

National Institute of Technology, RAIPUR
B.Tech. IV Semester **Branch: Electrical Engg**
Code: EL20411

Subject: Electrical Power System
Minimum number of Class tests to be conducted: 2

UNIT I

Over head lines and cables

General structure of electrical power system; power transmission & voltage levels; power distribution through overhead lines. single line diagram, Type of overhead conductors, solid conductors, stranded conductors, bundled conductors, skin effect, proximity effects, principle of corona, SAG and TENSION calculation, Types of cables, insulation resistance of cables, capacitance of cables dielectric stress, capacitance grading of cables, use of inter-sheaths,

UNIT II

Transmission Lines

Inductance and capacitance of single-phase, three-phase single circuit and double circuit lines, concept of GMD, transposition of lines, effect of earth on capacitance of transmission lines.

UNIT III: Transmission Lines (cont.):

Characteristics and performance of transmission lines, transmission lines as four terminal networks, nominal-T, nominal- π , equivalent-T, and equivalent- π \square representation of transmission lines, A, B, C, D constants, distributed parameters of long lines, hyperbolic solutions, Ferrantii effect, surge impedance loadings.

UNIT IV: Voltage Control Methods

Compensation of transmission lines, Voltage regulation, Power flow through a line, power flow equations, Methods of voltage control, on-load tap changing transformer, control of reactive power, basis of selection for line voltage, AC and DC distribution systems.

UNIT V: Traveling Waves:

Transients in power systems, wave equation, characteristic impedance, energy and power surge, velocity, traveling wave phenomenon in open circuited and short circuited lines, lines with series reactive termination, junction of two dissimilar lines, repeated reflections.

Text Books:

1. "Elements of Power Systems", Stevenson, 4th Edition
2. "Power System Engineering", Nagrath Kothari, TMH Pbs.

Reference Books:

1. "A Course In Electrical Power", Soni, Gupta and Bhatnagar, Dhanpat Rai.
2. Electrical power systems, Ashfaq Hussain, CBS Pbs.
3. Electrical power systems, C. L. Wadhwa, New Age Pbs.
4. "Substation Design and Control" by Gupta & Satnam

National Institute of Technology, RAIPUR
B.Tech. IV Semester **Branch: Electrical Engg**
Code: EL 20412

Subject: Electrical Engineering Materials & semiconductor device
Minimum number of Class tests to be conducted: 2

Unit 1: Conducting Materials

Review of energy bands, description of materials, drift velocity, collision time, Mean free path, mobility, conductivity, relaxation time, factors affecting conductivity of materials, types of thermal conductivity, Wiedmann-Franz law, super conductivity, effect of magnetic field, properties and application of high conducting materials, properties and applications high resistive material .

Unit 2: Semiconductors

Review of Si and Ge as semiconducting materials, Continuity Equation, P-N junction, Hall effect, mobility, Drift & Diffusion, Diffusion & Transition capacitances of P-N junction.

Unit 3: Dielectric Materials

Behavior of dielectric materials in static electric field, Dipole moments, Polarization, Dielectric constant, Polarizability, Susceptibility, mechanisms of polarization, behavior in alternating field, dielectric loss, loss tangent, types of dielectric & insulating materials, electrostriction, Piezo-electricity, Properties and Applications of gaseous(H_2 , N_2 , SF_6 etc), liquid (transformer oil, capacitor oil, paints etc) and solid (fibrous, paper board, wood, plastic, mica, ceramic material, rubber etc.) insulators.

Unit 4: Magnetic Materials

Permeability, Magnetic susceptibility, magnetic moment, Magnetization, Dipole moment, types of magnetic materials, Magnetostriction, eddy current & hysteresis losses, applications of silicon steel, soft and hard magnetic material.

Unit 5: Optical properties of Solids

Photo emission, photo emission materials, electro luminescence junction diode, photo emitters, photo transistor, photo resistors, injunction lasers, solar cell, optical properties of semiconductor, application of photo sensitive materials (CRT, Tube light, photo panels).

Text Books:

1. Electrical Engineering Materials: A.J. Dekker; PHI.
2. Electronic Devices & Circuits: Millman & Halkias; MGH.

Reference Books:

1. Electrical Engineering Materials: S.P Seth & P.V Gupta; Dhanpat Rai.
2. Solid State Electronic Devices : StreetMan & Banerjee; Pearson.
3. Electronic Devices & Circuit Theory : Boylestad & Nashelsky; Pearson.
4. Semiconductor devices : Jaspreet Singh; John Wiley.

