## SCHEME OF COURSES FOR B.TECH I YEAR
### COMMON TO ALL BRANCHES

**B.Tech I year, I Semester**
(Intermediate to all branches)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course No.</th>
<th>Subject</th>
<th>Credits</th>
<th>Teaching Schedule Hrs.</th>
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<tr>
<td>1.</td>
<td>PH-101T</td>
<td>Engineering Physics-I (All Branches)</td>
<td>4</td>
<td>310</td>
<td>4</td>
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<tr>
<td>2.</td>
<td>CY-101T</td>
<td>Engineering Chemistry (EE, EC &amp; EI)</td>
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<td>3.</td>
<td>MA-101T</td>
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<td>310</td>
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<tr>
<td>4.</td>
<td>HU-101T</td>
<td>Communicative English (EE, EC &amp; EI)</td>
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<td>5.</td>
<td>CS-101T</td>
<td>Computer Fundamentals &amp; Programming (EE, EC &amp; EI)</td>
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<td>8.</td>
<td>CY-103T</td>
<td>Environments Studies (CS, CH &amp; ME)</td>
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<td>HU-103T</td>
<td>Fundamentals of Economics (ME, CS &amp; CH)</td>
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**Laboratory Courses**

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**G. Total**

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## SCHEME OF COURSES FOR B.TECH I YEAR
### COMMON TO ALL BRANCHES

**B.Tech I year, II Semester**
*(Common to all branches)*

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**Laboratory Courses**

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<td>Workshop Practice Lab (EE, EC &amp; EI)</td>
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## B.TECH SEMESTER-III
### ELECTRICAL ENGINEERING

#### THEORY COURSES:

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<td>Electrical Machines-1</td>
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#### LABORATORY COURSES:

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<td>Electrical Machines-I</td>
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**TOTAL (THEORY + LABORATORY)**: 28 hours out of 30 hours.
# B.TECH SEMESTER-IV
## ELECTRICAL ENGINEERING

### THEORY COURSES:

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<td>1.</td>
<td>EI-202T</td>
<td>Linear Integrated Circuits</td>
<td>4</td>
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<td>Electromagnetic Theory</td>
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<td>3.</td>
<td>EC-204T</td>
<td>Digital Electronics</td>
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<td>4.</td>
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<td>Computer Organisation</td>
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<td>EE-204T</td>
<td>Electrical Machines-II</td>
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<td>Electrical Machines-II</td>
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<td>Digital Electronics</td>
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<td>Linear Integrated Circuit Lab</td>
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**TOTAL (THEORY + LABORATORY)**  
30  
33
# B.TECH SEMESTER-V
## ELECTRICAL ENGINEERING

### THEORY COURSES:

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<tbody>
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<td>1.</td>
<td>EE-301T</td>
<td>Control System(EC, EI &amp; EE)</td>
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<td>2.</td>
<td>EE-303T</td>
<td>Power Electronics(EC, EI &amp; EE)</td>
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<td>Signal &amp; System</td>
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### LABORATORY COURSES:

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<td>Instrumentation Lab</td>
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**TOTAL (THEORY + LABORATORY)**: 30 hours

24 hours
# B.TECH SEMESTER-VI
## ELECTRICAL ENGINEERING
### THEORY COURSES:

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<td>Power System -II</td>
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<td>EE-304T</td>
<td>Power Plant Engineering</td>
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<td>Computer Simulation Of Power system</td>
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<td>Digital &amp; Non Linear Control System</td>
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<td>Special Purpose Machines</td>
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### LABORATORY COURSES:

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<tbody>
<tr>
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<td>Control System(EE,EC &amp; EI)</td>
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**TOTAL (THEORY + LABORATORY)**

|               |            |                                  | **30**  |                        | **33**     |
# B.TECH SEMESTER-VII
## ELECTRICAL ENGINEERING

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<td>EE-405T</td>
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<table>
<thead>
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<tr>
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<tr>
<td>1.</td>
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**Pool Elective**
- 1. Non Conventional Energy Sources (EE-411T)
- 2. Neural Networks & Fuzzy Logic (EE-413T)
- 3. Utilization of Electrical Power & Traction (EE-415T)

**Open Elective**
- 1. HU-449T Principal of Management
- 2. MA-491T Operations Research
- 3. CY-491T Charge Transfer in Plasma
- 4. HU-493T Introduction to Psychology
- 5. CY-401T Polymeric Materials and their Applications
- 6. PH-419T Futuristic Materials
# B.TECH SEMESTER-VIII
## ELECTRICAL ENGINEERING

### THEORY COURSES:

<table>
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<tr>
<th>SI. No.</th>
<th>Course No.</th>
<th>Subject</th>
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<td>EE-402T</td>
<td>Electric Drives &amp; Control</td>
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<td>310</td>
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<td>EE-404T</td>
<td>Electrical Machine Design</td>
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### LABORATORY COURSES:

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<td>EE-404P</td>
<td>Power System</td>
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<td>Project-II</td>
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**TOTAL (THEORY + LABORATORY)**  

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</table>

### POOL ELECTIVE
- 1. EE-406T E.H.V AC & DC Transmission
- 2. EE-408T Power Quality.
- 3. EE-410T Power System Operation & Control

### OPEN ELECTIVES:
- 1. HU-402T Engineering Economics
- 2. PH-429T Material Imperfection and Applications
- 3. HU-409T Quantitative Methods in Economics
- 4. HU-407T Foreign Trade
B.Tech. FIRST YEAR (FIRST SEMESTER)

PAPER CODE:PH-101T  Engineering Physics-I
Credits-4
LTP(310)
(All Branches)

UNIT-I

UNIT-II
Diffraction: Basic idea of Fresnel & fraunhofer diffraction, single, double and n slit diffraction, diffraction grating, Rayleigh’s criterion of resolution, resolving power of telescope, microscope and grating.

UNIT-III
Polarization: Phenomenon of double refraction, Malus law, Nicol prism, quarter wave and half wave plates, production and analysis of plane, circularly and elliptically polarized light, optical activity, specific rotation, Lorentz half shade and biquartz proarimeters.

UNIT-IV
Wave Mechanics: Elementary idea of quantization, black body radiation, Frank-Hertz experiment, Photoelectric effect. Wave particle duality, De Broglie concept of matter waves, Heisenberg’s uncertainty principle, Schrodinge’s wave equation, physical significance of wave function, applications of Schrodinger’s wave equation: (i) Particle in one dimensional box. (ii) Potential Step (iii) Potential barrier-quantum mechanical tunneling (Basic idea).

UNIT-V
Solid State Physics: Structure of crystalline solid: Lattice translational vectors, unit cell, Bravais lattice, Miller indices and simple crystal structures.
Free electron model: Free electron gas in one and three dimensions, Fermi energy, Density of states, Heat capacity of the electron gas, failure of free electron model.
Band theory: Kronig Penny model, motion of electrons in one dimension according to the band theory, effective mass of an electron, concept of hole, distinction between metals, insulators and intrinsic semi-conductors.

Reference Books:
1) Geometrical & Physical Optics: B.K.Mathur
2) Introduction of Solid State Physics: C. Kittel
3) Solid State Physics: A.J. Dekkar
4) Quantum Mechanics: Singh and Bagdel
5) Optics: Ajai Ghatak
6) Quantum Mechanics: B.K. Agarwal & Hari Prakash
7) Optics: A.H. Flower
8) Geometrical & Physical: Zenkin’s & White
9) Quantum Mechanics: Eisberg

PAPER CODE:CY-101T  Engineering Chemistry
Credits:4
LTP(310)
UNIT-I

**Schrödinger equation**: origin of quantization; applications of particle in a box problem; hydrogen atom; properties of atomic orbitals; many electron atoms; molecular orbital theory; bonding and intermolecular forces.

UNIT-II

**Thermodynamics**: Fundamental definition and concepts of thermodynamics; Work, heat and energy; First law: \( C_p \) and \( C_v \); Second law: entropy; Helmholtz and Gibbs Energy; chemical potential; Third law: phase equilibria; chemical equilibrium.

UNIT-III

**Chemical kinetics**: Rate laws; elementary reaction and chain reaction.

UNIT-IV

**Periodic table and periodic properties**: basis of periodic table, trends in size, electron affinity, ionization potential and electro negativity, Use of Ellingham diagram and thermodynamics in the extraction of elements; Transition metal chemistry: inorganic complexes, isomerism, nomenclature; bonding in transition metal complexes; valence bond and crystal field theory, magnetism, bonding aspects, structural distortion; Bioinorganic chemistry: storage and transport proteins; Catalysis: hydrogenation, hydroformylation and olefin metathesis.

UNIT-V


**Suggested Books**

UNIT: I
Differential Calculus: Limit, continuity and differentiability of functions of single variable. Successive Differentiations, Leibnitz Theorem, Expansion of functions by Maclaurin’s and Taylor’s theorems.
Functions of several variables: Partial derivatives, Euler’s theorem, change of variables, total differential coefficients, maxima and minima, Lagrange’s method of multiplier.

UNIT: II
Integral Calculus: Fundamental and mean value theorems of integral calculus. Reduction formulae, Walli’s formula, Beta and Gamma functions, Double and Triple integrals, change of orders of integrations. Area enclosed by plane curves, surfaces and volumes of revolutions.

UNIT: III
Vectors and Matrices: Differentiations and integrations of vectors. Gradient, Divergence and Curl. Vector identities, Green’s, Gauss’s and stoke’s theorems with applications. Types and algebra of matrices, rank, solution of simultaneous linear equations, Eigen values and Eigen vectors, diagonalisation of matrices, Cayley-Hamilton Theorem.

