



Course Specification

(Bachelor)

Course Title: Reinforced Concrete Design (1)

Course Code: COE4204

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	<input checked="" type="checkbox"/> Department	Track	Others
B.	<input checked="" type="checkbox"/> Required		Elective		

3. Level/year at which this course is offered: (7th level/4th year)

4. Course General Description:

Review of properties of structural concrete and reinforcing steel; Introduction to reinforced concrete and building codes; Limit states and design philosophy, design of reinforced rectangular, T- and L-sections in flexure; doubly reinforced sections, behavior and design of beams for shear, bond, and development length including splices and cut-off points; Loads on beams; control of deflection and cracking; design of short columns.

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

Structural Analysis (2)-COE3202

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

NA

7. Course Main Objective(s):

- Understand Material Properties: Review the properties of structural concrete and reinforcing steel, and their interaction in reinforced concrete design.
- Learn Design Philosophy: Introduce reinforced concrete design principles, including limit states and building code requirements.
- Design Flexural Members: Design reinforced rectangular, T-, and L-sections in flexure, including doubly reinforced sections.
- Analyze Beam Behavior: Study the behavior and design of beams for shear, bond, and development length, including splices and cut-off points.
- Control Serviceability: Address deflection and cracking control in reinforced concrete beams to ensure serviceability.
- Design Short Columns: Perform the design and analysis of short columns under various loading conditions.





2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45	100
2	E-learning	None	None
3	Hybrid <ul style="list-style-type: none"> • Traditional classroom • E-learning 	None	None
4	Distance learning	None	None

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	45
2.	Laboratory/Studio	None
3.	Field	None
4.	Tutorial	None
5.	Others (specify)	None
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	Demonstrate knowledge of the properties of structural concrete and reinforcing steel and understand the principles of limit states, design philosophies, and building code provisions for reinforced concrete structures.	K1	Lectures, discussions, and assigned readings	Assignments, Quizzes, Midterm and final exam
1.2	Comprehend the behavior and design of beams, and columns under flexure, shear, axial loads.	K1	Lectures, discussions, and assigned readings	
2.0	Skills			
2.1	Apply advanced analysis and design techniques to structural components such as beams and columns slabs under various loading conditions.	S1	Lectures, discussions, and assigned readings	Assignments, Quizzes, Midterm and final





Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
2.2	Specify the Development Length of steel reinforcement Analyze reinforced concrete sections for the capacity and suitability	S2	Lectures, discussions, and assigned readings	exam
3.0	Values, autonomy, and responsibility			
3.1	NA			

C. Course Content

No	List of Topics	Contact Hours
1.1	<p>Unit 1. Design methodologies</p> <ul style="list-style-type: none"> • Introduction & course overview, • Design concepts & codes, history of Reinforced concrete (RC), • Materials required; steel and concrete, Material properties and their consideration in RC behavior and design • Design methodologies, Design process, • Types of Loads and load combinations, safety factors, Determination of member loads, pattern loads, analysis examples, • Flexural members – basic behavior and preview of the SBC Code methods. • Loads on beams 	7
2.2	<p>Unit 2. Analysis of Singly reinforced beam</p> <ul style="list-style-type: none"> • Modeling and analysis of singly reinforced beams • Flexural members; calculation of reinforcement, strain and ductility • Flexural members; limits of flexural reinforcement amounts; balanced conditions, under-reinforced, over-reinforced. • Flexural analysis of general shaped members 	8
3	<p>Unit 3. Design of singly reinforced beam</p> <ul style="list-style-type: none"> • Design of singly reinforced beams for flexure – general procedures • SBC guidelines for cover, spacing, deflections and other restrictions on reinforcement placement. 	7
4	<p>Unit 4. Doubly reinforced beam</p> <ul style="list-style-type: none"> • Advantages of doubly reinforced concrete beams • Analysis of doubly reinforced concrete beam • Design of Doubly reinforced beams • Criteria for effective flange width of a T-beam. • Analysis and Design of T-beams; 	7
5	<p>Unit 5. Shear Design</p> <ul style="list-style-type: none"> • Shear strength of a concrete beam • Design of shear reinforcement in RC beams 	6





No	List of Topics	Contact Hours
	<ul style="list-style-type: none"> Spacing of shear reinforcement 	
6	<p>Unit 6. Column Design</p> <ul style="list-style-type: none"> Columns; behavior, general requirements; Design of short columns 	5
7	<p>Unit 7. Development length and splices</p> <ul style="list-style-type: none"> Development of reinforcement Code requirements for reinforcement bar lengths and cutoffs Splices of rebar 	5
Total		45

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Assignments	From 2-to-12	15
2.	Quizzes	5,7,11	15
3.	Midterm exam	7	30
4	Final 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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Darwin D, Dolan CW, Nilson AH. Design of concrete structures. Latest edition. New York (NY): McGraw-Hill; [Latest Edition].
Electronic Materials	<ul style="list-style-type: none"> Civil Engineering Calculators (http://civilengineer.webinfolist.com/design/beamanalysis.htm)
Other Learning Materials	<ul style="list-style-type: none"> 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	Indirect
	Staff members	direct
Effectiveness of Students assessment	Students	Indirect
	Staff members	direct
Quality of learning resources	Students	Indirect
	Staff members	
The extent to which CLOs have been achieved	Staff 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

