



Course description:

This course covers the basics of: concrete and steel properties, analysis of cracked and uncracked sections, design methods: working stress design and strength design, flexural analysis and design of beams with singly and doubly reinforced sections as well as rectangular and T-sections, design for shear, bond requirements and development length, deflections, design of one-way solid and ribbed slabs, design of short columns, interaction diagrams, design of slender columns.

Aims of the course:

1. This course is intended to provide civil engineering students with the fundamental principles of the design and analysis of reinforced concrete structural members.
2. To provide civil engineering students with the clear understanding of the behavior of concrete and reinforcement as a structural material.
3. To introduce civil engineering students to the different alternatives of reinforced structural elements and systems of design.

Intended Learning Outcomes (ILOs):

Successful completion of this course should lead to the following learning outcomes:

1. Distinguish between the different properties of concrete and reinforcement.
2. Applying the design by working stress method and design strength method.
3. Ability to analyze singly and doubly rectangular reinforced beams and T-reinforced beams.
4. Ability to design singly and doubly rectangular reinforced beams and T-reinforced beams.
5. Analysis and design of reinforced beams for shear.
6. Calculate the required bond and development length and cutoff points.
7. Ability to analyze and design one-way solid and ribbed slabs.
8. Ability to analyze and design short columns subjected to pure axial loads and axial loads along with bending moments.
9. Ability to construct and use interaction diagrams.
10. Ability to analyze and design slender columns.
11. Ability to design excel spreadsheets for the various topics of analysis and design.

Course structures:

Week	C. Hrs	ILOs	Topics	Teaching Procedure	Assessment methods
1-2	6	1	Introduction to Reinforced Concrete: Concrete and Reinforced Concrete, Advantages and Disadvantages of Reinforced Concrete as a Structural	Lecture notes presented through slide projector and whiteboard	Regularly asking questions. HW1

			Material, Design Codes, Properties of Concrete, Reinforcing Steel, Introduction to Loads, Design Basis, Behavior of members subjected to Axial Loads.		
3-5	6	2,11	Flexural Analysis of Beams: Elastic Stresses and Concrete Uncracked, Cracking Moment, Elastic Stresses and Concrete Cracked, Working Stress Design Method, Nominal Flexural Strength.	Lecture notes presented through slide projector and whiteboard, solving examples and problems	HWs, Quiz, 1 st Exam
6-7	6	3,4,11	Flexural Analysis and Design of Beams: Design Strength Method, Analysis and Design of Singly Rectangular Beams, ACI Code Provisions.	Lecture notes presented through slide projector and whiteboard, solving examples and problems	HWs, Quiz
8-9	6	3,4,11	Flexural Analysis and Design of Beams: Analysis and Design of Doubly Rectangular Beams, Analysis and Design of T-Beams, ACI Code Provisions.	Lecture notes presented through slide projector and whiteboard, solving examples and problems	HWs, Quiz, 2 nd Exam
10	3	5,11	Shear and Diagonal Tension: Shear Stresses in Beams, Shear Strength of Concrete, Shear Reinforcement, Behavior of Beams with Shear Reinforcement, Design for Shear.	Lecture notes presented through slide projector and whiteboard, solving examples and problems	HWs, Quiz
11	3	6	Bond, Anchorage and Development Length: Cutoff and Bend Points, Development Lengths of Bars in Tension and Compression, Hooks	Lecture notes presented through slide projector and whiteboard, solving examples and problems	HWs
12	3	7	Analysis and Design of One-Way Slabs: Analysis and Design of One-Way Solid and Ribbed Slabs, ACI Code Provisions.	Lecture notes presented through slide projector and whiteboard, solving examples and problems	HWs, Quiz
13-14	6	8,9,11	Short Columns: Design of Axially Loaded Columns, Axial Load and Bending, Development of Interaction Diagrams. Use of Interaction Diagrams in the Analysis and Design.	Lecture notes presented through slide projector and whiteboard, solving examples and problems	HWs
15	3	10	Slender Columns: Analysis and Design of Slender Columns.	Lecture notes presented through slide projector and whiteboard, solving examples and problems	HWs, Final Exam

References:

“Design of Reinforced Concrete Structures,” by A. Nilson, D. Darwin and C. Dolan, 14th edition, McGraw-Hill.

“Building Code Requirements for Structural Concrete (ACI 318M-14) and Commentary (318RM-14),” American Concrete Institute, Farmington Hills, MI. 2014.



Assessment Methods:

Methods	Grade	Date
Team Project (Excel Spread Sheet)	6	25/5/2017
Homework and Quizzes	4	Bi-weekly
First Exam	20	12/4/2017
Second Exam	20	8/5/2017
Final Exam	50	TBD

