment	Satnam
4	A Course in Electrical Power	Soni, Gupta and Batnagar

COURSE CODE: ELE7517

INDUSTRIAL TRAINING AND VIVA

Practical /Industrial Training/Internship:

The students have to undergo a minimum four week practical training/internship/industrial training at 5^{th} semester or 7^{th} semester level at 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 fulfillment for the award of the degree of Bachelors of Technology in their respective branches of study.

COURSE CODE: ELE7617

Pre Project

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 the workable prototype regarding the project and the same will be evaluated for final award of the course.The preproject can be a full fledged project or a part of major project.

COURSE CODE: ELE7117L

Power System Protection Lab

1 Study of various types of relays.

2 Characteristics of fuses of different relays.

3 Characteristics of inverse time over current relays

4 Time graded protection using inverse time O/C relay

5 Visit to an Electric Sub-station to study various protective schemes.

6 Study of circuit breakers.

7 Study of differential protection scheme.

8 Study of an oil circuit breaker.

9 Operating quantity versus polarizing quantity characteristic of a directional attracted Armature relay.

10 Experiment on Digital Protection

COURSE CODE: ELE7317L

Electronic Measurements and Instrumentation Lab

1. Find Q of an LC Circuit.
2. To study use of 741 as an instrumentation Amplifier.
3. Study of ADC 0801.
4. Study of DAC 0808.
5. Experiments on study and use of transducers for common electrical and non-electrical quantities.
6. Experiments on wave form analysis for audio and radio range of signals.

8th Semester

COURSE CODE: ELE8117

Power Systems-III

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-Ralphson 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.

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. **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.

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. **Economic Operation of Power System:** Introduction, system constraints, economic dispatch neglecting losses, penalty factor, economic dispatch with losses, transmission loss equation, automatic load dispatching.

References

1	Power System Analysis	J.J. Grainger & W.D Stevenson	Tata McGraw-Hill
2	Electrical Power Systems	B.M. Weedy and Cory	John Wiley & sons.
3	Power Systems Engg.	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: HUM8217

General Management & Economics

Industrial Economics: Meaning & Importance of Industrialization. Organizations – Various types of organizations. Division of Economics, Basic Constituents (Micro and Macro Economics). Consumption and Market Structure: Law of demand 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.

Management: Introduction of Management: It's Nature, purpose and definitions. Process and functions of Management - Planning, Organizing, Actuating and Controlling, Functional Areas of management, Skills and role of Management. 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. 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. 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. Delegation of Authority: Meaning of Authority/delegation steps in the process of delegation, Factors determining the degree of delegation. Art of delegation.

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. 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. 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.

References

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
8.	Economics	Samuelson & William	McGraw-Hil
9.	Advanced Economics	K.P.M. Sundram	S. Chand
10.	Indian Economics	K.K.Dewett and J.D. Verma	S. Chand & Company
11.	Engineering Economics	Mansoor Ali & S. K.. Delala	-

COURSE CODE: ELE8317

Advanced Micro-controllers

Embedded systems and processors: Introduction to embedded systems, components of an embedded system, types of embedded system, levels of embedded system, Embedded System applications, Embedded system design considerations, Embedded Processors: Microprocessors, Microcontrollers, DSP and ASICs, Comparative Assessment of Embedded Processors. Embedded memory devices and Embedded I/O. Embedded high and low level programming. **Microcontrollers**: Microcontrollers for embedded systems, classes of microcontrollers, types of microcontrollers, introduction to microcontroller platforms: ARM,ATMEL/ AVR, PIC, ARDUINO, Raspberry and 8051. Choosing a Microcontroller for an embedded application.

8051 Architecture: 8051 Microcontroller hardware, internal Architecture, input/output pin and port architecture, bare minimum system with external circuits, other members of 8051. **Instructions and Programming :** Addressing modes :accessing memory using various addressing mode, Jump, Loop and call instructions,time delay generation and calculation, Single bit instructions and programming,I/O port programming: I/O programming, bit manipulation.

