ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT 1: ENGINEERING MATHEMATICS

Linear Algebra: Matrix Algebra, Systems of linear equations, Eigen values and eigen vectors.

Calculus: Mean value theorems, Theorems of integral calculus, Evaluation of definite and improper integrals, Partial Derivatives, Maxima and Minima, Multiple integrals, Fourier series. Vector identities, Directional derivatives, Line, Surface and Volume integrals, Stokes, Gauss and Green's theorems.

Differential equations: First order equation (linear and nonlinear), Higher order linear differential equations with constant coefficients, Method of variation of parameters, Cauchy's and Euler's equations, Initial and boundary value problems, Partial Differential Equation and variable separable method.

Complex variables: Analytic functions, Cauchy's integral theorem and integral formula, Taylor's and Laurent' series, Residue theorem, solution integrals.

Probability and Statistics: Sampling theorems, Conditional probability, Mean, median, mode and standard deviation, Random variables, Discrete and continuous distributions, Poisson, Normal and Binomial distribution, Correlation and regression analysis.

Numerical Methods: Solutions of non-linear algebraic equations, single and multi-step methods for differential equations.

UNIT 2: NETWORKS

Graphs Theory: Matrices associated with graphs; incidence, fundamental cut set and fundamental circuit matrices. Network Analysis: Nodal and mesh analysis. Network theorems: Superposition, Thevenin's, Norton's, Maximum power transfer theorems, Wye-Delta transformation. Steady state sinusoidal analysis using phasors. 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; State equations for networks.

UNIT 3: ELECTROMAGNETICS

Elements of vector calculus; Electrostatic Fields: Coulomb's Law, divergence and curl, Gauss' and Stokes' theorems; Magnetic Fields: Biot-Savat's Law, Ampere's circuital Law, Faraday's Law, Maxwell's equations, Poynting vector; Waveguides: TE and TM modes in rectangular and circular waveguides; boundary conditions; Transmission lines: characteristic impedance; impedance transformation; Smith chart; impedance matching; S parameters, pulse excitation. Fundamentals and Parameters of VHF and UHF antennas and Wave Propagation; RF and Microwave circuits and systems.

UNIT 4: ELECTRONIC DEVICES AND CIRCUITS

Energy bands, Carrier transport in silicon, Generation and recombination of carriers; P-N junction diode, Zener diode, Tunnel diode, BJT, JFET, MOS capacitor, MOSFET, LED, PIN and avalanche photo diode, Lasers; device technology of integrated circuits. Small signal equivalent circuits of diodes, BJTs, MOSFETs and analog CMOS. Biasing and bias stability of transistor and FET amplifiers. Rectifiers and Power Supplies; Feedback amplifiers and Oscillators, Tuned Amplifiers, Multivibrators; Operational Amplifiers and its applications; Function generators and wave-shaping circuits, 555 Timers

UNIT 5: DIGITAL CIRCUITS

Boolean algebra, minimization of Boolean functions; logic gates. Combinatorial circuits: arithmetic circuits, code converters, multiplexers, decoders, PROMs and PLAs. Sequential circuits: latches and flip-flops, counters and shift-registers; ADCs, DACs. Semiconductor memories; Microprocessors (8085 and 8086) and Microcontrollers (8051 and PIC): architecture, programming, and applications.

UNIT 6: CMOS VLSI SYSTEMS

MOSFET's as switches, Basic logic gates in CMOS, CMOS layers, CMOS inverter, Dynamic CMOS, Floor planning and Routing, Low power design, Reliability and testing of VLSI circuits, CMOS clocking and testing; Structural Gate Level Modeling; Switch Level Modeling; Behavioral and RTL Modeling — Multiplier, encoders, decoders, flip flops, registers; arithmetic circuits in CMOS VLSI.

UNIT 7: SIGNAL PROCESSING

Definitions and properties of Laplace transform, continuous-time and discrete-time Fourier series, continuous-time and discrete-time Fourier Transform, DFT and FFT, z-transform. Sampling theorem. Linear Time-Invariant (LTI) Systems: Signal transmission through LTI systems. Infinite impulse response filters; finite impulse response filters; Quantization effects and DSP architecture.

UNIT 8: CONTROL SYSTEMS

Basic control system components; Open loop and closed loop 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 loci, Routh-Hurwitz criterion, Bode and Nyquist plots. Control system compensators: elements of lead and lag compensation, elements of Proportional-Integral-Derivative control.

UNIT 9: ANALOG AND DIGITAL COMMUNICATION SYSTEMS

Random signals and noise theory: Amplitude, Angle and Pulse modulation and demodulation systems, superheterodyne receivers; signal-to-noise ratio; Pulse code modulation; differential pulse code modulation; digital modulation schemes: amplitude, phase and frequency shift keying schemes (ASK, PSK, FSK), Error Control Coding. Satellite Communication; Fundamentals of information theory and channel capacity theorem.

UNIT 10: COMPUTER COMMUNICATION

Data Communication: OSI reference model; Modems; Error detection and Correction; Data link control and Protocols; Local Area Networks and Metropolitan Networks; Wide Area Networks; Cloud Computing: architecture, services. Mobile Communication: architecture, structure; OFDM principle; Basics of TDMA, FDMA; CDMA, GSM, GPRS and WiMax.