



Course Specifications

Course Title:	Fluid Mechanics
Course Code:	453Math-3
Program:	B.Sc. Mathematics
Department:	Mathematics
College:	Arts and Sciences
Institution:	Najran University

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A. Course Identification

1. Credit hours:			
2. Course type			
a.	University <input type="checkbox"/>	College <input type="checkbox"/>	Department <input checked="" type="checkbox"/>
b.	Required <input checked="" type="checkbox"/>	Elective <input type="checkbox"/>	Others <input type="checkbox"/>
3. Level/year at which this course is offered: Level 7 / 8			
4. Pre-requisites for this course (if any): 343 Math-3			
5. Co-requisites for this course (if any): None			

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	3	100%
2	Blended		
3	E-learning		
4	Correspondence		
5	Other		

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	Lecture	٤٥
2	Laboratory/Studio	٠٠
3	Tutorial	٠٠
4	Others (specify)	٣
	Total	٤٨
Other Learning Hours*		
1	Study	35
2	Assignments	10
3	Library	10
4	Projects/Research Essays/Theses	---
5	Others(specify) (Office hours)	15
	Total	118

*The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times



B. Course Objectives and Learning Outcomes

1. Course Description

This course introduce: Importance of fluid mechanics, Kinematics of the Fluid Motion, Dynamics of Fluid Motion, Two-Dimensional Motion and Theory of Waves

2. Course Main Objective

The main objective is knowledge of the basic concepts related to the principles of fluid mechanics and problems solving.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	Knowledge:	
1.1	Recognize the related basic scientific facts, concepts, principles and techniques in fluid mechanics.	L1
1.2	Describe how to handle with Solution Methods of Equations of fluid motion.	L2
1.3	Recognize the Kinematics of the Fluid Motion, Two-Dimensional Motion and Theory of Waves.	L4
2	Skills :	
2.1	Acquire the necessary skills to understand the fluid mechanics.	L3
2.2	Prepare students to the descriptive analysis of fluid mechanics conclusions and recommendations.	L5
3	Competence:	
3.1	Work effectively within groups and independently.	L7
3.2	Apply critical thinking, communication skills and mathematical techniques in solving many problems in other disciplines.	L8

C. Course Content

No	List of Topics	Contact Hours
1	Kinematics of the Fluid Motion - Incompressible Fluids – The Lagrangian and Eulerian Methods Describing Fluid Motion – Streamlines and Paths of the Particles of fluid – Equation of Continuity – Motion of Fluid Element – connected Regions – Irrotational Motion.	6
2	The Velocity Potential Function - Laplace's Equation – Boundary Conditions – Uniqueness Theorems – Kinetic Energy –Symmetric motion about a point – Axisymmetric Motion – Two-dimensional Motion.	6
3	Dynamics of Fluid Motion Forces in Fluids – Euler's Momentum Equation – Integration of the Momentum Equation	3
4	Constancy of Circulation (Kelvin's Theorem) – Persistence of Irrotational Motion (Lagrange's Theorem) – Impulsive Motion.	6

5	Two-Dimensional Motion Stream Function – Velocity Potential – Complex Potential – Complex Velocity – Blasius Theorem – Uniform Stream – A rectilinear Vortex – Source and Sink -Uniform Stream past a Circular Cylinder - Uniform Stream past a Circular Cylinder with Circulation.	6
6	Source and an Equal Sink-Doublets - Source and an Equal Sink in a Uniform Stream – Source Infront of an Infinite Wall – Source Infront of a Circular Cylinder – Conformal Transformation in Hydrodynamics – The Joukowski Transformation.	6
7	Theory of Waves Mathematical Representation of Wave Motion – Two-Dimensional Waves in Hydrodynamics – Boundary Conditions at the Free Surface	6
8	Simple Harmonic Progressive Waves - Progressive Waves in Deep Water – Energy of a Progressive Waves – Stationary Waves.	6
Total		٤٥

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	Knowledge		
1.1	Recognize the related basic scientific facts, concepts, principles and techniques in fluid mechanics.	Direct teaching - discussion and dialogue - problem solving.	Exams Homework.
1.2	Describe how to handle with solution methods of equations of fluid motion.		
1.3	Recognize the kinematics of the fluid motion, two-dimensional motion and theory of waves		
2.0	Skills		
2.1	Acquire the necessary skills to understand the fluid mechanics.	- Lectures - Tutorials	Homework - Assignment - Quizzes - Test 1 and Test 2 Final exam
2.2	Prepare students to the descriptive analysis of fluid mechanics conclusions and recommendations		
...			
3.0	Competence		
3.1	Work effectively within groups and independently	- Solve exercises through individual work and groups. - Lectures, discussion and dialogue	- Solving exercises and homework. - Written tests.
3.2	Apply critical thinking, communication skills and mathematical techniques in solving many problems in other disciplines.		
...			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	First exam	7	20 degrees
2	Second exam	13	20 degrees

#	Assessment task*	Week Due	Percentage of Total Assessment Score
3	Homework and Assignments/Quizzes	Every week	10 degrees
4	Final exam	16	50 degrees

*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

- Office hours.
- Provide academic guidance services.
- Introduce students to the course plan in terms of objectives, content and evaluation procedures.

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	1- Textbook of Fluid Dynamics, F. Chorlton, London, 1970. ٢- ميكانيكا الموائع، أ.د. مصطفى مراد حواس. جامعة قاريونس، بنغازي ١٩٩٣م
Essential References Materials	3- Advanced Hydrodynamics, M. D. Raisinghania and R. S. Aggarwal, New Delhi, 1982.
Electronic Materials	<ul style="list-style-type: none"> • Electronic materials available on the internet. • Lectures on the Department of Mathematics YouTube Channel.
Other Learning Materials	Maple Software

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	<ul style="list-style-type: none"> • The number of seats in the classroom is at least 30 seats.
Technology Resources (AV, data show, Smart Board, software, etc.)	<ul style="list-style-type: none"> • Halls equipped with modern learning techniques and different display devices.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	None

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching	Students - Leadership Program.	Direct and Indirect
Effectiveness of assessment	Students - Leadership Program - Peer References.	Indirect

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Extent of achievement of course learning outcomes	Students - Leadership Program.	Indirect
Quality of learning resources	Students - Leadership Program.	Indirect

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	