PVP23

23CE3303: FLUID MECHANICS

(SYLLABUS)

Course Code	23CE3303	Year	II	Semester	I
Course Category	Professional Core	Branch	CIVIL	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	Engineering Physics, Mathematics, Engineering mechanics
Continuous Internal Evaluation	30	Semester End Evaluation	70	Total Marks	100

After successful completion of the course, the student will be able to		Blooms Level
CO1	**Understand** the principles of fluid statics, kinematics and dynamics	L2
CO2	**Apply** the laws of fluid statics to calculate hydrostatic pressure force	L3
CO3	**Understand** the fundamentals of fluid kinematics 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

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3-High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	-	-	-	2	-	-	1	-	1	1	3	1
CO2	3	3	-	-	-	2	-	-	3	-	3	3	3	1
CO3	3	1	-	-	-	3	-	-	1	-	1	1	3	2
CO4	3	2	-	-	-	1	-	-	2	-	2	2	3	2
CO5	3	3	-	-	-	2	-	-	3	-	3	3	3	2

UNIT No.	Contents	Mapped COs
I	**Basic concepts and definitions:** 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; Vapor pressure, Boiling point, Surface tension on water droplet and on soap bubble, capillarity- rise and fall	CO1
II	**Fluid statics**: Fluid Pressure: Pressure at a point, Pascal's law, pressure measurement. Piezometer, U-Tube Manometer, U Tube Differential Manometer. Pressure gauges working principle, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces.	CO1,CO2

III	**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; Stream line, path line, streak line and stream tube; stream function, velocity potential function only definitions. One, two and three - Dimensional continuity equation in Cartesian coordinates.	**CO1, CO2, CO3**
IV	**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; Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number;	**CO1. CO3, CO4**
V	**Analysis Of Pipe Flow:** Energy losses in pipelines; Darcy – Weisbach equation; Minor losses in pipelines; Hydraulic Gradient Line and Total Energy Line; Concept of equivalent pipe, Pipes in Parallel and Series. Notches and weirs: rectangular, triangular, trapezoidal.	**CO1, CO3, CO4, CO5**

Learning Resource(s)

Text Book(s)

1. P. M. Modi and S. M. Seth, Hydraulics and Fluid Mechanics, Standard Book House 22nd, 2019.
2. K. Subrahmanya, Theory and Applications of Fluid Mechanics, Tata McGraw Hill, 2nd edition 2018

Reference Book(s)

1. R. K. Bansal, A text of Fluid mechanics and hydraulic machines, Laxmi Publications (P) Ltd., New Delhi 11th edition, 2024.
2. N. Narayana Pillai, Principles of Fluid Mechanics and Fluid Machines, Universities Press Pvt Ltd, Hyderabad. 3rd Edition 2009.
3. Fluid Mechanics by Frank M. White, Henry Xue, Tata McGraw Hill, 9th edition , 2022.
4. C. S. P. Ojha, R. Berndtsson and P. N. Chadramouli, Fluid Mechanics and Machinery, Oxford University Press, 2010.
5. Introduction to Fluid Mechanics & Fluid Machines by S K Som, Gautam Biswas, S Chakraborty Tata McGraw Hill, 3rd edition 2011

Online Learning Resources:

https://archive.nptel.ac.in/courses/112/105/112105269/

https://nptel.ac.in/courses/112104118

https://nptel.ac.in/courses/105103192