II Year I Semester	**L**	**T**	**P**	**C**
Code: 17CE303	**4**	**1**	**0**	**3**

FLUID MECHANICS

Course Learning Objectives:

1. To understand the properties of fluids and fluid statics
2. To derive the equation of conservation of mass and its application
3. To solve kinematic problems such as finding particle paths and stream lines
4. To use important concepts of continuity equation, Bernoulli’s equation and turbulence, and apply the same to problems
5. To analyze laminar and turbulent flows
6. To understand the various flow measuring devices
7. To study in detail about boundary layers theory

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Understand the various properties of fluids and their influence on fluid motion and analyse a variety of problems in fluid statics and dynamics.
2. Calculate the forces that act on submerged planes and curves.
3. Identify and analyse various types of fluid flows.
4. Apply the integral forms of the three fundamental laws of fluid mechanics to turbulent and laminar flow through pipes and ducts in order to predict relevant pressures, velocities and forces.
5. Draw simple hydraulic and energy gradient lines.
6. Measure the quantities of fluid flowing in pipes, tanks and channels.

SYLLABUS

UNIT I :

Introduction:

Dimensions and units – Physical properties of fluids – specific gravity, viscosity, surface tension, vapour pressure and their influences on fluid motion, pressure at a point, Pascal’s law, Hydrostatic law -atmospheric, gauge and vacuum pressures measurement of pressure. Pressure gauges, Manometers: Differential and Micro Manometers.

UNTI II:

Hydrostatics & Fluid Kinematics:

Hydrostatic forces on submerged plane, Horizontal, Vertical, inclined and curved surfaces – Center of pressure.

Fluid Kinematics:Description of fluid flow, Stream line, path line and streak line and stream tube. Classification of flows: Steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational and irrotational flows – Equation of continuity for one, two , three dimensional flows – stream and velocity potential functions, flow net analysis.

UNIT III:Fluid Dynamics: Surface and body forces – Euler’s and Bernoulli’s equations for flow along a stream line - Momentum equation and its application – forces on pipe bend.

UNIT IV:

Laminar Flow And Turbulent Flows:

Reynold's experiment – Characteristics of Laminar & Turbulent flows, Shear and velocity distributions, Laws of Fluid friction, Hagen-Poiseulle Formula, Flow between parallel plates, Flow through long tubes, hydrodynamically smooth and rough flows.

Closed Conduit Flow:Darcy-Weisbach equation, Minor losses – pipes in series – pipes in parallel – Total energy line and hydraulic gradient line, variation of friction factor with Reynold's number – Moody's Chart, Pipe network problems, Hazen-Williams formula, Hard-Cross Method.

UNIT V:

Measurement of Flow:

Pitot tube, Venturi meter and Orifice meter – classification of orifices, small orifice and large orifice, flow over rectangular, triangular, trapezoidal and Stepped notches - –Broad crested weirs.

UNIT VI:

Boundary Layer Theory:

Boundary layer (BL) – concepts, Prandtl contribution, Characteristics of boundary layer along a thin flat plate, Vonkarman momentum integral equation, laminar and turbulent Boundary layers(no deviations)- BL in transition, separation of BL, Control of BL, flow around submerged objects-Drag and Lift- Magnus effect.

TEXT BOOKS:

1. Fluid Mechanics by P. N. Modi and S. M. Seth, Standard book house, New Delhi
2. A text of Fluid mechanics and hydraulic machines by R. K. Bansal - Laxmi Publications (P)ltd., New Delhi

REFERENCES:

1. Mechanics of Fluids by Merle C. Potter, David C. Wiggert and Bassem H. Ramadan, CENGAGE Learning
2. Fluid Mechanics and Machinery by C.S.P. Ojha, R. Berndtsson and P.N. Chandramouli, Oxford Higher Education.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	3	2	2	1	1	3	3	1	1	1	2	1	1	2	3
CO 2	3	2	3	3	2	3	3	1	3	3	3	2	3	3	2
CO 3	3	3	2	2	2	2	2	1	2	2	2	1	2	1	3
CO 4	3	3	2	3	3	3	2	1	3	3	2	3	3	1	3
CO 5	3	3	3	3	3	3	3	1	2	3	3	2	3	3	2
CO 6	3	3	3	3	3	3	3	1	2	3	3	2	3	3	2