

UCH302 PROCESS FLUID MECHANICS

L	T	P	Cr
3	1	2	4.5

Prerequisite(s): None

Introduction: Basic fluid concepts, Velocity and stress fields, Classification of fluids.

Fluid Statics: Basic equation for pressure field, Manometers.

Dimensional analysis: Methods of dimensional analysis.

Fluid flow phenomena: Types of flows, Methods of analysis.

Basic equations of fluid flow: Differential analysis, Potential flows, Velocity Potential, Navier-Stokes equation, Energy (Bernoulli) equation.

Flow through pipes: Introduction to turbulent flows, K factors, Valves, Pipe networks.

Flow measuring devices: Impinging jet, Pitot tube, Orifice meter, Rotameter, V-notch, Water current meter etc.

Pumps and compressors: Types, Working, Basic equations.

Flow of compressible fluids: Basic equations, Isentropic Flow through nozzles, Adiabatic friction flow, Isothermal friction flow.

Agitation and Mixing of liquids: Power consumption, mixing times, Scale up.

Flow through Coils: Helical coils and spherical coils.

Laboratory work:

Verification of Bernoulli's theorem, Calibration of venturimeter, Centrifugal pumps characteristic curves, Calibration of orifice meter, Rheology of non-newtonian fluids, Determination of friction factor for pipes of different materials, Determination of hydraulic coefficients of an orifice, Verification of momentum equation, Determination of loss coefficients for various types of pipe fittings, Calibration of a triangular notch, Calibration of rotameter, Visualization of laminar and turbulent flow.

Text Books

1. McCabe, W., Smith, J. and Harriot, P., *Unit Operations of Chemical Engineering*, McGraw-Hill (2005) 7th ed.

Reference Books

1. Levenspiel, O., *Engineering Flow and Heat Exchanger*, Springer (1998) 2nd ed.
2. Foust, A. S., Wenzel, L.A. and Clump C.W., *Principles of Unit Operations*, John Wiley (2008) 2nd ed.
3. Fox, R.W., McDonald, A.T, and Pritchard, P.J., *Introduction to Fluid Mechanics*, John Wiley (2008) 6th ed.
4. Wilkes, J.O., *Fluid Mechanics for Chemical Engineers with Microfluidics and CFD*, Prentice Hall of India (2005) 2nd ed.
5. Denn, M., *Process Fluid Mechanics*, Prentice Hall (1979).