ELECTRICAL & ELECTRONICS ENGINEERING YEAR: II SEMISTER: III

Sl. No.	Course No.	Subject	Periods			Evaluation Scheme					Credit
Theory			L	T	P	SESSIONAL EXAM				SUB TOTAL	
						TA	CT	TOT	ESE		
1	CS1312	NUMERICAL ANALYSIS & COMPUTER PROGRAMMING(C,C++)	2	1	-	15	10	25	50	75	3
2	ME1312	MATERIAL SCIENCE	2	1	-	15	10	25	50	75	3
3	ME1303	STRENGTH OF MATERIALS	3	1	-	30	20	50	100	150	4
4	ME1313	FLUID MECHANICS & FLUID MACHINERY	3	1	-	30	20	50	100	150	4
5	ME1305	MATHEMATICS III	3	1	-	30	20	50	100	150	4
6	MH1306	ELECTRICAL MEASUREMENTS & INSTRUMENTATION	3	1	-	30	20	50	100	150	4
PRACTICAL/DRAWING/DESIGN											
7	CS1302-P	NUMERICAL ANALYSIS & COMPUTER PROGRAMMING(C,C++)LAB	-	-	3	25	-	25	25	50	2
8	ME1307-P ME1308-P	MATERIAL SCIENCE/ STRENGTH OF MATERIALS LAB	-	-	3	25	-	25	25	50	2
9	ME1309-P	FLUID MECHANICS LAB	-	-	3	25	-	25	25	50	2
10	ME1310P	ELECTRICAL MEASUREMENTS & INSTRUMENTATION LAB	-	-	3	25	-	25	25	50	2
11	HS1303-P	GENERAL PROFICIENCY III	-	-	-	-	-	50	-	50	2
		TOTAL	16	6	12	-	-	-	-	1000	32

TA-TEACHERS ASSESSMENT CT-CLASS TEST ESE- END SEMESTER EXAMINATION

TOTAL MARKS: 1000 TOTAL PERIODS : 34 TOTAL CREDITS : 32

ELECTRICAL & ELECTRONICS ENGINEERING YEAR: II SEMISTER: IV

Sl. No.	Course No.	Subject	Periods			Evaluation Scheme					Credit
Theory			L	T	P	SESSIONAL EXAM				SUB TOTAL	
						TA	CT	TOT	ESE		
1	ME1411	SOLID STATE DEVICES	2	1	-	15	10	25	50	75	3
2	ME1412	CIRCUIT THEORY	2	1	-	15	10	25	50	75	3
3	ME1413	ELECTROMAGNETIC THEORY	3	1	-	30	20	50	100	150	4
4	ME1414	ELECTRICAL MACHINES I	3	1	-	30	20	50	100	150	4
5	ME1415	DIGITAL ELECTRONICS	3	1	-	30	20	50	100	150	4
6	EE1416	POWER SYSTEM I	3	1	-	30	20	50	100	150	4
PRACTICAL/DRAWING/DESIGN											
7	ME1406-P	SOLID STATE DEVICES LAB	-	-	3	25	-	25	25	50	2
8	ME1407-P	CIRCUIT THEORY LAB	-	-	3	25	-	25	25	50	2
9	ME1408-P	ELECTRICAL MACHINES LAB I	-	-	3	25	-	25	25	50	2
10	EE143-P	DIGITAL ELECTRONICS LAB	-	-	3	25	-	25	25	50	2
11	HS1404-P	GENERAL PROFICIENCY IV	-	-	-	-	-	50	-	50	2
		TOTAL	16	6	12	-	-	-	-	1000	32

TA-TEACHERS ASSESSMENT CT-CLASS TEST ESE- END SEMESTER EXAMINATION

TOTAL MARKS: 1000 TOTAL PERIODS: 34 TOTAL CREDITS: 32

ELECTRICAL & ELECTRONICS ENGINEERING YEAR: III SEMISTER: V

Sl. No.	Course No.	Subject	Periods			Evaluation Scheme					Credit
Theory			L	T	P	SESSIONAL EXAM				SUB TOTAL	
						TA	CT	TOT	ESE		
1	HS1511	MANAGEMENT SCIENCE	2	1	-	15	10	25	50	75	
2	EE1512	ANALOG ELECTRONICS	2	1	-	15	10	25	50	75	
3	EE1513	CONTROL ENGINEERING	3	1	-	30	20	50	100	150	
4	EE1514	ELECTRICAL MACHINES II	3	1	-	30	20	50	100	150	
5	EE1515	POWER SYSTEMS II	3	1	-	30	20	50	100	150	
6	EE1516	DIGITAL ELECTRONICS & LOGIC DESIGN	3	1	-	30	20	50	100	150	
PRACTICAL/DRAWING/DESIGN											
7	EE1517-P	ANALOG ELECTRONICS LAB	-	-	3	25	-	25	25	50	
8	EE1518-P	ELECTRICAL MACHINES II LAB	-	-	3	25	-	25	25	50	
9	EE1519-P	POWER SYSTEMS II LAB	-	-	3	25	-	25	25	50	
10	EE1520-P	DIGITAL & LOGIC DESIGN LAB	-	-	3	25	-	25	25	50	
11	HS1521-P	GENERAL PROFICIENCY V	-	-	-	-	-	50	-	50	
		TOTAL	16	6	12	-	-	-	-	1000	

TA-TEACHERS ASSESSMENT CT-CLASS TEST ESE- END SEMESTER EXAMINATION

TOTAL MARKS: 1000 TOTAL PERIODS: 34 TOTAL CREDITS: 32

ELECTRICAL & ELECTRONICS ENGINEERING YEAR: III SEMISTER: V

Sl. No.	Course No.	Subject	Periods			Evaluation Scheme					Credit
Theory			L	T	P	SESSIONAL EXAM				SUB TOTAL	
						TA	CT	TOT	ESE		
1	EC1611	SIGNALS & SYSTEMS	2	1	-	15	10	25	50	75	
2	EE1612	MICROPROCESSORS & MICROCONTROLLERS	2	1	-	15	10	25	50	75	
3	EE1613	COMMUNICATION ENGINEERING	3	1	-	30	20	50	100	150	
4	EE1614	POWER ELECTRONICS	3	1	-	30	20	50	100	150	
5	EE1615	POWER SYSTEM STABILITY	3	1	-	30	20	50	100	150	
6	EE1616	DESIGN OF CONTROL SYSTEM	3	1	-	30	20	50	100	150	
PRACTICAL/DRAWING/DESIGN											
7	EE1617-P	POWER ELECTRONICS LAB	-	-	3	25	-	25	25	50	
8	EE1618-P	MICROPROCESSORS & MICROCONTROLLERS LAB	-	-	3	25	-	25	25	50	
9	EE1619-P	POWER SYSTEM STABILITY LAB	-	-	3	25	-	25	25	50	
10	EE1620-P	CONTROL SYSTEMS	-	-	3	25	-	25	25	50	
11	ES1621-P	GENERAL PROFICIENCY VI	-	-	-	-	-	50	-	50	
		TOTAL	16	6	12	-	-	-	-	1000	

TA-TEACHERS ASSESSMENT CT-CLASS TEST ESE- END SEMESTER EXAMINATION

TOTAL MARKS: 1000 TOTAL PERIODS: 34 TOTAL CREDITS: 32

ELECTRICAL & ELECTRONICS ENGINEERING YEAR: IV SEMISTER: VI

Sl.No	Course No.	Subject	Periods			Evaluation Scheme					Credit
THEORY			L	T	P	SESSIONAL EXAM				SUB TOTAL	
						TA	CT	TOT	ESE		
1	HS1701	COMPUTER AIDED POWER SYSTEM	3	1	-	15	10	25	50	75	4
2	ME1702	NETWORK SYNTHESYS	3	1	-	15	10	25	50	75	4
3	ME1703	POWER SYSTEM PROTECTION & SWITCHGEAR	3	1	-	30	20	50	100	150	4
4		OPEN ELECTIVE I	3	1	-	30	20	50	100	150	4
5		PROFESSIONAL ELECTIVE I	3	1	-	30	20	50	100	150	4
PRACTICAL/DRAWING/DESIGN											
7	ME1704-P	COLLOQUIUM	-	-	3	30	20	50	100	150	2
8	ME1705-P	COMPUTER AIDED POWER SYSTEM LAB	-	-	3	25	-	25	25	50	2
9	ME1706-P	SWITCHGEAR & PROTECTION SYSTEM	-	-	3	25	-	25	25	50	2
10	ME1707-P	PROJECT I	-	-	3	25	-	25	25	50	2
11	HS1707-P	GENERAL PROFICIENCY VII	-	-	-	-	-	50	-	50	2
		TOTAL	15	5	12	-	-	-	-	1000	30

TA-TEACHERS ASSESSMENT CT-CLASS TEST ESE- END SEMESTER EXAMINATION
TOTAL MARKS: 1000 TOTAL PERIODS: 34 TOTAL CREDITS: 32

	Sl.No.	Code	PAPER
OPEN ELECTIVE I	01	HS2721	Enterprise Resource Management
	02	CS2721	E-Commerce Strategic IT
	03	HS2722	Technology Management.
	04	HS2723	Decision Support and Executive Information system.
	05	CS2722	Software Technology
	06	HS2724	Knowledge Management
PROFESSIONAL ELECTIVE II	01	HS2725	Non conventional Energy Source
	02	EE2721	High Voltage Engineering
	03	EE2722	Special Electrical Machines
	04	EE2723	HVDC Transmission
	05	EC2721	Microprocessor based System Design
	06	EC2722	Advance Topic in Microprocessor & Microcontroller
	07	EE2724	Computer Aided Design Of Electrical Machine

