University of Sistan and

Baluchestan

Department of Mechanical Engineering

Fluid mechanics I

Hamed Farzaneh – ۱۳۹۸ (۲۰۲۰)

COURSE OUTLINE

This is a course in Fluid Mechanics. The subject Fluid Mechanics has a wide scope and is of prime importance in several fields of engineering and science. Present course emphasizes the fundamental underlying fluid mechanical principles and application of those principles to solve real life problems. Special attention is given towards deriving all the governing equations starting from the fundamental principle. There is a well balanced coverage of physical concepts, mathematical operations along with examples and exercise problems of practical importance. After completion of the course, the students will have a strong fundamental understanding of the basic principles of Fluid Mechanics and will be able to apply the basic principles to analyze fluid mechanical systems

COURSE DETAIL

Module No.	Topic/s	Lectures
۱	**INTRODUCTION AND BASIC CONCEPTS** • Introduction • A Brief History of Fluid Mechanics • The No-Slip Condition • Classification of Fluid Flows • System and Control Volume • Importance of Dimensions and Units • Modeling in Engineering • Problem-Solving Technique	۲

	• Accuracy, Precision, and Significant Digits	
٢	**PROPERTIES OF FLUIDS** • Introduction • Density and Specific Gravity • Vapor Pressure and Cavitation • Energy and Specific Heats • Compressibility and Speed of Sound • Viscosity • Surface Tension and Capillary Effect	٢
٣	**PRESSURE AND FLUID STATICS** • Pressure • Pressure Measurement Devices • Introduction to Fluid Statics • Hydrostatic Forces on Submerged Plane Surfaces • Hydrostatic Forces on Submerged Curved Surfaces • Buoyancy and Stability • Fluids in Rigid-Body Motion	٢
٤	**FLUID KINEMATICS** • Lagrangian and Eulerian Descriptions • Flow Patterns and Flow Visualization • Plots of Fluid Flow Data • Other Kinematic Descriptions • Vorticity and Rotationality • Reynolds Transport Theorem	٥
٥	**BERNOULLI AND ENERGY EQUATIONS** • Introduction • Conservation of Mass • Mechanical Energy and Efficiency • The Bernoulli Equation • General Energy Equation • Energy Analysis of Steady Flows	٥
٦	**MOMENTUM ANALYSIS OF FLOW SYSTEMS** • Newton's Laws • Choosing a Control Volume • Forces Acting on a Control Volume	٤

	• The Linear Momentum Equation • Review of Rotational Motion and Angular Momentum • The Angular Momentum Equation	
٧	**DIMENSIONAL ANALYSIS AND MODELING** • Dimensions and Units • Dimensional Homogeneity • Dimensional Analysis and Similarity • The Method of Repeating Variables and The Buckingham Pi Theorem • Experimental Testing, Modeling, and Incomplete Similarity	٢

REFERENCES

Fluid Mechanics: Fundamentals and Applications,٣rd Edition / Yunus A. Cengel, John M. Cimbala, McGraw-Hill, ٢٠١٤

Introduction to Fluid Mechanics / Robert W. Fox, Philip J. Pritchard, Alan T. McDonald.