References:
UNIT: I
(a) Pronunciation: basic sounds of English (vowels and consonants) and word-stress.
(b) Vocabulary: word-formation (prefixes and suffixes), synonyms and antonyms.
(c) Syntax: parts of speech, active and passive voice, direct and indirect speech, tenses, basic sentence patterns, etc. The literary aspect will be dealt with through suitable texts such as poems, short stories and plays (chosen by the instructors). The main topics for discussion will be:
(a) What is literature?
(b) The nature of literary language (mainly “figurative language”)
(c) The literary forms or genres
(d) Literature and socio-cultural context

UNIT: II
UNIT I:

UNIT II:

UNIT III:

UNIT IV:

UNIT V:
Programming in C: History, Introduction to C Programming, Language, Structure of C Programs, Compilation and Execution of C Programs, Debugging Techniques, Data Type and sizes, Declaration of Variables, Modifiers, Identifiers and Keywords, Symbolic constants, Storage Classes (Global, Automatic, External, Register, And Static), Enumerations, Command line Parameters, Macros, The C Preprocessors.

UNIT 5:

UNIT 6:

References:
1) Computers Fundamental by Rajaraman
2) Computers Fundamental by B. Ram.
4) ‘Programming in C’ by E. Balagrusamy, TMIL.
6) Exploring ‘C’ by Yashwant Kanetkar
Carpentry: Wood, timber-exogenous & endogenous, Cross section of an exogenous tree, Seasoning of wood, Seasoning methods, defects (Both natural and that occurs during conversion), Brief description of carpentry tools, various carpentry process. Carpentry joints.

Pattern & Pattern making: Pattern, types of pattern (Single piece, split, Match plate, Sweep, Loose piece, Gated patterns), Pattern making allowances, Design considerations in pattern making, pattern making materials, Core prints.

Foundry: Moulding materials, types of foundry sands; characteristics of foundry sands; Binders & additives; moulding procedures: Floor moulding, Bench moulding, Pit moulding, Machine moulding, Green sand moulding, Dry sand moulding, CO₂, Core making processes.

Foundry’ tools & equipments: Tools used in foundry (hand tools); moulding machine- (Jolt machine, Squeezing machine, Sand Slinger, Push off machine), Furnaces (Pit furnace, cupola furnace).

Welding: Pressure and non-pressure, arc welding (AC and DC arc welding, Introduction to Carbon arc welding, metal arc welding, TIG & MIG welding); Electric resistance welding (Spot, seam, projection, But, thermit welding), welding tools and equipments, Gas welding (oxyacetylene).

Bench work & fitting: Tools (holding tools, striking tools, cutting tools), various operations performed in fitting shop (in detail).

Machine tools: Definition, type: Lathe specifications; Lathe operations in brief (facing, plain turning, step turning, taper turning, threading, drilling and boring). Milling machine (introduction & brief description of operations only).

Jigs & Fixture: Introduction, Location points, Basic Design of Jigs & Fixture, Types of Jigs & Fixture.

Text Book:
A text Book on workshop technology by B. S. Raghuvanshi

Reference Book:
Workshop technology by Hazara & Chaudhry,
Production technology by R.'K.Jain
UNIT:I
Importance of Engineering Drawing, Engineering Drawing Instruments and uses, Layout of Drawing sheet, Lettering and Dimensioning, Types of Lines. Scales: What is scale, Representative factor, Types of Scale: Plain, Diagonal and Vernier scales, Metric Measurements and conventions, Plain Scale, diagonal scale& vernier scale(forward & backward both).

UNIT:II
Conic Section, Definition, and different methods of construction of ellipse, hyperbola and parabola by Eccentricity method Construction of parabola and ellipse by Concentric circles method, Oblong method, Parallelogram method.

UNIT:III
Projections, Principle, types and conventions, Theory of Projections and orthographic projections:- Introduction, Types of projections, Orthographic projections, Planes of Projection, Four quadrants, Types of orthographic projections, (a) Projections of point and straight lines, (b) Projections of lines inclined to both the planes, Projection of planes, (a) Projection of solids (b) Projection of solids inclined to both H.P. & V.P. (of prisms pyramids etc).

UNIT:IV
Isometric Projections: Theory of isometric projection- Isometric lengths, Isometric scales:- Methods to draw Isometric view or projection, various positions of Isometric axes. Isometric projection with isometric lines, non-isometric lines and with curved & circular surfaces.

Recommended Text Book
1. A Text book of Engineering Drawing (Geometrical Drawing) by R.K. Dhawan
2. Engineering Drawing & Graphics, by K.Venugopal Rao
3. Engineering Drawing by P.S. Gil
4. Engineering Drawing by N. D. Bhatt
UNIT I:
**Introduction of Semiconductor Physics:** Band Theory of solids, Insulator, Semiconductor & Metals, Mobility and Conductivity, Electrons and holes in an intrinsic semiconductor, Carrier concentration in an intrinsic semiconductor, n-type material, p-type material, Donor and Acceptor impurities, Charge densities in a semiconductor, Hall-effect, Diffusion, the continuity equation, Fermi level in a semiconductor having impurities.

UNIT II:
**Junction Diode Characteristics:** p-n junctions, Forward bias, Reverse bias junction, V-I characteristics, Effect of temperature on a p-n junction diode, Maximum temperature operation, Reverse breakdown voltage, Capacitive effects in a p-n junction diode, Space charge capacitance, Diffusion capacitance, Diode Resistance, Static and Dynamic Resistance, Comparison of practical with ideal diode, load line analysis of a diode circuit.

UNIT III:
**Rectifying Circuits and DC Power supplies:** p-n junctions as an rectifier, form factor, average voltage and current, half wave & full wave rectifier, voltage regulation, Ripple factor, Bridge rectifier, Comparison of rectifier circuits, Filter circuits for power supplies, inductor filter, capacitor filter, Effect of capacitor series resistance, Peak inverse voltage of a half wave rectifier, LC filter, Comparison of filter circuits.

UNIT 4:
**Diode Applications:** Clippers, Series and parallel, Clampsers, Zener diodes, Zener diode specification, Voltage regulator circuits, Design of a voltage regulator circuits, Effect of supply voltage variations, Zener diode breakdown mechanism, Voltage multiplier circuits, voltage doublers, voltage Tripler, Quadrupoler.

UNIT 5:
**Bipolar Junction Transistor:** The junction transistor, Transistor current components, transistor as an amplifier, Common base configuration. Early effect, the input and output characteristics, Common emitter configuration I/O characteristics, Active, Saturation, Cut-off regions for both configurations, common collector configuration, common base current gain, common emitter current gain.

REFERENCES


2. Electronic Devices and Circuits, An introduction by Allen Mottershead, TMH.

3. Electronic Devices and Circuits theory by Robert L. Boylestad, Lonis nashelsky,
UNIT I

UNIT II
Probability and statistics: Definitions of probability and simple theorems, conditional probability, Baye’s Theorem, random variables, discrete and continuous distributions, Binomial, Poisson and normal distributions, correlation and linear regression.

UNIT III
Complex Analysis: Analytic functions, C-R equations in Cartesian and polar forms, Harmonic functions, Milne-Thomson method, complex integration, Cauchy’s theorem, Cauchy’s integral formula. Lioville’s and Morera’s Theorems, Taylor’s and Laurent’s theorems. Residues: Cauchy’s residue theorem, evaluation of real integrals of the type \( \int_0^{2\pi} f(\cos \theta, \sin \theta) \, d\theta \) and \( \int_{-\infty}^{\infty} f(x) \, dx \).

References:
UNIT I:
Basic Concept: Definitions & units, Introduction to Basic Laws, Circuit Elements, KVL, KCL, Ideal & Real Sources, Dependent & Independent Sources, Conversion of Voltage Source into Current Source & vice versa, Controlled and Uncontrolled Sources, Loop and Nodal Method of analysis, Star to Delta Transformation & vice-versa.

UNIT II:

UNIT III:
Network Theorems: Superposition, Thevenin, Norton, Maximum Power Transfer & Reciprocity Theorems.

UNIT IV:
Steady-State Response: Steady-State Response of Circuit to Sinusoidal functions, Phasor Representation of Sinusoids, Concept of Complex Impedance, Series & Parallel AC Circuits, Series & Parallel resonance.

UNIT V:

UNIT VI:
Transient: Response of RC, RL & RLC Circuit to DC Excitation only (simple problem).

UNIT VII:
Instruments: Introduction to MI, MC Instruments, Extension of range, Dynamometer Type Wattmeter, Simple problems based on these instruments.

Books:
1) Basic Circuit Theory by L.P. Huelsman, PHI.
2) Hughes Electrical Technology by M. Smith, Addison-Wessley Pub
3) Electrical Technology by B.L. Theraja.
4) Electrical Engineering Fundamentals by V. Deltoro, PHI
UNIT: I  
Dielectric Properties of Materials: Polarization of dielectrics, dielectric constant, electric susceptibility, non-uniform polarization, electric displacement vector, Lorentz local field, Polarizability, Clausius-Mosotti relation, frequency dependence of dielectric constant.  

UNIT: II  
Magnetic Properties of Materials: Magnetization, three magnetic vectors (B.M & H), susceptibility and permeability, Dia, Para, and ferromagnetism, Magnetic domains, hysteresis, Ferro electricity & Piezoelectricity.  

UNIT: III  
Maxwell’s Equations: Displacement Current, Maxwell’s equation in vacuum & medium (Integral and Differential forms), Poynting theorem, Poynting vector.  