ELECTRICAL & ELECTRONICS ENGINEERING YEAR : IV SEMISTER : VIII

Sl. No.	Course No.	Subject	Periods			Evaluation Scheme					Credit
THEORY			L	T	P	SESSIONAL EXAM				SUB TOTAL	
						TA	CT	TOT	ESE		
1	EE1811	OPEN ELECTIVE	3	1	-	30	20	50	100	150	4
2	EE1812	PROFESSIONAL ELECTIVE II	3	1	-	30	20	50	100	150	4
3	EE1813	PROFESSIONAL ELECTIVE III	3	1	-	30	20	50	100	150	4
4	EE1814	HIGH VOLTAGE ENGINEERING	3	1	-	30	20	50	100	150	4
5	EE1815	DIGITAL SIGNAL PROCESSING	3	1	-	30	20	50	100	150	4
PRACTICAL/DRAWING/DESIGN											
6	ME1803-P	PROJECT II	-	-	12	100	-	100	100	200	6
7	ME1808-P	GENERAL PROFICIENCY VIII	-	-	-	-	-	50	-	50	2
		TOTAL	15	5	12	-	-	-	-	1000	28

TA-TEACHERS ASSESSMENT CT-CLASS TEST ESE- END SEMESTER EXAMINATION
TOTAL MARKS: 1000 TOTAL PERIODS: 32 TOTAL CREDITS: 28
Total Credit of All the Four Years

	Sl.No.	Code	Paper
OPEN ELECTIVE I	1	CS2821	IT in Marketing Management
	2	CS2822	IT in HR Management
	3	CS2823	IT in Finance Management
	4	CS2824	project Management & Software Tools
	5	HS2821	Human Values
	6	HS2822	Science Technology and Society
PROFESSIONAL ELECTIVE II	1	EC2821	Data Communication And Design
	2	EC2822	Microprocessor based System Design
	3	EC2823	Advance Topic in Microprocessor & Microcontroller
	4	CS2825	Personnel Computer Systems
	5	EC2825	Biomedical Instrumentation
	6	EE2821	Power Electronics
PROFESSIONAL ELECTIVE III	1	CS2826	System Software
	2	CS2827	Computer Graphics
	3	EC2825	Modeling And Simulation
	4	EC2826	Television Engineering
	5	EC2827	VLSI Design
	6	EE2822	Neural Network & Fuzzy System
	7	CS2828	Computer Network

Syllabus of B. Tech. in Mechanical Engineering

Semester III

EE 1301 ELECTRICAL MEASUREMENTS & INSTRUMENTATION

(3-1-0)

Electrical Measurements: Characteristics of Measuring Instruments, Accuracy and Precision, Significant figures; Standards of Measurement & Errors, Type of errors — Gross errors, Systematic errors and random errors; Probability of errors — normal distribution of errors; limiting errors; Review of indicating and integrating instruments: Voltmeter, Ammeter, Wattmeter, Multi-meter and Energy meter.

Measurement of resistance: Measurement of low resistance — Kelvon Double Bridge; Measurement of medium resistance — Wheatstone bridge method; Measurement of high resistances - Megger, Insulation resistance measurement;

Magnetic measurements: Measurement of magnetic flux, magnetic measurements using Hall Effect Measurement of self-inductance, mutual inductance; Measurement of capacitance,

Measurement of voltage: Potentiometers — Principle of the potentiometer, study of unbalanced conditions, potentiometer use for the measurement of resistance, current and voltage, AC potentiometers; AC Bridge method — AC bridges under unbalanced conditions; Current measurement; AC bridges for Inductance and Capacitance measurement.

Instruments: Moving Coil and Moving Iron meters, Dynamometer and Induction instruments — wattmeter and energy meter, Electronic voltmeter, multi-meter, Instrument Transformers: Current and Voltage transformers; Frequency, Phase and Power Factor meters, Electronic multi-meters, Digital voltmeters, Analog and Digital Oscilloscopes, Time, frequency and phase-angle measurements using CRO, Spectrum & wave analyzer; Storage Oscilloscope; Signal and Function generators, Digital Counters

Instrumentation: Transducers — Classification & selection of transducers, Strain Gauges, Inductive & Capacitive transducers, Piezo-electric and Hall-effect transducers, Thermisters, Thermocouples; Photo-diodes & Photo-transistors, Encoder type Digital transducers, Signal-

-conditioning and telemetry; Basic concepts of smart sensors and application; Data Acquisition Systems.

Suggested Text Books & **References:**

- Helfrick and Cooper, "Modern Electronic Instrumentation and Measurement Techniques", Prentice-Hall of India, Reprint 1988.
- Jones, G. E., "Instrumentation Measurement and Feedback", Tata McGraw-Hill, 1986.
- Golding, E. W., "Electrical measurement and Measuring Instruments", 3rd Edition, Sir Issac Pitman and Sons, 1960.
- Buckingham, H. and Price, "Principles of Electrical Measurement," 1961.

MH1301 **MATHEMATICS- III** **(3-1-0)**

Introduction to Partial Differential Equations

Classification of second order linear partial differential equations, solution by separation of variable of heat conduction and wave equations, Laplace equations.

Numerical Methods

Errors in computation. Nonlinear equation f(x) = 0 in one variable: Regula Falsi; secant and Newton-Raphson methods. Convergence of these methods. Linear algebraic system of equation Gauss elimination method, decomposition method; Jacobi and Gauss-Seidal iterative methods, convergence of these methods, ill conditioned systems.

Interpolation

Lagrange, divided difference, equispaced Newton forward and backward difference formulas.

Approximation

Least Squares, differentiation using interpolation formulas.

Integration

Trapezoidal and Simpson rules, Gauss Quadrature rules.

Ordinary differential equations

Taylor, Euler and Runge-Kutta second order and classical fourth order formulas.

Partial differential equations

Finite difference schemes for one-dimensional heai and wave equations and Laplace equation.

Suggested Text Books References

-Jain, M. K., Iyengar, S. R. K. and Jain, R. K., "Numerical Methods for Scientific and Engineering Computation", yd Edition, New Age International, 1998.

-Froberg, C. E., "Introduction to Numerical Analysis", Addison- Wesley, 1995.

-Conte, S. D. and Boor, S. D., "Elementary Numerical Analysis: An Algorithmic A:pioiAch", 3rd Edition, McGraw Hill, 1984.

-Jain, M. K., Iyengar, S. R. K. and Jain, S. R. K., "Computational Methods for Partial Differential Equations", New Age International, 1998.

PRACTICAL:

EE I302-P ELECTRICAL MEASUREMENTS & INSTRUMENTATION (0-0-3)

List of Experiments:

- Study of Kelvin's Double Bridge and its application for measurement of Low resistance.
- Schering Bridge for measurement of Capacitance.
- Anderson's Bridge for measurement of capacitance.
- Study and use of LVDT or Displacement Transformer.
- Study and use of Time Division Multiplexing (TDM).
- Study and use of Frequency Division Multiplexing (FDM).

ME 1303 STRENGTH OF MATERIALS (3-1-0)

Stress: axial load-safety concept, general concepts; stress analysis of axially loaded bars; member strength of design criteria. (4 lectures)

Strain: Axial strain and deformation; strains arid deformation in axially loaded bars, stress-strain relationship, Poison's ratio, thermal strain and deformation, strain concentration. (4 lectures)

Generalized Hooke's law, Pressure vessels, constitutive relationship-generalized concepts, relationship between elastic constants; thin wall pressure vessel. (6 lectures)

Torsion: tensional stress and deformation in circular members. design of circular members in torsion, closed coil helical spring. (5 lectures)

SFD & **BMD:** Axial force, shear and bending moment diagram, introduction-direct approach for axial force, shear and bending, bending of beams with symmetrical cross-section. (4 lectures)

Stresses in Beam: Shear stress in beams; introduction-shear flow-share stress in beams. (4 lectures)

Combine stresses: Transformation of stress and strain; analysis for combined loading; transformation of stress and strain-Mohr's rule for stress transformation. (6 lectures)

Deflection of beams: Introduction-deflection by integration-deflection by moment—area method. (6 lectures)

Stability of column: Introduction-Euler's buckling load formula, Rankin's formula-introduction to beam column. (2 lectures)

ME 1312 Materials Science (2-1-0)

History of materials: Source of engineering materials; categorization of engineering materials [2 or 3 materials, their properties and hence their application just to make an illustrative point]; Periodic table approach to engineering materials 2 hours

Atomic bonding vis-a-vis properties of materials: Crystal structure and non-crystalline structure; Miller indices, X-ray diffraction, 2 hours

Defects, their origin, Frenkel and Schottky defects; Order-disorder transformations, association of defects, non-stoichiometric solids; role of defects in defining electronic properties of materials - Si, GaAs, Dislocations 3 hours

Diffusion in solids, atom mobilities, temperature and impurity dependence of diffusion, various diffusion processes. 2 hours

Binary phase diagrams (Pb-Sr, Al-Si, Ge-Si, Au-Si etc) , microstructure and its effect on properties. 2 hours Materials for use in electronic devices: Polymers, ceramics. semiconductors and metals - their structure and properties', insulators; superconductors; dielectric, ferroelectric, memory and magnetic materials. Case studies, 7 hours

Quantum mechanical approach to structure of materials : Energy bands in solids; electrical conductivity; puma, extrinsic and intrinsic semiconductors; carrier concentration; work function. 6 hours

Carrier transport mechanism: Scattering and drift of electrons and holes; diffusion and drift of carriers; Hall effect. 3 hours

Technology of fabrication of semiconductor devices; Unit operations: Thin film deposition, oxidation; diffusion; implantation lithography; etching; metallization, bonding; encapsulation and packaging; Description of a discrete device fabrication; IC fabrication technology. 6 hours

Sensors and actuators: classification and terminology; acoustic sensor, mechanical sensors, mechanical sensors magnetic sensors, radiation sensors, thermal sensors, biosensors, chemical sensors and Examples of integrated sensors. 4 hours

Opto-electronic materials and devices: Modulation of light: birefringence; Kerr effect, magneto-optic effects, acousto-optic effects. Display devices' CRTs. LE0s, LCDs, photoconductors, IR detectors, Photon devices, Lasers, Optical switching devices. 4 hours

Structural, chemical characterization of materials - introduction to X-ray Analysis, optical microscopy, ESCA, SEM-EDAX, STM, AFM; case studies of Si, GaAs, ferrites, lithium niobate. 3hours

Environmental assessment of semiconductor device production' retrospect and prospect. 1 hour

ME 1313 FLUID MECHANICS AND FLUID MACHINERY (3-1-0)

Introduction

Definition and fluid properties, Units and Dimensions, Classification of fluids, Normal and Shear messes in fluids.

