

AMPE04 FLUID MECHANICS

UNIT-1 THE CONCEPT OF FLUID

- 1.1 The fluid as a continuum physical and thermodynamic properties- basic laws- Newtonian and non-Newtonian fluids- flow patterns
- 1.2 Velocity field- streamlines and stream tubes- vorticity and irrotationality.
- 1.3 The principle of dimensional homogeneity- dimensional analysis, the Pi-theorems.
- 1.4 Similitude- use of dimensional analysis for scale up studies.

UNIT-2 PRESSURE AND PRESSURE GRADIENT

- 2.1 Equilibrium of fluid element
- 2.2 Hydrostatic pressure distributions- application to manometry- mass,
- 2.3 Energy and momentum balances- continuity equation,
- 2.4 Equation of motion,
- 2.5 Navier- stokes equation and Bernoulli's theorem.

UNIT-3 REYNOLD'S NUMBER REGIMES

- 3.1 Flow through pipes- head loss,
- 3.2 Friction factor, minor losses in pipe systems and multiple pipe systems
- 3.3 Boundary layer concepts,
- 3.4 Drag forces on solid particles in fluids- flow through fixed and fluidized beds.

UNIT-4 CONSTANT AND VARIABLE HEAD METERS

- 4.1 Pipes, fittings and performance,
- 4.2 Curves- compressors and its efficiency.
- 4.3 Comparison of adiabatic and isothermal flow of gases.
- 4.4 Valves, classification of pumps
- 4.5 Introduction to compressible flow,

UNIT-5 FLUID DYNAMICS IN POROUS MEDIA

- 5.1 Hydrostatic pressure and geothermal gradients.
- 5.2 Porosity- permeability relationships and rock microstructure.
- 5.3 Diffusivity equation steady state, pseudosteady state and transfer flow Radial flow and well models.
- 5.4 Skin, partial penetration and well productivity index.
- 5.5 Horizontal wells. Gas flow and Klinkenberg effect.

References Books:

1. White F.M., "Fluid Mechanics", IV Edition, Mc.Graw – Hill Inc. 1999. 2. Darby, R. "Chemical Engineering Fluid Mechanics" Marcel Decker, 1998