



College: Engineering Department: Civil Engineering
Course Title: Reinforced Concrete I

Course No: 0901403

Credit Hours: 3 C.H.

Semester: Second 2018/2019

About The Course

Course Title: Reinforced Concrete I

Class:1

Course No: 0901403

Credit Hours: 3 C.H.

Lecture Room:502

Obligatory/ Optional: **Obligatory**

1. Text Book: Text Book: Nilson, Arthur, H., Design of Reinforced Concrete, 14th edition, John Wiley & Sons (2010)
2. Building Code Requirements for Structural Concrete (ACI 318-14) and Commentary, ACI Committee (318-14)

The Instructor

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Course Description

Introduction, design Codes, safety provisions, axial load analysis, materials, flexural analysis, beam behavior, strength design, design and detailing of singly reinforced rectangular beams, doubly reinforced rectangular beams, and T-beams. Shear and diagonal tension in beams, bond, anchorage and development length, design and detailing of one-way solid and ribbed slabs, design of short columns, serviceability, ACI Code provisions for control of cracks and deflections.

Course Objectives

To develop an understanding of and appreciation for basic concepts in the behavior and design of reinforced concrete systems and elements. To introduce the basic concepts and steps for reinforced concrete sectional design mainly in accordance with ultimate strength design. To help the student develop an intuitive feeling about structural and material wise behavior and design of reinforced concrete systems and elements. To underline and discuss basic principles of mechanics regarding the analysis and design of reinforced concrete systems and elements.

Learning Outcome

Upon completion of the course, students will be able to:

1. They have acquired in-depth knowledge and critical understanding of the theory and principles of design and solution of Reinforced Concrete structures, since they could use new technologies and information systems in the design of civil Engineering structures with Reinforced concrete.
2. Be able to perceive, design and analyze Reinforced Concrete structures (Beams, Columns, Frames).
3. To have the ability to compose, solve and evaluate the internal forces (N, Q, M), the deformations, the stresses and reinforcements in various structures made of Reinforced Concrete.

Course Outline and Time schedule

Week	Course Outline
First week	Introduction: Text Book, References, and Outlines, Review of structures analysis and building materials
	Concrete materials and proportions, short and long term effects on concrete, reinforcing steel
2 nd week	Serviceability, design basis, design codes and specification, safety provisions on the ACI code.

	Reinforced concrete building elements, design methods un-cracked and cracked elastic section
3 rd week	Overview of Working Stress Design Method, basic concepts of Ultimate Strength Design Method ,Loads and load combinations acting on reinforced concrete structures
	Reinforced concrete beam behavior, Behavior of ductile and brittle modes of failure of R C sections under bending .
4 th week	ACI code based design requirements,Upper (maximum) and lower (minimum) steel percentages ,Spacing limits and concrete protection for reinforcement
	The equivalent rectangular compressive stress distribution (compressive stress block)
5 th week	Analysis of singly reinforced concrete rectangular sections for flexure
	Design of singly reinforced concrete rectangular sections for flexure
6 th week	Midterm Exam I
	Analysis and Design of double reinforced concrete rectangular sections for flexure
7 th week	Analysis Reinforced concrete flanged sections (T- and L- sections)
	Design examples for beams
8 th week	Design of flanged sections (T- and L- sections)
	Design examples for beams, cantilever- analysis of singly reinforced
9 th week	Introduction Shear Behavior of R C sections, Design for Shear Reinforcement
	Design examples for beams

10 th week	Introduction to development length of reinforcement
	Ultimate strength analysis and design for bond, anchorage length, development length, and splices of Reinforcement.
11 th week	Beams analysis under service loads
	Deflection of beams, Crack width limits in beams
12 th week	Midterm Exam II
	Introductions to R C columns
13 th week	Analysis of R C Short Columns under axial loads
	Analysis and design of tied short columns subjected to axial compression force only
14 th week	Design of R C Short Columns under axial loads
	Analysis and design of spiral short columns subjected to axial compression force only.
	ACI Code provisions for control of cracks and deflections
15 th week	Final Exam

Presentation methods and techniques

Methods of teaching varied according to the type of text, student and situation. The following techniques are usually used:

- 1- Lecturing with active participations.
Involve the civil engineering students in asking some questions related to the target topic of the course.
- 2- Problem solving.