National Institute of Technology, RAIPUR
B.Tech. IV Semester **Branch: Electrical Engg**
Code: EL20413

Subject: Electromagnetic fields
Minimum number of Class tests to be conducted: 2

UNIT I

Basics of Electromagnetic Fields: Scalars and vectors, vector algebra, the Cartesian, circular cylindrical and spherical coordinate systems, transformations between coordinate systems, Coulomb's law, electric field intensity, electric field due to several charges, Gauss law and its application, divergence and divergence theorem, Maxwell's first equation, the vector operator and divergence theorem.

UNIT II

Electrostatics : Electric potential, potential at any point due to discrete and distributed charges, principle of superposition potential and field between two coaxial cylinders, potential between two conducting spherical shells, conservative property, potential gradient, electric dipole, current and current density, continuity of current, metallic conductors, conductor properties and boundary conditions for dielectric materials, boundary conditions for perfect dielectric materials, capacitance Poisson and Laplace equation, uniqueness theorem, examples of the solution of Laplace and Poisson's equations.

UNIT III

Magnetostatics : The steady state magnetic field, Biot Savart Law, Ampere's circuital Law, Curl, Stokes theorem, magnetic flux and magnetic flux density, scalar and vector magnetic potentials.

UNIT IV

Magnetic Force And Inductance : Force on a moving charge, force on a differential current element, force between differential current elements, force and torque on a closed circuit, magnetic materials, magnetization and permeability, magnetic boundary conditions.

UNIT V

Time Varying Field And Maxwell's Equations : Modification of Maxwell's equations under time varying conditions, displacement current, source free wave equation, power flow and energy, sinusoidal time varying field, Helmholtz equation, complex pointing vector, Boundary condition, relation between field theory and current theory.

Text Books:

1. "Engineering Electromagnetics", Hayt, TMH Pbs.
2. "Electromagnetic Field theory and transmission lines", Raju, Pearson.

Reference Books:

1. Sadiku, "Electromagnetic Fields"
2. "Principle And Application Of Electromagnetic Fields", Robert Polnsey and Robert collin.
3. "Fields and wave electromagnetics", Chang.
4. Electromagnetic field, Bhat, CBS Pbs.

National Institute of Technology, RAIPUR

B.Tech. IV Semester

Branch: Electrical Engg

Code: EL20414

Subject: Digital Electronics and Logic Design

Minimum number of Class tests to be conducted: 2

Unit I

Fundamentals of Digital Electronics

Review of number systems - binary, octal and hexadecimal number systems, their conversions and arithmetic, 1's and 2's complements; weighed and non-weighted codes, BCD codes, excess-3 code, Gray code, error correcting and detecting codes; Review of logic gates and logic families such as RTL, DTL, TTL, Schottky TTL, ECL, MOS, CMOS, I2L etc; Boolean algebra.

Unit II

Combinational Logic Circuits

Introduction to Karnaugh map, minterms and maxterms representation of logical functions, sum of product and product of sum form minimization, redundant terms, Quine- Mcklusky method for minimization, design of combinational logic circuits, design of half adder and subtractor, design of full adder and subtractor, binary parallel adder & subtractor, IC 7483, excess-3 adder, BCD to seven segment decoder, IC 7447.

Unit III

Sequential Logic Circuits

Flip-Flops: R-S, D, J-K, T, Master slave flip-flops, their conversion, different flip-flop ICs. Counters: Different types of counters, design of divide by N asynchronous and synchronous counters, design of BCD, decade, up-down counter, ring and shift counters, different counter ICs. Shift Registers: data-in and data-out modes, SISO, SIPO, PISO and PIPO modes, left shift and right shift register; Universal shift register, IC 7495. Multiplexer, cascading of multiplexer; Demultiplexer, cascading of demultiplexer, different multiplexer and demultiplexer ICs.

Unit IV

D/A and A/D Converters

Digital to analog converter (DAC)-weighted register method, R-2R ladder method, analog to digital converter (ADC)- parallel comparator method, counter method, successive approximation method, counting A/D converter, dual Slope A/D converter, A/D converter using voltage to frequency and voltage to time conversion.