UNIT: IV  
Electromagnetic Waves: Wave equation, plane waves, Propagation of electromagnetic waves through non-conducting medium, reflection and transmission.  

UNIT: V  
Superconductivity: Temperature dependence of resistivity in superconducting materials, Effect of magnetic field (Meissner effect), Type I and Type II superconductors, BCS theory (Qualitative), high temperature superconductors. Characteristics of superconductors in superconducting state, applications of superconductors.  

UNIT: VI  
Nuclear Physics: Basic properties and constituents of nucleus, mass defect, packing fraction and binding energy, semi empirical mass formula, elementary idea of nuclear forces and their characteristic properties, Nuclear fission, important components and working of nuclear fission reactor, Basic Concept of nuclear fusion reactors.  

Books:  
1) Electricity and Magnetism: Berkley Physics Course-II.  
2) Electromagnetic waves & Radiating systems: Jordan and Keith.  
3) Solid State Physics: C.Kittel  
4) Nuclear Physics: I. Kaplan  
5) Modern Physics: A.Beiser  
Multidisciplinary nature of environmental studies, Ecosystems, Biodiversity and its conservation, Indicators of environmental pollution, Environment and human health. Consumption of natural resources and environmental degradation of forests, water, coal, minerals, energy, and land. Sustainable development, Environmental policy and legislation, Environmental impact assessment. Pollution of lakes, rivers, ground water, coasts, and oceans, Science and technology for drinking water and wastewater treatment and issues in management of systems. Solid and hazardous waste management: causes, effects and control measures. Air and noise pollution, science and engineering of pollution control, Global Issues including climate change, global warming, acid rain, ozone layer depletion, nuclear hazards, Disaster management, industrial accidents, floods, earthquakes, cyclones and landslides, Green house effect etc.

Suggested Books
UNIT: I
Microeconomics: What is Economics? basic economic problems and nature of economics; demand and supply; consumer choice; individual and market demand; production and cost of production; profit maximization and perfect competition; market structure-monopoly, monopsony, monopolistic competition, and oligopoly; externalities and public goods; factor markets-land, labour and capital market.

UNIT: II
Macroeconomics: National income accounting-income, expenditure and components of GDP; consumption and saving; investment spending and demand for money; financial systems-central bank, money, credit, financial markets and asset prices; income and spending; money, interest and income; fiscal and monetary policies; economic growth and accumulation; aggregate supply-wages, prices and unemployment; inflation.

Suggested Books:
A. THERMODYNAMICS:

UNIT: I

UNIT: II
First Law: First law of thermodynamics. Concept of processes, flow processes and control volume, flow work, steady flow energy equation, Mechanical work in a steady flow of process.

UNIT: III
Properties of steam and thermodynamics cycles: Properties of steam, use of property diagram, Steam-Tables, processes involving steam in closed and open systems. Rankine cycle.

B. MECHANICS

UNIT: IV
Force system and Analysis:
Friction: Introduction, Laws of coulomb friction, Equilibrium of bodies involving dry friction-Belt Friction.

UNIT: V
Stress and Strain Analysis:
Simple stress and strain: Introduction, Normal shear stresses, stress-strain diagrams for ductile and brittle materials, elastic constants, one dimensional loading of members of varying cross sections, strain Energy.

UNIT: VI
Newton’s Second Law: D’ alemberts Principle-problems (for horizontal & inclined surface). Analysis of lift, motion problem. Motion of several connection bodies, Motion of two bodies connected by as tiring, when one body is lying on horizontal surface and other is hanging free, when one body is lying on inclined plane and other is hanging free case (i) Smooth inclined surface case (ii) Rough inclined surface of co-efficient of friction ‘µ’ (only problems).
Books:
1) Thermodynamics by P.K. Nag.
2) Thermodynamic by P.L. Ballaney.
6) Yadav R.: Steam & Gas Turbines.
Subject: Analog Electronics                        Code: EI-201 T                         Credits: 4
Branches: EC, EI, CSIT and EE                      Sem: III semester                      L P T: 3 1 0

Unit 1: Transistor as an amplifier: Transistor Biasing and thermal stabilization: The operating point, Biasing Circuits, fixed bias, bias stability, self bias or emitter bias, fixing of Q-point using graphically & analytical methods, stabilization against variation in $I_{CO}$, $V_{BE}$, $\beta$: Bias compensation Diode for $I_{CO}$, $V_{BE}$.

Unit 2: The Transistor at low frequencies: Two port devices and the hybrid model. The $h$-parameter, determination of $h$-parameter from input and output characteristics. Analysis of a transistor amplifier circuit using $h$-parameters; the emitter follower (its modelling), Miller’s theorem and its dual, cascading transistor amplifier (up to 2 stages), simplified hybrid model, high input resistance transistor circuit e.g. Darlington, Emitter follower.

Unit 3: Field effect transistors: General description on FET, JFET operations, and its characteristic, MOSFET, the FET small signal model, CS and CD amplifiers at high and low frequencies.

Unit 4: Feedback amplifiers: Classification of amplifiers, feedback concepts, transfer gain with feedback, general characteristics of negative feedback amplifier, input and output resistances for voltage series, current series, current shunt, voltage shunt feedback, analysis of feedback amplifier (voltage series, current series, current shunt, voltage shunt feedback).

Unit 1: Power amplifier: Class A large signal amplifier, second harmonic distortion, higher order harmonic generation, the transfer audio power amplifier, efficiency, class B, class C, class AB and push-pull amplifier.

REFERENCES

1. Integrated Electronics Analog and Digital circuits and systems, J. Millman, Halkias and Prikh, TMD.

2. Electronics Devices and Circuit Theory; Robert Boylestad & Nashlasky (PHI).

Unit – I:
Graph Theory: Graph of a Network, definitions, tree, co tree, link, basic loop and basic cut set, Incidence matrix, cut set matrix, Tie set matrix Duality, Loop and Nodal methods of analysis.

Unit – II:

Unit – III:
Laplace transforms: Introduction to Laplace Transform

Unit-IV:
Fourier Series: Introduction to Fourier Analysis.

Unit – V:
Network Functions: Concept of Complex frequency, Transform Impedances, Network functions of one port and two port networks, concept of poles and zeros, properties of driving point and transfer functions, time response and stability from pole zero plot.

Unit – VI:
Two Port Networks: Characterization of LTI two port networks ZY, ABCD and h parameters, reciprocity and symmetry. Inter-relationships between the parameters, inter-connections of two port networks, Ladder and Lattice networks. T & Π Representation.

Unit – VII:
(a)Network Synthesis: Positive real function; definition and properties; properties of LC, RC and RL driving point functions, synthesis of LC, RC and RL driving point immittance functions using Foster and Cauer first and second forms.

(b)Filters: Image parameters and characteristics impedance, passive and active filter fundamentals, low pass, highpass, (constant K type) filters, and introduction to active filters.

Text Books:
1. Networks and Systems, D. Roy Chowdhury, New Age International Publishers

Reference Books:
1. Network Analysis, M.E. Valkenburg, Pearson Education.
Note: A setting of eight questions will be there covering all the units proportionally out of which any five are to be attempted.

UNIT:1  **Ordinary Differential Equations:** First order equations (linear and non-linear). Linear equations of second and higher orders with constant and variable coefficients. Solution of second order equations by removing first derivative, changing of dependent and independent variables and method of variation of parameters.

UNIT:2  **Special Functions & Partial Diff. Eqns:** Power Series solutions of second order equations by Frobenious method. Legendre polynomials and Berel’s functions of first kind and their properties method of separation of variable for heat, wave and Laplace equations: Their solutions and related application.

UNIT:3  **Integral Transforms:** Laplace transform, existence theorem, Laplace transform of derivatives and integrals, Laplace transform of special functions. Inverse Laplace transform, convolution theorem. Applications of Laplace transform and its inverse to solve ordinary and partial differential equation. Introduction to Fourier transforms. Fourier series, half range sine and cosine series, related applications.

References
Subject: Electronic Measurement & Instrumentation       Code: EI-203T       Credits: 4

Branches: EC, EI                          Sem: III Sem          L P T: 3 1 0

Unit 1:- Measurement & measurement system: Methods of measurement, Direct & Indirect types of measurement systems, Mechanical, Electrical: Classification of Instruments, Null type, deflection type; Mode operation: Analog, Digital.

Unit 2:- Characteristics of Instrumentation & measurement System: Static & Dynamic characteristics, Noise, Linearity hysteresis, Threshold, Dead Time & Dead Zone, Loading Effect, Input & Output Impedance.

Unit 3:- Errors in measurements

Unit 4:- Dynamic response of Instruments & measuring Systems: Dynamic response, First order system, second order System

Unit 5:- Bridges: DC Bridge-Wheatstone Bridge, Kelvin Bridge, measurement of low & High Resistance; AC Bridge-General equation of bridge balance, General form of AC Bridge, Maxwell’s Bridge. Hay’s Bridge, Wein Bridge, Schering Bridge.

Unit 6:- Potentiometers: DC Basic Circuit, Laboratory type, Standardization of Potentiometers; AC: Drysdale polar potentiometers, Gall-Tinsley AC Potentiometer (Working & Construction both).

Unit 7:- Analog Ammeter & Voltmeter


Unit 9:- CRO: Observation of waveform on CRO, Measurement of Large & frequency (Lissajous figure).

REFERENCE BOOKS

Electronic Measurement & Instrumentation Published, Dhanpat Rai & Sons, By:- A.K. Sawhney.
UNIT – I:
Electromechanical Energy Conversion Principles:
Principle of energy conversion.

