Course Specification
(Bachelor)

Course Title:	Fluid Mechanics
Course Code:	CE 2601
Program:	Bachelor of Science in Civil Engineering
Department:	Civil Engineering Department
College:	College of Engineering & Architecture
Institution:	Umm Al-Qura University
Version:	1
Last Revision Date:	31 January 2025

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A. General information about the course:

1. Course Identification

1. Credit hours: (3)					
2. Course type					
A.	☐ University	☐ College	☒ Department	☐ Track	☐ Others
B.	☒ Required		☐ Elective		
3. Level/year at which this course is offered: (Level 5 / 3rd year)					
4. Course General Description:					
The course presents the fundamental principles of fluid mechanics and application of those principles to determine hydrostatic forces, stability of floating and submerged bodies and forces of moving fluid by applying the energy and momentum equations.					
5. Pre-requirements for this course (if any)**:**					
Dynamics					
6. Co-requisites for this course (if any)**:**					
Not Applicable					
7. Course Main Objective(s):					
To learn the basic principles of fluid mechanics and apply those to determine hydrostatic forces, stability of floating and submerged bodies and forces of moving fluid by applying the energy and momentum equations.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	75	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**	30
2.	**Laboratory/Studio**	45
3.	**Field**	
4.	**Tutorial**	
5.	**Others (specify)**	
Total		75

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	Demonstrate knowledge of fluid mechanics applications in civil engineering.	**K.1**	Through lectures, module notes, tutorials, and coursework.	Written exams.
1.2	Acquire knowledge of common instruments used in measuring pressures, velocity and flow rates.	**K.1**	Through lectures, module notes, tutorials, and coursework.	Written exams.
2.0	**Skills**			
2.1	Calculate basic fluid properties.	**S.1**	Through lectures, module notes, tutorials, and coursework.	written exams.
2.2	Determine hydrostatic forces on surfaces.	**S.1**	Through lectures, module notes, tutorials, and coursework.	written exams.
2.3	Assess stability of floating and submerged bodies.	**S.1**	Through lectures, module notes, tutorials, and coursework.	written exams.

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
2.4	Apply the energy equation of moving fluid.	**S.1**	Through lectures, module notes, tutorials, and coursework.	written exams.
2.5	Apply momentum equations to evaluate forces of moving fluid.	**S.1**	Through lectures, module notes, tutorials, and coursework.	written exams.
2.6	Perform a series of experiments on fluid properties, hydrostatics forces on surfaces, and impact of a water jet.	**S.2**	Lectures / practical works	Lab works, Written and oral examinations
3.0	**Values, autonomy, and responsibility**			
3.1	Work as individually and as a team member coordinating a team and communicate in reasonable way, write reports etc.	**V.2**	Lectures / practical works	lab works and reports.
3.2	Use various resources to search and learn new material related to the subject independently	**V.3**	Search in a particular topic	Reports and oral examination.

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to fluid mechanics, its application, fluid definition, dimensions, and units.	**5**
2.	Fluid properties: density, specific weight, specific gravity, viscosity, surface tension, vapor pressure, bulk modulus of elasticity and ideal gas law.	**10**
3.	Fluid statics: pressure, pressure variation with elevation, pressure measurements: barometer, bourdon tube gage, piezometer, manometer.	**10**

4.	Forces on plane surfaces, forces on curved surfaces.	**10**
5.	Buoyancy & Stability of immersed and floating bodies.	**8**
6.	Fluid kinematics (descriptions of fluid motion, streamlines, path lines, streak lines, flow types, acceleration). Control volume approach and continuity equation.	**8**
7.	Fluid dynamics: Euler's Equation - The Bernoulli Equation	**8**
8.	The energy equation, Hydraulic & Energy grade lines	**8**
9.	The Momentum equation and its application	**8**
Total		**75**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**Quizzes**	Monthly	10%
2.	**Assignments**	Bi-weekly	10%
3.	**Mid-Term Exam**	7th week	25%
4.	**Lab reports and exam**	Bi-weekly	15%
5.	**Final-Term Exam**	15/16	40%

*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	- Donald F. Elger, Barbara A. LeBret, Clayton T. Crowe, John A. Roberson, "Engineering Fluid Mechanics" John Wiley & Sons, Inc., 11th edition, August 2016.
Supportive References	- Hibbeler, R. C. “Fluid Mechanics”. Pearson, 2nd edition, 2018. - Douglas JF, Gasiorek JM, Swaffield JA, and Jack LB, “Fluid Mechanics”, Pearson, 5thEdition, 2005.
Electronic Materials	Institution of Civil Engineers http://www.sciencedirect.com
Other Learning Materials	Journal of Hydraulic Engineering, ASCE.

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms for lectures and exams for 30 students during the scheduled class hours.
Technology equipment	A white board, Computer with multi-media,

Items	Resources
(projector, smart board, software)	a printer, internet connection, data show.
Other equipment (depending on the nature of the specialty)	Well-equipped Laboratory. Some of the required equipment: - ST 250 Cavitation - HM 150.18 Osborne Reynolds' Demonstration - HM 150 Base Module for Experiments in hydraulics - HM 115 Hydrostatic Trainer

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	• Students • Instructor • Program leader	• Indirect • Direct • Direct
Effectiveness of Students assessment	• Independent member	• Direct
Quality of learning resources	• Students • Instructor	• Indirect • Indirect
The extent to which CLOs have been achieved	• Instructor • Students • Program leader	• Direct • Indirect • Direct
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**CIVIL ENGINEERING COUNCIL**
REFERENCE NO.	**THE FIFTEENTH SESSION OF THE ACADEMIC YEAR 1446**
DATE	**30 APRIL 2025**