Unit V

Memory devices & Programmable Logic Devices

Organisation of RAM and ROM, Memory subsystem, Timing circuits, clock circuit and IC timer Programmable Logic Devices, Programmable Logic Array, Complex Programmable logic Devices (CPLDs), Field Programmable Gate array (FPGA).

Text Books

1. Gothman, "Digital Electronics", Prentice Hall Publications
2. Malvino and Leach, "Digital Principles and Applications", McGraw Hill

Publications.

Reference Books

1. R. P. Jain, "Modern Digital Electronics", Tata McGraw Hill Publications.
2. Anand Kumar, "Fundamentals of Digital Circuits", Prentice-Hall India

National Institute of Technology, RAIPUR

B.Tech. IV Semester

Branch: Electrical Engg

Code: EL20415

Subject: Electrical measurements and Instrumentation

Minimum number of Class tests to be conducted: 2

UNIT-I

Electrical Measurements: Standards of Measurement & Errors, Review of indicating and integrating instruments: Voltmeter, Ammeter, Wattmeter, Multimeter and Energy meter.

UNIT-II

Measurement of Resistance, Inductance and Capacitance: Measurement of low, medium and high resistances, insulation resistance measurement, AC bridges for inductance and capacitance measurement.

UNIT-III

Instrument Transformers: Current and Potential transfers, ratio and phase angle errors, design considerations and testing.

UNIT-IV

Electronic Measurements: Electronic voltmeter, multi-meter, wattmeter & energy meter. Time, Frequency and phase angle measurements using CRO; Spectrum & Wave analyzer. Digital counter, frequency meter, voltmeter, multi-meter and storage oscilloscope.

UNIT-V

Instrumentation: Transducers, classification & selection of transducers, strain gauges, inductive & capacitive transducers, piezoelectric and Hall-effect transducers, thermistors, thermocouples, photo-diodes & photo-transistors, encoder type digital transducers, signal conditioning and telemetry, basic concepts of smart sensors and application. Data Acquisition Systems.

Text Books:

1. Jones, B.E., "Instrumentation Measurement and Feedback", Tata McGraw-Hill, 1986.
2. Golding, E.W., "Electrical Measurement and Measuring Instruments", 3rd Edition, Sir Issac Pitman and Sons, 1960.

Reference Books:

1. Helfrick and Cooper, "Modern Electronic Instrumentation and Measurement Techniques", Prentice-Hall of India, Reprint 1988.
2. Buckingham, H. and Price, E.N., "Principles of Electrical Measurements", 1961.
3. A. K. Sawhney "Electrical Measurement and Measuring Instruments" Dhanpat Rai & Sons

National Institute of Technology, RAIPUR

B.Tech. IV Semester

Branch: Electrical Engg

Code: EL20416

Subject: Electrical Network Analysis And Synthesis

Minimum number of Class tests to be conducted: 2

UNIT I

Networks and Laplace Transform - I

Network equation, formulation of network equations, initial conditions in networks and network solution with Laplace transformation, step, ramp and impulse functions, initial and final value theorem and convolution integral.

UNIT II

Networks and Laplace Transform – II

Transform impedance and transform circuits, Thevenin's and Norton's theorem, duality, Fourier transform, discrete and continuous spectrum, relation and Laplace transforms.

UNIT III

Network Functions

Network function for one-port and two-port, calculation of network function for ladder and general networks, poles and zeros with restrictions for driving point functions and transform functions, two-port parameters, stability by Routh-Harwitz criterion.

UNIT IV

Network Synthesis

Identification of network synthesis, Brune's positive and real function (PRF), properties of PRF, testing of driving point functions, even and odd function, one terminal pair network driving point synthesis with LC elements, RC elements, Foster and Cauer form.

UNIT V

Filters

Low pass filters, high pass filters, band pass filters, band reject filters, Gain equalizer and delay equalizers, Butterworth filters, m-derived filters, constant k-filters, design of filters.

Text Books:

1. "Network Analysis", Valkenburg, PHI Pbs.
2. Circuit theory, Kurikose-PHI Pbs.

Reference Books:

1. "Introduction To Network Synthesis", Valkenburg, PHI Pbs.
2. "Network Analysis And Synthesis", Wadhwa, New Age Pbs.