Syllabus of PGET-2023

M.Tech - ECE

Electrical Circuit Analysis

Electrical sources – DC, AC, Voltage, current and power sources. Electrical components - passive and active. Basic circuit laws, mesh and nodal analysis. AC waveforms-frequency, phase, amplitude, peak, RMS values and calculation of power. Response of passive components to AC waveforms – impedance. Frequency domain analysis of RLC circuits, resonance. Transient analysis of electric circuits, Steady state analysis of circuits. Network theorems - Superposition, Thevenin, Norton and Maximum Power Transfer. Two port networks.

Analogue Electronics

Energy bands in intrinsic and extrinsic silicon; Carrier transport: diffusion current, drift current, mobility and resistivity; Generation and recombination of carriers; Poisson and continuity equations; Basic Semiconductor theory, PN junctions, PN junction diodes, Zener Diode, Rectifiers and Regulator circuits. BJTs, JFET and MOSFET: characteristics, biasing, different configurations. Single amplifiers. Amplifiers with different types of feedbacks. Power Amplifiers, Oscillators, differential amplifiers and its applications, Op-amps and applications.

Digital Electronics

Boolean algebra, Logic families. Minimization techniques for Boolean expressions-K-map reduction. Combinational circuits. Sequential circuits. Timing diagram and State diagram. Finite state machines. Semiconductor memories. Wave shaping circuits.

Communications

Elements of communication systems. Random signals: Random variables, autocorrelation, power spectral density. Theory of Modulation and detection in analogue and digital systems. Sampling and data reconstruction; Quantization. Time division and frequency division multiplexing techniques. Noise and it’s effect on communication systems. QAM, MAP and ML decoding, matched filter receiver, calculation of bandwidth, SNR and BER for digital modulation, Line coding schemes, ISI and solutions to avoid ISI.

Signal Processing

Signal types and their representation - Time Domain, Frequency Domain. Discrete and Continuous Transforms- Laplace, Fourier and Z- Transforms. Introduction to Systems- Linear and Non-Linear, Continuous and Discrete time Systems. System Characterization-Time Domain and Frequency Domain. Systems Stability Criterion. DFT and FFT. Digital Filters- FIR, IIR.

Microelectronics and VLSI Design

VLSI Design flow, VLSI circuits and system representation, CMOS processing technology, MOS Transistor Theory, Short channel effects, Elements of Physical Design, Logic Design with MOSFETs, CMOS inverter, Transmission gate, Analysis of CMOS Logic Gates.

Control Systems

Basic control system components: Block diagram description, reduction of block diagrams. Open loop and closed loop feedback systems and stability analysis of these systems. Signal flow graphs and their use in determining transfer functions of systems; transient and steady state analysis of LTI control systems and frequency response. Tools and techniques for LTI control system analysis: root locus, Routh - Hurwitz criterion, Bode and Nyquist plots.

Electromagnetics

EM Spectrum, EM waves and their propagation in different media. Maxwell's Equations. Plane Waves and properties: reflection and refraction, polarization, phase and group velocity, skin depth, transmission Lines including waveguides, basics of antennas.