

University of Engineering and Technology, Taxila

Department of Civil Engineering

Course Title:	CE-201	Fluid Mechanics - I
Pre-requisite(s):	None	
Credit Hours:	2 + 1	
Contact Hours:	2 + 3	
Text Book(s):	Fluid Mechanics with Engineering Applications, Daugherty, R. L., J. b. Franzini and Fenimore, Latest Edition	
Reference Book(s):	1. Fundamentals of Fluid Mechanics, Monson Young, Latest Edition 2. Fluid Mechanics, Douglas, Latest Edition	

Catalog Data:

Introduction; Fluid Statics; Forces on Immersed Bodies; Fluid Kinematics; Hydrodynamics; Flow Measurement; Steady Flow through Pipes; Pipes in series and parallel; Uniform Flow in Open Channels.

Course Objectives:

- To understand fundamentals of fluid mechanics.
- To enhance skills of utilizing fluid mechanics for civil engineering applications.

Course Learning Outcomes:

At the end of this course, the student will:

CLO 1: Understand the basic concept of fluid statics and kinematics

CLO 2: Understand the steady flow through pipes

CLO 3: Have knowledge about fluid mechanics application in civil engineering

CLO 4: Have knowledge about uniform flow in open channels

Course Contents:

1. Properties of Fluid Mechanics

- Solids and fluids (liquids and gases)
- Units and dimensions
- Introduction to Fluid Mechanics, Fluid Kinematics, Fluid Dynamics
- Physical properties of fluids; density, specific weight, specific volume, specific gravity, surface tension, compressibility
- Ideal and Real Fluids, Types of Fluids
- Viscosity and its measurement
- Newton's equation of viscosity
- Hydrostatics
- Kinematics
- Hydrodynamics
- Hydraulics

2. Fluid Statics

- Pressure intensity and pressure head
- Pressure and specific weight relationship
- Absolute and gauge pressure
- Measurement of pressure
- Piezometer, manometer
- Pressure transducers
- Differential manometer and Borden gauge

3. Forces on Immersed Bodies

- Forces on submerged planes & curved surfaces and their applications
- Drag and lift forces, buoyancy and floatation
- Equilibrium of floating and submerged bodies

4. Fluid Kinematics

- Steady and unsteady flow
- Laminar and turbulent flow
- Uniform and non-uniform flow
- Pathline streamlines and stream tubes
- Velocity and discharge
- Control volume
- Equation of continuity for compressible and incompressible fluids

5. Hydrodynamics / Energy Consideration in Steady Flow

- Different forms of energy in a flowing liquid
- Bernoulli's equation and its application
- Energy line and Hydraulic Gradient Line
- Introduction to density currents, free and forced vortex
- Forces on pressure conduits, reducers and bends, stationary and moving blades
- Torques in rotating machines

6. Flow Measurement

- Measurement of Static Pressure and Velocity
- Measurement of Discharge
- Orifices and mouthpieces, sharp-crested weirs and notches
- Pitot tube and pitot static tube
- Venturimeter, velocity methods

7. Steady Flow through Pipes

- Darcy-Weisbach equation for flow in pipes
- Losses in pipe lines
- Hydraulic grade lines and energy lines
- Pipes in series and parallel
- Transmission of energy through pipes
- Introduction to computer aided analysis of pipe networks

8. Steady Flow in Open Channels

- Chezy's and Manning's equations
- Bazin's and Kutter's equations
- Most economical rectangular and trapezoidal sections

Grading Policy:

Sr. No.	Grading	% of Total Marks
1.	Assignments	10 %
2.	Quizzes	10 %
3.	Laboratory	20 %
4.	Mid Term Exam	20 %
5.	Final Exam	40 %
	Total	100 %

Student Learning Outcomes:

Students who pass the course will gain the knowledge about fundamentals of fluid mechanics. They will be able to apply fluid mechanics in civil engineering projects.

Course Professional Outcome/Industrial Usage:

Students learn basic ideas and concept of fluid mechanics. Furthermore, they would be able to identify fluid mechanics for civil engineering applications.

Mapping:

PLO's \ CLO's	CLO 1 Basic Concept	CLO 2 Design Parameters	CLO 3 Application	CLO 4 Characteristics of Uniform Flow
PLO 1 (Engineering Knowledge)	✓			
PLO 2 (Problem Analysis)		✓	✓	✓
PLO 3 (Design/Development of Solutions)				
PLO 4 (Investigation)				
PLO 5 (Modern Tool Usage)				
PLO 6 (The Engineer and Society)				
PLO 7 (Environment and Sustainability)				
PLO 8 (Ethics)				
PLO 9 (Individual and Team work)				
PLO 10 (Communication)				
PLO 11 (Project Management)				
PLO 12 (Lifelong Learning)				

Assessment Modules \ CLOs	CLO 1	CLO 2	CLO 3	CLO 4
Assignments		✓		✓
Quizzes	✓	✓	✓	
Midterm Exam	✓	✓		
Final Exam	✓	✓	✓	✓