

Syllabus – Entrance Test (M.Tech. Power System & Control)

Topics	Sub-topics
Electrical Circuits and Fields	<ul style="list-style-type: none"> • Basic concepts: Concepts of resistance, • inductance, • capacitance and various factors effecting them., • Circuit laws: ohms law KCL, • KVL, node and mesh analysis, • resonance, • ideal current and voltage sources, • Source conversions: Thevenin's, • Norton's and Superposition and Maximum Power Transfer theorems, • Simple Circuit solution using network theorems. • Three phase circuits; • Ampere's and Biot-Savart's laws; • inductance; • dielectrics; • capacitance.
Electrical Machines	<ul style="list-style-type: none"> • Single phase transformer – equivalent circuit, phasor diagram, tests, regulation and efficiency; • three phase transformers – connections, parallel operation; autotransformer, Energy conversion principles, Electro-mechanical energy conversion ; • 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; • servo and stepper motors. Braking of DC and AC motors
Power Systems	<ul style="list-style-type: none"> • Basic power generation concepts; • transmission line models and performance; • cable performance, insulation; corona and radio interference; distribution systems; • power factor correction; economic operation; symmetrical components; • principles of over-current, differential and distance protection; • Generator, feeder, transformer and bus-bar protection; Lightning protection; • solid state relays and circuit breakers; • Sub-Station Practices, Load frequency control, Tariffs, Earthing. • Utilisation of Electrical energy: Illumination, electrical heating and welding, electroplating.

Control Systems	<ul style="list-style-type: none"> • Basic control system components; • block diagrammatic description, reduction of block diagrams. • Open loop and closed loop (feedback) systems and • stability analysis of these systems.
Electrical and Electronic Measurements	<ul style="list-style-type: none"> • Bridges and potentiometers; • PMMC, moving iron, dynamometer and induction type instruments; Extension of range, measurement of voltage, current, power, energy and power factor; • instrument transformers; • digital voltmeters and multimeters; • phase, time and frequency measurement; • Q-meters; oscilloscopes. • Transducers: measurement of displacement, flow and temperature, Megger. • Measurements of active and reactive power, Measurement of Energy.
Power Electronics and Drives	<ul style="list-style-type: none"> • Semiconductor power diodes, transistors, thyristors, triacs and MOSFETs – static characteristics and principles of operation; • triggering circuits; • phase control rectifiers; • bridge converters – fully controlled and half controlled; • Choppers and Inverters; • concepts of adjustable speed dc and ac drives.
Electronic Devices and Circuits	<ul style="list-style-type: none"> • Energy bands in silicon, intrinsic and extrinsic silicon. Carrier transport in silicon: diffusion current, drift current, mobility, resistivity. • p-n junction diode, Zener diode, tunnel diode, BJT, JFET, MOS capacitor, MOSFET, LED, avalanche photo diode • Small Signal Equivalent circuits of diodes, BJTs, MOSFETs. • Simple diode circuits, clipping, clamping, rectifier. • Biasing and bias stability of transistor and FET amplifiers. • Single- and multi-stage, tuned voltage, operational, feedback, and power amplifiers. • Frequency response of amplifiers. Simple op-amp circuits. • Filters. • Sinusoidal oscillators; criterion for oscillation; single-transistor and op-amp configurations. • Function generators and wave-shaping circuits, 555 Timers IC and its applications. • Power supplies