Statics of Fluids

Types of forces on fluid system. Mechanics of fluids at rest and in rigid body translation, Manometry, forces on fully and partially submerged bodies.

Kinematics of Fluid Motion

Types of motion, Streamlines, Path lines and Streak lines, Velocity and rotation. Stream function, Acceleration of a fluid particle, voracity and Circulation, Irrational flow, Potential function, Differential equation of conversation of mass.

Dynamics of Ideal Fluid Flow

Euler's equations of motion, Bernoulli's equation and applications to flow measurement, pumping, fluid machines.

Integral Analysis of Flow

System and control volume approaches, The transport theorem, Conservation of mass, linear momentum equation, energy equation, Application to roto-dynamic machines.

Mechanics of Viscous Flow

Navier-Stokes equations, Exact solutions, Flow between parallel plates, Laminar Flow through — circular pipe, Transition from laminar to turbulent flows, Turbulent flow in a circular pipe, Concept of the Boundary Layer and drag on the bodies, Phenomenon of separation.

Dimensional Analysis and Similarity in Motion

Buckingham's P-theorem, Geometric, kinematic and dynamic similarity, Applications.

Fluid Energy Conservation Systems

Mechanisms, Types of Pumps and hydro-turbines, Classification, Working principle, Characteristic and Applications, Wind energy and wind turbines.

Suggested Text Books & References

1. Fox, R. W. and Mc Donald, A. T., "Introduction to Fluid Mechanics", 4th edition, John Willie and Sons Ins,1995.

2. Kumar, K.L., "Engineering Fluid Mechanics", Eurasia Publishing House (P) Ltd, 1976. Gupta, Vijay and

3. Gupta, S.K., "Fluid Mechanics and Applications". Tata Mc Graw Hill C. 1985.
4. Modi, P.N. and Seth, S.M., "Hydraulic and Fluid Mechanics", Standard Book House, 1968.

PRACTICAL / DRAWING / DESIGN

ME1307 - P- Material Science Lab.

List of experiments.

- To study the lattice structure of various types of unit cell. Observe the Miller Indices for various Planes and directions in a unit cell.
- To study the microstructure of cast iron, mild steel, brass, solder under annealed, cold worked. forged / rolled conditions.
- To verify the Hall effect
- To determine the fracture. characteristics of ductile and brittle materials
- To determine the chemical composition of a few common alloys.
- To determine percentage of C and S content in an alloy with Fe as main constituent.

ME1348 -P - Strength of Material Lab. (0-0-3)

List of experiments

- Introduction to testing equipments.
- Uniaxial tension test (Mild steel, Timber)
- Uniaxial compression test (Timber — along and across, concrete, bricks, etc.).
- Torsion test (Mild steel / aluminum)
- Bending stress distribution in beams using demac gauges and extensometer.
- Analysis of truss model with spring members
- Compression test on brick masonry specimen
- Hardness test
- Creep test
- Impact test
- Strength of etched and un-etched glass
- Sprint test
- To study the microstructure of various metals

CS 1313 - P - **Numerical Analysis And Computer Programming Lab** (0-0-3)

List of experiments

- Development of computer program for
- Numerical integration by Trapezoidal and Simpson's rule
- Gauss — Siedel iteration method
- Various matrix operation and their use as sub-routines
- Uses of pointers, data structures, loops, arrays.

EC 1404 SOLID STATE DEVICES (3-1-0)

Semiconductors: Energy band diagram, covalent band, bond and free electrons, and hole mobilities, intrinsic and extrinsic semiconductors, Fermi and impurity revels impurity compensation, charge neutrality equation and semiconductor conductivity, Einstein relation, sift and diffusion, photoconductivity and hall effect.

Semiconductor Diode: Theory and band diagram of p-n junction as a diode, current component and I-V characteristics of p-n diode, effect of temperature on diode current, breakdown mechanisms, avalanche and zener diode LED, optional absorption in a semiconductor, photovoltaic effect, solar cell, photodiode, avalanche photodiode, negative conductor in semiconductor, transit time devices, IMPATT, TRAPATT, Gunn device.

Transistor: Basic structure and principle of operation of BJT. Current components and amplifying property of B1T, CB, CE & CC configuration and its FP, 0/P characteristics, current gain, and active, saturation and cutoff region of O/P char.

FET: Basic structure, characteristics of JFET, drain conductance and trans conductance of JFET, important properties of JFET. Static and dynamic characteristics MOS structure MOS capacitance, MOS static char. and equivalent ckt.

Suggested textbooks & **References:**

- Dekker, A.J., "Electronic Engineering Materials", PHI, New Delhi, 1998.
- Allision, A.J., "Electrorc Engineering Materials and Devices", Teta McGraw Hill Publishing Company Ltd., New Delhi, 1998.
- Millman, J. and Halkias C.C., "Electronic Devices and Circuits", Tata McGraw Hill, 1998.
- Runyan, W.R., "Semiconductor Measurements and Instrumentation", McGraw Hill, New York, 1975.
- Millman, J. and Halkias, C.C., "Electronic Devices and circuits", Tata McGraw Hill, 1998.

EE 1402 **CIRCUIT THEORY** **(2 — 1 — 0)**

Review of circuit concepts:

L, C, Mutual Inductance, Controlled sources, Transformers, Dot convention for coupled circuits, Nodal & Loop analysis, Relation between filed & circuit parameters.

Network Theorems (with proof):

Thevenin's, Norton's, Tellegen's, Reciprocity theorem, Maximum Power Transfer theorem, Compensation theorem, Reciprocity theorem.

Time and Frequency domain analysis of circuits for step, ramp, exponential and damped exponential inputs, Wave form synthesis, Laplace transform method and complex frequency approach.

Network functions:

Driving point and Transfer function, Calculations of network function, Poles and Zeros and their significance, Concept of stability of active networks, Frequency response (frequency & phase plots).

Coupled circuits and Two-Port Networks:

Analysis of mutually coupled circuits; two port parameters, relations among different parameters, scattering parameters

Elements of Filter Design:

Low-Pass, High-Pass and Band-Pass filters; Butter worth and *Chebyshev* approximations: Design of first order and second order low-pass filters; Elementary synthesis techniques.

Suggested Text Books & **References:**

- Kuo, F. F., "Network Analysis", John Wiley and Sons Inc., 1966.
- Valkenburg, Van "Network Analyis", PHI

EE 1403 **ELECTROMAGNETIC THEORY** (3 — 1 — 0)

General Principles: Concept of gradient, divergence and curl, Ampere's Laws, Magnetic vector and scalar potentials; Eddy current Loss and Skin Effect, The field concept, Source of Electromagnetic-field — Classification, Boundary conditions

Boundary value problems in Electrostatics: Laplace and Poisson's equations, Product solution method of solving Laplace's equation, Rectangular, Spherical and Cylindrical coordinates, method of Images; Field plotting methods.

Magneto-static Fields: Integral theorems; Coulomb's Law, Gauss' Equipotential surface Divergence theorem, Poissons's evaluation of capacitance, Electrostatic energy, Electrostatic uniqueness theorem, Faraday's Law of Magneto-static energy, Ampere's Laws, Magnetic vector and scalar potentials; Eddy current Loss and Skin Effect, Boundary value problems in Magneto-static; Current sheet and flux sheet.

Electromagnetic fields: Propagation of Electromagnetic waves in dielectrics and conductors, space sheet, transmission lines. Polarization, Reflection and Refraction of plane waves, Brewster angle, Surface impedance, Poynting theorem, Power loss in plane conductor, Transmission line equations, Standing waves, Impedance matching, Transmission charts, Smith charts, guided wave, Rectangular wave guides wave impedance, and characteristic impedances: Retarded potentials Radiation from elementary dipole and half wave dipole, Radiation pattern.

Radiation and Antenna: Retarded potential, Hertzian dipole, Antenna pattern, directivity and gain, Application of field theory to electrical devices

Suggested Text Books & **References:**

- Rao, N. N., "Elements of Engineering Electromagnetic", Third Edition, Prentice Hall, India, 1992.
- Mathew, N., Sadilai, O., "Elements of Electromagnetic", Second Edition, Sauders College Publishing, 1994.
- Ramo, S., Whinnery, S. and Van Duzer, T., "Fields and Waves in Communication Electronics", 3rd Edition, John Wiley and Sons, 1994.
- Kraus, *J.* D., "Electromagnetic", 3rd Edition, McGraw Hill, 1989.Jordan, E. C. and Balmain, K. G,, "Electromagnetic Waves and Radiating Systems",

EE 1404 **ELECTRICAL MACHINES — I (3 — 1 — 0)**

Electromagnetic and transformers:

Review of laws of Electromagnetic and Electro-mechanics.

Autotransformer: Equivalent circuits and equations shown step-up and step-down operations; Comparison with two winding transformer on the basis of copper losses and volume of copper.

Three-phase transformers, special constructional features — cruciform mitering, alternative winding arrangements, cooling methodology, conservators, breathers, Buchholz relay, Transformer connections, vector phase groups. Phase conversions — 3 to 1, 3 to 2, 3 to 6 and 3 to 12.

Parallel operation of single and three-phase transformers and load sharing; Testing of 3-phase transformers; Special Purpose Transformers: Pulse, Isolation, Welding, Rectifier, High frequency.

DC Machines:

Review of constructional features. Methods of excitation, Armature windings, Power balance, Voltage and torque equations. Operation *as* generator — Self excitation principles; Armature reaction, Characteristics of generators and motors, Commutation; Starting and speed control including solid state controllers; Braking, Losses, Efficiency; Testing, efficiency and application of DC motors; Parallel operation of generators; Amplidyne and Metadyne.

Poly-phase Synchronous Machines:

Constructional features, Poly-phase Distributed AC Windings: Types, Coil span and winding factors; Excitation systems, e. m. f. equation and harmonic elimination; Interaction between excitation flux and armature in. m. f, equivalent circuit model and phasor diagram for circle diagram; Power angle equations and characteristics. Voltage regulation and affect of AVR; Synchronizing methods, Parallel operation and load sharing, active and reactive power control, operation on infinite bus-bar.

