Course Specification
(Bachelor)

Course Title:	Design of Prestressed Concrete Structures
Course Code:	CE 4109
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

Table of Contents

A. General information about the course: 3

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

C. Course Content 5

D. Students Assessment Activities 5

E. Learning Resources and Facilities 6

F. Assessment of Course Quality 6

G. Specification Approval 7

A. General information about the course:

1. Course Identification

1. Credit hours:					
3 hours					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	Others
B.	☐ Required		☒ Elective		
3. Level/year at which this course is offered: (Level 9,10 / 5th Year)					
4. Course General Description:					
To present the concept of design of Prestressed Concrete and its applications – Introduction in prestressed concrete – Post-tension presstressing – Pre-tension presstressing – Losses in prestressing – Straining action due to prestressing – Different stages of Design of Prestressed concrete elements – Design for shear – Design of end block zone – Applications of prestressed concrete in determinate structures – Applications of prestressed concrete in indeterminate structures.					
5. Pre-requirements for this course (if any)**:**					
Department approval					
6. Co-requisites for this course (if any)**:**					
None					
7. Course Main Objective(s):					
To understand the concept and structural design of prestressed concrete structures and its applications in various types of structures.					

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		

No	Mode of Instruction	Contact Hours	Percentage
4	Distance learning		

1. **Contact Hours** (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	45
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	To Define the concept and different types of presstressing and its applications.	K1	Class work and discussions	Class tests and quizzes
1.2	To demonstrate the design methods of prestressed concrete for determinate and indeterminate structures.	K2	Class work and discussions	Class tests and quizzes
2.0	**Skills**			
2.1	To summarize the different types of presstressing and its applications.	S1	Class work and discussions	Assignements
2.2	To analyze and calculate the element internal forces in prestressed concrete of determinate and indeterminate structures.	S1	Class work and discussions	Assignements
2.3	To design different prestressed elements in bending and shear using various applications.	S3	Class work and discussions	Assignements

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
3.0	**Values, autonomy, and responsibility**			
3.1	To demonstrate ability of life-long learning and applying of official codes, specification and practices in different prestressed concrete structures.	V3	Class work and discussions	Class tests and quizzes
3.2	To use skills required for the real-life concrete projects serving society.	V3	Class work and discussions	Class tests and quizzes

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction in prestressed concrete structures and its concept.	3
2.	The concept of prestressed concrete	3
3.	Types of presstressing and its applications in different structures.	3
4.	Post-tension presstressing.	3
5.	Pre-tension presstressing.	3
6.	Straining action and internal forces in different prestressed structural elements.	3
7.	Initial stage analysis in prestressed concrete structures	3
8.	Final and transfer stage analysis in prestressed concrete structures	3
9.	Losses in prestressed concrete structures	3
10.	Transfer stage and permissible stresses according to SBC	3
11.	Working stage and permissible stresses.	3
12.	Distribution of stress along different section of structural elements.	3
13.	Equivalent load method due to presstressing of elements.	3
14.	Design of prestressed elements for shear resistance.	3
15.	Analysis of indeterminate prestressed concrete structures	3
Total		**45**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes	3, 5, and 7	20%
2.	Midterm Examination	7	30%

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
3.	Final Exmaination	12	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	• Nilson, A.H., "Design Of Prestressed Concrete" John Wiley.
Supportive References	• Nilson, A.H. and Winter, G., "Design of Concrete Structures", McGraw-Hill Int. 11th Edition. • Lin, T.Y. and Burns, H., "Design of Prestressed Concrete Structures", John Wiley, 3rd Edition.
Electronic Materials	• http://www.sciencedirect.com • http://ocw.mit.edu • Blackboard (www.uqu.edu.sa)
Other Learning Materials	-

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classroom
Technology equipment (projector, smart board, software)	Projector and blackboard
Other equipment (depending on the nature of the specialty)	None

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Facuty (s)	Direct
Effectiveness of Students assessment	Facuty (s)	Direct
Quality of learning resources	Program leader	Indirect
The extent to which CLOs have been achieved		
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

