

23CE21T3 FLUID MECHANICS

Course Category	Professional Core	Credits	3
Course Type	Theory	Lecture – Tutorial –Practical	2-1-0
Prerequisite	-	Sessional Evaluation	30
		Semester End Exam. Evaluation	70
		Total Marks	100

Course Objectives	<ol style="list-style-type: none"> 1. To understand the fundamental properties of fluids and solids. 2. To explain the principles of fluid pressure and measure hydrostatic forces on surfaces. 3. To classify different types of fluid flow and understand fluid flow visualization techniques. 4. To explain integral forms of fundamental laws of fluid mechanics to predict relevant pressures, velocities and forces. 5. To understand various concepts of pipe flow. 		
Course Outcomes	COs	Statements	Blooms Level
	CO1	Identify the difference between fluids and solids, and understand various fluid properties.	L2
	CO2	Apply the laws of fluid statics and concepts of buoyancy	L3
	CO3	Understand and classify various types of fluid flow, and differentiate types of fluid flows	L2
	CO4	Apply the Principle of conservation of energy for flow measurement.	L3
	CO5	Analyse the losses in pipes and discharge through pipe network.	L4
Course Content	<p align="center">UNIT I</p> <p>Basic concepts and Definitions: Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Specific volume, Kinematic and dynamic viscosity; Variation of viscosity with temperature, Newton law of viscosity; Vapour pressure, Boiling point, Surface tension, Capillarity, Bulk modulus of elasticity, Compressibility.</p> <p align="center">UNIT II</p> <p>Fluid Statics: 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 and inverted U-Tube</p>		

	<p>Differential Manometer; Pressure gauges; Hydrostatic pressure and force - Horizontal, vertical and inclined and curved surfaces; Buoyancy and stability of floating and submerged bodies.</p> <p style="text-align: center;">UNIT III</p> <p>Fluid kinematics: 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; Velocity and acceleration, Stream line, path line, streak line and stream tube; stream function, velocity potential function; One, two and three - Dimensional continuity equations in Cartesian coordinates.</p> <p style="text-align: center;">UNIT IV</p> <p>Fluid Dynamics: 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; Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number; Introduction to notches and weirs.</p> <p style="text-align: center;">UNIT V</p> <p>Analysis Of Pipe Flow: Energy losses in pipelines; Darcy – Weisbach equation; Minor losses in pipelines; Hydraulic Grade Line and Total Energy Line; Concept of equivalent length – Pipes in Parallel and Series; Water hammer in pipes.</p>
<p>Textbooks and Reference books</p>	<p>TEXTBOOKS:</p> <ol style="list-style-type: none"> 1. Dr. P.N. Modi, Dr. S.M. Seth, “<i>Hydraulics and Fluid Mechanics Including Hydraulics Machine</i>”, Standard Book House, 22nd edition, 2019. 2. A. K. Jain, “<i>Fluid Mechanics including Hydraulic Machines</i>”, Khanna Publications, 2016. 3. R.K. Bansal, “<i>A Textbook of Fluid Mechanics and Hydraulic Machines</i>”, Laxmi Publications, 11th edition, 2024. <p>REFERENCE BOOKS:</p> <ol style="list-style-type: none"> 1. N. Narayana Pillai, “<i>Principles of Fluid Mechanics and Fluid Machines</i>”, Universities Press Pvt. Ltd, 3rd edition, 2009. 2. Frank M. White, Henry Xue, “<i>Fluid Mechanics</i>”, Tata McGraw Hill, 9th edition, 2022.

	<p>3. C. S. P. Ojha, R. Berndtsson and P. N. Chadramouli, “<i>Fluid Mechanics and Machinery</i>”, Oxford University Press, 2010.</p> <p>4. S K Som, Gautam Biswas, S Chakraborty, “<i>Introduction to Fluid Mechanics and Fluid Machines</i>”, Tata McGraw Hill, 3rd edition 2017.</p>
E-resources	<p>1. https://archive.nptel.ac.in/courses/112/105/112105269/</p> <p>2. https://nptel.ac.in/courses/112104118</p> <p>3. https://nptel.ac.in/courses/105103192</p>

CO-PO Mapping: 3-High Mapping, 2-Moderate Mapping, 1-Low Mapping, - -Not Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO 1	3	1	-	1	1	-	1	-	-	-	1	3	-	1	-
CO 2	3	1	-	2	1	-	1	-	-	-	2	3	-	2	-
CO 3	3	1	-	3	1	-	1	-	-	-	2	3	-	1	-
CO 4	3	1	1	2	1	-	1	-	-	-	2	3	-	1	-
CO 5	3	1	3	3	1	-	1	-	-	-	3	3	-	2	1