

Faculty of Engineering & Technology

Fluid Mechanics

Information :

Course Code : MPR 252

Level : Undergraduate

Course Hours : 4.00- Hours

Department : Department of Mechanical Engineering

Instructor Information :

Title	Name	Office hours
Lecturer	Anas Mohamed Abdelrahman Ali	
Assistant Lecturer	Moustafa Raafat Aziz Shousha	1

Area Of Study :

By the end of the course the students will be able to:

- 1) Demonstrate knowledge of Types and characteristics of flow, fluid statics, kinematics of flows and basics of fluid dynamics.
- 2) Define and solve problems in fluid dynamics in various engineering applications.
- 3) Predict performing of basic applications of fluid mechanics systems in modern life.

Description :

Basic properties of fluids and fundamental concepts, Statics of fluids, Hydrostatic forces and buoyancy, Fluid kinematics, Characterization of fluid flow, Basic equations: conservation of mass, momentum and energy, Bernoulli's equation, Energy Equation Applications. Momentum equation. Laminar and Turbulent flow in ducts and pipes and their External flow; Lift and Drag forces, Basics of dimensional analysis and dynamic similarity.

Course outcomes :

a.Knowledge and Understanding: :

1 -	Define fluid properties, stresses in fluids at rest and in motion and types of fluid flows.
2 -	Identify the governing equations of fluid flow: continuity, energy and momentum equations from principles of mass, energy and momentum conservation.
3 -	Identify the terms of Bernoulli's equation, include major and minor losses and draw the energy and the hydraulic gradient lines for flow systems.
4 -	Explain velocity and flow measuring devices, boundary layers, separation, friction, drag, lift, circulation and occurrence of the problem of cavitation.

b.Intellectual Skills: :

1 -	Analyze Bernoulli's equation and energy equation in flow problems.
2 -	Predict friction losses in pipes and ducts
3 -	Calculate drag and lift forces for different flow conditions.

c.Professional and Practical Skills: :

1 -	Use appropriate fluid measurement with lab equipment.
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- 2 - Perform experiments in the lab within proper technical, safety and ethical framework.

d.General and Transferable Skills: :

- 1 - Write reports in accordance with the standard scientific guidelines
- 2 - Present reports, discuss results and defend his/her ideas.
- 3 - Work coherently and successfully as a part of a team in assignments.

Course Topic And Contents :

Topic	No. of hours	Lecture	Tutorial / Practical
Introduction and Basic Concepts History of Fluid Mechanics, No-slip condition, Classification of fluid flows.	6	3	3
Fluid Properties, Vapor pressure and Cavitation, Compressibility and speed of sound, Viscosity, Surface tension and capillary effect.	6	3	3
Pressure and Fluid Statics Hydrostatic Forces on Submerged Plane Surfaces, Hydrostatic Forces on Submerged Curved Surfaces, Buoyancy and Stability.	9	6	3
Fluid Kinematics Lagrangian and Eulerian Descriptions, Flow Patterns and Flow Visualization, Vorticity and Rotationality.	9	3	6
Mass, Bernoulli, and Energy Equations Mechanical Energy and Efficiency, The Bernoulli Equation, General Energy Equation, Energy Analysis of Steady Flows.	24	12	12
Fluid Momentum Newton's Laws, The Linear Momentum Equation.	6	3	3
Internal Flow Introduction, Laminar and Turbulent Flows, The Entrance Region, Laminar Flow in Pipes, Turbulent Flow in Pipes, Minor Losses.	9	6	3
Internal Flow Piping Networks and Pump Selection, Flow rate and velocity measurement.	9	3	6
External Flow: Drag and Lift Introduction, Drag and Lift, Friction and Pressure Drag, Drag Coefficients of Common Geometries, Parallel Flow Over Flat Plates, Flow Over Cylinders and Spheres, Lift.	12	6	6

Teaching And Learning Methodologies :

Interactive Lecture

Problem based learning

Discussion

Experimental learning

Project based learning

Search

Course Assessment :

Methods of assessment	Relative weight %	Week No	Assess What
1st -Mid-term evaluation	25.00	6	
2 nd -Mid-term evaluation	25.00	11	
Final examination	40.00	16	
General Performance	10.00	14	

Recommended books :

Fluid Mechanics 6E , By Douglas, Gassiorik and Swaffield , Publisher: Pearson,new York, USA
 Streeter, V.L., Wylie, E. B., and Bedford, K. W., " Fluid Mechanics " 9th Edition, McGraw Hill, New York, USA