Analysis under sudden short circuit; Transient parameters;

Motoring mode, Transition from motoring to generating mode, Phasor diagram, steady state operating characteristics, V-curves, starting, synchronous condenser, hunting — damper winding effects, speed control including solid state control.

Testing of Synchronous Machines — Stability considerations; Brushless generators, Single-phase generators.

Induction Machines:

Review of basic theory and construction, phasor diagram and equivalent circuits, Torque-speed characteristics, testing and circle diagram; Starting and speed control including solid state controllers.

Suggested Books & **References:**

- Mcpherson, George, *"Introduction to Electric Machines and Transformers",* John Wiley and Sons, 1980
- Naser Syed, A., *"Electric Machine and Transformer",* New York, Macmillan, 1984.
- Sen, P. C., "Thyristor DC Drives", New York, Wiley, 1991.
- Sen., P. C., *"Principles of Electric Machines and Power Electronics",* (Second Edition), John Wiley & Sons 1997.
- Say, M. G., *"Alternating Current Machines",* (5^{th} Edition), ELBS, 1986. Fitzgeral, Kingsley C. and Umans, S. D., *"Electric Machinery", (5th* Edition) McGraw-Hill Book Co., 1992.

EE 1405 DIGITAL ELECTRONICS (3 -1- 0)

Review of Binary numbers, Boolean functions, Karnaugh Maps, and minimal realization of combinational circuits;

Half and Full Adder, Comparator, Scmiit Triggers, monostable, bistable and astable multivibrators, Multiplexer, Demultiplexers, Decoders and encoders, counters,

Transistor (BJT & MOS) as switching element;

Logic Gates: TTL, ECL, and CMOS gates;

Memories: RAM, ROM, EPROM, EEPROM, R-S, J-K, T and D flip-flops;

State transition diagram, Asynchronous and synchronous design, counters, registers;

Shift registers, AID, and D/A Converters;

Arithmetic Circuits, State Machine Design, Memory Cells, Introduction to Digital Circuit Testing, Introduction to Hardware Description Language, Introduction to Field Programmable Devices.

Suggested Books & **References:**

• Taub and Schilling, *"Digital Integrated Electronics"*, McGraw Hill, 1976.

PRACTICAL: EC 1409-P SOLID STATE DEVICES LAB (0 – 0 – 3)

List of Experiments:

(i) I_D–V_D characteristics of Junction *Field Effect transistor (JFET).*

(ii) To obtain *SCR* characteristics.

(iii) Measurement of *h-parameters* of *Bipolar Junction Transistor (BJT).*

(iv) Measurement of energy band gap and resistivity of semiconductor sample.

(v) Measurement of carrier concentration in a semiconductor by *Hall* measurements.

(vi) Measurement of *Junction Capacitance* and *Ideality Factor* of semiconductor diode.

(vii) Effect of temperature on leakage current and breakdown voltage of p-n junction.

(viii) TAT and relaxation oscillator

(ix) Frequency response of RC-coupled amplifier

PRACTICAL: EE 1407-P CIRCUIT THEORY LAB (0 – 0 – 3)

List of Experiments:

- Verification of Tellegen's Theorem and Reciprocity theorem.
- Time and Frequency domain analysis of circuits for Step, Ramp and Exponential inputs.
- Design of first order and second order Filters.
- Analysis of mutually coupled circuit.
- Response of RLC series circuit for Step input.
- Wave form Synthesis using CRO.
- Design and simulation circuit by using software.

PRACTICAL: EE 1408-P ELECTRICAL MACHINES LAB I (0 -0-3)

List of Experiments:

Characteristics of DC Machines -- motors and generators with different excitation.

Hopkinsin's test and Fields test – loss calculations and prediction of performance characteristics.

Speed control of DC motors — conventional and electronics.

Determination efficiency of single-phase transformer by using back-to-back test;

Determination efficiency of single-phase transformers by R-L & R-C loads.

Determination of equivalent circuit parameters of a three-phase slip-ring induction motor;

Determination of equivalent circuit parameters of a three-phase squirrel cage induction motor by block rotor test and to draw circle diagram;

Phase conversion using Scott connection and perform load test.

No-load short-circuit and Zero Power Factor (ZPF) tests on a synchronous machine; Determination of voltage regulation at specified load by (i) EMF, (ii) MMF, (iii) Potier method, (iv) ASA methods and comparison of results; Load angle characteristic and comparison with theoretically predicted results.

V-curves and inverted V-curves of synchronous machines; Comparison with predicted characteristics; Synchronization of three phase alternator with infinite bus bar; Study of variation of excitation and mechanical power input on performance

Slip-test, short circuit and lagging current tests on a salient pole machine and determination of armature parameters; Estimation of voltage regulation at specified loads using Blondel's method; Comparison with results from load test.

Sudden short circuit test and determination of Xc, $X^{d'}$, $X^{d''}$ and machine time constants. Determination of X_1, X_2, X_0 by fault simulation methods;

Study of Automatic Voltage Regulators (AVR) and from grid to stand alone mode.

Suggested Books & **References:**

- McPherson, G. and Lararnore R. D., *"An Introduction to Electrical 'Machines and lYansformer",* (2^{nd} Edition), John Wiley 4::t Sons, 1990.
- Say **M. G.,** and Taylor, E. 0., *"Direct Current Machines"* r[l]Ed. Pitman 1961.
- Del Toro, V., *"Electrical Machines & Power Systems",* 1985, Prentice Hall, Inc., Englewood Ciiffs, 1985.
- Del Toro, V., *"Electromechanical Devices for Energy Conversion & Control Systems",* 1985, PHI Pvt. Ltd., 1985.
- Garik, M. L. *Sz-*, Weil, R. T., *"DC & AC Machines",* Affiliated East-West Pvt.Ltd., East-West student Edition,1968.

Kosow, I.L., "Electric Machinery & Transformers" , PHI,2^{nd} Ed.1992.

- Griffiths, D. J., *"Introduction to Electrodynamics",* PHI, 1981.
- Nasar Syed, A., *"Electric Machines & Power Systems, Volume-P,* McGraw-Hill, Inc U.S.A., 1995.
- Nasar Syed, A. *84.* Unnewehr, L. E., *"Electromechanics & Electric Machines, Volume- II",* John Wiley & Sons, Canada, 1971.
- Openshaw Tayor, E., *"The Performance & Design of A. C. Commutator Motors",* A. H. Wheeler & Co. (P) Ltd., Allahabad, 1971.
- Ivanov-Smolonsky, A., *"Electrical machies Vol-2",* Mir Publihsers Moscow, 1982.
- Ivanov-Smolonsky, A., *"Electrical machies Vol-3",* Mir Publihsers Moscow, 1982.
- Fitzgerald, A. E. & Kingsley Charles, Jr., *"Electrical Machinery"* (2^{nd} Ed.), McGraw- Hill & Kogakusha Company Ltd. Japan, 1961.

PRACTICAL: EE 1409-P DIGITAL ELECTRONICS LAB (0 — 0 — 3) List of Experiments:

- To study the switching characteristics of a diode.
- To study the switching characteristics of a Bipolar Junction Transistor.
- Implementation of logic functions using gates, Multiplexers and De-multiplexers.
- To set up an RS, a clocked RS, J-K, Edge triggered J-K, Master Slave K-J flip-flops using NAND Gates.
- Design & implementation of sequential memory using shift register to design and test counters and sequence detectors using J-K flip-flops.

EE1406 POWER SYSTEM — I (3 — 1 — 0)

Generation of Electric Power:

Brief description and of Thermal, Hydro, Nuclear and Gas Power Plants and other non-conventional power plants;

Transmission and Distribution Systems

DC 2-wire and 3-wire systems, AC single phase, three phase and 4-wire systems, and comparison of copper efficiency;

Distribution Systems: Primary and Secondary distribution systems, concentrated and uniformly distributed loads on distributors fed at one and both ends, ring distribution, sub- mains and tapered mains, voltage drop and power loss calculations, voltage regulators.

Overhead Transmission Lines:

Types of conductors, Line Parameters: Calculation of inductance and capacitance of single and double circuit transmission lines, three phase lines with stranded and bundle conductors, Generalized ABCD constants and equivalent circuits of short, medium and shunt compensation; Introduction to FACTS; Per unit representation of system quantities, Steady state performance of transmission network, Elements of load flow analysis, Nature of faults in electrical systems, Fault calculations in power networks, Elements of economic operation;

Overhead Line Insulators:

Type, String efficiency, voltage distribution in string of suspended insulators, grading ring, preventive maintenance;

Mechanical Design of Transmission Lines:

Different type tower, Sag-tension calculations, Sag-template, String charts, Vibrations and Damping, Corona — Corona losses, radio and audio noise; transmission line — communication line interference.

Cables:

Calculations of capacity of cables, Charging current, Stress, Grading, Heating of cables, Construction and Characteristics of HV and El-TV cable;

Tariffs and Load Curves:

Definition and different tariffs for domestic, commercial, industrial application; Different Lad and Load duration curves; Curves and their significance;

Introduction to EHV / HVDC Transmission:

Brief description of both the systems with working and constructional details;

Suggested Books & **References:**

• Grainger John, J. and Steverson, Jr. W. D., *"Power System Analysis"*, McGraw Hill, 1994.

Semester V

HSI 502_ MANAGEMENT SCIENCE (2-1-0)

Basic Concepts and Functions of Management Planning

Nature, Purpose and Objectives of Planning, Organizing: nature and Purpose, Authority and Responsibility, Staff bug, Supply of Human Resources, Performance Appraisal, Controlling: System and Process of Controlling, Control Techniques.

Human Resource Management

Nature and Scope of Human Resource Planning, Training and Development, Recruitment and Selection, Career Growth, Grievances, Motivation and its types, Need For Motivation, Reward and Punishment, Models for Motivation, Leaders:

Kind of Leaders, leadership styles, Roles and Function of Leaders, Conflict Management, Kinds and Cause of Conflict, Settlement of Conflict, Group and Team \working, Organizational Design and Development.

Marketing Management

Marketing Environment: Consumer Markets and Buyer Behavior, Marketing Mix, Advertising and Sales Promotion, Channels of Distribution.

