

19ME3403-FLUID MECHANICS

Offering Branches	ME		
Course category:	Program Core	Credits	4
Course Type:	Theory	Lecture-Tutorial-Practical:	3-1-0
Prerequisites	19ME3301 -Engineering Mechanics	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	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
Course Content			
UNIT-1	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
UNIT-2	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. 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 irrotational, viscous and inviscid, continuity equation, Description of fluid flow,		CO2

	Stream line, path line, streak lines and stream tube	
UNIT-3	<p>FLUID DYNAMICS: Euler's and Bernoulli's equations for flow along a stream line, momentum equation and its application on force on pipe bend.</p> <p>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.</p>	CO3
UNIT-4	<p>MEASUREMENT OF FLOW: Pitot tube, Venturimeter and orifice meter –flow over rectangular, triangular, trapezoidal and stepped notches.</p> <p>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</p>	CO4
UNIT-5	<p>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.</p>	CO5
Learning Resources		
Text books:	<p>1.Hydraulics and Fluid Mechanics including hydraulic machines, by P.N.Modi and S.M.Seth, Standarard book house, 2000, New Delhi.</p> <p>2.K.L.Kumar / Engineering Fluid Mechanics / S chand Publications.</p>	
Reference books	<p>1.Fluid Mechanics and Hydraulic Machines, by R.K.Bansal, Laxmi publications (P) Ltd. 2011, New Delhi.</p> <p>2.Hydraulics and Fluid Mechanics and fluid machines, by S Ramamrutham, Dhanapat rai publishing company,New Delhi</p> <p>3.Fluid Mechanics and Hydraulic Machines, by R.K.Rajput, S.Chand limited publications, 2008, New Delhi.</p> <p>4.Fluid Mechanics and Hydraulic Machines, by Sukumar Pati, Mc Graw Hill Education Private Limited, 2014, New Delhi.</p> <p>5.Fluid Flow Machines by N.S.Govinda Rao, Tata Mc Graw Hill publishing company Ltd.</p> <p>6.Fluid Mechanics and Hydraulic Machines by K.R.Arora, Standard Publishers Distributors</p>	
e- Resources & other digital material	<p>1. https://nptel.ac.in/courses/112/105/112105171/</p> <p>2. https://nptel.ac.in/courses/112/105/112105183/</p> <p>3. https://nptel.ac.in/courses/105/101/105101082/</p> <p>4. https://nptel.ac.in/courses/105/103/105103095/</p>	

Course coordinator

HOD

II B.TECH - II Semester
19ME3403-FLUID MECHANICS
MICRO SYLLABUS-PVP19

UNIT I

PROPERTIES OF FLUIDS

- Density,
- Specific weight,
- Specific volume,
- Specific gravity,
- 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.

UNIT 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.

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 (Explanation only)

- Steady and unsteady,
- Uniform and non-uniform,
- Laminar and turbulent,
- Rotational and irrotational,
- Viscous and inviscid,

Continuity equation,

Description of fluid flow (Explanation only),

- Stream line,
- Path line,
- Streak lines and
- Stream tube

UNIT – 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.

UNIT – IV

MEASUREMENT OF FLOW:

- Pitot tube,
- Venturimeter and
- Orifice meter
- Rectangular notch
- Triangular notch
- Trapezoidal notch and
- Stepped notches.

IMPACT OF JETS:

Hydrodynamic force of jets on stationary and moving

- Flat,
- Inclined and
- Curved vanes-velocity– expressions for work done and efficiency

Angular momentum principle

UNIT – 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.