

NORTH MAHARASHTRA UNIVERSITY, JALGAON
Faculty of Engineering and Technology
Pre PhD course No: 2 Syllabus
Electronics Engineering/Industrial Electronics / Electronics and Telecommunication Engineering

UNIT-I: Analog Circuits

Small Signal Equivalent circuits of diodes, BJTs, MOSFETs and analog CMOS. Simple diode circuits, clipping, clamping, rectifier. Biasing and bias stability of transistor and FET amplifiers. Amplifiers: single-and multi-stage, differential and operational, feedback, and power. 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. Power supplies.

UNIT-II: Digital circuits

Boolean algebra, minimization of Boolean functions; logic gates; digital IC families (DTL, TTL, ECL, MOS, CMOS). Combinatorial circuits: arithmetic circuits, code converters, multiplexers, decoders, PROMs and PLAs. Sequential circuits: latches and flip-flops, counters and shift-registers. Sample and hold circuits, ADCs, DACs.

UNIT-III: Networks

Network graphs: matrices associated with graphs; incidence, fundamental cut set and fundamental circuit matrices. Solution methods: nodal and mesh analysis. Network theorems: superposition, Thevenin and Norton's maximum power transfer, Wye-Delta transformation. Linear constant coefficient differential equations; time domain analysis of simple RLC circuits, Solution of network equations using Laplace transform: frequency domain analysis of RLC circuits. 2-port network parameters: driving point and transfer functions.

UNIT-IV: Control Systems

Basic control system components; block diagrammatic description, reduction of block diagrams. Open loop and closed loop (feedback) systems and stability analysis of these systems. transient and steady state analysis of LTI control systems and frequency response. Tools and techniques for LTI control system analysis: root loci, Routh-Hurwitz criterion, Bode plots.

UNIT-V: Communications

Random signals and noise: probability, random variables, probability density function, autocorrelation, power spectral density. Analog communication systems: amplitude and angle modulation and demodulation systems, spectral analysis of these operations, superheterodyne receivers; elements of hardware, realizations of analog communication systems; signal-to-noise ratio (SNR) calculations for amplitude modulation (AM) and frequency modulation (FM) for low noise conditions.

Reference Books:

1. Jacob Millman and Christos Halkias, "**Integrated Electronics**" Tata McGraw Hill.
2. R.P. Jain, "**Modern Digital Electronics**", Tata McGraw Hill
3. D Roy Chaudhary, "**Network and System**", New Age International
4. I. J. Nagrath and M. Gopal, "**Control System Engineering**", New Age International
5. George Kannedy and Bernard Davis, "**Electronics Communication System**", Tata McGraw Hill