Financial Management and Accounting Concepts

Book Keeping, Financial Statement Analysis, Financial Ratios, Capital Budgeting, Break-Even Analysis.

Production/Operation Management:

Planning and Design of Production and Operation Systems, Facilities Planning, Location, Layout and Movement of Materials, Materials Management and Inventory.. Control, Maintenance management, PERT & CPM.

Management Information System:

Role of information in decision making, Information system planning, Design and Implementation, Evaluation and Effectiveness of Information System.

Statistical Quality Control, TQM and ISO Certification

Social and Ethical Issues in Management,

Ethics in management, Social Factors, Unfair and Restrictive Trade Practices. Strategic and

Technology Management:

Need, Nature. Scope and Strategy, SWOT analysis, value and concepts

SEMESTER —V

EE1501 **ANALOG ELECTRONICS** (2-1-0)

Review of construction, operation and characteristics of Diode and BJT's

Region of operation, Biasing. Bias stability, Current mirror biasing. Transistor as amplifier, Load line analysis, Design for maximum symmetrical swing, thermal stabilization, FET, JFET and MOSFET devices. Device structure characteristics and equations: FET as an amplifier; Common Source, Common Drain and Common Gate configurations,

Small Signal Analysis:

Mid-frequency response of BJT and FET circuits; Hybrid parameter models and analysis; Low frequency response including the effects of emitter bypass and coupling capacitors; High frequency response.

Multistage Transistor Circuits:

Differential amplifier, Cascade amplifier; internal details of Op-amps; some linear and non-linear applications of Op-amps; Schmitt trigger using Op-amp;

Lower Amplifiers:

Class A, Class B, and Class C operation; Push Pull Amplifier: Complementary symmetry configuration. **Feedback in Amplifiers:**

Different types of feedback; stability and oscillation: Wien bridge. Phase Shift, Colpitts and Hartley Oscillators;

Operational Amplifiers (741) — use and its applications

Introduction to and use of Circuit Simulation Software (SPICE) with an Op-amp;

List of Experiments:

- To design and test of a multistage RC-coupled amplifier with given specifications.
- To design and test a current mirror using BJTs
  - (a) Set up an RC oscillator using a BJT to give sinusoidal output at 2 kHz.
  - (b) Set up a Wien Bridge oscillator using a BJT to give sinusoidal Output at 2 kHz.
- To design and test a series voltage regulator with short circuit protection.
- To design and test a complementary symmetry power amplifier and observe its performance.
- To implement a summer and integrator by using op-amp-.

PRACTICAL: **EE 1506-P ANALOG ELECTRONICS LAB (0- 0- 3)**

Suggested Books & **References:**

- Sedra Adel, S. and Smith Kenneth C., *"Microelectronic Circuits Engineering",* June 1997.
- Sedra, K. C., "1995 Problems Supplement to Microelectronic Circuits", Oxford University Press, 1995.
- Roberts, G. W. and Sedra, A. S., "SPICE (The Oxford Series in Electrical and Computer Engineering)", Second Edition, 1996.
- Millman & Taub, "Pulse Digital Switching Waveforms" McGraw Hill.

EE 1502 CONTROL ENGINEERING (3-1- 0)

Introduction to Control Problem

Scope of control, Parts of a Control System, Mathematical modeling of physical systems — Mechanical, Electrical, Thermal and Hydraulic systems, Differential Equation; Systems with dead-time, System response, Control hardware and their models: Potentiometers, Synchros, LVDDT, DC and AC Servomotors, Tacho-generators, Electro-hydraulic vales, Hydraulic servomotors, Electro-pneumatic valves, Pneumatic actuators; Closed-loop systems; Block diagram and Signal Flow Graph analysis, Transfer function.

Basic characteristics of Feedback Control Systems

Stability, Steady-state accuracy, Transient accuracy, Disturbance rejection, Sensitivity and Robustness; Basic modes of feedback control: Proportional. Integral and Derivative, Feed-forward and multi-loop Control Configurations; Stability concept, Relative stability, Routh Stability criterion.

Time response of second-order systems, steady-state errors, and error constants; Performance in time-domain; Root locus method of design; Lead and Lag compensation.

Frequency-response analysis

Relationship between time and frequency response, Polar plots, Bode's plot, stability in frequency domain, Nyquist plots, Nyqusit stability criterion; Performance specifications in frequency-domain; Frequency-domain methods of design, Compensation and their realization in time and frequency domain; Lead and Lag compensation.

Op-amp based and digital implementation of compensators; Tuning process controller; State variable formulation and solution.

State variable Analysis

Concepts of state, State variable, State model, State models for linear continuous time functions, Diagonalization of transfer function, solution of state equations, Concept of controllability and observability;

Introduction to Optimal control and Non-linear control

Optimal Control problems, Regulator problem, Output regulator, Trekking problem; Non-linear system — Basic concept and analysis;

Suggested Books & References:

- Gopal, M., "Control Systems: Principles and Design", Tata McGraw Hill, 1997.
- Kuo, B. C., "Automatic Control System", Prentice Hall, Sixth Edition, 1993.

- Ogata, K., "Modern Control Engineering", Prentice Hall, Second Edition, 1991.

- Nagrath & Gopal , “Modern Control Engineering”, New Ages International.

EE1503 ELECTRICAL MACHINES —II (3 -1 - 0)

3-phase Induction Motor:

Review of Constructional details, Poly-phase Distributed AC Windings, production of EMF, Coupled circuit equations, Steady state analysis Equivalent circuit, Phasor diagram, Power flow diagram and torque-slip characteristics; Starting and speed control; Effect of rotor resistance, deep and double cage rotor; Speed control schemes including solid state and vector control; Braking.

Effect of space/time harmonics and analysis; Testing, Losses and Efficiency; Induction generators — Grid connected and Self excited mode; Applications;

Single Phase Motors:

Induction Types double field revolving theory, equivalent circuit, Characteristics, Starting of single-phase motor, Shaded pole machines.

Synchronous type Hysteresis motor, Reluctance motor, Stepper motors. Variable reluctance and permanent magnet type, Permanent Magnet Synchronous motor, Brushless motor.

Special Electric Motors

Switched reluctance motor, Linear machines-Power energy and levitation types; Permanent Magnet DC motors.

Machines for control Systems

Disc motors, Printed Circuit Motors, Servo motors --- AC and DC, Tacho-generators, Synchros, Disk Machines**.**

PRACTICAL: EE 1507-P ELECTRICAL MACHINES II LAB (0 — 0 — 3)

List of Experiments:

- Parallel operation of two identical three-phase transformers.
- No-load short-circuit and zero power factor test on synchronous machine.
- Determination of torque-speed characteristics of a 3-phase induction machine in braking, motoring and generating regions and its calibration.
- Study of the effect of rotor resistance on the load characteristics of wound rotor Induction motor:
- Speed control of Induction Motor — conventional and electronic control. Solid state speed control using (i) *V* constant, (ii) *V I f constant*, (iii) Slip-energy injection.
- Load characteristics of Induction generator working in (i) Grid connected mode, (ii) Self-excited mode.
- Determination of equivalent circuit and parameters of single-phase Induction Motor. Prediction of torque-speed characteristics and verification of load test.
- Load characteristics of Universal Motor, operating on DC and AC supply. Comparison of performance with the two results.
- Starting of Slip-ring Induction Motor by using (a) three-phase variac, (ii) Star connected rheostat, (iii) Oil-immersed rotor resistance starter.
- Experimental determination of performance characteristics of two-phase servo motor.
- Determination of equivalent circuit parameters of 3-phase Induction Motor by (i) No-
- load test, (ii) Blocked rotor test; and to draw the circle diagram of 3-phase Induction`,

Motor.

- Determination of Torque and sli[p] rate characteristics of Stepper Motor and determination of operating range.
- Load characteristics of hysteresis motor and shaded pole motor.
- Characteristics of Permanent Magnet Motor.
- Characteristics of Switched Reluctance Motor.

Suggested Books & **References:**

- McPherson, George, *"Introduction to Electric Machines and Transformers"*, John Wiley and Sons, 1980
- Naser Syed, A., *"Electric Machine and Transformer"*, New York, Macmillan, 1984.

- Sen, P. C., "Thyristor DC Drives", New York, Wiley, 1991.
- Sen, P. C., *"Principles of Electric Machines and Power Electronics",* (Second Edition), John Wiley & Sons 1997.
- Say, M. G., *"Alternating Current Machines",* (5^{th} Edition), ELBS, 1986.
- Fitzgeral, Kingsley C. and Umans, S. D., *"Electric Machinery",* (5t McGraw-Hill Book Co., 1992.
- McPherson, G. and Laramore **R. D.,** *"An Introduction to Electrical Machines and Transformer", (2"^{d}* Edition), John Wiley & Sons, 1990.
- Say M. G., and Taylor, E. 0., *"Direct Current Machines" 3rd* Ed. Pitman 1961.
- Del Toro, V., *"Electrical Machines & Power Systems",* 1985, Prentice Hall, Inc., Englewood Cliffs, 1985.
- Del Toro, V., *"Electromechanical Devices for Energy Conversion & Control Systems",* 1985, PHI Pvt. Ltd., 1985.
- Garik, M. L. & Weil, R. T., *"DC & AC Machines",* Affiliated East-West Pvt. Ltd., East-West student Edition, 1968.
- Kosow, I. L., *"Electric Machinery & Transformers",* PHI, 2"^{d} Ed. 1992.
- Griffiths, D. J., *"Introduction to Electrodynamics",* PHI, 1981.
- Nasar Syed, A., "Electric Machines & Power Systems, Volume-I", McGraw-Hill, Inc U.S.A., 1995.
- Nasar Syed, A. & Unnewehr, L. E., "Electromechanics & Electric Machines, Volume- IF, John Wiley & Sons, Canada, 1971.
- Openshaw Tayor, E., "The Performance & Design of A. C Commutator Motors", A. H. Wheeler & Co. (P) Ltd., Allahabad, 1971.
- Ivanov-Smolonsky, A., "Electrical morhies Vol-2". Mir Publihsers Moscow, 1982.
- Ivanov-Smolonsky, A., "Electrical machies Vol-3", Mir Publihsers Moscow, 1982.
- Fitzgerald, A. E. & Kingsley Charles, Jr., "Electrical Machinery" (2"d Ed.), McGraw- Hill & Kogakusha Company Ltd. Japan, 1961.

