

SYLLABUS - DAT

Optics

Geometrical Optics:, Refraction of light, Snell's law, total internal reflection and its applications, refraction at spherical surfaces, lenses, thin lens formula, lensmaker's formula

Wave optics: Interference and diffraction of light, concept of coherence, polarization, Jones vectors, Muller matrices

Optoelectronics

Optical processes in semiconductors: electron-hole pair formation and recombination, absorption in semi-conductors, Electron states in direct gap and indirect gap semiconductors.

Properties of Photons and Electrons, PN junction, carrier recombination and diffusion, injection efficiency, heterojunction, internal quantum efficiency, external quantum efficiency.

Basic optoelectronic devices: LED and Laser diodes

Different types of optoelectronic materials and applications. Luminescence, Phosphorescence and Fluorescence

Fiber Optics

Step index and graded index fibres, single mode and multimode fibres, Numerical aperture, cut off wavelength, V-Parameter. Transmission characteristics of optical fibre, attenuation, absorption and scattering losses.

Electronics

Analog Electronics: P-N Junction diodes, Biasing, Applications of diodes, Bipolar Junction Transistors, Transistor Configurations, Field Effect Transistors,

Differential amplifiers, Common mode and differential mode gain, Operational amplifiers, Applications of operational amplifiers, Waveform generators, Silicon Controlled Rectifier (SCR), DIAC, TRIAC, LASCR, GTO, UJT.

Digital Electronics: Different number systems and their inter conversion, Logic gates, Boolean algebra, Flip-flops: R-S, J-K and J-K Master Slave Flip-Flops.

A/D and D/A convertors.

Modern Physics

Rutherford atom model, Bohr atom model, Hydrogen spectral series

Solid state Physics

Crystal systems and symmetry elements; Reciprocal lattice, crystal diffraction and Braggs Law, Free electron theory and electronic specific heat, Fermi level, classification of materials based on band gap, electrical conduction in metals and semiconductors, effect of doping on Fermi level in semiconductors.

Magnetic properties of solids, dia, para and ferromagnetism, Dielectric properties of solids: polarisability, ferroelectric crystals. Superconductors, Type I and Type II superconductors, Meissner effect, BCS Theory of superconductivity.

Electromagnetic Theory

Electrostatics: Gauss' Law and its applications, Laplace and Poisson equations. Magnetostatics: Biot-Savart law, Ampere's theorem, electromagnetic induction. Maxwell's equations in free space and linear isotropic media, boundary conditions on fields at interfaces, Scalar and vector potentials, Electromagnetic waves in free space, dielectrics and conductors. Reflection and refraction, polarization, Fresnel's Law, Dispersion relations in plasma, Radiating electric dipole.