

## **MT-625 Viscous Fluids**

Viscous flow phenomena, properties of fluids, boundary conditions; Equation of continuity, Navier Stokes equations, energy equation, boundary conditions, orthogonal coordinate systems, dimensionless Parameter, velocity considerations, two dimensional considerations and the stream functions; Couette flows, Poiseuille flow, unsteady duct flows, similarity solutions, exact analytic solution; Laminar boundary layers equations; similarity solutions, two dimensional solutions, thermal boundary layer; Small disturbance stability, linearized stability, parametric effects in the linear stability theory, transition to turbulences; Boundary layer equation in plane flow, general solution and exact solutions of the boundary layer equations; Thermal boundary layers without coupling of velocity field to the temperature field; Boundary layer equations for the temperature field; forced convection, effect of Prandtl number, similar solution of the thermal boundary layers; Thermal boundary layer with coupling of velocity field to the temperature field: Boundary layer with moderate wall heat transfer, natural convection effect of dissipation, indirect natural convection , mixed convection; Boundary layer controls, continuous suction and blowing, massive suction and blowing, similar solutions.

### **Recommended book(s)**

#### **Reference Books(s)**

1. F.M. White, "Viscous Fluid Flow", 3<sup>rd</sup> edition, McGraw Hill Inc. 2011
2. H. Schlichting & K. Gertsen, "Boundary Layer Theory", 8<sup>th</sup> Edition, Springer-Verlag Berlin, 2016
3. Roger J. Hosking, Robert L. Dewar, "Fundamental Fluid Mechanics and Magnetohydrodynamics" 1<sup>st</sup> Edition, Springer, 2016.
4. Sebastien Galtier, "Modern Magnetohydrodynamics", Cambridge University Press; 1<sup>st</sup> edition 2016.
5. Andrey Beresnyak, "Turbulence in Magnetohydrodynamics", De Gruyter, 2019