UNIT-II:
Single Phase Transformer:
Construction & principle of ideal two winding transformer, no-load current waveform, plotting of no-load current waveform from B-H curve, phasor diagrams at no-load and at load conditions, rating, equivalent circuit, tests, voltage regulation, losses and efficiency, auto transformer, parallel operation of single phase transformer.

UNIT-III:
Three Phase Transformer
Types of connections, 3 to 2 phase & 3 to 6 phase conversions.

UNIT-IV:
D.C. Machines:
Construction of DC Machines, Armature winding, Emf and torque equation, Armature Reaction, Commutation, Interpoles and Compensating Windings, Self excitation of shunt generator, Performance, Types & Characteristics of D.C. generators.

UNIT-V:
D.C. Machines (Contd.):
Performance & Characteristics of D.C. motors, Starting of D.C. motors; 3 point and 4 point starters, Speed control of D.C. motors: Field Control, armature control and Voltage Control (Ward Leonard method); Efficiency and Testing of D.C. machines (Hopkinson’s Test, Swinburn’s Test & Direct load test)

Text Books:
2. Husain Ashfaq, ”Electrical Machines”, Dhanpat Rai & Sons

Reference Books:
UNIT I:
(1) Philosophy Of Measurement:
Methods of Measurement, Measurement System, Classification of instrument system,
Characteristics of instruments & measurement system, Errors in measurement & its analysis,
Standards.
(2) Analog Measurement of Electrical Quantities:
Electrodynamic, Thermocouple, Electrostatic & Rectifier type Ammeters & Voltmeters,
Electrodynamic Wattmeter, Three Phase Wattmeter, Power in three phase system, errors &
remedies in wattmeter and energy meter.

UNIT II:
Instrument Transformer and their applications in the extension of instrument range, Introduction
to measurement of speed, frequency and power factor.

UNIT III:
Measurement of Parameters:
Different methods of measuring low, medium and high resistances, measurement of inductance
& capacitance with the help of AC Bridges, Q Meter.

UNIT IV:
(1) AC Potentiometer: Polar type & Co-ordinate type AC potentiometers, application of AC
Potentiometers in electrical measurement
(2) Magnetic Measurement: Ballistic Galvanometer, flux meter, determination of hysteresis
loop, measurement of iron losses.

Text Book:
   Wheeler & Co. Pvt. Ltd. India.
   India.

Reference Books:
UNIT – I:
Crystal Structure of Materials:
A. Bonds in solids, crystal structure, co-ordination number, atomic packing factor, Miller Indices, Bragg’s law and x-ray diffraction, structural Imperfections, crystal growth

UNIT – II:
Dielectric Material:

UNIT – III:
Conductivity of Metals:
Electron theory of metals, factors affecting electrical resistance of materials, thermal conductivity of metals, heat developed in current carrying conductors, thermoelectric effect, superconductivity and super conducting materials, Properties and applications of electrical conducting and insulating materials, mechanical properties of metals.

UNIT – IV:
Mechanism of Conduction in semiconductor materials:
Types of semiconductors, current carriers in semiconductors, Half effect, Drift and Diffusion currents, continuity equation, P-N junction diode, junction transistor, FET & IGFET, properties of semiconducting materials.

UNIT – V:
Magnetic Properties of Material:
Origin of permanent magnetic dipoles in matters, Classification Diamagnetism, Paramagnetism, Ferromagnetism, Antiferromagnetism and Ferrimagnetism, magnetostriction, properties of magnetic materials, soft and hard magnetic materials, permanent magnetic materials.

Text Books:
1. A.J. Dekker, "Electrical Engineering Materials” Prentice Hall of India

Reference Books:
Unit 1:- Elements of Vector Calculus: Co-ordinate system, differential volume, surface 7 line elements, gradient, divergence, curl and del-operator.

Unit 2:- Review of static electric field: Coulomb’s Law, Electric field-intensity, electric flux and flux density, Gauss’s Law, conservation properties of electrostatic field, electric potential, Energy and work in electric field, Current, current density and conductor capacitance & dielectric materials, polarization relative permittivity, multiple dielectric capacitors, energy stored in a capacitor.

Unit 3:- Review of magnetic field: Faraday’s law, Lenz’s law, bio-savart law, Ampere’s law, Magnetic flux density, Vector magnetic potential, stokes theorem, magnetic force, Displacement current, self, internal and mutual inductance.

Unit 4:- Maxwell’s Laplace’s and Poisson’s Equation and Boundary condition: Introduction and its applications.

Unit 5:- Electromagnetic waves: Introduction and solutions for partially-conducting perfect dielectric and good conductor mediums, skin depth, interface conditions ate normal incidence, oblique incidence and Snell’s laws, perpendicular and parallel polarization, standing wave, power and the pointing vectors.

Unit 6:- Transmission Lines: Wave equation for ideal transmission line, characteristics impedance, propagation & reflection, VSWR, impedance, transformation, smith chart, parallel and co-axial transmission lines, Impedance Matching, single and double stub matching, impedance matching single and double stub matching, impedance measurement, Motion of charged particles in an Electric & Magnetic Field.

REFERENCES

1. Electromagnetic; john D. Kraus TMH
4. Electromagnetic wave and radiating system; John, Balmin
5. Engineering Electromagnetics; William Haytt
Unit 1:- **Differential Amplifiers**: Introduction, Differential amplifier circuit configuration, D.C. and A.C. analysis for dual-input balanced output, single input-balanced output, dual input unbalanced output, single input-on balanced output, differential amplifier configuration, FET differential Amplifier, an introduction, differential amplifier with swamping resistors, cascaded differential amplifier stages, cascade or CE-CB configuration.

Unit 2:- **Operational Amplifiers**: Introduction, Block diagram representation of typical Op-Amplifier, level transistor stage of op-amp, transistor current mirrors and active loads, output stage of op-amp, transfer characteristic of output stage, constant current bias, Thermal stability.

Unit 3:- **Interpretation of data sheets and characteristics of an op-amp**: Interpreting a typical set of data sheets, electrical parameters like, input offset voltage, input offset current, input bias current, CMRR, Slew rate etc. The ideal op-amp, equivalent circuit of an op-amp, ideal voltage transfer curve, open loop op-amp. Configuration.

Unit 4:- **An Op-Amp. With negative feedback**: Block diagram representation of feedback configuration, voltage series and voltage shunt feedback amplifier, concentrating on voltage gain, input & output resistances, bandwidth with feedback expressions, voltage follower circuits.

Unit 5:- **Frequency response of an op-Amp.**: Frequency response, compensating networks, high frequency op-amp., equivalent circuit, open loop voltage gain as a function of frequency.

Unit 6:- **Applications of Op-Amp. & Linear I.C.’s**: Summing amplifier, scaling and averaging amplifier, instrumentation amplifier integrator, differentiator, differential amp. Realization using one and two op-amp.

(i) Active filters; Advantages of active filters over passive filters, First order low pass Butterworth filter design, Second order L.P. Butterworth filter, first and second order H.P. Butterworth filters. Higher order filtered an introduction; band pass and band reject filters. All pass filter design, introduction to oscillators.

Unit 5:- **555 timer, 566 (VCO), P.L.L., - I.C.’s**

REFERENCES

2. Operational amplifiers and linear integrated Ckts by Coughlin, Driscoll-PHI (India).
3. Linear integrated ckts by D. Roy Chaudhary, Shail Jain/New age international (P) Ltd, India.
Subject: Digital Electronics          Code: EC-204 T        Credits: 4
Branches: EC, EI EE and CSIT        SEM: IV Semester       L P T: 3 1 0

Unit 1: Basic concept of Boolean algebra: Different rules for arithmetic operation, minimisation of switching functions with theorem and K-Map up to five variables, reduction techniques, prime and essential implicants, concepts of don’t care condition, min. and max. Terms SOP, POS variables, entered mapping VEM, plotting & reading theory, QM methods.

Unit 2: Digital logic families: TTL, RTL, DTL, ECL, Totem pole and open collector concept, comparison of logic families.

Unit 3: Combinational Logic: Design of combinational logic circuit using different chips/gates. Code converter: BCD-gray, excess three, encoders, decoders, multiplexers, de-multiplexers, 7-segment decoder/driver, ROM, PLA, full and half adder/subtractor, parallel adder/subtractor, look ahead carry generator, parity bit checker/generator, implementation of Boolean function with mux and decoder.

Unit 4: Sequential logic circuit: Concept of memory storage, Latches, Flip Flops, JK, SR, T, D, Master slave, characteristic table truth table, concept of flip flop, conversion techniques, race around condition, Triggering of flip flop, classification of sequential machines, oscillators, analysis of synchronous sequential circuits, design steps for sequential circuits, state diagram, state reduction minimization of the next state decoder, o/p decoder designing.

Unit 5: Design of single mode and multimode counter: Ripple & ring, Registers, Shift register, Shift register sequences, Ring counter using shift register and memories type of register universal and directional.

REFERENCES

1. Digital logic and computer design by MORRIS MANO (PHI)
3. Fundamental of digital electronics by BARITTEE, TMH
Subject: Industrial Management
Code: ME-212T
Branches: EC, EI, EE, and CSIT
Semester: IV Sem
Credits 04
LPT: 3 1 0

1. Work study, method study & work measurement including time study, work sampling, production study, PMTS, MTM, importance of time standards, rating & allowance. Work study, incentive schemes, job description, analysis & evaluation.


3. Market research, principle of marketing, customers viewpoint & selective selling, functions & scope of marketing, sales forecasting techniques.