8051 Timers,Counters, Serial Communication , Interrupts and their Programming : Timer and counter architecture in 8051,programming 8051 timers, counter programming, pulse frequency and pulse width measurements. Serial communication in 8051: Basics of serial communication, 8051 connection toRS232, 8051 serial communication programming. Interrupts programming: Interrupts of 8051,programming timer interrupts, programming external hardware interrupts, and programming serial communication interrupts. **Application of 8051 Microcontroller :**Interfacing memory with 8051,Programmable peripheral interface (PPI)-8255, programming 8255, 8255 interfacing with 8051. Interfacing Key board. Interfacing LED/ LCD, Interfacing A/D & D/A converters, Interfacing DC motor,Relay,solenoid,steppermotor,servomotor.

Books:

1. The 8051 Microcontrollers and Embedded Systems : Muhammed Ali Mazidi
2. The 8051 Microcontrollers Architecture, Programming & Applications Kenneth J. Ayala
3. Design with PIC Microcontroller: John Petman

COURSE CODE: ELE8417
MAJOR PROJECT

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 fulfillment for the award of the degree of bachelors of Technology in their respective branches of study.

COURSE CODE:ELE8317L

Advanced Micro-controllers Lab

1. Generate a specified time delay using Embedded ‘C’.
2. Interface a ADC and a temperature sensor to measure temperature
3. Interface a DAC & Generate a stair case wave form – with step duration and no. of steps as variables
4. Flash a LED connected at a specified output port terminal
5. Interface a stepper motor – and rotate it clock wise or anti clock wise through given angle steps
6. Using Keil software write a program to pick the smallest among a given set of numbers
7. Using Keil software write a program to pick the largest among a given set of numbers
8. Using Keil software write a program to arrange a given set of numbers in ascending order
9. Using Keil software write a program to arrange a given set of numbers in descending order
10. Using Keil software write a program to generate a rectangular wave form at a specified port terminal

COURSE CODE: ELE-X*17E

OPEN ELECTIVES

ELE E1 :ADVANCED POWER SYSTEM CONTROL

Basic concepts : Classification of security states, Factors affecting power system security, Security control: corrective, preventive, emergency, restorative control, Single contingency analysis using line outage distribution factors and generation shift factors for linearised AC and DC model, Fast contingency analysis algorithm for non linear AC model, Contingency ranking, Security indices, System under severe upsets and islanding.

Primary and secondary voltage control : Automatic voltage control, Modeling of AVR loop, Static and dynamic analysis, Stability compensation, System level voltage control using OLTC, Reactive power injection, Secondary control using ANN.
SCADA system : Data acquisition, Block diagram of data acquisition system, Data transmission and acquisition system, Data transmission and telemetry, Functions of SCADA.

Automatic generation control : Plant and system level control, ALFC of single area system, Modeling, Static and transient response, ALFC of multi area system modeling, Static and transient response of two area system, Development of state variable model of two area system, Digital load frequency controller, Decentralized control

References:
1. POWER GENERATION, OPERATION AND CONTROL by ALLEN J WOOD AND BRUCE WOLLENBERG, WILEY, 1st Edition,
2. POWER SYSTEM OPERATION AND CONTROL by S. SIVANGARAJU AND G. SREENIVASAN, PEARSON, 1st Edition,

ELE E2 :HIGH VOLTAGE ENGINEERING

High Voltage DC generation : Half and Full Wave Rectifier Circuits, Voltage doubler circuit, Cockcroft-Walson Voltage Multiplier Circuit, Deltron Circuit for Vary High Voltage, Electrostatic Machine, Ved De Graaf Generator, Regulation of DC Voltage
DC Power Transmission Technology : Introduction to DC Transmission Technology, Comparison of AC and DC Transmission Technology, Application of DC Transmission, Classification of DC Transmission System, Planning of HVDC Transmission, Modern Trends in DC Transmission System, DC Circuit Breakers and Cables, Comparison of Line Commutated Converters Link

Analysis of HVDC Converters and system Control : Choice of converter configuration, Simplified analysis of Graetz Circuits, Converter bridge characteristics, Characteristics of twelve pulse converter, General Principles of DC link control, Converter control characteristics, Firing Angle Control, Generation of Harmonics and Filtering, Higher level converters and power control

Multiterminal DC system and Harmonics : Potential applications of MTDC, Types of MTDC system, Control and Protection of MTDC system, Parallel operation of AC and DC transmission, Harmonics on AC and DC side, Filters for Harmonics Eliminations Power Flow Analysis in AC/DC Systems : Per Unit Quantities of DC Quantities, Modeling of DC link, Solution of DC Load Flow, Solution of AC-DC Power Flow, Contingency Analysis, Probabilistic load flow

