Course Specification
(Bachelor)

Course Title:	Water Resources Engineering
Course Code:	CE 3603
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 7/4th year)

4. Course General Description:

This course provides a comprehensive overview of water resources engineering, focusing on its scope, planning, and economic and social aspects. It covers hydrological processes, including precipitation, evaporation, transpiration, infiltration, surface runoff, and basin recharge. Groundwater and well hydraulics are also explored. The course examines reservoir characteristics, yield, sediment transport, and sedimentation control. Additionally, it addresses dam types, the forces acting on them, and their structural stability.

5. Pre-requirements for this course (if any)**:**

Hydraulics (CE 2602)

6. Co-requisites for this course (if any)**:**

Not Applicable

7. Course Main Objective(s):

The course aims to equip students with the essential skills and competencies necessary to analyze and solve complex problems in the field of water resources engineering.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	5	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**	2
2.	**Laboratory/Studio**	3
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	Explain the fundamental concepts of hydrology and integrate physical hydrological processes.	K.1	Through lectures, module notes, tutorials, coursework, and project	Assignments, quizzes, and written exams.
1.2	Recognize different types of dams and their functions.	K.2	Through lectures, module notes, tutorials, coursework, and project	Assignments, quizzes, and written exams.
2.0	**Skills**			
2.1	Apply appropriate methods to analyze hydrological data.	S.2	Through lectures, module notes, tutorials, coursework, practical works, and project	Assignments, quizzes, Lab works, and written exams.
2.2	professionally apply the principle of groundwater to calculate the groundwater movements.	S.3	Through lectures, module notes, tutorials, coursework, practical works, and project	Assignments, quizzes written exams, Lab works, and term project.
2.3	Compute reservoir storage capacity.	S.1	Through lectures, module notes, tutorials,	Assignments, quizzes and

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
			coursework, and project	written exams.
2.4	Analyze and design different types of dams.	S.1	Through lectures, module notes, tutorials, coursework, and project	Assignments, quizzes written exams, and term project.
3.0	**Values, autonomy, and responsibility**			
3.1	Exhibit commitment to professional and academic ethical standards in water resources engineering.	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	Lecture practical works, and training tutorials	class works, project, lab works and reports

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction, scope of water resources engineering, water quantities.	5
2.	Hydraulic structures, economy of water resources, social aspects of water resources engineering, planning of water projects.	5
3.	Hydrologic cycle, types of precipitation and its measurements.	5
4.	Methods of Estimating Missing Precipitation data.	5
5.	Design Storm, Frequency Analysis of Point Rainfall, Intensity Duration Frequency Relationship (IDF)	5
6.	Evaporation and measurement.	5
7.	Transpiration and measurement	5
8.	Quantitative hydrology: infiltration and methods of measurement.	5
9.	Watersheds, Runoff, Rating Curve, Measurement of Runoff.	5
10.	Hydrograph, unit hydrograph.	5
11.	Groundwater: occurrence, sources, types of groundwater reservoirs, Groundwater flow.	5
12.	Reservoirs: reservoir characteristics, reservoir yield, reservoir capacity for a certain demand.	5

13.	Reservoir clearance, leakage from reservoirs, reservoir site selection.	5
14.	Dams: Types, forces on dams, structural stability for dams.	5
15.	Dams: Analysis and construction of different types of dams, important precaution for dams' construction.	5
	Total	75

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	10%
3.	Group project	13	5%
4.	Mid-Term Exam	8	25%
5.	Lab Reports	Weekly	15%
6.	Final-Term Exam	16/17	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	David A. Chin, "Water-Resources Engineering" 3rd Edition (2012), Prentice Hall, ISBN-10: 0132833212, ISBN-13: 9780132833219
Supportive References	Philip B. Bedient, Wayne C. Huber and Baxter E. Vieux, "Hydrology and Floodplain Analysis", 5th Edition (2012),
Electronic Materials	• Journal of Hydrology @ elsevier.com • Institution of Civil Engineers • Journal of Hydrologic Engineering, ASCE • Journal of Irrigation and Drainage Engineering, ASCE • Journal of Water Resources Planning and Management, ASCE • Journal of Sustainable Water in the Built Environment, ASCE • Water Resources Research
Other Learning Materials	The following software are helpful for applications of the subjects to engineering projects: • StormCAD • CulvertMaster • FlowMaster

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. Also, dedicated laboratory space for hands-on hydrological

Items	Resources
	experiments.
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)	Hydrological, Dams and Reservoir Analysis Equipments

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**