4. Performance measures of a Production system, Production, Productivity, Efficiency, Effectiveness, Quality, Flexibility, Agility etc.

5. Organization, organization structure, department on functional charts for business & industrial organization centralized & decentralized organizations, manpower planning, requirement & forecasting, recruitment training & placement.


Text Book:
1. Engineering Management by: Fraidoon Mazda

Reference:
2. Marketing Management by: Philip Kotler

2. **Arithmetic for Computer**: - Introduction to number system, negative numbers, addition & subtraction, logical operation, constructing and A.L.U., multiplications & division, floating point arithmetic.

3. **Processor Design**: - Processor organisation, Processor Level, information representation, instruction format, Addressing modes (Implied Mode, Immediate mode, register indirect mode, auto increment or Auto decrement mode, direct addressing mode, indirect addressing mode, relative addressing mode, index addressing mode), instruction types.

4. **Control Design**: - Control memory address sequencing, micro instruction interpretation, CPU control unit, basic concepts of micro programmed control, micro program sequencer for a control memory, micro instruction formats.

5. **Memory Organization**: - Classification memories, Memory Hierarchy, Optimization of memory hierarchy, Virtual Memory, Dynamic Address Translation Scheme addressing scheme for main memory, segmented memory system, paged segment memory, memory management policies, High speed memories, characteristics of cache memory, Cache memory organisation, Block replacement policies, interleaved memories, associated memories.

6. **System Organization**: - Bus arbitration, Programmed I/O (IO addressing, IO instruction), DMA (Types & procedures), interrupts (procedure, interrupt selection, vectored interrupts), Concurrency Control, System management.

**REFERENCES**

3. Computer System Architecture, by M. Morris Mano, PHI
Subject: Linear Integrated Circuit Lab  
Code: EI-202P  
Credits: 2

Branches: EC, EI and EE  
SEM: IV Semester  
L P T: 0 0 3

List of Experiments

1. To perform inverting, non-inverting amplifier and voltage follower using 741 IC.

2. To perform integrator and differentiator using 741.

3. To determine parameters of 741 IC a) input bias current, b) input off-set current, c) input off-set voltage d) slew rate.

4. To perform the comparator circuit using 741 IC.

5. To perform the square wave generator circuits using 741 IC.

6. To perform the Wein Bridge Oscillator circuit using 741 IC.
B-TECH. SEMESTER-IV
ELECTRICAL MACHINE-II
EE-204T

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**UNIT-I:**

**Synchronous Machine I:**

**UNIT-II:**

**Synchronous Machine II:**
Two Reaction Theory, Power flow equations of cylindrical and salient pole machines, operating characteristics

**Synchronous Motor:**
Starting methods, Effect of varying field current at different loads, V- Curves, Hunting & damping, synchronous condenser

**UNIT-III:**

**Three phase Induction Machine :**
Constructional features, Rotating magnetic field, Principle of operation, Phasor diagram, equivalent circuit, torque and power equations, Torque- slip characteristics, no load & blocked rotor tests, efficiency, methods of starting, methods of speed control of induction motor: pole changing, stator voltage control, stator frequency control, cascading, V/F method of speed control, rotor voltage injection method, cogging, crawling.

**Text Books:**
2. Ashfaq Hussain“Electric Machines” Dhanpat Rai & Company

**Reference Books:**
4. P.S.Bimbhra, “Electrical Machinery”, Khanna Publisher
6. M.G.Say, “Alternating Current Machines”,Pitman & Sons
Branches: EC, EI & ME

UNIT-I:
TRANSFORMER:
Principle & construction of single phase transformer, EMF equation, phasor diagram, equivalent circuit diagram, SC test, OC test, efficiency.

UNIT-II:
DC MACHINES:
Principle & construction of DC generator, types of windings, types of DC generator, OCC, load characteristics, principle & construction of DC motor, back EMF, torque equation, load characteristics.

UNIT-III:
INDUCTION MOTORS:
Principle and construction of 3-phase induction motor, concept of slip, phasor diagram. Equivalent circuit diagram, T-S characteristics.

UNIT-IV:
SYNCHRONOUS MACHINES:

Text Books:
Electrical Technology by B.L. Theraja
P.S. Bimbhra, “Electrical Machinery”, Khanna Publisher
Subject: Microprocessor & their Applications  
Code: EI-301T  
Credits: 4

Branches: EC, EI, EE, ME and CSIT  
SEM: V Semester  
L P T: 3 1 0

Unit 1:- General features of Microprocessor: Microprocessor architecture and its operation, Memory, Memory Organisation, Memory Mapped I/O mapped I/O Scheme.

Unit 2:- Architecture of 8085 Microprocessor: 8085 Microprocessor pin configuration, Internal architecture and its operation, Control signals, Flag register, Timing control unit, Decoding, Execution of an instructions and memory interfacing. Timing instruction cycle, Opcode Fetch, memory and input output read/write cycle of an instruction set.

Unit 3:- Programming Techniques of 8085 Microprocessor: How to write and execute a simple program timing and execution of the instructions, Addressing modes, programming techniques, programming technique for looping, counting and indexing, counter programs and timing delay program and timing calculations, stack operation and subroutine programs.

Unit 4:- Interrupts of 8085 Microprocessor: Hardware and software interrupts, interrupts call locations, RIM, SIM, RST 7.5, 6.5 and 5.5.

Unit 5:- Programmable interfaces of 8085 microprocessor: Programmable peripheral interface 8255, programmable interval timer 8253/8254, DMA controller 8257, and interrupt controller 8259.

Unit 6:- Microprocessor Applications: Delay subroutine, seven segment display, water level indicator, microprocessor based traffic control.

Unit 7:- Introduction of 8086 microprocessor: Internal Architecture organisation, Maximum mode and minimum mode, instruction set, initialization instructions, constructing the machine codes for 8086 instruction. Assembler directives, addressing modes, procedure and macros, re-entrant and recursive procedures.


REFERENCES BOOKS

1. Microprocessor Architecture programming and application with 8085/8080 by Ramesh S. Gaonkar.
3. Microprocessor and interfacing Programming and Hardware by Douglas V. Hall.
Subject: Microprocessor Lab  

Code: EI-301P  
Credits: 2

Branches: EC, EI, EE, ME and CSIT  
SEM: V Semester  
L P T: 0 0 3

1. Write a program using 8085 Microprocessor for Decimal, Hexadecimal addition and subtraction of two Numbers.

2. Write a program using 8085 Microprocessor for addition and subtraction of two BCD numbers.

3. To perform multiplication and division of two 8 bit numbers using 8085.

4. To find the largest and smallest number in an array of data using 8085 instruction set.

5. To write a program to arrange an array of data in ascending and descending order.

6. To convert given Hexadecimal number into its equivalent ASCII number and vice versa using 8085 instruction set.

7. To write a program to initiate 8251 and to check the transmission and reception of character.

8. To interface 8253 programmable interval timer to 8085 and verify the operation of 8253 in six different modes.

9. To interface DAC with 8085 to demonstrate the generation of square, saw tooth and triangular wave.

10. Serial communication between two 8085 through RS-232 C port.

Note :-In addition, Institutes may include two more experiments based on the expertise.
B-TECH. SEMESTER-V
CONTROL SYSTEM
EE-301T

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**Branches**: EE, EC & EI

**Unit-I**:
The Control System:
Open loop & closed control; servomechanism, Physical systems. Principle of feedback Transfer functions, Block diagram algebra, Signal flow graph, Mason’s gain formula Reduction of parameter variation and effects of disturbance by using negative feedback.

**Unit-II**:
Time Response analysis:
Standard test signals, time response of first and second order systems, time response specifications, steady state errors and error constants, Design specifications of second order systems: basic concept of P, PD, PI, PID controllers.

**Unit-III**:
Stability and Algebraic Criteria:
Concept of stability and necessary conditions, Routh-Hurwitz criteria and limitations.

**Root Locus Technique**:
The root locus concepts, construction of root loci

**Unit-IV**:
Frequency response Analysis:
Frequency response, correlation between time and frequency responses, polar plots, Bode plots

**Stability in Frequency Domain**:
Frequency Domain specifications, Nyquist stability criterion, assessment of relative stability: gain margin and phase margin, constant M&N circles.

**Text Books**:

**Reference Books**:
B-TECH. SEMESTER-V
POWER SYSTEM-I
EE-305T

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**Unit-I:**
**Power System Components:**
Single line Diagram of Power system, Brief description of power system Elements: Synchronous machine, transformer, transmission line, bus bar, circuit breaker and isolator

**Supply System:**
Different kinds of supply system and their comparison, choice of transmission voltage

**Transmission Lines:**
Configurations, types of conductors, resistance of line, skin effect, Kelvin’s law.Proximity effect

**Unit-II:**
**Over Head Transmission Lines**
Calculation of inductance and capacitance of single phase, three phase, single circuit and double circuit transmission lines, Representation and performance of short, medium and long transmission lines, Ferranti effect. Surge impedance loading

**Unit-III:**
**Corona and Interference:**
Phenomenon of corona, corona formation, calculation of potential gradient, corona loss, factors affecting corona, methods of reducing corona and interference. Electrostatic and electromagnetic interference with communication lines

**Overhead line Insulators:**
Type of insulators and their applications, potential distribution over a string of insulators, methods of equalizing the potential, string efficiency

**Unit-IV:**
**Mechanical Design of transmission line:**
Catenary curve, calculation of sag & tension, effects of wind and ice loading, sag template, vibration dampers

**Insulated cables:**
Type of cables and their construction, dielectric stress, grading of cables, insulation resistance, capacitance of single phase and three phase cables, dielectric loss, heating of cables

**Text Books:**
3. Asfaq Hussain, “Power System”, CBS Publishers and Distributors,

**Reference Books:**
Unit 1:- Fourier analysis of signals, Amplitude, Phase and Power spectrum, Orthogonality of functions, Types of signals, Fourier transform of some useful functions, Singularity functions & its properties, Dirac Delta function & its properties, Sampling function, Laplace transform of some useful functions.

