ME 311 Fluid Mechanics - II (3-0-0-6)

Pre-requisite: ME 221 or equivalent.

Viscous Flow and Boundary Layer Theory: Introduction to Navier-Stokes Equations; Boundary-layer equations; Momentum integral estimates; Laminar flat plate boundary layer – Blasius equation; Displacement and momentum thickness; Boundary layers with pressure gradient; Flow separation; Turbulent flat plate boundary layers. Compressible Flow: The speed of sound; Adiabatic and isentropic steady flow - Mach-number relations, Isentropic flow with area changes; Normal-shock wave - Rankine-Hugoniot relations; Mach waves, oblique shock wave, Prandtl Meyer expansion waves; Performance of nozzles; Fanno and Rayleigh flow. Turbomachines: Euler-equation for turbo-machines; Impulse turbine- Pelton wheel; Reaction turbine- Francis turbine, propeller turbine; Centrifugal pump; Performance parameters and characteristics of pumps and turbines; Cavitation; Net positive suction head (NPSH); Role of dimensional analysis and similitude; Positive displacement pumps.

Texts:

[1] F. M. White, Fluid Mechanics, 6th Ed., Tata McGraw-Hill, 2008.

[2] R.W. Fox, A.T. McDonald and P.J. Pritchard, Introduction To Fluid Mechanics, 6th Ed., John Wiley, 2004

References:

[1] B.R. Munson, D.F. Young, and T.H. Okhiishi, Fundamentals Of Fluid Mechanics, 5th Ed., Wiley India Edition, 2002.

[2] J. D. Anderson (Jr.), Modern Compressible Flow, McGraw-Hill International Edition, 1990.

[3] Y. A. Cengel and J.M. Cimbala, Fluid Mechanics, Tata McGraw-Hill, 2006.

[4] J.F. Douglas, J.M. Gasiorek, J. A. Swaffield and L.B. Jack, Fluid Mechanics, Pearson Education, 2008.

[5] S.L. Dixon, Fluid Mechanics And Thermodynamics Of Turbomachinery, 5th Ed., Elsevier, 1998