

**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**  
**INSTITUTE OF PETROLEUM & NATURAL GAS ENGINEERING**

**Title of Subject** : **Fluid Mechanics**  
**Course Code** : PG-213  
**Semester** : 3<sup>rd</sup>  
**Effective** : 24-Batch and onwards  
**Assessment** : 30% Sessional Marks, 30% midterm, 40% Final Examination  
**Credit Hours** : **2 + 1** **Contact Hours : 32/48**

**Aims** : Introduces the key concepts such as hydrostatics, kinematics, hydrodynamics, and hydraulics. Students will explore fluid properties, including specific weight, surface tension, and viscosity, and cover topics such as fluid statics, forces on submerged surfaces, buoyancy, and fluid kinematics. The course also includes hydrodynamics with a focus on energy in flowing liquids, Bernoulli's equation, and flow measurement techniques. Additionally, students will study steady flow through pipes, addressing Darcy's equation, energy losses, and principles of pipe network analysis.

**Course Learning Outcomes:** : After studying this course, the learners will be able to:  
CLOs for Theory

CLO	Description	Taxonomy level	Linked to PLO
1	Describe the physical properties of fluids, discharge and pressure measurement devices and to prepare hydraulic grade lines and energy lines for pipes, discharge measurement devices and apply empirical methods for uniform flow in open channels.	C2	2
2	Compute pressure and center of pressure on submerged surfaces and to analyze stability of floating and submerged bodies.	C3	3

CLOs for Practical

CLO	Description	Taxonomy level	Linked to PLO
1	Perform basic computer maintenance, troubleshooting, and up gradation.	P2	3
2	Practice Microsoft Office applications for document processing.	P3	3
3	Implement various programming concepts.	P3	5

<b>Course</b>	: <b>Introduction to fluid mechanics:</b>
<b>Outline:</b>	<p>Introduction to fluid mechanics, hydrostatics, kinematics, hydrodynamics, hydraulics, solids and fluids, liquids, and gases. Units and dimensions, physical properties of fluids, specific weight, specific volume, specific gravity, surface tension, compressibility, viscosity, newton's equation of viscosity.</p> <p><b>Fluid Statics:</b> pressure intensity and pressure head, pressure specific weight relationship, absolute and gage pressure, measurement of pressure, piezometer, Manometer, pressure transducer, differential manometer, and bourdon gage. Forces on submerged plane and curved surfaces and their applications. Buoyancy and floatation, equilibrium of floating and submerged surfaces.</p> <p><b>Fluid Kinematics:</b> steady and unsteady flow, laminar and turbulent flow, uniform and non-uniform flow, path lines, streamlines and stream tubes, velocity and discharge, equation of continuity for compressible and incompressible fluids.</p> <p><b>Hydro dynamics/Fluid dynamics:</b> different forms of energy in a flowing liquid, head, Bernoulli's equation and its application, energy lines and hydraulic grade lines, free and forced vortex. Flow Measurement: orifice meter, pitot tube and pitot static tube, venturi meter.</p> <p><b>Steady flow through pipes:</b> Darcy's Weisbach equation for flow in pipes, energy losses in pipelines, hydraulic grade lines and energy lines, pipes in series and parallel, transmission of energy through pipes, introduction to computer aided analysis of pipe network</p>
<b>Lab</b>	: Layout of Fluid Mechanics and Hydraulics lab. Determination of various properties of fluid,
<b>Outline:</b>	<p>head loss in a pipe of uniform diameter. Determine the hydrostatic forces on a submerged plane and locate the position of center of pressure i.e. depth of center of pressure. Investigate the validity of Bernoulli's equation when applied to a steady flow of water in a tapered duct. Determine the coefficient of discharge for the horizontal venturimeter or for the calibration of venturimeter. Determine coefficient of contraction (Cc), coefficient of velocity (Cv) and coefficient of discharge (Cd) of an orifice. Determine coefficient of discharge (Cd) of an orifice and hence to calibrate it.</p>

#### Recommended Books

- Fluid mechanics with Engineering Applications by Robert L. Daugherty.
- A textbook of fluid mechanics and hydraulic machines by Dr. R. K. Bansal.
- A textbook of Hydraulics, Fluid Mechanics and hydraulic machinery by R. S. Khurmi.
- Fluid Mechanics by J. F. Douglas.

<b>Approval</b>	Industrial Advisory Board	Res. No	<u>6.02</u>	Dated	<u>05-08-2024</u>
	Board of Studies	Res. No	<u>42.02</u>	Dated	<u>16-04-2025</u>
	Board of Faculty of Engineering	Res. No	<u>47.10</u>	Dated	<u>29-05-2025</u>
	Academic Council	Res. No		Dated	