20CE3301 - MECHANICS OF FLUIDS

Offering Branches	CE			
Course Category:	Professional Core		Credits:	3
Course Type:	Theory		Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20BS1101- Calculus and Linear Algebra 20BS1201- Differential Equations and Vector Calculus 20BS1104-Applied Physics		Continuous Evaluation:	30
			Semester End Evaluation:	70
			Total Marks:	100

Course Outcomes

Upon successful completion of the course, the student will be able to:

CO1	**Understand, analyze** and **apply** various fluid properties to solve the fluid problems and use various devices for measuring fluid pressure.	K4
CO2	**Apply** hydrostatic law to find hydrostatic force on various submerged planes and use of law of conservation mass to fluid flow.	K3
CO3	**Apply** the concept of boundary layer theory to determine lift and drag forces on a submerged body.	K3
CO4	**Apply** appropriate flow equations and principles to **analyse** pipe flow problems.	K4
CO5	**Apply** Bernoulli's equation to fluid flow problems and use of different fluid flow measuring devices.	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low	2-Medium	3-High

Course Content

UNIT-1	**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, Pressure and its Measurement: Atmospheric, gauge and vacuum pressure- measurement of pressure. Pressure gauges, Manometers: differential manometers.	CO1
UNIT-2	**HYDROSTATIC FORCES:** Hydrostatic forces on submerged, horizontal, vertical and inclined surfaces, Total pressure and centre of pressure derivations and problems. **FLUID KINEMATICS-** Description of fluid**,** stream line, path line and streak lines and stream tube. Classification of flows- steady, unsteady, uniform non-uniform, laminar, turbulent, rotational, irrotational flows, Equation of continuity for one, three dimensional flows.	CO1, CO2
UNIT-3	**FLUID DYNAMICS:** Surface and body forces – Euler's and Bernoulli's equations for flow along a stream line for 3-D flow, Momentum equation and its application – forces on pipe bend. Boundary layer – concept, characteristics of boundary layer along a thin flat plate, Separation of boundary layer, Flow around submerged objects- drag and lift**.**	CO1, CO3
UNIT-4	**LAMINAR FLOW:** Reynold's experiment- Characteristics of laminar and turbulent flows. Flow between fixed parallel plates, Flow through horizontal pipes. **FLOW THROUGH PIPES –** Laws of fluid friction – Darcy's equation, minor losses Pipes in series- pipes in parallel-equivalent pipe, total energy line and	CO1, CO4

	hydraulic gradient line.	
UNIT-5	**MEASUREMENT OF FLOW:** Pitot tube, Venturi meter and orifice meter. Classification of orifices, Flow over rectangular, triangular, trapezoidal notch, Broad crested weirs	**CO5**

Learning Resources

Text Books	1. P.N. Modi and S.M. Seth, Fluid Mechanics (18th edition) Standard Book House,2017. 2. A.K. Jain, Fluid Mechanics, Khanna publishers,2010
Reference Books	1. L. Victor, Streeter and E. Benjamin Wylie, Fluid Mechanics, Tata McGraw Hill,1985. 2. M. Franck White, Fluid Mechanics, Tata McGraw Hill,2017. 3. K. Subramanya, Theory and Applications of Fluid Mechanics, Tata McGraw Hill,2001. 4. A text book of Fluid Mechanics and Hydraulic Machines by R. K. Rajput, S. chand Technical publishers
e-Resources& other digital material	1. Fluid Mechanics virtual labs. http://eerc03-iiith.vlabs.ac.in/ 2. https://nptel.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/fluid_mechanics/index.htm 3. https://nptel.ac.in/courses/105105119.