EE 1504 POWER SYSTEMS II (3-0-0)

System Representation

Single line representation, Per Unit systems, Modeling of Transformer, Load, Synchronous machines;

Formation of Network Matrices

Bus admittance and impedance matrices, Algorithms for formation of Z-Bus and Y- Bus matrices, Modification of bus impedance matrix, Sparsity oriented inversions for Y-Bus;

Short Circuit Studies

Short circuit studies for balanced three-phase networks for various types of shunt faults using sequence networks, Short circuit studies using Z-Bus matrixl;

Load Flow Studies

Power system equations, solution techniques, Gauss-Seidel iterative method, Newton-Raphson method, Fast-coupled method, Comparison of methods, Acceleration of convergence, Voltage controlled busses, Digital computer studies of lad flow, Information from load flow;

Stability Studies

Stability problem, Swing equation, Power angle equation, Equal area criterion of stability, Elements of steady state and dynamic stability studies, Methods of simulation for transient stability, Representation of network, load and generators, System security concepts;

Power System Monitoring and Control

Economic operation and load dispatch, Elementary ideas of voltage — VAR and load-frequency controls, Load-frequency control elements, Voltage control elements, Block diagram representation of hydro and steam turbine governors, Tie-line bias control;

PRACTICAL: EE 1508-P POWER SYSTEM LAB (0-0-3)

List of Experiments:

- Power Factor Control of a system excited by single-phase supply.
- To determine phase-sequence of three-phase circuit using (i) RC method, (ii) two lamp method.
- Measurement of Earth-resistance by Earth Tester.
- Study of different type of insulators.
- Simulation of DC distribution by network analyzer.
- To determine positive, negative and zero sequence impedance of three-phase transformer / three-phase induction motor.
- Power Factor Control of a system excited by Single-phase supply.
- Simulation of DC distribution by network analyzer.
- To determine generalized constant **A, B, C, D** of given system.
- To determine dielectric strength of insulating oil.

Suggested Books & **References:**

- Elgerd, 0. I., *"Electric Energy System Theory: An Introdcution",* Tata McGraw Hill, Second Edition, 1982.
- Gainger John, J. and Stevenson., W. D. Jr., "Power System Analysis", McGraw Hill, 1994.
- Kundur, P., "Power System Stability and Control", McGraw Hill, 1994.
- Kimbark, E.E., "Power System Stability, Vol I: Elements of Stability Calculations", John Wiley & Sons, 1948.

EE 1505 DIGITAL ELECTRONICS AND LOGIC DESIGN (3 -1-0)

Number Systems and Codes

Decimal Odometer, Binary Odometer, Number Codes, Why Binary numbers are used, Binary-to-Decimal Conversion, Decimal-to-Binary Conversion, Hexadecimal Numbers, Hexadecimal-Binary Conversion, Hexadecimal-to-Decimal Conversion, Decimal-to Hexadecimal Conversion, BCD Numbers, The ASCII Code.

Gates

Inverter, OR, AND, NOT, NOR, and NAND Gates, Boolean algebra, De Morgan's Second Theorem, Exclusive-NOR Gate. Controlled Inverter;

TTL Circuits

Digital Integrated Circuits, 7400 Devices, TTL Characteristics, TTL Overview, and OR-Invert Gates, Open-Collector Gates, Multiplexers.

Boolean Algebra and Karnaugh Maps

Boolean Relations, Sum-of-Products method, Algeraic Simplification, Karnaugh maps, Pars, Wads, and Octets, Karnaugh simplifications, Don't-Care Conditions.

Arithmetic-Logic Units

Binary Addition, Binary Subtraction, Half Adders, Full Adders, Binary Address, Singed Binary Numbers, 2's Complement, 2's Complement Adder-Subtractor.

Flip Flops

RS Latches, Level Clocking, D-Latches, Edge-Triggered D-Flip-Flops, Edge triggered 7K Master-Slave Flip-Flop.

Registers and Counters

Buffer Registers, Shift Registers, Controlled Shift Registers, Ripple Counter, Synchronous Counters, Ring Counters, Other Counters, Three-State Register, Bus-Organize computers.

Memories

RAMs ROMs, PROMs, EPROMs; TTL Memory, Hexadecimal Addresses

PRACTICAL: EE 1509-P DIGITAL ELECTRONICS & LOGIC DESIGN LAB

(0-0-3)

List of Experiments:

- Verification of Logic Gates.
- Verification and realization of different Flop-Flops
- Study of 4-Bit Register.
- Study of Synchronous Counter
- Study of BCD Counter
- Study of Ripple Counter
- Design of MOD 6 Counter
- Design of Up and Down Counter

Suggested Books & **References:**

- Malvino, A. P. *"Digital Computer Electronics",*
- Taub & Shilling, "Digital Integrated Electronics", McGraw Hill, 1976.

SEMESTER — VI

EC 1612 SIGNALS & SYSTEMS (2-1 -0)

Dynamic Representation of Systems

Systems Attributes, Causality linearity, Stability, Time-invariance; Special Signals, Complex exponentials, Singularity functions - Impulse and Step functions; Linear Time- invariant Systems: Differential equation representation. Convolution integral, Discrete form of special functions, discrete convolution and its properties, Realization of LTI —Differential and Difference equations.

Fourier Analysis of Continuous Time Signals and Systems

Fourier series, Fourier Transform and properties, Parseval's theorem, Frequency response of LTI systems; Sampling theorem;

Fourier Analysis of Discrete Time Signals and Systems

Discrete Time Fourier Transform, and properties, Frequency response of discrete time LTI systems;

Laplace Transform

Laplace Transform and its inverse: Definition, existence conditions, Region of Convergence and properties, Application of Laplace transform for the analysis of continuous time LTI system; Significance of Poles and Zeros.

Z-Transform

Z-Transform and its inverse: Definition, existence conditions, Region of Convergence and properties, Application of Z-Transform for the analysis of discrete time LTI systems; Significance of Poles and Zeros.

Random Signals

Introduction to probability; Baycs Concept of random variable, Probabilizydensity and distribution functions, Function of a random variable; Moments, Independence of a random variable; Introduction to random process; Auto and cross correlation; Power spectral density, White noise, Random signal analysis;

Suggested Books & **References:**

- Oppenheim Alan, V., Willsky Alan. S., and Nawab, H. *"Signals and Systems"*, Prentice Hall, 1997.
- Haykin Symon, *"Communication Systems"*, 3" Edition, John Wiley, 1995

EE 1601 MICROPROCESSORS AND MICROCONTROLLERS (2 -1 - 0)

Architecture of 8085 Microprocessor

Functional Block Diagram — Registers, ALU, Bus systems, Timing and control signals, Machine cycles and timing diagrams.

Programming of 8085

Instruction formats, Addressing modes, Instruction set, Need for Assembly language — Development of Assembly language programs.

Memory Interfacing

Interface requirements — Address space partitioning — Buffereing of Buses — timing constraints, Memory control signals, Read and write cycles, Interdacing SRAM, EPROM and DRAM sections.

I/O Interfacing

Memory mapped I/O scheme, I/O mapped I/O scheme, Input and Output cycles, Simple I/O ports, Programmable Peripheral Interface (8235), Data Transfer Scheme: Programmable Data Transfer, DMA data transfer, Synchronous, Asynchronous and interrupt driven Data Transfer Scheme, Interfacing, Simple Keyboards and LED displays.

Interrupts and DMA

Interrupt feature, Need for interrupts, Characteristics of Interrupts, Types of Interrupts, Interrupt structure, Methods of servicing interrupts, Developments of interrupt service subroutines; Multiple interrupt requests and their handling, Need for Direct Memory Access., Devices for handling DMA, Programmable DMA controller 8237.

Applications

Interfacing of AID converters (ADC 0800/ADC 0808/ ADC 0809); Interfacing of D/A converters (DAC 0800)' Waveform generators; Multiplexed Seven Segment LED display systems; Measurement of frequency, Phase angle, and Power Factor; Traffic Light Controller, Stepper Motor Control.

Intel 8051 Microcontroller

Architecture of 8051; Memory Organization, Addressing Modes; Instruction set; Boolean processing; Simple programs.

8051 Peripheral Functions

8051 interrupt structures; Timer and serial functions; Parallel port features; Modes of operation: Power control; Interfacing of 8051; typical applications, MCS family features 8031/8051/8751.

PRACTICAL:

EE 1607-P MICROPROCESSOR & MICROCONTROLLER LAB (0 - 0 - 3)

List of Experiments:

- Programming to add (i) two 8-bit numbers, (ii) two 16-bit numbers.
- Programming to find the smallest number in a data entry.
- To find larger of two numbers.
- To find largest number from a series of numbers
- To arrange a series of number in descending order.
- To find l's complement of a 16-bit/8-bit.
- To find 2's complement of a 16-bit/8-bit.
- Programming to find multiplication of two 8-bit numbers.
- Programming to find a square root of a number.
- Programming and verification of speed control of stepper motor.
- Programming and verification of Seven-segment display

Suggested Books & References:

- Gaonkar, R. S., "Microprocessor Architecture Programming and Applications with the 8085/8080A", 3th Edition, Penram International Publishing House, 1997.
- Singh, I. P., "Microprocessor Systems", Module 9: "Microcontrollers and their Applications", IMPACT Learning Material Series, IIT, New Delhi, 1997.
- Douglas, V. Hall, "Microprocessors and Interfacing Programming and Hardware" 2nd Edition, McGraw Hill Inc., 1992.
- Kenneth, L. Short.. "Microprocessors and Programmed Logic" Prentice Hall of India, 2nd Edition, 1987.
- Microcontroller Hand Book, INTEL, 1984.

EE 1602 COMMUNICATION ENGINEERING (3 — 1 — 0)

Review

Review of frequency Band, Fourier Transform and Fourier series.