Unit 2:- Convolution of signals, Graphical & analytical methods of convolution, sampling theorem, Nyquist rate & Nyquist interval, Aliasing, Aperture effect, Recovery from sampled signal, natural sampling, flat top sampling. Time convolution theorem, Frequency convolution theorem.


Unit 4:- Systems & Filters: Linear system, Time invariant & LTI system, Impulse response, Causal systems, Filter characteristics of linear systems, Low pass filter High pass filters, Band pass filters, Band pass, Band stop filters.

Unit 5:- Random variables and probability theory, PDF, CDF and their properties, Normal and Gaussian distribution.

REFERENCES BOOKS

1. Modern Digital & Analog System by B.P. lathi
2. Communication systems by Singh & Spare
3. Communication systems by Simon Haykins
4. Digital communication systems by Taub & Schilling
5. Probability theory and Queuing methods
B-TECH. SEMESTER-V
POWER ELECTRONICS
EE-303T

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Branches: EE, EC & EI


Thyristor:
Operation, V-I characteristics, two transistor model, methods of turn-on. Operation of GTO, MCT and TRIAC.


Unit-IV: AC Voltage Controllers: Principle of On-Off and phase controls. Single phase ac voltage controller with resistive and inductive loads. Three phase ac voltage controllers (various configurations and comparison only) Single phase transformer taps changer.


Unit-VI: Cycloconverters: 1- φ & 3- φ Cyclo-converters, mid-point & bridge type cyclo-converters, advantage of cyclo-converters.

Text Books:

Reference Books:
B-TECH. SEMESTER-V
INSTRUMENTATION
EE-307T

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Unit-I:
Transducer – I: Definition, advantages of electrical transducers, classification, characteristics, factors affecting the choice of transducers, Potentiometers, Strain gauges, Resistance thermometer, Thermistors, Thermocouples, LVDT, RVDT

Unit-II:

Unit-III:
Telemetry: General telemetry system, land line & radio frequency telemetering system, transmission channels and media, receiver & transmitter. Data
Acquisition System: Analog data acquisition system, Digital data acquisition system, Modern digital data acquisition system.

Unit-IV:
Display Devices and Recorders: Display devices, storage oscilloscope, spectrum analyzer, strip chart & x-y recorders, magnetic tape & digital tape recorders.
Recent Developments: Computer aided measurements, fibre optic transducers, microsensors, smart sensors, smart transmitters.

Unit-V:
Process Control: Principle, elements of process control system, process characteristics, proportional (P), integral (I), Derivative (D), PI, PD and PID control modes. Electronic, Pneumatic & digital controllers.

UNIT VI: Cathode Ray Oscilloscope: Basic CRO circuit (Block Diagram), Cathode ray tube (CRT) & its components, application of CRO in measurement, Lissajous Pattern.

Text Books:

Reference Books:
6. Rajendra Prasad, “Electronic Measurement and Instrumentation Khanna Publisher
Unit-I: 
Representation of Power System Components:
Synchronous machines, Transformers, Transmission lines, One line diagram, Impedance and reactance diagram, per unit System
Symmetrical components:
Symmetrical Components of unbalanced phasors, power in terms of symmetrical components, sequence impedances and sequence networks.

Unit-II: 
Insulation Coordination:
Introduction, Definitions, Determincation of Insultation, Impulse Level and Insulation Level of Sub Station Equipment – Lighting Arrester Selection and Location

Unit-III: 
Traveling Waves:
Wave equation for uniform Transmission lines, velocity of propagation, surge impedance, reflection and transmission of traveling waves under different line loadings. Bewlay’s lattice diagram, protection of equipments and line against traveling waves

Unit-IV: 
Neutral grounding:
Necessity of neutral grounding, various methods of neutral grounding, earthing transformer, grounding practices

Unit-V: 
Electrical Design of Transmission Line:
Design consideration of EHV transmission lines, choice of voltage, number of circuits, conductor configuration, insulation design, selection of ground wires.

Text Books:

Reference Books:
5. L. P. Singh; “Advanced Power System Analysis & Dynamics”, New Age International
Subject: Element of Communication Engineering  

Code: EC-312T  

Credits: 4  

Branches : EE  

SEM: VI Semester  

L P T: 3 1 0  

Unit 1:- Modulation Process: Definition of amplitude modulation, frequency modulation & phase modulation, DSB-AM, DSB-SC-AM, using linear modulation and non linear modulation.  

Unit 2:- Linear Modulation: Collector modulator or plate modulator and base modulator.  

Unit 3:- Non linear modulation: Balanced modulating & ring modulator  


Unit 5:- Demodulation/detection process: Demodulation of AM waves, diode detection 1, average detection and 2. Envelop detection, superhetrodyne receiver.  

Unit 6:- Demodulation of FM or frequency discriminators: Single tuned discriminators, double tuned discriminators, foster seely discriminators, ratio detectors, and phase locked loop (PLL) demodulator.  

Unit 7:- Noise: SNR (signal to noise ratio), noise figure, noise temperature of a cascaded system, S/N in DSB-SC receiver, S/Nin SSB-SC receiver, S/N in FM receiver, pre-emphasis and de-emphasis.  

Reference Books  

1. Communication systems - B.P. Lathi  
2. Communication system - Simon Haykin  
3. Principles of communication - George Kennedy  
4. Communication system - R.P. Singh & S.D. Spare  
5. Principles of communication system - Taub Shilling
Unit-I:
Symmetrical fault analysis:
Transient in R-L series circuit, calculation of 3-phase short circuit current and reactance of synchronous machine, internal voltage of loaded machines under transient conditions

Unit-II:
Unsymmetrical faults:
Analysis of single line to ground fault, line-to-line fault and Double Line to ground fault on an unloaded generators and power system network with and without fault impedance. Formation of Zbus using singular transformation and algorithm, computer method for short circuit calculations

Unit-III:
Load Flows:
Introduction, bus classifications, nodal admittance matrix (BUS Y), development of load flow equations, load flow solution using Gauss Siedel and Newton-Raphson method, approximation to N-R method, line flow equations and fast decoupled method

Unit-IV:
Power System Stability:
Stability and Stability limit, Steady state stability study, derivation of Swing equation, transient stability studies by equal area criterion and step-by-step method. Factors affecting steady state and transient stability and methods of improvement

Text Books:
UNIT-I:
INTRODUCTION:
Planning of electricity supply, prediction of load and energy demand forecast techniques.

UNIT-II:
THERMAL STATION:
Detailed description of thermal plant-coal handling plant, boiler,economizer,preheater, electrostatic precipitator, ash disposal.

UNIT-III:
HYDRO-STATION:
Types of turbines, types of dams, description of hydro plant.

UNIT-IV:
NUCLEAR STATION:
Nuclear fuels, nuclear reaction, types of reactors, description of nuclear plant.

Text Books:
2. Power System analysis by W.D Stevenson Granger MGH.
3. Power System Engineering by Nagrath and Kothari TMH.
UNIT-I:
Signal Processing in Digital Control:
Basic digital control system, advantages of digital control and implementation problems, basic
discrete time signals, z-transform and inverse z-transform, modeling of sample-hold circuit,,
pulse transfer function, solution of difference equation by z-Transform method.

UNIT-II:
Design of Digital Control Algorithms:
Steady state accuracy, transient response and frequency response specifications, digital
compensator design using frequency response plots and root locus plots.

UNIT-III:
State Space Analysis and Design:
State space representation of digital control system, conversion of state variable models to
transfer functions and vice versa, solution of state difference equations, controllability and
observability, design of digital control system with state feedback.

UNIT-IV:
Stability of Discrete System:
Stability on the z-plane and Jury stability criterion, bilinear transformation, Routh stability
criterion on rth plane.
Lyapunou’s Stability in the sense of Lyapunou, stability theorems for continuous and discrete
systems, stability analysis using Lyapunor’s method.

Text Books:

Reference Books:
UNIT-I:
INDUCTION MOTOR:
Deep bar & double cage type three phase induction motor, single phase induction motors-double field revolving theory & cross field theory, type s of single phase induction motor-capacitor start/run motor, shaded pole, hysteresis motor.

UNIT-II:
LINEAR INDUCTION MOTOR:
Principle, magnetic levitation, types of LIM.

UNIT-III:
COMMUTATOR MACHINES:

UNIT-IV:
CROSS FIELD THEORY:
Cross field generator-Amplidyne and metadyne.

UNIT-V:
SPECIAL MACHINES:
Stepper motor-variable reluctance type and hybrid type, ac & dc servomotors, switched reluctance motor, permanent magnet motor.

Text Books:
1. DC SPEED CONTROL SYSTEM
   (a) To study D.C. speed control system on open loop and close loop.
   (b) To study of Transient performance, another time signal is added at the input of control Circuit.
   (c) To study how eddy current breaking is being disturbance rejected by close and open loop.

2. DC MOTOR POSITION CONTROL
   (a) To study of potentiometer displacement constant on D.C. motor position control.
   (b) To study of D.C. position control through continuous command.
   (c) To study of D.C. position control through step command.
   (d) To study of D.C. position control through Dynamic response.

