

**Department of Electronics and Communication Engineering**  
**Indus Institute of Technology & Engineering**  
**Ph.D Syllabus**

**Electronics Devices & Circuit Theory**

Energy bands in intrinsic and extrinsic silicon, Generation and recombination of carriers, P-N junction, Zener diode, BJT, MOS capacitor, MOSFET, LED, and photodiode, Integrated circuit fabrication process: oxidation, diffusion, ion implantation. Basic control system components, Feedback principle, Transfer function, Block diagram representation, Signal flow graph, Transient and steady-state analysis of LTI systems, Frequency response, Routh-Hurwitz and Nyquist stability criteria, Bode and root-locus plots, Lag, lead and lag-lead compensation, Network solution methods: nodal and mesh analysis, Network theorems: superposition, Thevenin and Norton's, maximum power transfer, Wye-Delta transformation.

**Image Processing/Signal Processing**

Continuous-time signals: Fourier series and Fourier transform representations, sampling theorem and applications; Discrete-time signals: discrete-time Fourier transform (DTFT), DFT, FFT, Z-transform, interpolation of discrete-time signals; LTI systems: definition and properties, causality, stability, impulse response, convolution, poles and zeros, parallel and cascade structure, frequency response, group delay, phase delay, digital filter design techniques. Digital Image Fundamentals, Human visual system, Image as a 2D data, Image representation – Gray scale and Color images, image sampling and quantization, Histogram Processing Techniques

**RF/Antenna/Microwave/Communication systems**

Analog communications: amplitude modulation and demodulation, angle modulation and demodulation, spectra of AM and FM, superheterodyne receivers, circuits for analog communications; PCM, DPCM, digital modulation schemes, amplitude, phase and frequency shift keying (ASK, PSK, FSK), Transmission lines: equations, characteristic impedance, impedance matching, impedance transformation, S-parameters, Smith chart; Waveguides: modes, boundary conditions, cut-off frequencies, dispersion relations; Antennas: antenna types, radiation pattern, gain and directivity, return loss, antenna arrays;

**Microprocessor/Microcontroller**

8085 Microprocessor and its architecture, Instruction set and assembly language programming of 8085, I/O Interface, Interfacing with peripherals, 8051 Microcontroller, 8051 Real Time Control, Instruction set and assembly language programming of 8051

**Computer Networking**

Concept of layering. OSI and TCP/IP Protocol Stacks, Basics of packet, circuit and virtual circuit-switching, Data link layer: framing, error detection, Medium Access Control, Ethernet bridging, Routing protocols: shortest path, flooding, distance vector and link state routing, Fragmentation and IP addressing, IPv4, CIDR notation, Basics of IP support protocols (ARP, DHCP, ICMP), , Transport layer: flow control and congestion control, UDP, TCP, sockets, Application layer protocols: DNS, SMTP, HTTP, FTP, Email.