

**III Year-II Semester  
(20CE6646) Advanced Fluid Mechanics**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

**Pre- Requisites: Fundamentals of Fluid Mechanics**

**UNIT-I:**

Kinematics of Flow: Description of fluid motion - Lagrangian and Eulerian approaches, Equations of continuity, energy and linear momentum in Cartesian and polar coordinates, Standard 2D Flow Patterns: Uniform flow, Source, sink, vortex, doublet and their combinations, D'Alembert's paradox

**UNIT-II:**

Laminar Flow: Derivation of Navier-Stokes equations – exact solutions for flow between parallel plates, Hagen Poissulle flows, Couette flow, velocity, shear stress and pressure distribution, flow near a suddenly accelerated plate and an oscillating plate.

**UNIT-III:**

Boundary Layers: Boundary layer equations, Boundary layer thickness boundary layer on a flat plate, similarity solutions, Integral form of boundary layer equations, Separation in boundary layer under adverse pressure gradient, turbulent boundary layer.

**UNIT-IV:**

Turbulent Flows: Reynolds equations of motion, semi-empirical theories of turbulence, Prandtl mixing length, velocity profiles for inner, outer and overlap layers, shear stress and pressure distribution, equilibrium boundary layers.

**UNIT-V:**

Hydraulic transients : Basic concepts- transient flow equation, transient in pumping systems, transient in hydroelectric power plants, cavitation, water hammer, surges and their protection works.

**Course Outcomes:**

S.No	Course Outcomes	BTL
1	Basic concepts of mathematical and physical background to analyze real life problems in fluidmechanics	L2
2	Understanding of possess skills to take up research activities involving fluidmotions	L2
3	Develop the boundary layer concept on fluid motion	L5
4	Analyze the irregular fluid in motion	L4
5	Explain about the basic concept of Hydraulic Transients	L2

**Reference Books:**

1. Foundations of Fluid Mechanics by S W YUAN
2. Fluid Mechanics by White
3. Fluid Mechanics by Hunter and Rose
4. Fluid Mechanics by C S P Ojhha
5. Boundary layer theory by Schlichting H
6. Applied Hydraulics of pumps by Tullis, Hydraulic Transients by Hanif Choudhary