III Year - II Semester	L	T	P	C
20CE6646	3	0	0	3

ADVANCED FLUID MECHANICS

Course Outcomes

At the end of the course, the student will be able to

- Basic concepts of mathematical and physical background to analyze real life problems in fluid mechanics
- Understanding of possess skills to take up research activities involving fluid motions
- Develop the boundary layer concept on fluid motion
- Analyze the irregular fluid in motion
- Explain about the basic concept of Hydraulic Transients

SYLLABUS

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 Poisulle 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.

REFERENCES

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