FLUID MECHANICS

Course Code	19ME3403	Year	II	Semester	II
Course Category	Program Core	Branch	ME	Course Type	Theory
Credits	4	L – T – P	3 – 1 – 0	Prerequisites	Engineering Mechanics
Continuous Internal Evaluation	30	Semester End Evaluation	70	Total Marks	100

Course Outcomes		Levels
After successful completion of the course, the student will be able to		
CO1	Describe the concepts of fluid properties, pressure measurement by manometers.	L1
CO2	Estimate the forces acting on submerged body in a static fluid.	L2
CO3	Apply conservation laws to solve fluid flow problems in engineering applications.	L3
CO4	Analyze the various flow measuring devices and estimate the force exerted by the jet on vanes.	L3
CO5	Apply Rayleigh's method, and Buckingham Pi theorem to arrange given variables into dimensionless groups.	L3

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	2	3											3	2
CO2	2	3											3	2
CO3	2	3											3	2
CO4	2	3											3	2
CO5	2	3											3	2

Syllabus		
Unit No.	**Contents**	**Mapped COs**
I	**PROPERTIES OF FLUIDS** Properties of fluids- Density, specific weight, specific volume, specific gravity, Viscosity-Dynamic viscosity, Kinematic Viscosity-Cohesion, Adhesion, surface tension, capillarity and vapor pressure, compressibility and elasticity. **MEASUREMENT OF PRESSURE:** Pascal's law, Manometers–Simple Manometers-Piezometer, U- tube manometer, Single column manometers, Differential manometers-U- Tube differential manometers and inverted U-Tube differential manometers.	CO1
II	**HYDROSTATIC FORCES ON SURFACES:** Total pressure and center of pressure on horizontal plane surface, Vertical plane surface, inclined plane surface, Practical applications of total pressure and center of pressure-Dams, Gates and Tanks.	CO2

	BUOYANCY AND FLOATING: Buoyancy-Archimedes principle- center of buoyancy-metacenter and metacentric height-stability of submerged and floating bodies-determination of metacentric height. **FLUID KINEMATICS**: Classification of flows-steady and unsteady, uniform and non- uniform, laminar and turbulent, rotational and irrational, viscous and inviscid, continuity equation, Description of fluid flow, Stream line, path line, streak lines and stream tube	
III	**FLUID DYNAMICS**: Euler's and Bernoulli's equations for flow along a stream line, momentum equation and its application on force on pipe bend. **CLOSED CONDUIT FLOW**: Reynolds's experiment- Darcy Weisbach equation- Minor losses in pipes-pipes in series and pipes in parallel- total energy line- hydraulic gradient line.	CO3
IV	**MEASUREMENT OF FLOW**: Pitot tube, Venturi meter and orifice meter –flow over rectangular, triangular, trapezoidal and stepped notches. **IMPACT OF JETS**: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip – velocity triangles at inlet and outlet – expressions for work done and efficiency - angular momentum principle	CO4
V	**DIMENSIONAL ANALYSIS:** Fundamental and derived dimensions, Rayleigh method, Buckingham theorem, dimensionless groups, application of dimensional groups, model testing and similitude, types of similarity - geometric, kinematic and dynamic, model testing methods.	CO5

Learning Recourse(s)

Text Book(s)

1. Hydraulics and Fluid Mechanics including hydraulic machines, by P.N.Modi and S.M.Seth, Standarard book house, 2000, New Delhi.
2. K.L. Kumar / Engineering Fluid Mechanics / S chand Publications.

Reference Book(s)

1. Fluid Mechanics and Hydraulic Machines, by R.K.Bansal,Laxmi publications (P) Ltd. 2011, New Delhi.
2. Hydraulics and Fluid Mechanics and fluid machines, by S Ramamrutham, Dhanapat rai publishing company, New Delhi
3. Fluid Mechanics and Hydraulic Machines, by R.K.Rajput, S.Chand limited publications, 2008, New Delhi.
4. Fluid Mechanics and Hydraulic Machines, by Sukumar Pati, Mc Graw Hill Education Private Limited, 2014, New Delhi.
5. Fluid Flow Machines by N.S.Govinda Rao, Tata Mc Graw Hill publishing company Ltd.
6. Fluid Mechanics and Hydraulic Machines by K.R. Arora, Standard Publishers Distributors

e-Resources & other digital material
1. https://nptel.ac.in/courses/112/105/112105171/ 2. https://nptel.ac.in/courses/112/105/112105183/ 3. https://nptel.ac.in/courses/105/101/105101082/ 4. https://nptel.ac.in/courses/105/103/105103095/