Module (Course Syllabus) Catalogue

2023-2024

College/ Institute	Erbil Polytechnic University	
Department	Highway Engineering Technique Department	
Module Name	Reinforced Concrete Design – I	
Module Code	RCD501	
Degree	Technical Diploma ☐ Bachelor ✓ High Diploma ☐ Master ☐ PhD ☐	
Semester	6th	
Qualification	M.Sc. Structural Engineering	
Scientific Title	Assistant Lecturer	
ECTS (Credits)	6	
Module type	Prerequisite ☐ Core ✓ Assist. ☐	
Weekly hours	4 hours	
Weekly hours (Theory)	(4) hr Class	(159) Total hrs Workload
Weekly hours (Practical)	(None)hr Class	(None)Total hrs Workload
Number of Weeks	15	
Lecturer (Theory)	HUNAR ISSA	
E-Mail & Mobile NO.	hunar.omer@epu.edu.iq – 07504487577	
Lecturer (Practical)	None	
E-Mail & Mobile NO.		
Websites		

Course Book

Course Description	Increase student knowledge and learn the principles and practices for the analyses, design, contracting, and construction of structural concrete elements. After attending this course, student shall have a firm grasp of the background and design specifics necessary to compete in this industry, including industry-leading information on the principles and practices of structural concrete members design for buildings, infrastructure, utilities, and industrial facilities. Understand practical emerging technologies including advanced design techniques for specific structural elements.
Course objectives	• Understand the importance of basic principles of reinforced concrete design for certain structural elements. • Apply analytical skills to solving problems in reinforced concrete design. • Understand the basic requirements of international codes for reinforced concrete design. • Appreciate the interaction between the structural analysis, strength of material, mechanics of structural and the reinforced concrete design. • Identify the key mechanical and structural issues in reinforced concrete design. • Appreciate the range of structural elements types available and their application. • Select an appropriate reinforced concrete system for a structure • Appreciate the practical problems of design and detailing for reinforced concrete structures, buildings and facilities. • Introduce the student to certain case studies
Student's obligation	a. To attend the classes regularly with minimum absence. b. To participate actively in the class discussion and Q&A session. c. Study on daily basis to digest the class material d. To write note off-handouts e. Prepared for sudden Quizzes f. Vet through the references provided by the lecturer and to solve as much as possible of homework and exercises for the subjective materials. g. Prepare the assignment and the seminar as instructed by the lecture. h. Solve and submit the home works on time. i. Prepare and submit the requested scientific reports on time to the standards set by the lecturer. j. Prepare and present seminars in the number required for the titled assigned by the lecturer. k. Prepare for and attend the mid – terms exam l. Prepare for and attend the final – exam
Required Learning Materials	Students at this stage with the workload assigned technical for the subject are not required to scatter their attention with bunch of sources. Students are encouraged to thoroughly study the reference given by the lecturer and to vet through available cyber data related to the subject and this shall include the concrete technology worked examples and all those are support with construction site visit for the students to appreciate and monitor closely the application of the theoretical concept in construction.

Evaluation	**Task**	**Weight (Marks)**	**Due Week**	**Relevant Learning Outcome**
	Paper Review	None for B.SC.		

	Assignments	Homework	10	Weekly	Application for subject by subject
		Class Activity	2	Weekly	Participate in syllabus learning
		Report	8	4th & 8th	Concentrate on certain subject of the module and cover its technical aspects
		Seminar	8	6th & 10th	Individual or in group for subjects within the module but out of the syllabus
		Essay			
		Project			
	Quiz		8		
	Lab.				
	Midterm Exam		24	7th	
	Final Exam		40	14th & 15th	
	Total		**100**		

Specific learning outcome:	1- The analysis and design of two – way slabs 2- The analysis and design of various R.C columns design 3- The analysis and design of stair case of various types 4- Get familiar with various types of retaining structures, their analysis and design 5- Attend construction sites for the elements above 6- Interaction between various RC elements through the courses of RC I, RC II and Prestress Concrete in Reinforced Concrete Bridge Design Module on 7th semester 7 – Vet through the available topics related to the course syllabus published up to date. 8 – As the module time line is relatively short, the student shall be able to study on his/her own further subjects in RC module 9 – introduce the recipient to available software to analysis and design the RC structural elements individually or in whole.
Course References:	1 - 318-19: Building Code Requirements for Structural Concrete and Commentary. 2 - Reinforced Concrete: Mechanics and Design, by James K. Wight | Jun 22, 2021. 3 - Reinforced Concrete Buildings: Behaviour and Design by Ahmad A. Hamid | Jan 19, 2021. 4 - Design of Concrete Structures by David Darwin and Charles Dolan | Jul 6, 2020. 5 - Structural Concrete: Theory and Design by M. Nadim Hassoun and Akthem Al-Manaseer | Mar 10, 2020. 6 - Reinforced Concrete Design by Abi O. Aghayere and Jason Vigil | Mar 16, 2018.

