

PMI31104 FLUID MECHANICS (4-0-0)

Module I

(10 hours)

Introduction: Scope of fluid mechanics and its development as a science

Physical property of Fluid: Density, specific gravity, specific weight, specific volume, surface tension and capillarity, viscosity, compressibility and bulk modulus, Fluid classification.

Fluid statics: Pressure, Pascal's Law, Pressure variation for incompressible fluid, atmospheric pressure, absolute pressure, gauge pressure and vacuum pressure, manometer.

Hydrostatic process on submerged surface, force on a horizontal submerged plane surface, force on a vertical submerged plane surface.

Buoyancy and floatation, Archimedes' principle, stability of immersed and floating bodies, determination of Meta centric height.

Module II

(10 hours)

Fluid kinematics: Introduction, description of fluid flow, classification of fluid flow. Reynold's number, Acceleration of fluid particles, flow rate and continuity equation, differential equation of continuity,

Mathematical definitions of irrotational and rotational motion. Circulation, potential function and stream function. Flow network.

Module III

(12 hours)

Fluid dynamics : Introduction, Euler's equation along a streamline, energy equation, Bernoulli's equation and its application to siphon, venturimeter, orificemeter, pitot tube. Flow in pipes and ducts: Loss due to friction, Minor energy losses in pipes Hydraulic Gradient Line (HGL), Total Energy Line (TEL), Power transmission in the fluid flow in pipes, fluid flow in pipes in series and parallel. Flow through nozzles.

Module IV

(08 hours)

Steady & Unsteady Flows; Overall mass, energy & momentum balance; Navier Stokes equation; Newton's Law, Non-Newtonian Fluids; Laminar flow in falling film, flow through conduits etc; Inviscid fluid flow, Viscous flow, Laminar & Turbulent Boundary Layer Theory, Friction Factor; Flow past immersed objects, packed and fluidized bed.

Text Books:

1. P. N. Modi and S. M. Seth, Hydraulic and Fluid Mechanics, Standard Book House, New Delhi, 2002.
2. R.K.Bansal, A Text Book of Fluid Mechanics and Hydraulic Machines, Laxmi Publications
3. K. C. Patra, Engineering Fluid Mechanics & Hydraulic Machines, Narosa Publishing House, New Delhi, I st edition, 2008.

Reference Books:

1. J. F. Douglas, J. M. Gasiorek, J. A. Swaffield, Fluid Mechanics, Pearson Education, Asia, 1st edition, 2002.
2. F. M. White, Fluid Mechanics, Tata McGraw-Hill, 5th Edition, New Delhi, 2003.
3. R. K. Bansal, Fluid Mechanics and Hyd. Machines, Laxmi publisher, New Delhi, 2008.
4. Som & Biswas, Fluid Mechanics and Fluid Machines, Tata McGraw Hill, New Delhi, 2004.
5. Subramanyam, Problems in Fluid Mechanics, Tata McGraw Hill, New Delhi, 2004.