Amplitude Modulation Systems

Need for modulation, normal AM, Generation and demodulation — envelop and synchronous detection; Modulation index; DSBSC: Generation and demodulation, Effect of phase and frequency offset on demodulation; SSB: Generation using filter and phasing method, detection; Frequency division multiplexing systems using SSB.

Angle Modulation Systems

Concept of frequency and phase modulation, frequency deviation and modulation index, FM spectra, Carson's Rule, Narrowband FM, Generation of Wideband, FM- Armstrong method, Direct FM generation; Demodulation of FM-discriminator; PLL

Sampling and Discrete time Modulations

Sampling Theorem — Low Pass and Band Pass; Pulse Amplitude Modulation (PAM), Pulse Width Modulation (PWM), Pulse Position Modulation (PPM) — their generation and detection, Phase time division multiplying.

Digital Communication

PCM, Quantization noise, Bandwidth, Advantages over analog communication, PCM system, Differential PCM, Delta Modulation, Digital Modulation — ASK, FSK, PSK, DPSK, Digital multiplexing.

Power Line Carrier

Interfacing with power line, Description of a typical system

Microwave Communication

Transit and Receive Antennas, Ling Budget, Line of Sight Systems, Satellite Liilg — GT ratio of earth station, VSATS and GPSS, FDMA, TDMA, CDMA.

Optical Communication Systems

Types of optical fibers — step index and graded index, multimode and single mode; Attenuation and Dispersion in fibers; Optical transmitters — LEDs and Laser Diode; Optical Receivers — PIN and APDs, Fiber optic links.

Suggested Books & **References:**

• Haykins Simon *"Communication Systems",* 3rd Edition, John Wiley, Singapore, 1984.

- Couch Leon, W., *"Modern Communication Systems",* Prentice Hall, India, 1998.
- Keiser Gerd, *"Optical Fiber Communications",* 2nd Edition, McGraw Hill, 1991.
- Lathi, *"Modern Digital and Analog Communication System",* Oxford University Press.

EE 1603 POWER ELECTRONICS (3-1-0)

Power Semiconductor Devices

History of development of Power Electronic devices, Constructional features; Characteristics, rating and specification, gate/base drive circuits; Protection including cooling and application of diodes; SCRs, GT0s, BJTs, MCT, MOSFET and IGBT; Electromagnetic interference.

AC to DC Converters

Operation and analysis of Single phase and multi-phase uncontrolled and controlled rectifiers with R., R-L, and back EMF load, effect of source inductance, Freewheeling effect; 'Power Factor Improvement methods for Phase-Controlled rectifiers; Filters.

AC to AC Voltage Converter

Operation and analysis of single-phase integral cycle and phase controlled converters; Configuration of three-phase controllers.

DC to DC Converters

Single-phase and three-phase bridge inverters, VSI and CSI, Voltage control — PWM and Square wave operation; Harmonics and their reduction techniques.

Cyclo-converters

Single-phase and three-phase configurations and operating Principle;

PRACTICAL: EE 1606-P POWER ELECTRONICS LAB (0 — 0 — 3)

List of Experiments:

- Study of V-I characteristics of SCR, Triac and Diac
- Study of BJT and IGBT, GTO and MOSFET.
- Study of a UJT firing circuit for the control of SCRs.
- To generate and study the PWM control signal for single-phase DC to DC inverter.
- To study and use of the single-phase half controlled and fully controlled AC to DC Converter and effect of firing angle control on load voltage and waveforms.
- To study and use of back to back connected SCR / Triac controlled AC Voltage**,** controller and its wave forms with Variation of firing angle.

- Study and use of Chopper circuit for the control of DC voltage using (i) Pulse Width Modulation, (ii) Frequency Control, (iii) Current limit Control.
- Study of Single-phase inverter and its waveform.
- Study of three-phase firing circuit with synchronization, and testing with tree-phase AC to DC bridge converter.
- Testing of waveforms of digital firing modules.
- Study and Testing of a three-phase bridge inverter with different types of loads.
- To study the harmonics and reactive power measurement in AC mains with rectifier and AC Voltage Controller loads.

Suggested Books & References:

- Rashid Muhammad, H., "Power Electronics, Devices and Applications", 2nd Edition, Prentice Hall, 1998.
- Mohan Ned, Undeland Tore, M. and Robbins William, P. "Power Electronics: Converer, Applications and Design", John Wiley & Sons, 1994.
- Landel Cyrill, W., "Power Electronics", McGraw Hill, London, 1981.
- Dewan, S. B. and Satrughan A., "Power Semiconductor Circuits", John Wiley & Sons, 1975.
- Dubey, G. K., Doradlla, S. R., "Thyristorised Power Controllers", Wiley Eastern, 1987.

EE 1604 **POWER SYSTEM STABILITY** (3-1-0)

Introduction

System Modeling and Dynamics of Synchronous Generator;

Small Signal Stability Analysis (Low Frequency Oscillations)

- Analysis of Single Machine System.
- Application of P. S. Stabilizers.
- Analysis of Multi-machine System.

Small Signal Stability Analysis (Synchronous Frequency Oscillations)

- Transient Stability Analysis.
- Dynamic Stability Analysis.
- Dynamic Equivalence.
- Voltage Stability Analysis.
- Static VAR control and loads.
- Direct Stability evaluation— Lypnor and Popor's criteria.

PRACTICAL: EE 1608-P POWER SYSTEM STABILITY LAB (0 -0 -3)

List of Experiments:

- Study of Synchronous Generator.
- Study and analysis of Transient stability of a Single and Multi-Machine System.
- Study and analysis of Dynamic stability of a Multi-Single Machine System.
- Analysis of voltage stability.
- To control Static VAR.

Suggested Books & References:

- Nagrath, I. J. and Kothari, D. P. *"Power System Engineering"*, Tata McGraw Hill, New delhi, 1994.
- Podiyar, K. R., *"Power System Dynamics: Stability and Control"*, Interline, 1996.

EE 1605 DESIGN OF CONTROL SYSTEMS (3 -1 -0)

Review of frequency response, Frequency domain specifications; Design of controllers for single loop systems in the frequency domain — Lag, lead, Lag-Lead networks as compensators; Design of P, PDT, I, PI and PID controllers for first, second and third order systems; Control loop with auxiliary feedback, Feed forward control, Multivariable control.

Ziegler and Nichol's methods, Oppelt's method; State variable representation of control systems; Design using state variable feedback;
AC Carrier Control Systems

Modern Control Theory

Formulation of equations of a system — Linearization, Input-output relations, State space methods; State Transition Matrix, Stability, controllability, Observeability and Transfer Function

Lyapunov's direct method, Sensitivity, Optimal control formulation, Calculus of variations, Performance indices, Pontryagin's maximum principle, Time optimal control, Principle of optimally, Dynamic programming

Pole placement, Quadratic performance index, Linear regulator problem;

PRACTICAL: EE 1609-P CONTROL SYSTEM LAB (0-0-3)

List of Experiments:

- Identification of transfer function of a system using Bode plots from experimentally obtained frequency response.
- Experimental study of characteristics of Synchro device & AC and DC servo motor.
- Position control of DC servo system with Lead / Lag compensator in the loop.
- Experimental study of a hydraulic servomechanism.
- Experimental study of a pneumatic system.
- PID tuning on process control simulator_
- Stepper motor control using 8-bit Microprocessor.
- PID control of thermal and / or liquid level system.
- Study of Proportional, Integral and Derivative Control.
- Study of stability of a control mechanism.

Suggested Books & **References:**

- Gopal, M. *"Control Systems: Principles and Design",* Tata McGraw Hill, 1997.
- Kuo, B. C. *"Digital Control Systems",* 2"[1] Edition, Saunders College Publishing, 1992.
- Ogata, K., "Discrete Time Control System", Prentice Hall, 1987.

HS1606-P GENERAL PROFICIENCY VI (0-0-0)

Debate, Elocution, Extempore, Group Discussion, Panel Discussion, Presentation -Paper & oral, Allegation & clarification, Quiz / Brain Teaser, Survey Report / Project Report / Case Study, Dissertation, Mock Interview, Expository / Argumentative Report & National Service Scheme (NSS)

SEMESTER — VII

EE 1701 COMPUTER AIDED POWER SYSTEMS (3—1—0)

Representation of Power System Components

- Modeling, Y-Bus formulation
- GS, NR, FDLF methods

Optimal Power System Operation

- Unit commitment
- Reliability
- Economic Dispatch
- Emission Dispatch
- Optimal Load flow
- Optimal Hydro-thermal scheduling a,

Power System security

State estimation

Load forecasting

Fault analysis — balanced and unbalanced Automatic generation control

Power System Transients

Computer Aided Power System Protection

PRACTICAL:

EE 1705-P COMPUTER AIDED POWER SYSTEM LAB (0—0—3)

List of Experiments:

- Study of Security of Power System.
- Study of Faults in Power System.
  - Study of methods of Fault Detection in Power System. For unbalanced and unbalanced loadings.
  - Computer Aided Design of Control Automatic Power Generation.
  - Computer Aided Design of Power System Protection.
  - Experiments based on the problems discussed in the class such as Y-Base formulation, optimal load flow analysis, Load forecasting etc.

Suggested Books & **References:**

- Nagrath, I. J. and Kothari, D. P. *"Power System Engineering"*, Tata McGraw Hill, New delhi, 1994.
- Mahalanabis, A. K., Kothari, D. P. and Ahson *"Computer Aided Power System Analysis and Control"*, TMH, New Delhi, 1998.

EE 1702 NETWORK SYNTHESIS (2 — 1 — 0)

Introduction to synthesis Problems

Formulation of State Synthesis Problems

Basic Impedance Synthesis Problems, LC and RC impedances Reciprocal and Synthesis

Transfer Function of ladder networks

Properties of second-order systems

Second-order Low Pass Networks

Second-order Band Pass Networks

Second-order High Pass Networks

Approximations, LP, HP, BP

Band-stop functions and realizations

Reciprocal transfer functions synthesis

Non-reciprocal transfer function s synthesis

T. F. Synthesis with prescribed loading

Scattering matrix synthesis

Suggested Books & **References:**

- Enderson et al, B. D. 0., *"Network Analysis and Synthesis: A Modern Systems Theory Approach"*, Prentice Hall, Inc. Englewood Cliffs, New Jersey, 1973..
- Budak Aram, *"Passive and Active Network Analysis and synthesis"*, Houghtnn Miffin Co., Boston, 1974.

