

FLUID MECHANICS

III Semester: CE

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACEC03	Core	3	1	0	4	30	70	100
Contact Classes:45	Tutorial Classes: 15	Practical Classes: Nil			Total Classes:60			

Prerequisite: Engineering Mechanics

I. COURSEOVERVIEW

This course provides students with an introduction to principal concepts and methods of fluid mechanics. Topics covered in the course include pressure, hydrostatics, and buoyancy; open systems and control volume analysis; mass conservation and momentum conservation for moving fluids; viscous fluid flows, flow through pipes; dimensional analysis; boundary layers, and lift and drag on objects. Students will work to formulate the models necessary to study, analyze, and design fluid systems through the application of these concepts, and to develop the problem solving skills essential to good engineering practice of fluid mechanics in practical applications.

II. COURSEOBJECTIVES

The Students will try to learn:

- I Understand and study the effect of fluid properties on a flow system.
- II Apply the concept of fluid pressure, its measurements and applications.
- III Explore the static, kinematic and dynamic behavior of fluids.
- IV Assess the fluid flow and flow parameters using measuring devices.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:

- | | | |
|------|---|------------|
| CO 1 | Recall basic principles and concepts of Fluid Mechanics for ascertaining differences between solids and fluids. | Remember |
| CO 2 | Classify the fluids based on Newton's law of viscosity for calculating shear and viscosity of incompressible fluids. | Understand |
| CO 3 | Interpret the principles of manometry and pressure for measuring gauge and differential pressures in fluids. | Understand |
| CO 4 | Make use of hydrostatic forces and Archimedes principle for locating the point of application of force on various types of floating and immersed bodies. | Apply |
| CO 5 | Utilize the conservation laws in differential forms for determining velocities, pressures and acceleration in a moving liquid. | Apply |
| CO 6 | Explain velocity potential, stream function for estimating the possibility of the flow. | Understand |

IV. COURSE SYLLABUS

MODULE-I:PROPERTIES OF FLUIDS (12)

Distinction between a fluid and a solid; Properties of fluids, intrinsic and extrinsic, Newton law of viscosity with classification, cavitation, surface tension, capillarity, Bulk modulus of elasticity, and compressibility.

MODULE-II:FLUID STATICS(12)

Fluid Pressure: Pressure at a point, Pascal's law, Pressure measuring devices, piezometer, different types of manometers and pressure gauges; Hydrostatic pressure for submerged bodies. buoyancy and stability of floating bodies.

MODULE-III:FLUID KINEMATICS (12)

Classification of fluid flow with respect to time, space, rotation about its axis, Reynolds number, Froude number, combinations of fluid flows.

Flow patterns, Laplace equations and flow net, Derivation of Continuity equations in Cartesian coordinate system with practical applications.

MODULE–IV:FLUID DYNAMICS(12)

Surface and body forces, law of conservation of mass and energy, equations of motion, Euler’s equation and derivation of Bernoulli’s equation, TEL and HGL of pipes; Practical applications of Bernoulli’s equation; Momentum principle, applications.

MODULE–V:FLOW THROUGH PIPES (12)

Major losses (Derivation of Darcy’s Weischbach – Equation) and minor losses through pipes, Pipes in series, equivalent pipes, pipes in parallel. Analysis of pipe networks - Hardy Cross method.

V. TEXT BOOKS

1. S. Ramamrutham, “Hydraulic Fluid Mechanics and Fluid Machines”, Dhanpat Rai Publishing Company Private Limited, 9th Edition, 2014.
2. C. S. P. Ojha, R. Berndtsson and P. N. Chadramouli, “Fluid Mechanics and Machinery”, Oxford University Press, 2010.
3. P M Modi and S M Seth, “Hydraulics and Fluid Mechanics”, Standard Book House, 2014.

VI. REFERENCE BOOKS

1. K. Subramanya, “Theory and Applications of Fluid Mechanics”, Tata McGraw Hill.
2. R.L. Daugherty, J.B. Franzini and E.J. Finnemore, “Fluid Mechanics with Engineering Applications”, International Student Edition, Tata Mc Graw Hill.
3. Jack b. Evett, Cheng Liu, “2500 Solved Problems in Fluid Mechanics and Hydraulics”, MCGRAW-HILL, INC.

VII. WEB REFERENCES

1. <http://nptel.ac.in/courses/112105171/1>
2. <http://nptel.ac.in/courses/105101082/>
3. <http://nptel.ac.in/courses/112104118/ui/TOC.htm>

VIII. E-TEXT BOOKS

1. <http://engineeringstudymaterial.net/tag/fluid-mechanics-books/>
2. <http://www.allexamresults.net/2015/10/Download-Pdf-Fluid-Mechanics-and-Hydraulic-Machines-by-rk-Bansal.html>
3. <http://varunkamboj.typepad.com/files/engineering-fluid-mechanics-1.pdf>