# FLUID MECHANICS

**IV Semester: CE**

| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | L | T | P | C | CIA | SEE | Total |
| ACEB06 | PCC | 3 | 1 | - | 4 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: 15 | Practical Classes: Nil | | | | Total Classes: 60 | | |

## COURSE OBJECTIVES:

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|---|---|
| I | The fundamental knowledge of fluid properties at rest, in transit for various conditions in both closed and open channel flows. |
| II | The concept of buoyancy, stability of floating bodies and the forces acting on immersed bodies by employing the concept of pressure. |
| III | The basic laws of energy, mass and their governing equations for various fluid flow systems |
| IV | The use of dimensionless analysis in determining the appropriate units for an unknown quantity in an equation necessary to develop the relation between model and prototype. |

## COURSE OUTCOMES:

**After successful completion of the course students are able to:**

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| CO 1 | **Recall** the definitions and fundamental concepts of Fluid Mechanics for finding the differences between solids and fluids. |
| CO 2 | **Classify** the fluids based on Newton's law of viscosity for calculating shear and viscosity of an incompressible fluids. |
| CO 3 | **Interpret** the principles of manometry and pressure for measuring gauge and differential pressures in fluids. |
| CO 4 | **Make use of** hydrostatic forces and Archimedes principlefor locating the point of application of force on various types of floating and immersed bodies. |
| CO 5 | **Utilize** the conservation laws in differential forms for determining velocities, pressures and acceleration in a moving liquid. |
| CO 6 | **Explain** velocity potential, stream functionforestimating the possibility of the flow. |
| CO 7 | **Analyze** fluid flow with the mass and energy equationsfordetermining analytical solutions of fluid flow problems. |
| CO 8 | **Interpret** the law of conservation of energy, Bernoulli's theorem for estimating total energyof various geometrical cross sections and discharge through it. |
| CO 9 | **Apply** the principles of dimensional analysis for building the relation between model and prototypes. |
| CO 10 | **Apply** the similitude conceptfor testing of engineering models. |

| MODULE –I | BASIC CONCEPTS AND DEFINITIONS | Classes: 09 |
|---|---|---|

Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity with temperature, Newton law of viscosity; Vapour pressure, boiling point, cavitation; surface tension, capillarity, Bulk modulus of elasticity, compressibility.

| MODULE –II | FLUID STATICS | Classes: 09 |
|---|---|---|
| Fluid Pressure: Pressure at a point, Pascal's law, pressure variation with temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column Manometer, U-Tube Differential Manometer, Micro manometers. Pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies. | | |
| **MODULE –III** | **FLUID KINEMATICS** | **Classes: 10** |
| Classification of fluid flow: steady and unsteady flow, uniform and non-uniform flow, laminar and turbulent flow, rotational and irrotational flow, compressible and incompressible flow, ideal and real fluid flow-, one-, two- and three-dimensional flows.<br><br>Stream line, path line, streak line and stream tube; stream function, velocity potential function. One-, two and three -dimensional continuity equations in Cartesian coordinates. | | |
| **MODULE –IV** | **FLUID DYNAMICS** | **Classes: 09** |
| Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; Practical applications of Bernoulli's equation: Venturimeter, orifice meter and pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend; Vortex Flow – Free and Forced; | | |
| **MODULE –V** | **DIMENSIONAL ANALYSIS** | **Classes: 08** |
| Dimensional Analysis and Dynamic Similitude - Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number; Buckingham's π-Theorem. | | |

**Text Books:**


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


**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.


**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

**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