3. AC MOTOR POSITION CONTROL
   (a) To study of A.C. motor position control through continuous command.
   (b) To study of error detector on A.C. motor position control through step command.
   (c) To study of A.C. position control through dynamic response.

4. MAGNETIC AMPLIFIER
   (a) To study Input / Output characteristic of a magnetic amplifier in mode (i) Saturable Reactor, (ii) Self Saturable Reactor.

5. SYNCHRO TRANSMITTER / RECEIVER
   (a) To study of Synchro Transmitter in term of Position v/s Phase and voltage magnitude with respect to Rotor Voltage Magnitude/Phase.
   (b) To study of remote position indication system using Synchro-transmitter/receiver.

6. PID CONTROLLER
   (a) To observe open loop performance of building block and calibration of PID Controls.
   (b) To study P, PI and PID controller with type 0 system with delay.
   (c) To study P, PI and PID controller with type 1 system.

7. LEAD LAG COMPENSATOR
   (a) To study the open loop response on compensator.
   (b) Close loop transient response.

8. LINEAR SYSTEM SIMULATOR
   (a) Open loop response
   (i) Error detector with gain, (ii) Time constant, (iii) Integrator
   (b) Close loop system
   (I) First order system (II) Second order system (III) Third order system

9. Introduction to MATLAB (Control System Toolbox), Implement at least any two experiment in MATLAB.
   b. Determine transpose, inverse values of given matrix.
   c. Plot the pole-zero configuration in s-plane for the given transfer function.
   d. Determine the transfer function for given closed loop system in block diagram representation.
   e. Plot unit step response of given transfer function and find peak overshoot, peak time.
   f. Plot unit step response and to find rise time and delay time.
   g. Plot locus of given transfer function, locate closed loop poles for different values of k.
   h. Plot root locus of given transfer function and to find out S, Wd, Wn at given root & to discuss stability.
   i. Plot bode plot of given transfer function.
   j. Plot bode plot of given transfer function and find gain and phase margins
   k. Plot Nyquist plot for given transfer function and to compare their relative stability
   l. Plot the Nyquist plot for given transfer function and to discuss closed loop stability, gain and phase margin.

Note:-In addition, Institutes may include more experiments based on the expertise.
Unit I:
Introduction to Protection System: Introduction to protection system and its elements, functions of protective relaying, protective zones, primary and backup protection, desirable qualities of protective relaying, basic terminology.
Relays: Electromagnetic, attracted and induction type relays, thermal relay, gas actuated relay, design considerations of electromagnetic relay.

Unit-II:
Relay Application and Characteristics: Amplitude and phase comparators, over current relays, directional relays, distance relays, differential relay
Static Relays: Comparison with electromagnetic relay, classification and their description, over current relays, directional relay, distance relays, differential relay.

Unit-III:
Protection of Transmission Line: Over current protection, distance protection, pilot wire protection, carrier current protection, protection of bus, auto re-closing,

Unit-IV:
Testing Of Circuit Breaker: Classification, testing station and equipments, testing procedure, direct and indirect testing

Unit-V:
Apparatus Protection: Protection of Transformer, generator and motor.
Circuit Breaker: Operating modes, selection of circuit breakers, constructional features and operation of Bulk Oil, Minimum Oil, Air Blast, SF6, Vacuum and d. c. circuit breakers.

Text Books:
2. B. Ravindranath and M. Chander, Power system Protection and Switchgear,iley Eastern Ltd.

Reference Books:
5. T.S.M Rao,“Power System Protection: Static Relays with Microprocessor Applications” Tata Macgraw Hill”.
UNIT-I:
Break Down In Gases:
Ionization processes, Townsend’s criterion, breakdown in electronegative gases, time lags for breakdown, streamer theory, Paschen’s law, break down in non-uniform field, breakdown in vacuum.

Break Down In Liquid Dielectrics:
Classification of liquid dielectric, characteristic of liquid dielectric, breakdown in pure liquid and commercial liquid.

Break Down In Solid Dielectrics:
Intrinsic breakdown, electromechanical breakdown, breakdown of solid, dielectric in practice, breakdown in composite dielectrics.

UNIT-II:
Generation of High Voltages and Currents:
Generation of high direct current voltages, generation of high alternating voltages, generation of impulse voltages, generation of impulse currents, tripping and control of impulse generators.

UNIT-III:
Measurement of High Voltages and Currents:
Measurement of high direct current voltages, measurement of high alternating and impulse voltages, measurement of high direct, alternating and impulse currents, Cathode Ray Oscillographs for impulse voltage and current measurements.

UNIT-IV:
Non-Destructive Testing:
Measurement of direct current resistively, measurement of dielectric constant and loss factor, partial discharge measurements

High Voltage Testing:
Testing of insulators and bushings, testing of isolators and circuit breakers, testing of cables, testing of transformers, testing of surge arresters, radio interference measurements.

Text Book:

Reference Books:
7. Subir Ray,’ An Introduction to High Voltage Engineering’ Prentice Hall of India
UNIT-I:
INTRODUCTION:
Power Crisis, future energy demand, role of Private sectors in energy management,

UNIT-II:
MHD generation:
Working principle, open and closed cycles, MHD systems, advantages, parameters governing power output.

UNIT-III
Solar power plant:
Conversion of solar heat to electricity, Solar energy collectors, Photovoltaic cell, power generation, future prospects of solar energy use.

UNIT-IV:
Wind Energy:
Windmills, power output with combined operation of wind turbine generation and isolated generating system, technical choices & economic size.

UNIT-V:
Geothermal Energy:
Earth energy, heat extraction, vapor turbine cycle, difficulties & disadvantages

UNIT-VI:
Tidal energy:
Tidal phenomenon, tidal barrage, tidal power Schemes.

UNIT-VII:
Ocean Thermal Energy:
Introduction, energy conversion, problems.

UNIT-VIII:
Chemical Energy Sources:
Fuel cells, classifications, hydrogen production, hydrogen energy, utilization of hydrogen gas.

UNIT-IX:
Thermoionic generator:
Basic principle Thermoionic generator.

Text Books:
1. Non-conventional energy sources by G.D. Rai, Khanna Publisher.
Unit-I:
Neural Networks-I (Introduction & Architecture):
Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Various learning techniques; perception and convergence rule, Auto-associative and hetero-associative memory

Unit-II:
Neural Networks-II (Back propagation networks):
Architecture: perceptron model, solution, single layer artificial neural network, multilayer perception model; back propagation learning methods, effect of learning rule co-efficient, back propagation algorithm, factors affecting backpropagation training, applications.

Unit-III:
Fuzzy Logic-I (Introduction):
Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

Unit-IV:
Fuzzy Logic –II (Fuzzy Membership, Rules)
Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfication & Defuzzification, Fuzzy Controller, Industrial applications.

Unit-V:
Fuzzy Neural Networks:
L-R Type fuzzy numbers, fuzzy neuron, fuzzy backpropagation (BP), architecture, learning in fuzzy BP, inference by fuzzy BP, applications.

Text Books:
1. Kumar Satish, “Neural Networks” Tata Mc Graw Hill

Reference Books:
3. Simon Haykin, “Neural Networks” Prentice Hall of India
4. Timothy J. Ross, “Fuzzy Logic with Engineering Applications” Wiley India.
B-TECH. SEMESTER-VII
UTILIZATION OF ELECTRICAL ENERGY & TRACTION
EE-415T

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**Unit-I:**
**Electric Heating:**
Advantages and methods of electric heating, Resistance heating, Electric arc heating, Induction heating, Dielectric heating

**Unit-II:**
**Electric Welding:**
Electric Arc Welding, Electric Resistance welding, Electronic welding control

**Electrolyte Process:**
Principles of electro deposition, Laws of electrolysis, applications of electrolysis

**Unit-III:**
**Illumination:**
Various definitions, Laws of illumination, requirements of good lighting Design of in door lighting and outdoor lighting systems

**Refrigeration and Air Conditioning:**
Refrigeration systems, domestic refrigerator, water cooler Types of air conditioning, Window air conditioner

**Unit-IV:**
**Electric Traction - I**
Types of electric traction, systems of track electrification Traction mechanics- types of services, speed time curve and its simplification, average and schedule speeds Tractive effort, specific energy consumption, mechanics of train movement, coefficient of adhesion and its influence

**Unit-V:**
**Electric Traction – II**
Salient features of traction drives Series – parallel control of dc traction drives (bridge transition) and energy saving Power Electronic control of dc and ac traction drives Diesel electric traction.

**Text Books:**

**Reference Books:**
B-TECH. SEMESTER-VIII
ELECTRIC DRIVES & CONTROL
EE-402T

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Unit-I:
**Fundamentals of Electric Drive:** Electric Drives and its parts, advantages of electric drives
Classification of electric drives Speed-torque conventions and multi-quadrant operations
Constant torque and constant power operation Types of load, Load torque: components, nature and classification.

Unit-II:
**Dynamics of Electric Drive:** Dynamics of motor-load combination; Steady state stability of Electric Drive; Transient stability of electric Drive.
**Selection of Motor Power rating:**
Thermal model of motor for heating and cooling, classes of motor duty, determination of motor power rating for continuous duty, short time duty and intermittent duty. Load equalization

Unit-III:
**Electric Braking:**
Purpose and types of electric braking, braking of dc, three phase induction and synchronous motors
**Dynamics During Starting and Braking:** Calculation of acceleration time and energy loss during starting of dc shunt and three phase induction motors, methods of reducing energy loss during starting. Energy relations during braking, dynamics during braking

Unit-IV:
**Power Electronic Control of DC Drives:** Single phase and three phase controlled converter fed separately excited dc motor drives (continuous conduction only), dual converter fed separately excited dc motor drive, rectifier control of dc series motor. Supply harmonics, power factor and ripples in motor current Chopper control of separately excited dc motor and dc series motor.