References:
1. HVDC POWER TRANSMISSION SYSTEM by K.R. PADIYAR, NEW AGEINTERNATIONAL, 3rd Edition, (2015)
2. POWER TRANSMISSION BY DIRECT CURRENT by ERICH UHLMANN, BPBPUBLICATIONS , 1st Edition, (2004)
3. POWER SYSTEM STABILITY AND CONTROL by PRABHA KUNDUR, MCGRAW HILLEDUCATION, 1st Edition, (2006)

ELEE3 :FLEXIBLE AC TRANSMISSION SYSTEM

FACTS concept and general system considerations : Transmission interconnections, Flow of power in an AC system, What limits the loading capability?, Power flow and dynamic stability considerations of a transmission interconnection, Relative importance of controllable parameter, Basic types of FACTS controllers, Brief description and definitions of FACTS controllers, Possible benefits from FACTS technology

Static shunt compensators : Objectives of shunt compensation, Methods of controllableVar generation, Static Var compensators, Comparison between STATCOM and SVC, Static Var systems

Static series compensators : Objectives of series compensation, Variable impedance type series compensators, Switching converter type series compensators Static voltage and phase angle regulators : Objectives of voltage and phase angle regulators, Approaches to Thyristor-controlled voltage regulators (TCVRs), Approaches to Thyristor-controlled phase angle regulators (TCPARs), Switching converter-based voltage and phase angle regulators, Hybrid phase angle regulators

Combined compensators : Introduction, The unified power flow controller (UPFC), The interline power flow controller (IPFC)

Special purpose facts controllers : Subsynchronous resonance, NGH-SSR damping scheme, Thyristor-controlled braking resistor (TCBR), Fault current limiter (FCL), Thyristor controlled voltage limiter (TCVL)

References:

1. UNDERSTANDING FACTS: CONCEPTS AND TECHNOLOGY OF FLEXIBLE AC TRANSMISSION SYSTEMS by NARAIN G. HINGORANI, LASZLO GYUGYI, WILEY, 1st Edition,

2. FACTS CONTROLLERS IN POWER TRANSMISSION AND DISTRIBUTION by K. R. PADIYAR, NEW AGE INTERNATIONAL LTD,INDIA, 1st Edition

ELEE4 :ELECTRIC DRIVES

INTRODUCTION : Classification of Electric drive, Components of Electric Drives, Advantages of Electric driven, Review of characteristics and speed control of d.c. and a.c. motors**DYNAMICS OF ELECTRIC DRIVES** : Fundamental torque equation, Speed-torqueconventions and multi-quadrant operation, Equivalent values of drive parameters, Components of load torques, Nature and Classification of load torques, Calculation of time and energy-loss in transient operations, Criteria for steady state stability, Load equalization, Thermal model of motor for heating and cooling, Classes of motor duty, Determination of motor rating, Frequency of operation of motors subjected to intermittent loads

RECTIFIER CONTROL OF DC DRIVES : Controlled rectifier circuits, 1-phase fully controlled rectifier-fed separately excited d.c. motor, 1-phase half-controlled rectifierfed separately excited d.c. motor, 3-phase fully controlled rectifier-fed separately excitedd.c. motor, Multi-quadrant operation of fully-controlled rectifier-fed d.c. motor **CHOPPER CONTROL OF DC DRIVES** : Principle of operation and control techniques, Motoring operation of separately excited and series excited motors, Multi quadrant control of chopper-fed motors

INDUCTION AND SYNCHRONOUS MOTOR DRIVES : 3-phase a.c. voltage controller-fed IM drive, Voltage Source Inverter (VSI) and Current Source Inverter (CSI) variable frequency drives of Induction and Synchronous Machines, Comparison of VSI and CSI drives, Cyclo-converter-fed IM drive, Static rotor resistance control of 3-phase slip ring IM **BRAKING METHODS :** Various methods of braking d.c. and a.c. motors,Regenerative braking of d.c. motors during chopper control, Static scherbius drive, Commutatorless Kramer drive, Introduction to Microprocessor Control of Electric Drives

References:

1. FUNDAMENTALS OF ELECTRICAL DRIVES by G K DUBEY, NAROSA, 2nd Edition, (2012)
2. A FIRST COURSE ON ELECTRICAL DRIVES by SK PILLAI, NEW AGE INTERNATIONAL LTD., 2nd Edition, (1989)