

**DEPARTMENT OF ELECTRICAL ENGINEERING**  
**MALAVIYA NATIONAL INSTITUTE OF TECHNOLOGY JAIPUR**  
**Syllabus for M. Tech Examination**

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**Network theory:** Node and Mesh analysis, network theorems, transient and steady-state responses, convolution integral, sinusoidal analysis of single-phase and three-phase networks, resonance, magnetically coupled circuits, Fourier series, graph theory and network equation, network functions, two-port networks, network synthesis and passive filters.

**Electrical Machines:** Magnetic circuit, electromechanical energy conversion, theory, construction, working principle, characteristics, operation and control, and applications of dc machines, transformers, induction machines, and synchronous machines.

**Signals and Systems:** Continuous and discrete time signals, sampling mechanism and its applications, Laplace transform and Z-transform, R.M.S. value, average value calculation for any general periodic waveform. Fourier transform

**Power Systems:** Power distribution and substation practices: diversity factor, power factor correction. Parameters and performance of transmission lines, corona, cables, mechanical design of transmission lines, line insulators, underground cables. Line compensation, voltage and frequency control and economic load dispatch. Symmetrical components and Switch-gear & protection: protection schemes and circuit breakers. Per-unit quantities, bus admittance matrix, load flow. Power system stability, equal area criterion.

**Control Systems:** Modeling and representation of systems, feedback mechanism, transfer function, block diagrams and signal flow graphs, time-domain analysis, root locus, transient and steady-state analysis of LTI systems, stability analysis, Nyquist criteria, Bode methods, P, PI and PID controllers; state space model, solution of state equations of LTI system.

**Power Electronics:** Characteristics and design of thyristor circuits, MOSFET, IGBT; DC-DC conversion, single and three-phase uncontrolled rectifiers, voltage and current commutated thyristor-based converters, bidirectional converters, magnitude and phase of line current harmonics for uncontrolled and thyristor-based converters, power factor and distortion factors. Cycloconverters, control of electric drives.

**Electromagnetic Fields:** Coulomb's law, electric field, electric flux, Gauss's law, divergence, electric field and potential due to point, line, plane and spherical charge distributions, Lorentz force, inductance, magnetomotive force, reluctance, magnetic circuits, self and mutual inductance of simple configurations. Divergence, curl, electrostatic and magnetostatic-Coulomb's law, Ampere's law, Maxwells's equations, Poynting theorem, and wave propagation.

**Electrical and Electronic Measurements:** Error analysis, analog measurement of dc and ac quantities: potentiometers, measurement of voltage, current, power, energy and power factor, phase, time, and frequency. Potentiometers, ac bridges, instrument transformers, transducers. Digital meters.

**Analog and Digital Electronics:** Diode circuits: clipping, clamping and rectifiers. BJT and MOSFETs: rectifiers, amplifiers, biasing, equivalent circuit and frequency response. Oscillators and feedback amplifiers, operational amplifiers, difference amplifiers, active filters, digital logic, binary algebra, combinatorial and sequential logic circuits, multiplexers, sample and hold circuits, A/D and D/A converters.