Course Specification
(Bachelor)

Course Title:	Water Structures
Course Code:	CE 4608
Program:	Bachelor of Science in Civil Engineering
Department:	Civil Engineering Department
College:	College of Engineering and 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 9 or 10/5th year)					
4. Course General Description:					
This course covers the design of cross structures (culverts, siphons, and aqueducts), control structure, energy dissipation below hydraulic structures, spillways, and design of dams.					
5. Pre-requirements for this course (if any)**:**					
Hydralics					
6. Co-requisites for this course (if any)**:**					
Not Applicable					
7. Course Main Objective(s):					
Students will develop their competence in the skills necessary for water structures design applications.					

2. Teaching mode (mark all that apply)

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

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	describe the importance of cross works, control structures, energy dissipation and dams.	K.1	Through lectures, module notes, tutorials, coursework, and project	Assignments, quizzes, and written exams.
1.2	explain the basic principles and concepts of analysis and design of hydraulic structures.	K.1	Through lectures, module notes, tutorials, coursework, and project	Assignments, quizzes, and written exams.
1.3	describe and predict flow conditions in hydraulic structures.	K.1	Through lectures, module notes, tutorials, coursework, and project	Assignments, quizzes, and written exams.
2.0	**Skills**			
2.1	professionally analyze the flow conditions in hydraulic structures.	S.2	Through lectures, module notes, tutorials, coursework, and project	Assignments, quizzes and written exams.
2.2	determine the most appropriate hydraulic structures that is suitable for a specific problem	S.3	Through lectures, module notes, tutorials, coursework, and project	Assignments, quizzes and written exams, term project.

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
2.3	effectively apply the hydraulic principles to the analysis and design of optimum structures in hydraulic system.	S.1& S.3	Through lectures, module notes, tutorials, coursework, and project	Assignments, quizzes and written exams, term project.
3.0	Values, autonomy, and responsibility			
3.1	Exhibit commitment to professional and academic ethical standards in hydraulic design problems.	V.1	Lectures and training tutorials	Project and reports
3.2	Demonstrate the ability to work both independently and collaboratively within a team, effectively communicating findings and producing technical reports.	V.2	Lectures and training tutorials	class works, project and reports

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction, Importance of hydraulic structure, principles of hydraulic system analysis. Classification of hydraulic structure according to use.	3
2.	Dams, Historical review, Type of dams, Selection of type of dam, Forces acting on dam, Gravity dams, Arch dams.	9
3.	Spillways, General types of spillways, Ogee type spillway.	6
4.	Energy Dissipation, Energy dissipation on spillways, Hydraulic jump energy dissipation, Control structures	9
5.	Regulators, Channel diversion, Head regulator, Cross regulator.	6
6.	Cross structures, Aqueducts and transitions, Culverts, Bridges.	12
Total		**45**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Assignments	Weekly	5%
2.	Quizzes	3 & 6 & 9,12	15%
3.	Group project	13	5%
4.	Mid-Term Exam	8	25%
5.	Final-Term Exam	16/17	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	David A. Chin, "Water-Resources Engineering" 3rd Edition (2012), Prentice Hall, ISBN-10: 0132833212, ISBN-13: 9780132833219
Supportive References	Novak, P., et al. 2007. Hydraulic structures. 4th Ed. Taylor and Francis, London.
Electronic Materials	• Institution of Civil Engineers • Institute of Hydraulic Structure and Water Environment
Other Learning Materials	Non

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	White board needs to be replaced with a bigger one with all writing and other accessories.
Technology equipment (projector, smart board, software)	Computer with multi-media, a printer, internet connection, and data show.
Other equipment (depending on the nature of the specialty)	Non

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 teaching staff	• 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**