EE 1703 POWER SYSTEM PROTECTION & SWITCHGEAR (3 — 1 — 0)

Protection

Importance of Protective relaying in Power Systems, Fundamental requirements of a good protection Scheme; Primary and Back-up Relaying;

Classification of Relays

Constructional — Electromechanical and Static Relays, Over-current, Directional, Differential, Distance Relays, etc. and their principles and applications.

Current Trend in Protective Relaying

Microprocessor and PC based Relaying

Switchgear

Classification of Switchgear, Fault Analysis, Symmetrical Faults on a Synchronous machine, Fault clearing process, Arcing phenomena and principles of arc interruption, AC and Dc circuit breakers, Different types of Circuit Breakers and their constructional features, Testing and Selection of Circuit Breakers.

PRACTICAL: EE 1706-P SVVITCHGEAR & PROTECTION Liii3 (0 — 0 — 3)

List of Experiments:

- Study of protective relays and their working.
- To study the function of Buchholz relay.
- To draw the characteristics curves of percentage biased differential relay for various current setting and bias setting.
- To study the characteristics feature of inverse time over-current relay.
- Study of digital distance relay.
- Study of various types of Switchgears.
- Study of different types of faults occurring in Transmission Network.
- Study of various types of Protection Systems of Power Systems.
- Study of different types of Electromechanical and Static Relays.
- Study of different types of Circuit Breakers.
- Testing and application of Circuit Breakers.
- Study of different types of faults occurring in Circuit Breakers.
- Fault classification using MATLAB.

Suggested Books & **References:**

- The Elementary Council, *"Power System Protection"*, Vol. 1, 2 & 3, Peter Peregrinus Ltd., 1990.
- Van, A. R., & Warrington, C. *"Protective Relays: Their Theory and Practice"*, Vol. 1, & 2, Chapman and Hall, 1969.
- Paithankar, Y. G *"Transmiss[i]on Aretwork Protection: Theory and Practice"* Marcel Dekker Inc., 1998.
- GEC Measurements, *"Protective Relays: Application Guide"* GEC Measurements, 1987.

PRACTICAL:

1. EE 1704-P	**Colloquium**	**(0-0-3)**
2. EE 1707-P	**Project — 1**	**(0-0-3)**

SEMESTER — VIII

EE 1801 HIGH VOLTAGE ENGINEERING (3—1—0)

Breakdown in Gases

Mechanism of breakdown in gases, various related ionization processes, Townsend's and Steamer theories, Paschen's law, Breakdown in Non-uniform fields; Effect of wave shape of impressed voltage on the breakdown strength, Breakdown of sphere gape and rod gap;

Breakdown in Liquid and Solids

Mechanisms of breakdown in liquids, suspended particle, suspended water, cavitations and bubble and electronic breakdown theories; Mechanisms of breakdown in solids; Intrinsic electro-mechanical, erosion, surface, thermal and streamer; Relation between electric strength of solids and time, intrinsic breakdown strength;

Impulse Generator

Specifications of an impulse voltage wave, standard impulse, reasons for adopting the particular shape, Analysis and control of simple circuit of impulse generator; Multi-stage impulse generator (Marks circuit) circuit working, earthing and tripping; Techniques to observe wave front on C. R. 0.

Generation of High Voltage

Methods of generation of power frequency, high voltage cascade transformers and resonance methods, Generation of high voltage DC, Voltage stabilization, Tesla coil.

Measurement of High Voltage

Potential dividers — resistive, capacitive and mixed dividers for high voltage, sphere gap, construction, mounting, effect of nearby earthed objects, humidity and atmoispheric conditions, effect Gt iiiadiation and polarity; Electrostatic voltniaer — principice and classification, constructional details of an absolute electrostatic voltmeter; Oscilloscopes and their applications in high voltage measurement.

High Voltage Testing

Measurement of insulation resistance of cables; Wet and dry flashover test of insulators, Testing of insulators in simulated polluted conditions; Testing of transformers and rotating machines; Measurement of breakdown strength of oil; Basic techniques of nondestructive testing of insulators; Measurement of loss angle, High Voltage Schering bridge and partial discharge measurement

techniques.

Over Voltage and Insulation Coordination

Lighting Switching and temporary over voltages, BIL, SIL, methods of insulation coordination;

Suggested Books & **References:**

- Bewley, L. V., *"Traveling Waves on Transmission Systems",* Wiley New York, 2I'd Edition, 1963.
- Nidu, M. S. and Kamaraju, V., *"High Voltage Engineering",* Tata McGraw Hill, 1982.
- Wadhawa, C. L., *"High Voltage Engineering"* Wiley Eastern, 1994.
- Radzevig, D. K., *"High Voltage Engineering"* Khanna Publisher, 1992.

EE 1802 DIGITAL SIGNAL PROCESSING (3—1—6)

Sampling and Data Reconstruction process, Z-transforms;

Discrete linear systems; Frequency domain design of digital filters;

Quantization effects in digital filters;

Discrete Fourier transform and FFT algorithms.

High speed convolution and its applications to digital filtering; Multi-rate filtering;

Suggested Books & **References:**

- Rabiner, L. R. & Gold, B., *"Theory and Application of Digital Signal Processing"*, Prentice Hall, 1989.
- Openheim & Schafer, *"Digital Signal Processing"*, Prentice Hall, 1995.

PRICTICAL:

1.	**EE 1803-P**	**Project- II**	**(0-0-12)**
2.	**HS 1808-P**	**GENERAL PROFICIENCY VIII**	**(0-0-0)**

LIST **OF PROFESSIONAL** & **OPEN ELECTIVES**

ELECTIVES	SI.No.	Code	Paper
OPEN ELECTIVE I	01	HS 2721	Enterprise Resource Management.
	02	CS 2721	E-Commerce, Strategic IT
	03	HS 2722	Technology Management.
	04	HS 2723	Decision Support and Executive Information system.
	05	CS 2722	Software Technology.
	06	HS2724	Knowledge Management
PREFESSIONAL ELECTIVES I	01	HS2725	Non Conventional Energy Sources
	02	EE2721	High voltage Engineering
	03	EE2722	Special Electrical Machines
	04	EE2723	HVDC Transmission
	05	EC2721	Microprocessor Based System Design
	06	EC2722	Advanced Topics in Microprocessors and Microcontrollers
	07	EE2724	Computer Aided Design of Electrical Machines.

ELECTIVES	SI.No.	Code	Paper
OPEN ELECTIVE II	07	CS 2821	IT in Marketing Management.
	08	CS 2822	IT in HR Management.
	09	CS2823	IT in Finance Management.
	10	CS **2824**	Project Management and Software Tools.
	11	HS 2821	Human Values
	12	HS 2822	Science Technology & Society
PREFESSIONAL ELECTIVES I I	07	EC 2821	Data Communication And Design
	08	EC 2822	Microprocessor based System Design
	09	EC 2823	Advanced Topics In Microprocessors & Microelectronics
	10	CS 2825	Personnel Computer Systems
	11	EC 2824	Biomedical Instrumentation i
	12	EE2821	Power Electronics
PREFESSIONAL ELECTIVES III	17.	CS 2P.2f:	System Software
	14	CS 2827	Computer Graphics
	15	EC 2825	Modeling And Simulation
	16	EC 2826	Television Engineering
	17	EC 2827	V L S I Design
	18	EE 2822	Neural Network & Fuzzy System
	19	CS 2828	Computer Networks

Note: *The Institutions can frame Syllabi of Professional Electives and Open electives to be offered by them in the particular area.*

Open Electives

HUMAN VALUES

The objectives of the course is an exploration of human vales which go into making a 'good' human being, a 'good' human society and a 'good' life. The context is the work life and the personal life of modern Indian professionals. The course has been taught for two years as an elective curse to B. Tech. Part —III students of IT-BIU.

1. The value-crisis in the contemporary Indian Society.
2. The nature of values: The value spectrum for a 'good' life.
3. The Indian system of values.
4. Material development and its values: the challenge of science and technology.
5. Psychological values: integrated personality; mental health.
6. Societal values: the modern search for a 'good' society; justice, democracy, rule of law; values in the Indian constitution.
7. Aesthetic values: perception and enjoyment of beauty.
8. Moral and ethical values; nature of moral judgments; canons of ethics; ethics of virtue; ethics of duty; ethics of responsibility.
9. Work ethics; professional ethics.
10. Spiritual values; different concepts; secular spirituality.
11. Relative and absolute values.
12. Human values: humanism and human values; human rights; human values as freedom, creativity, love and wisdom.
13. Management by values: professional excellence; inter-personal relationships at work place; leadership and team building; conflict resolution and stress management; management of power.

SCIENCE TECHNOLOGY AND SOCIETY

It will be innovative course dealing with social, human and ethical implications of engineering and technology, with special reference to the Indian situation. Its three main components are:

- Social and Cultural history of technology,
- Social and Human critiques of technology,
- Engineering Ethics and Professional Ethics,
- The proposed course structure is as follow:

1. Science, Technology and Engineering, as knowledge and as social and professional activities.
2. Inter-relationship of technology growth and social, economic and cultural growth; historical perspective.
3. Ancient, medieval and modern technology / Industrial revolution and its impact. The Indian Science and Technology.
4. Social and human critiques of technology: Mumford and Ellul.
5. Rapid technological growth and depletion of resources. Reports of the club of Rome. Limits to growth; sustainable development.
6. Energy crisis; renewable energy resources.
7. Environmental degradation and pollution. Eco-friendly technologies. Environmental regulations. Environmental ethics.
8. Technology and the arms race. The nuclear threat.
9. Appropriate technology movement Schumacher; later developments.
10. Technology and the developing nations. Problems of technology transfer. Technology assessment / Impact analysis.
11. Human operator in engineering projects and industries. Problems of man machine interaction. Impact of assembly line and automations. Human centred technology.
12. Industrial hazards and safety. Safety regulations. Safety engineering.