

## BTech Bridging Unit (BBU) in Physical Principles in Engineering

### Objectives

- Apply principles of thermodynamics in analyzing non-flow and flow processes.
- Analyse heat transfer processes
- Introduce electricity, magnetism and electromagnetic waves as applied in Engineering

### Description

- Energy Equation and Its applications - Application of First Law to control volume. Derivation of steady flow energy equation. Application to simple flow processes.
- 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.
- 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.
- 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.

### Assessment

- Tests/Quizzes: 10%
- Others (e.g. Projects, assignments, homework, class participation): 15%
- Final Examination: 75%