Course Specification

(Bachelor)

Course Title:	Hydraulics
Course Code:	CE 2602
Program:	Civil Engineering
Department:	Civil Engineering Department
College:	College of Engineering & Architecture
Institution:	Umm Al-Qura University
Version:	1
Last Revision Date:	31 January 2025

Table of Contents

A. General information about the course: 3

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods 4

C. Course Content 4

D. Students Assessment Activities 5

E. Learning Resources and Facilities 5

F. Assessment of Course Quality 5

G. Specification Approval 6

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 6 / 3rd year)					
4. Course General Description:					
The course presents the fundamentals of hydraulics engineering principles and methods applied to the analysis and design of hydraulic engineering systems. This includes the various aspects of pipe flow, open channel, pumps and Hydraulic modeling related to the subject of hydraulics.					
5. Pre-requirements for this course (if any)**:**					
Fluid Mechanics (CE2601-3)					
6. Co-requisites for this course (if any)**:**					
Not Applicable					
7. Course Main Objective(s):					
The main objective of the course is to achieve an understanding of the basic hydraulic engineering principles and an ability to apply those principles to solve various hydraulics problems in pipe flow, networks, open channel flow, and hydraulics machines.					

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 fundamentals of hydraulic engineering.	**K.1**	Through lectures, module notes, tutorials, and coursework.	Assignments, quizzes, and written exams.
2.0	**Skills**			
2.1	Calculate flow in water distribution systems and analyze networks.	**S.1**	Through lectures, module notes, tutorials, coursework, and project work.	Assignments, quizzes, and written exams.
2.2	Analyze and compute flow in different types of open channels.	**S.1**	Through lectures, module notes, tutorials, and coursework.	Assignments, quizzes, and written exams.
2.3	Perform experiments of flow measurements through pipes and open channels.	**S.2**	Lectures / practical works	Lab works, and Lab exam
2.4	Analyze, evaluate, and select different types of pumps.	**S.1**	Through Lectures	Quizzes, and written exams

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
2.5	Use an engineering software to analyze pipe networks	**S3**	Through lectures and tutorials.	Term project
3.0	**Values, autonomy, and responsibility**			
3.2	Demonstrate commitment to professional and academic values and standards in the engineering profession.	**V.1**	Lectures and training tutorials	Project and reports.
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.

C. Course Content

No	List of Topics	Contact Hours
1.	Steady flow in pipes: general equation of flow, secondary losses, friction loses.	**10**
2.	Pipes in series and pipes in parallel.	**5**
3.	Special pipe systems and networks: problems of three tanks.	**5**
4.	Special pipe systems and networks: Hardy cross method for pipe networks analysis.	**10**
5.	Flow measurements: velocity measurement, discharge measurement.	**5**
6.	Open channels: general equation of flow, types of flow, Chezy's and Manning's formulas.	**10**
7.	Normal depth, specific energy, critical depth, application on specific energy.	**10**
8.	Gradually varied flow, rapidly varied flow, different forms of water surfaces.	**5**
9.	Pumps: types of pumps, velocity triangles in pumps.	**10**
10.	Modeling & Similitude: hydraulic modeling, non-dimensional	**5**

	numbers, Π-Theorem, and application.	
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	5%
3.	**Mid-Term Exam**	7th week	25%
4.	**Term Project**	10	5%
5.	**Lab reports and exam**	Bi-weekly	15%
6.	**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	- Houghtalen, R. J., Akan, O. Hwang, N. H. and "Fundamental of Hydraulic Engineering Systems", Prentice-Hall, 5th edition, 2016.
Supportive References	• E. J. Finnemore and J. B. Franzini, "Fluid Mechanics with Engineering Applications" (Tenth Edition), McGraw-Hill Education - ISBN 0072432020 & 9780072432022 • D. F. Young, B. R. Munson, T. H. Okiishi & W. W. Huebsch, "A brief introduction to Fluid Mechanics" 5th Edition, John Wiley & Sons, Inc. – ISBN-10: 0470596791 ISBN-13:978-0470596791 • David A. Chin, "Water-Resources Engineering" 3rd Edition (2012), Prentice Hall, ISBN-10: 0132833212, ISBN-13: 9780132833219
Electronic Materials	• Journal of Hydraulic Engineering, ASCE • Institution of Civil Engineers • http://www.sciencedirect.com
Other Learning Materials	Other learning material such as computer-based programs and software. • EPANET • WaterCAD

2. Required Facilities and equipment

Items	Resources
facilities	Classrooms for lectures and exams with

Items	Resources
(Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	students working on their laptops for 30 students during the scheduled class hours.
Technology equipment (projector, smart board, software)	• Smart Board, Computer with multi-media, a printer, internet connection, • Hydraulic modeling software. (e.g. EPANET, Water Cad).
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**