Course topics (Theory)	**Weeks**	
Introduction to Reinforced Concrete Structures		
1. Structural Elements and Structural Forms	1st	
2. Flooring and Roofing Systems	1st	
3. Loads	1st	
4. Design Codes and Specification	1st	

5. Design Criteria	2nd	
6. Design Philosophy	2nd	
7. Strength Versus Working-Stress Design Methods	2nd	
8. Fundamental Assumptions For Reinforced Concrete Behavior	2nd	
9. Examples	2nd	
10. Additional Examples	2nd	
Materials		
1. Introduction	2nd	
2. Concrete, Chemical Aspects		
3. Concrete, Physical Aspects	2nd	
4. Reinforcing Steels For Concrete	2nd	
5. General Problems.	2nd	
Design of Concrete Structures and Fundamental Assumptions		
1. Introduction	3th	
2. Members and Sections	3th	
3. Theory, Codes, and Practice	3th	
4. Fundamental Assumptions for Reinforced Concrete Behavior	3th	
5. Behavior of Members Subject to Axial Loads	3th	
6. Bending of Homogeneous Beams	3th	
Design of Reinforced Concrete Beams		
Flexural Analysis and Design of Beams		
1. Introduction.	4th	
2. Behavior of Concrete Beams	4th	
3. Procedure and Examples for Flexure Analysis of Rectangular Beams with Tension Reinforcement.	4th	
4. Home Work of Article 4.3, Flexure Strength Analysis of Beams with Rectangular Sections.	4th	
5. Practical Flexure Design of a Rectangular Beam with Tension Reinforcement Only and Pre-specified Dimensions (b and h).	4th	
6. Home Work of Article 4.5, Practical Flexure Design of a Rectangular Beam with Tension Reinforcement Only and Pre-specified Dimensions (b and h).	4th	
7. Practical Flexure Design of a Rectangular Beam with Tension Reinforcement Only and Non-specified Dimensions.	5th	

8. Home Work of article 4.7, Practical Flexure Design of a Rectangular Beam with Tension Reinforcement Only and Non-specified Dimensions (b and h).	5th	
9. Analysis of a Rectangular Beam with Tension and Compression Reinforcements (a Doubly Reinforced Beam).	5th	
10. Home Work of Article 4.9, Analysis of a Rectangular Section with Tension and Compression Reinforcements Only (a Doubly Reinforced Section).	5th	
11. Design of a Doubly Reinforced Rectangular Section.	5th	
12. Home Work of Article 4.11, Design of a Doubly Reinforced Rectangular Section.	6th	
13. Flexure Analysis of a Section with T Shape.	6th	
14. Home Work Article 4.13, Analysis of a Section with T Shape.	6th	
15. Design of a Beam with T-Shape	6th	
16. Home Work of Article 4.15, Design of a Section with T Shape.	6th	
17. Analysis of Beams with Irregular Sections.	6th	
18. Home Work 4.17, Analysis of Beams with Irregular Sections.	6th	
Shear and Diagonal Tension in Beams		
1. Basic Concepts.	7th	
2. Computing of Applied Factored Shear Force $\boldsymbol{Vu}$.	7th	
3. Shear Strength Provided by Concrete $\boldsymbol{Vc}$.	7th	
4. Shear Strength Provided by Shear Reinforcement $\boldsymbol{Vs}$.	7th	
5. Summary of Practical Procedure for Shear Design.	8th	
6. Basic Design Examples.	8th	
7. Problems for Solution on Basic Shear Aspects.	8th	
8. Shear Design Based on the More Detailed Relation for Vc.	8th	
9. Shear Design with Effects of Axial Loads.	8th	
Bond, Anchorage, and Development Length		
1. Fundamentals of Flexural Bond.	9th	
2. ACI Provisions for Development of Reinforcement.	9th	
3. ACI Code Provisions for Development of Tension Reinforcement.	9th	
4. Anchorage of Tension Bars by Hooks.	9th	
5. Anchorage Requirements for Web Reinforcement.	9th	
6. Development of Bars in Compression.	10th	
7. Development of Bundled Bars.	10th	
8. Lap Splices	10th	
9. Development of Flexural Reinforcement.	10th	

10. Integrated Beam Design Example.	10th	
11. Computer Applications.	10th	
Serviceability		
1. Fundamentals of Flexural Bond.	11th	
2. ACI Provisions for Development of Reinforcement.	11th	
3. ACI Code Provisions for Development of Tension Reinforcement.	11th	
4. Anchorage of Tension Bars by Hooks.	11th	
5. Anchorage Requirements for Web Reinforcement.	12th	
6. Development of Bars in Compression.	13th	
7. Development of Bundled Bars.	13th	
8. Lap Splices.	14th	
9. Development of Flexural Reinforcement.	14th	
10. Integrated Beam Design Example	14th	
Analysis and Design for Torsion		
1. Basic Concepts.	14th	
2. ACI Provisions for Torsion Classification and Computing of Tu.	15th	
3. ACI Provisions for ϕTn.	15th	
4. Design Examples.	15th	
5. Computer Applications	15th	

Questions Example Design

First year teaching, no questions example yet

Extra notes:

None so far

External Evaluator