

BTech Preparatory Unit (BPU) in Physical Principles in Engineering (No examination required)

Syllabus

1. Energy Equation and Its applications - Application of First Law to control volume. Derivation of steady flow energy equation. Application to simple flow processes.
2. Introduction to Basic Heat Transfer - Mechanisms of heat transfer in conduction, convection and radiation. One-dimensional steady heat conduction in plane, cylindrical and spherical systems. Concept of thermal network analysis. Convective heat transfer. Heat transfer coefficient. Non-dimensional groups in convection. Convective boundary condition. Overall heat transfer coefficient. Simple transient heat transfer analysis. Combined modes of heat transfer.
3. The Electric Field- Electric Charge. Coulomb's Law of Forces between Charges. Charge Distributions. Electric potential V and relationship to E . Concept of Electric Flux and Electric Flux Density D . Gauss' Law. Polarisation and Conduction. Capacitance. Resistance. The Magnetic Field- Magnetic Field due to currents. Biot-Savart's Law. Ampere's Law. Force on Moving electric charges. Force between parallel current-carrying conductors.
4. Electromagnetic Induction- Faraday's Law of Induction. Electromotive Force (EMF). Lenz's Law. Energy stored in the magnetic field. Inductance. Electrodynamics – Fields and Waves- Displacement current correction to Ampere's Law. Maxwell's Equations. One-Dimensional Wave equation. Plane Waves as simplest solutions. Energy Transport by Waves.