Unit-V:
**Power Electronic Control of AC Drives:** Three Phase induction Motor Drive: Static Voltage control scheme, static frequency control scheme (VSI, CSI, and cyclo – converter based) static rotor resistance and slip power recovery control schemes.
**Three Phase Synchronous motor:**
Self controlled scheme
**Special Drives:**
Switched Reluctance motor, Brushless dc motor. Selection of motor for particular applications

Text Books:

Reference Books:
UNIT-I:
Basic Considerations:
Basic concept of design, limitation in design, standardization, modern trends in design and manufacturing techniques, Classification of insulating materials. Calculation of total mmf and magnetizing current. Transformer Design: Output equation design of core, yoke and windings, overall dimensions, Computation of no load current to voltage regulation, efficiency and cooling system designs

UNIT-II:
Design of rotating machines – I:
Output equations of rotating machines, specific electric and magnetic loadings, factors affecting size of rotating machines, separation of main dimensions, selection of frame size. Core and armature design of dc and 3-phase ac machines

UNIT-III:
Design of rotating machines – II:
Rotor design of three phase induction motors. Design of field system of DC machine and synchronous machines. Estimation of performance from design data.

UNIT-IV:
Computer Aided Design
Philosophy of computer aided design, advantages and limitations.
Computer aided design approaches analysis, synthesis and hybrid methods.
Concept of optimization and its general procedure.
Flow charts and ‘c’ based computer programs for the design of transformer, dc machine, three phase induction and synchronous machines.

Text Books:

Reference Books:
UNIT-I:
Introduction: Need of EHV transmission, standard transmission voltage, comparison of EHV ac & dc transmission systems and their applications & limitations, surface voltage gradients in conductor, distribution of voltage gradients on sub-conductors, mechanical considerations of transmission lines, modern trends in EHV AC and DC transmission.

UNIT-II:
EHV AC Transmission: Corona loss formulas, corona current, audible noise – generation and characteristics corona pulses their generation and properties, radio interference (RI) effects, over voltage due to switching, ferroresonance, reduction of switching surges on EHV system, principle of half wave transmission.

UNIT-III:
Extra High Voltage Testing: Characteristics and generation of impulse voltage, generation of high Ac and Dc voltages, measurement of high voltage by sphregaps and potential dividers.
Consideration for Design of EHV Lines: Design factors under steady state limits, EHV line insulation design based upon transient over voltages. Effects of pollution on performance of EHV lines.

UNIT-IV:
EHV DC Transmission – I: Types of dc links, converter station, choice of converter configuration and pulse number, effect of source inductance on operation of converters. Principle of dc link control, converter controls characteristics, firing angle control, current and excitation angle control, power control, starting and stopping of dc link.

UNIT-V:
EHV DC Transmission – II: Converter faults, protection against over currents and over voltages, smoothing reactors, generation of harmonics, ac and dc filters, Multi Terminal DC systems (MTDC): Types, control, protection and applications.

Text Books:

Reference Books:
Unit-I: Introduction to Power Quality:
Terms and definitions of transients,
Long Duration Voltage Variations: under Voltage, Under Voltage and Sustained Interruptions;
Short Duration Voltage Variations: interruption, Sag, Swell; Voltage Imbalance; Notching D C offset, waveform distortion; voltage fluctuation; power frequency variations.

Unit-II: Voltage Sag:
Sources of voltage sag: motor starting, arc furnace, fault clearing etc; estimating voltage sag performance and principle of its protection; solutions at end user level- Isolation Transformer, Voltage Regulator, Static UPS, Rotary UPS, Active Series Compensator.

Unit-III: Electrical Transients:
Sources of Transient Over voltages- Atmospheric and switching transients- motor starting transients, pf correction capacitor switching transients, ups switching transients, neutral voltage swing etc; devices for over voltage protection.

Unit-IV: Harmonics:
Causes of harmonics; current and voltage harmonics: measurement of harmonics; effects of harmonics on – Transformers, AC Motors, Capacitor Banks, Cables, and Protection Devices, Energy Metering, Communication Lines etc. harmonic mitigation techniques.

Unit-V: Measurement and Solving of Power Quality Problems: Power quality measurement devices-Harmonic Analyzer , Transient Disturbance Analyzer, wiring and grounding tester, Flicker Meter, Oscilloscope, multimeter etc.

Introduction to Custom Power Devices:
Network Reconfiguration devices; Load compensation and voltage regulation using DSTATCOM; protecting sensitive loads using DVR; Unified power Quality Conditioner. (UPQC)

Text Books:
UNIT-I:
Introduction:
Structure of power systems, Power system control center and real time computer control, SCADA system. Level decomposition in power system. Power system security. Various operational stages of power system. Power system voltage stability.

UNIT-II:
Economic Operation:

UNIT-III:
Load Frequency Control:
Concept of load frequency control, Load frequency control of single area system:
Turbine speed governing system and modeling, block diagram representation of single area system, steadystate analysis, dynamic response, control area concept, P-I control, load frequency control and economic dispatch control. Load frequency control of two area system:
Tie line power modeling, block diagram representation of two area system, static and dynamic response.

UNIT-IV:
Automatic Voltage Control:
Schematic diagram and block diagram representation, different types of Excitation systems & their controllers.
Voltage and Reactive Power control:
Concept of voltage control, methods of voltage control-control by tap changing transformer. Shunt Compensation, series compensation, phase angle compensation.

UNIT-V:
State Estimation:
Detection and identification, Linear and non-linear models.
Flexible AC Transmission Systems:
Concept and objectives
FACTs controllers: Structures & Characteristics of following FACTs Controllers.
TCR, FC-TCR, TSC, SVC, STATCOM, TSSC, TCSC, SSSC, TC-PAR, UPFC

Text Books:
Open-Elective, (Final Year)

Code: HU-449 T  Subject : Principle of Management  Credits 4(3-1-0)

UNIT 1: Management as a discipline: Definition, nature, scope, functions, managerial Skills, Management. Thought-Historical Prospective, Social Responsibility, of Business.

UNIT2: Planning: Concept and purpose, planning process, Management, By Objectives (MBO), Decision making.

UNIT3: Organization: Concept and purpose of organisation, types of organisation, bases of Departmentation, concept of Authority and Responsibility, Span of Management, Line and Staff Authority, Functional Authority, Delegation of Authority, Centralization and Decentralization of Authority, Coordination Staffing.


UNIT5: Controlling: Concept, Provides, Requirements, for adequate control, controlling and earning, Budgeting control Importance, Management Audit, Management in future.


UNIT 4: Sequencing: Introduction, principle assumptions processing of jobs through two, three & m machine's.


UNIT 6: Replacement: Replacement of item that fail completely.

UNIT 7: Inventory: Elementry Inventory Models, Inventory models with price breaks.

List of Pool Elective:
1. EI-402 PCB Design & Technology
2. EI-456 Aircraft Instrumentation
3. EC-458 Digital Image Processing
4. EC-460 Microwave Integrated circuit
Semiconductors:
Introduction of semiconductors, intrinsic and extrinsic, II-VI and IIIV semiconductors and its alloys, Advantages and necessity of the tailoring of semiconductor, Semiconductors and it alloys used of LED and other devices, Utility of semiconducting alloys like GaAlAs, GaAIN, GaAlP etc.

Superconductors:

Material for Magnetic media:
Material useful for magnetic recording head, magnetic disk, magnetic tape media, Magneto optic recording materials. Holography, data storage materials.

Holography:
Fundamentals of holography, Difference between conventional photography and holography. Techniques to make a hologram. Advantages of holography over other techniques.

Introduction of following with applications:
Fibre optics, Lasers, Ceramics, Dielectric Characterization of Materials

Books:
2) Solid State Physics: Ashcrost/Mervin

UNIT:2 Measures of Central Tendencies: arithmetic mean, Median, Mode, Geometric Mean and Harmonic Mean, Demerits and Uses of all methods.


UNIT:5 Linear Regression Analysis: Introduction, Two method of Linear Regression Analysis:- (1) Line of Regression of Y on X and (2) Line of Regression and X on Y. Why two lines of regression Coefficient of Regression. Relation between the coefficient of correlation and Regression.

UNIT:6 Index Number: Definition, Uses and Types of Index Numbers, Methods of Construction Index Numbers-(1) Simple Aggregate Method (2) Weighted Aggregate Method (3) Fisher’s Ideal Index Numbers (4) const of living Index Numbers (5) Chain Base Index Numbers. Base Shifting. Limitations of Index Numbers.

UNIT: 2  **Theories of International Trade**: The Classical Theory:-Absolute Advantage Model of Adam Smith, comparative Advantage Model of David Ricardo, the Neo-classical Analysis:-International trade Equilibrium under Constant cost, Increasing Cost and Decreasing cost conditions.

UNIT: 3  **Tariffs and Quota**: types and Effect of tariffs and Quotas, Quota vs. Tariff.

UNIT: 4  **International Monetary fund (I.M.F.)**: Nature, Objectives and functions of I.M.F. International Monetary System, since the demise of Bretton Woods System.


UNIT: 6  **India’s Trade Policy**: Trends of Exports and Imports of India since independence, Composition of India’s Foreign Trade.