- Encourage the students to solve the given assignments and submit them at the definite time,
- 3- Cooperative learning.
By enhancing the students studying in groups .
 - 4- Discussion.
To discuss the results and the answers of the target problems.
 - 5- Learning by activities.
To encourage the students to some group activity.
 - 6- Connecting students with different sources of information.

Sources of information and Instructional Aids

- Computer software ... power point
- Using weight board.
- Library sources

Assessment Strategy and its tools

The assigned syllabus is assessed and evaluated
Through: feedback and the skills that are acquired by the students
The tools:

- 1- Formal (stage) evaluation
 - a) Class Participation 10%
 - b) Ist Exam 20%
 - c) 2nd Exam 20%
 - d) Group activity and Quizzes 10%

Tool & Evaluation

Tests and quizzes are permanent tools & assessment, in addition to the activity file which contains curricular and the co-curricular activities, research, report papers and the active participation of the student in the lecture.

The following table clarifies the organization of the assessment schedule:

Test	Date	Grade
First Exam		20
2 nd Exam		20
Activities &	Students should be notified about	20

Participation And Quizzes	their marks	
Final Exam		40

Activities and Instructional Assignment

- 1- Practical assignments to achieve the syllabus objectives.
- 2- Group Activity.

Regulations to maintain the teaching-Learning Process in the Lecture:

- 1- Regular attendance.
- 2- Respect of commencement and ending of the lecture time.
- 3- Positive relationship between student and teacher.
- 4- Commitment to present assignments on time.
- 5- High commitment during the lecture to avoid any kind of disturbance and distortion.
- 6- High sense of trust and sincerity when referring to any piece of information and to mention the source.
- 7- The student who absents himself should submit an accepted excuse.
- 8- University relevant regulations should be applied in case the student's behavior is not accepted.
- 9- Allowed Absence percentages is (20%).

References :

- 1. Nawy, E.G., "Reinforced Concrete - A Fundamental Approach", 5th Edition, Prentice Hall.
- 2. Wang, Chu-Kia and Salmon C. G., "Reinforced Concrete Design", 5th Edition, Harper Collins.
- 3. McCormac, J. C. "Design of Reinforced Concrete", 4th Edition, Addison – Wesley.
- 4. Ferguson, P. M., "Reinforced Concrete Fundamentals," John Wiley & Sons..
- 5. Building Code Requirements for Structural Concrete (ACI 318-14) and Commentary, ACI Committee (318-14), Farmington Hills, MI, 2014, 530 pp.
- 6. Teaching notes

Syllabus Classification

Objectives	<i>Learning outcome</i>	<i>Assessment tools</i>
Be able to perform analysis and design of reinforced concrete members	<ol style="list-style-type: none"> 1. Students will understand the general mechanical behavior of reinforced concrete 2. Students will be able to analyze and design reinforced concrete flexural members. 3. Student will be able to analyze and design reinforced concrete compression members. 4. Students will be able to analyze and design for vertical shear in reinforced concrete. 5. Students will be able to analyze transfer and development length of concrete reinforcement. 	<ol style="list-style-type: none"> 1--Correct answers to 1 or 2of design problems corresponding to each outcome. 2- Correct answers to midterm and final examinations
Be able to identify and interpret the appropriate relevant industry design codes	<ol style="list-style-type: none"> 1. Students will be able to identify and apply the applicable industry design codes relevant to the design of reinforced concrete members. 2. Student will be familiar with professional and ethical issues and the importance of lifelong learning in structural engineering. 	<ol style="list-style-type: none"> 1-Correct answers to 1or 2 design of problems corresponding to each outcome with emphasis placed on identification of applicable industry design code. 2- Correct answers to midterm and final examinations. Questions include design/analysis problems that require the selection of the appropriate industry design code.
To become familiar with professional and contemporary issues in the design and fabrication of reinforced concrete members	<ol style="list-style-type: none"> 1. Students will become familiar with the reinforced concrete fabrication and construction process. 2. Students will be able to perform an industry relevant design project in a team setting 	Students will be required to perform as a group, each with individual assignments, on an industry relevant design project

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