

MT602: VISCOUS FLUID DYNAMICS-I

Syllabus: Viscosity, Analysis of stress and rate of strain; Stoke's law of friction; Thermal conductivity and Generalized law of heat conduction; Equations of state and continuity; Navier-Stokes equations of motion, Vorticity and Circulation; Dynamical similarity; Inspection and dimensional analysis; Buckingham theorem and its application; Non-dimensional parameters and their physical importance; Reynolds number; Froude number. Mach number; Prandtl number.; Eckert number; Grashoff number; Brinkmann number; Non-dimensional coefficients; Lift and drag coefficients; Skin friction; Nusselt number, Recovery factor; Exact solution of Navier-Stokes equations; Velocity distribution for plane Couette flow; Plane Poiseuille flow; Generalized plane; Couette flow; Hagen-Poiseuille flow; Flow in tubes of uniform cross-sections; Flow between two concentric rotating cylinder; Stagnation point flows : Hiemenz flow, Flow due to rotating disc; Concept of unsteady flow; Flow due to plane wall suddenly set in the motion (Stokes first problem); Flow due to an oscillating plane wall (Stoke's second problem).

UNIT SCHEDULE

- Unit 1** Basic Concept
- Unit 2** Fundamental Equations of the flow of Viscous Fluids
- Unit 3** Dynamical similarity and Inspection and dimensional analysis
- Unit 4** Exact Solutions of the Navier-Stokes equations
- Unit 5** Stagnation point flow and flow due to a rotating disc
- Unit 6** Unsteady Motion of fluids