Course Specification
(Bachelor)

Course Title:	Reinforced Concrete Design (2)
Course Code:	COE4205
Program:	Bachelor of Construction Engineering
Department:	Department of Civil and Environmental Engineering
College:	College of Engineering and computing in Al-Qunfudhah
Institution:	Umm Al-Qura University
Version:	4
Last Revision Date:	February 26

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A. General information about the course:

1. Course Identification

1. Credit hours: (3 credits)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (9th level/ 5thyear)					
4. Course General Description:					
Behavior and design of columns under axial load and bending including slenderness effects; ACI Code provisions for serviceability requirements; deflection of flexural members; design of frames; design of one and two-way slabs on beams using the ACI Direct Design Method; analysis and design of frames and continuous beams; design of one-way and two-way joist floor system; design of flat slab; design of stairs behavior; design project of multistory building with two-way flooring system which integrates the design of different structural components; computer application in interactive design.					
5. Pre-requirements for this course (if any):					
Reinforced Concrete Design (1)-COE4204					
6. Co-requisites for this course (if any)**:**					
NA					
7. Course Main Objective(s):					

- Understand Column Behavior: Analyze and design columns under axial load and bending, including slenderness effects, in compliance with ACI Code provisions.
- Master Serviceability and Deflection: Evaluate serviceability requirements and calculate deflections in flexural members to ensure structural performance.
- Design Frames and Continuous Beams: Perform analysis and design of frames and continuous beams, considering load distribution and stability.
- Design Slabs and Floor Systems: Design one-way and two-way slabs, joist floor systems, and flat slabs using the ACI Direct Design Method.
- Integrate Structural Components: Develop a design project for a multistory building with a two-way flooring system, integrating the design of various structural elements.
- Apply Computer-Aided Design: Utilize computer applications for interactive structural analysis and design, comparing results with manual calculations.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	3 credit hours Contact hours (2 lecture sessions+3 lab)	100

No	Mode of Instruction	Contact Hours	Percentage
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**			
2.0	**Skills**			
2.1	Design of continuous beams, slabs and prestressed beams.	**S1**	Lectures, discussions, and assigned readings	Assignments, Quizzes, Midterm, final exam
2.2	Design of two-way solid slabs using the moment coefficient method and the Direct-Design Method	**S2**		
2.3	Design of short columns subjected to uniaxial and biaxial bending moment and design of long (Slender) columns.	**S2**		
2.4	Design of continuous beams and slabs.	**S4**	Lectures, discussions, and assigned readings	Lab exam
3.0	**Values, autonomy, and responsibility**			
3.1	**NA**			

C. Course Content

No	List of Topics	Contact Hours
1. 1	**Unit 1. Columns under Axial load and bending** • Behavior of columns under axial load and bending • Use of Interaction Diagrams, • Design of columns under axial load and bending including slenderness effects	5
2. 2	**Unit 3. Serviceability requirements** • ACI Code provisions for serviceability requirements; • Deflection of flexural members; • Control of Flexural Cracks	4
3	**Unit 3. One and Two-way slab design** • One and two-way slab behavior • Analysis of One and two-Way Slabs • Column and Middle Strips • Design of slabs on beams using the ACI Direct Design Method • Limitations of Direct Design Method	6
4	**Unit 4. Design of frames** • Analysis and design of frames • Analysis and Design of continuous beams. • Lateral Bracing for Buildings • Development Length for Continuous Members;	6
5	**Unit 5. Joist floor system** • Load distribution in one-way and two-way joist floor system • Requirements of joist floor construction, • Design of one-way joist floor system;	3
6	**Unit 6. Flat slab system** • Load distribution in two-way flat slab system • Requirements of flat slab construction, • Design of flat slab;	3
7	**Unit 7. Stairs and retaining walls** • Different types of stairs • Design of stairs	3
8	**Lab Sessions** 1. Columns: Test axial load and bending; analyze slenderness effects. 2. Deflection: Measure deflection in flexural members; compare with ACI Code. 3. Frames: Build and test frames; evaluate load distribution. 4. Slabs: Design and test one/two-way slabs using ACI Direct Design Method. 5. Continuous Beams: Analyze moments and shear forces in beam setups. 6. Joist Floors: Test one/two-way joist systems; assess load capacity. 7. Flat Slabs: Construct models; evaluate punching shear and deflection.	45

No	List of Topics	Contact Hours
	8. Stairs: Design and test stair models for safety and serviceability. 9. Integrated Project: Design a multistory building with two-way flooring. **10.** Software: Use structural design software; compare with manual calculations.	
Total		**75**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**Assignments**	**From 2-to-12**	**10**
2.	**Quizzes**	**5,7,11**	**10**
3.	**Lab exam**	**15**	**10**
4.	**Midterm exam**	**7**	**20**
4	**Final 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	• Hassoun MN, Al-Manaseer A. Structural concrete: theory and design. Latest edition. Hoboken (NJ): John Wiley & Sons; [Latest Edition]. • McCormac JC, Brown RH. Design of reinforced concrete. Latest edition. Hoboken (NJ): Wiley; [Latest Edition].
Supportive References	• Darwin D, Dolan CW, Nilson AH. Design of concrete structures. Latest edition. New York (NY): McGraw-Hill; [Latest Edition].
Electronic Materials	• Civil Engineering Calculators (http://civilengineer.webinfolist.com/design/beamanalysis.htm)
Other Learning Materials	• The Saudi Building Code (SBC 301), “Design Loads for Buildings and Structures”, 2018. • The Saudi Building Code (SBC 304), “Concrete Structures”, 2018. • ACI Committee, 318. "Building code requirements for structural concrete (ACI 318-19) and commentary." American Concrete Institute, 2019.

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Lecture rooms with a capacity of at least 25 students
Technology equipment (projector, smart board, software)	The room must be fitted with multimedia projector, smart board and a computer.
Other equipment (depending on the nature of the specialty)	NA

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	**Students** **Sttaff members**	**Indirect** **direct**
Effectiveness of Students assessment	**Students** **Sttaff members**	**Indirect** **direct**
Quality of learning resources	**Students** **Sttaff members**	**Indirect**
The extent to which CLOs have been achieved	**Sttaff members**	**direct**
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**Civil and Environmental Engineering Department Council in Al-Qunfudah**
REFERENCE NO.	**The fifteenth session of the academic year 1446**
DATE	**01/05/2025**