

University of Engineering and Technology, Taxila
Department of Civil Engineering

Course Title:	Reinforced Concrete - II (CE-402)
Pre-requisite(s):	Reinforced Concrete - I
Credit Hours:	3 + 1
Contact Hours:	3 + 3
Text Book(s):	<ol style="list-style-type: none">1. Design of Concrete Structures. <i>by</i> Nilson A. H., David D., Charles W. D, 2003, McGraw-Hill2. Building Code of Pakistan, 2007.3. ACI Manual4. ACI Detailing Manual (2004)
Reference Book(s):	<ol style="list-style-type: none">1. Design of Reinforced Concrete Structures, <i>by</i> Hassoun, M. N., PWS Engineering.2. Reinforced Concrete Design, <i>by</i> Wang C. K., Charles G. S., Harper and Row.

Catalog Data:

Analysis and Design of Miscellaneous Structural Elements; Analysis and Design of Complex Structural Elements; Introduction to earthquake resistant design of structures; Pre-stressing Principles and Design Philosophy.

Course Objectives:

- To enable students to design miscellaneous and complex structural elements manually.
- To give basic understanding of earthquake-resistant design and evaluation/assessment and retrofitting of concrete structures and pre-stressed concrete.

Course Learning Outcomes:

At the end of this course, the student will:

CLO:1 Gain the ability to design miscellaneous and complex structural elements.

CLO:2 Know the basic concepts of earthquake-resistant design of concrete structures.

CLO:3 Know the basic concepts of pre-stressed concrete.

Course Contents:

1. Analysis and Design of Miscellaneous Structural Elements

- Analysis and design of stairs
- Analysis and design of gravity retaining wall
- Analysis and design of cantilever retaining wall
- Analysis and design of culverts
- Introduction to analysis and design of bridge

2. Analysis and Design of Complex Structural Elements

- Analysis and design of flat plate slab
- Analysis and design of flat slab
- Analysis and design of slender columns
- Analysis and design of shear walls
- Analysis and design of eccentric footing

3. Introduction to Earthquake Resistant Design of Structures

- Base shear
- Seismic Zones
- Soil types
- Response modification factor
- Importance factor
- Time Period
- Seismic Weight
- Seismic service and factored load combinations
- Seismic detailing for structural members

4. Pre-stressing Principles and Design Philosophy

- Principles of pre-stressing
- Properties and Importance of high strength concrete and steel used in pre-stressing
- Behavioral aspects of pre-stressed beams and comparison with reinforced concrete beams
- Post tensioning and pre-tensioning techniques
- Profiles of post-tensioned tendons, bonded and non-bonded tendons
- Pre-stress losses, immediate and time-dependent losses, lump sum and detailed estimation of pre-stress loss
- Analysis and design of pre-stressed beams

Grading Policy:

Sr. No.	Grading	% of Total Marks
1	Assignments	10
2	Quizzes	10
3	Practical	20
4	Midterm Exam	20
5	Final Exam	40
Total		100

Student Learning Outcomes:

Students who pass the course will be able to design miscellaneous and complex structural elements manually. Furthermore, they will have basic understanding of earthquake-resistant design of concrete structures and pre-stressed concrete.

Course Professional Outcome/Industrial Usage:

Students appreciate the need for becoming good structural engineers capable to design miscellaneous and complex structural elements and for basic understanding of earthquake-resistant design of concrete structures and pre-stressed concrete.

CLOs	CLOs		
	CLO 1 (Misc. & Complex Structural Elements)	CLO 2 (Earthquake- resistant Design)	CLO 3 (Pre-stressed Concrete)
PLO 1 (Engineering Knowledge)			
PLO 2 (Problem Analysis)	✓	✓	
PLO 3 (Design/Development of Solutions)	✓	✓	✓
PLO 4 (Investigation)		✓	
PLO 5 (Modern Tool Usage)			
PLO 6 (The Engineer and Society)			
PLO 7 (Environment and Sustainability)			
PLO 8 (Ethics)			
PLO 9 (Individual and Team work)			
PLO 10 (Communication)			
PLO 11 (Project Management)			
PLO 12 (Lifelong Learning)			

Assessment Modules	CLOs		
	CLO 1	CLO 2	CLO 3
Assignments		✓	
Quizzes	✓	✓	
Midterm Exam	✓	✓	
Final Exam	✓	✓	