



TN TRB Assistant Professor Syllabus - ELECTRONICS / ELECTRONICS & COMMUNICATION

SYLLABUS

UNIT-1. Electronic Devices

Introduction to Semiconductors, energy bands in solids, concept of effective mass, density of states, Fermi levels. PN Junction, Diode equation and diode equivalent circuit, Breakdown in diodes, Zener diode, Tunnel diode, Metal semiconductor junction – Ohmic and Schottky contacts, Characteristics and equivalent circuits of JFET, MOSFET. Low dimensional semiconductor devices– quantum wells, quantum wires, quantum dots. High Electron Mobility Transistor (HEMT), Solar cells, I-V characteristics, fill factor and efficiency, LED, LCD and flexible display devices. Photodetectors and Optical fiber devices.

UNIT-2. IC Fabrication Technology

IC fabrication – crystal growth, epitaxy, oxidation, lithography, doping, etching, isolation methods, metallization, bonding, Thin film deposition and characterization Techniques: XRD, SEM, TEM, EDX, Thin film active and passive devices, MOS technology and VLSI, scaling of MOS devices, NMOS and CMOS structures and fabrication, Characteristics of MOS transistors and threshold voltage, NMOS and CMOS inverters, Charge-Coupled Devices (CCD) – structure, charge storage and transfer, Basics of VLSI design, stick diagrams, Layout design rules.

UNIT-3. Network Theorems and AC Circuits

Superposition, Thevenin, Norton and Maximum Power Transfer Theorems, Network elements, Network graphs, Nodal and Mesh analysis. Laplace Transform, Fourier Transform and Z-transform. Time and frequency domain response, Passive filters, Two-port Network Parameters: Z, Y, ABCD and h-parameters, Transfer functions, Signal representation, State variable method of circuit analysis, AC circuit analysis, Transient analysis, Zero and Poles, Bode Plots. Continuous time signals, Fourier Series and Fourier transform representations, Sampling theorem and applications, Discrete time signal, Discrete Fourier transform (DFT), Fast Fourier transform (FFT), Basic concepts of digital signal processing, digital filters– IIR, FIR.

UNIT- 4. Amplifiers , Oscillators and wave shaping Circuits

Rectifiers, Voltage regulated ICs and regulated power supply, Biasing of Bipolar junction transistors and FETs, operating point and stability, Amplifiers, Classification of amplifiers, Concept of feedback, Hartley, Colpitt's and Phase Shift oscillators, Operational amplifiers (OPAMP)–characteristics, computational applications, comparators, Schmitt trigger, Instrumentation amplifiers, wave shaping circuits, Phase locked loops, Active filters, Multivibrators, Voltage to frequency convertors (V/F), frequency to voltage convertors (F/V).

UNIT-5. Logic Families



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Logic Families, Logic Gates, Boolean algebra and minimization techniques, Combinational circuits, Programmable Logic Devices (PLD), CPLD, flip-flops, memories, Sequential Circuits: Counters – Ring, Ripple, Synchronous, Asynchronous, Shift registers, multiplexers and de-multiplexers, A/D and D/A converters, Analysis and Design of fundamental mode state machines: State variables and State diagram. Sequential PLD, FPGA, Analysis and Design of digital circuits using HDL.

UNIT-6. Microprocessor, Microcontroller and Interfacing

Introduction of Microprocessor 8085 and 8086: Architecture, Addressing modes, instruction set, interrupts, Programming, Memory and I/O interfacing. Introduction of Microcontrollers – 8051 for embedded systems, Architecture and register set of Microcontroller 8051, Addressing modes, Instruction set of 8051 – Data transfer instructions, Arithmetic and Logic instructions, bit-level and

byte-level control transfer instructions, 8051 assembly programming – stack operations, subroutines, interrupts, 8051 programming as timer/counter, 8051 serial communication, 8051 interfacing RS232, LED/LCD display, Keyboard, Stepper motor.

UNIT-7. Antenna Design and Wave Propagation

Electrostatics–vector calculus, Gauss's Law, Laplace and Poisson's equations, Magnetostatics – Biot Savart's law, Ampere's law and electromagnetic induction, Maxwell's equations and wave equations, Plane wave propagation

in free-space, dielectrics and conductors, Poynting theorem, reflection and refraction, polarization, interference, coherence and diffraction, transmission lines and waveguides – line equations, impedance, reflections and voltage standing wave ratio, rectangular waveguides. Antennas–retarded potential and Hertzian dipole, half wave antenna, antenna patterns, radiation intensity, gain, effective area and Frii's free space receiver power equation. Microwave Sources and Devices-Reflex Klystron, Magnetron, TWT, Gunn diode, IMPATT diode, Crystal Detector and

PIN diode. Radar – block diagram of radar, frequencies and power used, Radar range equation.

UNIT-8. Analog and Digital communication

Analog modulation and demodulation-AM, FM and PM, Principle of super heterodyne receiver, Random signals, noise, noise temperature and noise figure, Basic concepts of information theory, Error detection and correction, Digital modulation and demodulation – PCM, ASK, FSK, PSK, BPSK, QPSK and QAM, Time and Frequency-Division Multiplexing, Multiple Access techniques, Data Communications–Modems, Codes, Principles of Mobile and Satellite Communication, Optical communication, Optical sources–LED, spontaneous and stimulated emission, semiconductor Lasers, Detectors – PIN photodiodes, Avalanche photodiodes (APD),



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Optical fibers – attenuation and dispersion characteristics, Bandwidth, Wavelength division multiplexing. Fundamentals of Internet of Things (IoT) for communication.

UNIT-9. Power Electronics

Power devices – characteristics of SCR, DIAC, TRIAC, power transistors, Protection of thyristors against over voltage and over current. SCR triggering– dv/dt and di/dt , triggering with single pulse and train of pulses, A.C. and D.C. motors–construction and speed control. Switched Mode Power Supply (SMPS). Uninterrupted Power Supply (UPS). Open and closed-loop control systems, Block diagram reduction techniques, transfer function and signal flow diagram, Stability criterion: Routh-Hurwitz and Nyquist plot, On-off controller, Proportional(P), Proportional-Integral(PI), Proportional-Derivative (PD), PID controllers.

UNIT– 10. Electronic Instrumentation

Transducers–Resistance, Inductance, Capacitance, Piezoelectric, Thermoelectric, Hall effect, Photoelectric, Measurement of displacement, velocity, acceleration, force, torque, strain, temperature, pressure, flow, humidity, thickness, pH. Measuring Equipment – Measurement of R, L and C, Bridge and Potentiometers, voltage, current, power, energy, frequency/time, phase, Digital Multimeters, CRO, Digital Storage Oscilloscope, Spectrum Analyzer, Biomedical Instruments – ECG, EEG, Blood Pressure Measurements, MEMS / NEMS and its applications–Sensors for IoT applications.