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 :

This course aims to:
ÅEnrich the student knowledge of Types and characteristics of flow, fluid statics, and kinematics of flows and basics of fluid dynamics.
ÅPrepare the student solve problems in fluid dynamics in various engineering applications.
ÅTrain the student to 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.
4 -	Draw the energy and the hydraulic gradient lines for flow systems.
5 -	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.

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. 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. 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. 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 Newtonôs 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
Research

Course Assessment :

Methods of assessment	Relative weight %	Week No	Assess What
Assignment	5.00	16	
Final Exam	40.00	16	
Lab Exper.	8.00		
Mid- Exam 1I	15.00	11	
Mid- Exam I	15.00	6	
Participation	7.00	16	
Project B.L.	5.00	8	
Quizzes	5.00	11	

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