AMDE04 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 Bernoullis 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