Course Specification
(Bachelor)

Course Title:	Fluid Mechanics I
Course Code:	ME3232
Program:	Bachelor's in Mechanical Engineering
Department:	Mechanical Engineering Department
College:	College of Engineering and Architecture
Institution:	Umm Al-Qura University
Version:	*Course Specification Version Number*
Last Revision Date:	12/23/2024

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: (3 hours)					
2. Course type					
A.	☐ University	☐ College	☒ Department	☐ Track	☐ Others
B.	☒ Required		☐ Elective		
3. Level/year at which this course is offered: (Level 5)					
4. Course General Description:					
FLUID PROPERTIES-PRESSURE DISTRIBUTION IN A FLUID-FLUID KINEMATICS- BERNOULLI AND ENERGY EQUATIONS AND MOMENTUM ANALYSIS OF FLOW SYSTEMS-DIMENSIONAL ANALYSIS AND SIMILARITY-INTERNAL FLOW					
5. Pre-requirements for this course (if any):					
Engineering Analysis (1)					
6. Co-requisites for this course (if any):					
None					
7. Course Main Objective(s):					
Understanding and learning the basics of fluid mechanics, fluid properties, the fundamentals of fluid statics and meaning of hydrostatic pressure, the methods of pressure measurement, forces on submerged surfaces, the conditions of stability of submerged and floating bodies. Learning the fundamentals of fluid dynamics, the concepts of continuity, momentum and energy equations, Bernoulli equation and its applications analysis of fluid flow using the energy equation.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	80	100 %
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	32
2.	**Laboratory/Studio**	48
3.	**Field**	
4.	**Tutorial**	
5.	**Others (specify)**	
Total		80

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	Able to describe the fundamentals of fluid statics	K1, P	Lectures, tutorials and independent study assignments	Homework, Quizzes, Midterm and Exam
1.2	Able to describe the fluid kinematics	K1, P	Lectures, tutorials and independent study assignments	Homework, Quizzes, Midterm and Exam
1.3	Able to apply the different types of conservation equations (Mass, Bernoulli, Momentum and Energy equation in fluid flow)	K1, P	Lectures, tutorials and independent study assignments	Homework, Quizzes, Midterm and Exam
1.4	Able to apply the momentum analysis of flow systems	K1, P	Lectures, tutorials and independent study assignments	Homework, Quizzes, Midterm and Exam
1.5	Recognize the dimensional analysis of different equations o the dimensionless groups	K1, P	Lectures, tutorials and independent study assignments	Homework, Quizzes, Midterm and Exam

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
2.0	**Skills**			
2.1	Ability to apply knowledge of mathematics, science, and engineering to fluid mechanics.	S2, P	Lectures, tutorials and independent study assignments	Homework, Quizzes, Midterm and Exam
2.2	Ability to identify, formulate, and solve engineering problems in fluid mechanics	S3, P	Lectures, tutorials and independent study assignments	Homework, Quizzes, Midterm and Exam
...				
3.0	**Values, autonomy, and responsibility**			
3.1	Ability to self-learning about engineering problems in fluid mechanics	V3, P	Study presentation and report preparation	Oral presentation and minor projects.
3.2	Ability to work within a team to solve an engineering problems in fluid mechanics	V3, P	Study presentation and report preparation	Oral presentation and minor projects.
3.3	Ability to analyze and synthesize an engineering problems in fluid mechanics	V3, P	Study presentation and report preparation	Oral presentation and minor projects.

C. Course Content

No	List of Topics	Contact Hours
1.	1. **INTRODUCTION** 1. Basic Definitions 2. The No-Slip Condition 3. Classification of Fluid Flows 4. System and Control Volume 5. Importance of Dimensions and Units	**2**
2.	2. **PROPERTIES OF FLUIDS** 1. Introduction 2. Density and Specific Gravity 3. Vapor Pressure and Cavitation 4. Viscosity 5. Surface Tension and Capillary Effect	**3**

3.	3. **FLUID STATICS** 1. Absolute and Gauge Pressure 2. Basic Equation of Fluid Statics 3. Pressure - Depth Relationships 4. Pressure measurement devices 5. Hydrostatic forces on submerged plane surfaces 6. Hydrostatic forces on submerged curved surfaces 7. Buoyancy and stability	**4**
4.	4. **FLUID KINAMTICS** 1. Lagrangian and Eulerian Descriptions 2. Flow Patterns and Flow Visualization 3. Plots Equation of Fluid Flow Data 4. Types of Motion or Deformation of Fluid Elements 5. Vorticity and Rotationality 6. The Reynolds Transport Theorem	**5**
5.	5. **CONTINUITY, BERNOULLI AND ENERGY EQUATIONS** 1. Conservation of Mass 2. Mechanical Energy and Efficiency 3. The Bernoulli Equation 4. General Energy Equation 5. Energy Analysis of Steady Flows	**6**
6.	6. **MOMENTUM ANALYSIS OF FLOW SYSTEMS** 1. Newton's Laws 2. Choosing a Control Volume 3. Forces Acting on a Control Volume 4. The Linear Momentum Equation 5. The Angular Momentum Equation	**4**
7.	**7. DIMENSIONAL ANALYSIS AND SIMILARITY** 1. Dimension and units 2. Dimensional homogeneity 3. Dimensional analysis and similarity 4. The method of repeating variables and THE BUCKING PI theorem	**4**
8.	**8. INTERNAL FLOW** 1. Introduction 2. LAMINAR AND TURBULENT FLOWS 3. Types of Fluid Flow Problems 4. MINOR LOSSES 5. PIPING NETWORKS AND PUMP SELECTION 6. FLOW RATE AND VELOCITY MEASUREMENT	**4**
9.	**LAB WORK**	**48**
Total		**80**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quiz and Home works	3	10%
2.	Midterm exam 1	7	15%
3.	Group project	8	10%
4.	Midterm exam 2	10	15%
5.	Final exam	16	50%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	1. FLUID MECHANICS NOTES, Peter E. Clark, USA, 2007. 2. An Introduction to Fluid Mechanics, P. A. Sleigh and C. J. Noakes, UK, 2008, 3. An Introduction to Fluid Mechanics-Notes, A. Sleigh, School of Civil Engineering, University of Leeds, UK, 2001.
Supportive References	"Fluid Mechanics: Fundamentals and Applications, 4th edition, Yunus A. Cengel, John M. Cimbala " "Fluid Mechanics", Frank M. White, McGraw-Hill Publishers, 7th Edition.
Electronic Materials	All the lecture notes
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms
Technology equipment (projector, smart board, software)	Data show
Other equipment (depending on the nature of the specialty)	Lab

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Faculty	Direct (project, HW, Quiz,

Assessment Areas/Issues	Assessor	Assessment Methods
		midterm and final exam)
Effectiveness of Students assessment	Students	Indirect (Student Survey)
Quality of learning resources	Program Coordinator	Direct) CLOSO folder analysis)
The extent to which CLOs have been achieved		
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	
REFERENCE NO.	
DATE	**12/23/2024**