

ME 648 Viscous Fluid Flow (3-0-0-6)

Preliminary concepts; Conservation of mass, momentum and energy; Exact solutions of the viscous flow equations: Couette flows, Poiseuille flow through ducts, unsteady duct flows; Laminar boundary-layers: integral analysis and similarity solutions; Laminar free shear flows: jet, wake, and plume; Stability of laminar flows; Turbulent flow: fundamentals, Reynolds-averaged equations, velocity profile in wall-bounded flows, turbulent flow in pipes and channels, turbulent free-shear flows (jet, wake, and plume); Turbulence modelling: zero, one, and two equation models of turbulence; Numerical methods.

Textsbooks:

- [1] Frank M White, *Viscous Fluid Flow*, McGraw-Hill, 1991. ,
- [2] Schlichting and Gersten. *Boundary-Layer Theory*. Springer-Verlag, 2000.
- [3] F S Sherman, *Viscous Flow*, McGraw-Hill, 1990.