19CE3302 - FLUID MECHANICS

Offering Branches	CE		
Course Category:	Program Core	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical :**	3-0-0
Prerequisites:	1. 19BS1101-Engineering Mathematics – I 2. 19BS1201-Engineering Mathematics – II 3. 19BS1204- 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	Determine the fluid pressure and use various devices for measuring fluid pressure.	**L5**
CO2	Calculate hydrostatic force and use of law of conservation mass to fluid flow.	**L5**
CO3	Apply Bernoulli's equation to fluid flow problems and boundary layer theory to determine lift and drag forces on a submerged body.	**L4**
CO4	Apply appropriate equations and principles to analyze pipe flow problems.	**L4**
CO5	Use of different fluid flow measuring devices.	**L4**

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

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

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 - atmospheric, gauge and vacuum pressure- measurement of pressure. Pressure gauges, Manometers: differential and Micro Manometers.	**CO1**
UNIT - 2	**HYDROSTATIC FORCES:** Hydrostatic forces on submerged plane, horizontal, vertical, inclined, and curved 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 , two, three dimensional flows- stream and velocity potential functions, flow net analysis	**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, Navier–stokes equations, Momentum equation and its application – forces on pipe bend. Boundary layer – concepts, Prandtl contribution, Characteristics of boundary layer along a thin flat plate, Separation of boundary layer, Flow	**CO3**

	around submerged objects- drag and lift- Magnus effect**.**	
UNIT - 4	**LAMINAR FLOW:** Reynold's experiment- Characteristics of laminar and turbulent flows. Flow between parallel plates, flow through long tubes. **FLOW THROUGH PIPES –** Laws of fluid friction – Darcy's 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' chart**.**	**CO4**
UNIT - 5	**MEASUREMENT OF FLOW:** Pitot tube, Venturi meter and orifice meter. Classification of orifices, Flow over rectangular, triangular, trapezoidal and stepped notches, Broad crested weirs	**CO5**

Learning Resources

Text Books	1. P.N. Modi and S.M. Seth, Fluid Mechanics (18^{th} edition) Standard Book House,2017. 2. A.K. Jain, Fluid Mechanics, Khanna publishers,2010 3. A text book of Fluid Mechanics and Hydraulic Machines (7^{th} edition) Laxmi publications(P) ltd; New Delhi, 2000
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
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/1051051199.