

# Fluid Mechanics-I (ME 231)

(II Year Mech. IV Semester)

## Unit 1:

Fluid Properties & Fluid Statics: Units & Dimensions, Dimensional Analysis, Significance of non-dimensional numbers as applied to Fluid Mech. Fluid as Continuum, Incompressible & Compressible Fluids, Stress at a point, Newton's Law of viscosity, Newtonian fluids, Thermodynamic/ Hydrodynamics pressure, Manometer, Hydrostatic forces on submerged plane & curved surfaces, Rigid body motion of fluid.

(12 Periods)

## Unit 2:

Fluid Kinematics : Eulerian & Lagrangian description of fluid motion, Velocity & Acceleration, Stream line, Path line & Streak line, 2-D Stream Function in Cartesian & polar coordinates, Translation, Vorticity & Angular Velocity, Irrotational Flow, Circulation, Velocity Potential, Relationship between & for 2-D potential flows, Flow classification.

(10 Periods)

## Unit 3:

Fluid Dynamics : System & Control volume, Basic & Subsidiary Laws, Transport Theorem (no proof), Laws of conservation of mass, Momentum & Energy, Integral & Differential Approaches, Euler's & Bernoulli's Equations for Steady flow of an incompressible Fluid application.

(10 Periods)

## Unit 4:

Pipe Flow : Laminar & Turbulent Flows, Friction Factor, Moody's Diagram, Energy Losses Through pipes, Bends & Pipe Fittings, Velocity distributions in pipes, Power transmission through pipes, Constriction meters, Pitot & Pitot static tubes.

(08 Periods)

## Unit 5:

1-D Steady Compressible Flow: Velocity of sound, Isentropic Flow, Stagnation & Critical conditions, Reference velocities, Area Ratio as a function of Mach. No, Mass Flow rate, Flow through nozzles and Diffusers.

(10 Periods)

## BOOKS:

1. F.M. White: Fluid Mechanics, McGraw Hill
2. M.J. Fox & A.T. McDonald, Introduction to Fluid Mechanics, John Wiley & Sons.