

# **ELECTRICAL AND ELECTRONICS ENGINEERING**

## **UNIT 1: ENGINEERING MATHEMATICS**

Linear Algebra: Matrix Algebra, Systems of Linear equations, Eigen Values and eigen vector. Calculus: Mean Value Theorems, Theorems of integral Calculus Evaluation of definite and improper integrals, Partial Derivatives, Maxima and minima, Multiple integrals, Fourier series. Vector identities, Directional derivatives, Line, surface and Volume integrals, Stokes, Gauss and Green's theorems. Differential equations: First order equation (linear and nonlinear), Higher order linear differential equations with constant coefficients, Method of variation of parameters, Cauchy's and Euler's equations, initial and boundary value problem, Partial Differential Equations and variable separable method. Complex variables: Analytic functions, Cauchy's integral theorem and integral formula, Taylor's and Laurent's series, Residue theorem, solution integrals. Numerical Methods: solutions of non-linear algebraic equations, single and multistep methods for differential equations. Transform Theory: Fourier transform, Laplace transform, Z-transform.

## **UNIT 2: ELECTRIC CIRCUITS AND FIELDS**

KCL, KVL, node and mesh analysis, transient response of dc and ac network, sinusoidal steady – state analysis, resonance, ideal current and voltage sources, Thevenin's Norton's and Superposition and Maximum Power Transfer theorems, three phase circuits. Gauss Theorem, electric field and potential due to point, line, plane and spherical charge distributions, Ampere's and Biot-Savart's laws, inductance, dielectrics, capacitance.

## **UNIT 3: DIGITAL SIGNAL PROCESSING**

Representation of continuous and discrete-time signals, shifting and scaling operations, linear, time-invariant and causal systems, Fourier series representation of continuous periodic signals, sampling theorem, Fourier, Laplace and Z transforms.

#### **UNIT 4: ELECTRICAL MACHINES**

Single phase transformer – equivalent circuit, phase diagram, tests, regulation and efficiency, three phase transformers - connections, parallel operation, auto-transformer, energy conversion principles, DC machines - types, windings, generator characteristics, armature reaction and commutation, starting and speed control of motors, three phase induction motors - principles, types, performance characteristics, starting and speed control, single phase induction motors, synchronous machines - performance, regulation and parallel operation of generators, motor starting, characteristics and applications, Special Electrical machines.

#### **UNIT 5: POWER SYSTEMS**

Basic power generation concepts, transmission line models and performance, cable performance insulation, corona and radio interference, distribution systems, per – unit quantities, bus impedance and admittance matrices, load flow, voltage control, power factor correction, Economic operation, symmetrical components, fault analysis.

#### **UNIT 6: PROTECTION AND SWITCHGEAR**

Principle of over - current, differential and distance protection, solid state relays and digital protection, circuit breakers, system stability concepts, swing curves and equal area criterion. High voltage generation and measurements.

#### **UNIT 7: CONTROL SYSTEM**

Principle and feedback, transfer function, block diagrams, steady – state errors, Routh and Nyquist techniques, Bode plots, root loci, lag, lead and lead-leg compensation.

#### **UNIT 8: ELECTRICAL AND ELECTRONICS MEASUREMENTS**

Bridges and potentiometers, PMMC, moving iron, dynamometer and induction type instruments, measurement of voltage, current, power, energy and power factor, instruments transformers, phase, time and frequency measurement, Q-meters, Oscilloscopes, Transducers and Data acquisition systems.

## **UNIT 9: ANALOG AND DIGITAL ELECTRONICS**

Characteristics of diodes, BJT, FET, amplifiers - biasing, equivalent circuit and frequency response, oscillators and feedback amplifiers, operational amplifiers- characteristics and applications, simple active filters, VCOs' and timers, combinational and sequential logic circuit, multiplexer, Schmitt trigger, multi Vibrators, sample and hold circuit, A/D and D/A convertors, 8085 and 8086 - microprocessor and 8051 microcontroller basics, architecture, programming and interfacing.

## **UNIT 10: POWER ELECTRONICS AND DRIVES**

Semiconductor power diodes, transistors, thyristors, TRIACs, MOSFETs and IGBTs- static characteristics and principles of operation, triggering circuits, phase control rectifiers, bridge converters – fully controlled and half controlled, principles of choppers and inverters, basic concepts of adjustable speed dc and ac drives.