North South University

Department of Civil and Environmental Engineering (DCEE)

CEE 335: Reinforced Concrete I

Course Outline

1 BASIC INFORMATION

1.1 COURSE DESCRIPTION

Materials and fundamental behavior of reinforced concrete; loads and design philosophies; analysis of beam section under various stages of loading; design of singly reinforced, doubly reinforced and T-beams according to USD methods; shear and diagonal tension; bond and anchorage; reinforced concrete floor and roof systems, design of one way slabs; two way slab design by ACI coefficients, column supported slab design by direct design and equivalent frame methods; strip method for slabs.

1.2 COURSE CONTENTS

1. Materials: Concrete and Steel
2. Design philosophies and fundamental assumptions
3. Flexural analysis and design of beams
4. USD of singly reinforced, doubly reinforced and T beams
5. Shear and diagonal tension
6. Bond, anchorage and development length
7. Analysis and design of reinforced concrete slabs

1.3 COURSE INFORMATION

1. Third level undergraduate course
2. credit hours: 3 hours of classroom contact and 6 hours of self-study per week.
3. Two classes per week having 1.5 hours of duration
4. Tutorials moderated by teaching assistants
5. The course requires background knowledge on mechanics of solids, particularly bending moment and shear force diagrams, bending stress, shear stress and stress transformation
6. The course requires knowledge on Engineering Materials.

1.4 PREREQUISITE COURSES:

1. CEE212: Solid Mechanics
2. CEE212L: Solid Mechanics Lab
3. CEE214: Engineering Materials

1.5 FACULTY

1. Name: Dr. Mohammad Nazmul Islam, PhD, Professor, DCEE, Initial: NZU
2. Room No: SAC 746,
3. Phone: Office Ph: 8852000 ext. 1982, Mobile: 01715117113
4. E-mail: mohammad.islam@northsouth.edu
5. Office hours for Summer 2019: MW 12:00 pm – 2:00 pm.

1.6 CLASS HOURS:

- Section 2: ST 2:40 pm – 4:10 pm (Room #SAC 304)

1.7 TEXT BOOK:

Design of Concrete Structures, 15th edition, by Arthur Nilson, David Darwin, Charles Dolan

1.8 REFERENCE BOOKS:

1. Reinforced Concrete: A Fundamental Approach, by Edward G Nawy, 6th Edition, 2008.

2 COURSE OBJECTIVES AND OUTCOMES

2.1 COURSE OBJECTIVES:

1. To understand the design philosophies of reinforced concrete structures with loads and materials properties
2. To develop skills on mechanics of reinforced concrete beams
3. To understand bond characteristics between steel and concrete
4. To develop skills on mechanics of reinforced concrete slabs

2.2 COURSE OUTCOMES (COs):

1. CO 1. Understand material properties and behavior of reinforced concrete
2. CO 2. Understand the design philosophy of reinforced concrete structures by the Ultimate Strength Design method.
3. CO 3. Develop skills on analysis and design of different types of reinforced concrete beams by USD method including shear, bond and anchorage.
4. CO 4. Develop skills on analysis and design of reinforced concrete slabs by Direct Design and Equivalent Frame methods as well as strip method

2.3 MAPPING OF COURSE OUTCOMES TO BSCEE PROGRAM OUTCOMES

L: Slightly maps (low); M: Moderately maps (medium); H: Substantially maps (high)

	PO - 1	PO - 2	PO - 3	PO - 4	PO - 5	PO - 6	PO - 7	PO - 8	PO - 9	PO - 10	PO - 11	PO - 12	PO - 13
CO1	H												
CO2			L			H							
CO3			H	L		M							
CO4			H	M									

2.4 CO DELIVERY AND ASSESSMENT

Course outcomes	Bloom's taxonomy, domain/level *(C: Cognitive, P: Psychomotor A: Affective)*	Delivery methods and activities	Assessment tools
CO1	C3	Lecture	Quiz
CO2	A3	Lecture	Quiz, essay writing
CO3	C4	Lecture, examples, exercises, hands-on practice, tutorials, home work	In-class exams, midterm exams, Final Exam, assignments
CO4	C5		

2.4.1 Cognitive domain (knowledge-based): C

1: Knowledge, 2: Comprehension, 3 Application, 4 Analysis, 5: Synthesis, 6: Evaluation

2.4.2 The affective domain (emotion-based): A

1: Receiving, .2: Responding, 3: Valuing, 4: Organizing, 5: Characterizing

2.4.3 The psychomotor domain (action-based): P

1: Perception, 2: Set, 3: Guided response, 4: Mechanism, 5: Complex overt response, 6: Adaptation, 7: Origination

3 BSCEE PROGRAM OUTCOMES (PO)

3.1.1 PO – 1: Engineering Knowledge

Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex civil engineering problems.

3.1.2 PO – 2: Problem analysis

Identify, formulate, research the literature and analyze complex civil engineering problems and reach substantiated conclusions using first principles of mathematics, the natural sciences and the engineering sciences.

3.1.3 PO – 3: Design/development of solutions

Design solutions for complex civil engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety as well as cultural, societal and environmental concerns.

3.1.4 PO – 4: Investigation

Conduct investigations of complex problems, considering design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.

3.1.5 PO – 5: Modern tool usage

Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex civil engineering activities with an understanding of the limitations.

3.1.6 PO – 6: The engineer and society

Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional civil engineering practice.

3.1.7 PO – 7: Environment and sustainability

Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of, and need for sustainable development.

3.1.8 PO – 8: Ethics

Apply ethical principles and commit to professional ethics, responsibilities and the norms of the civil engineering practice.

3.1.9 PO – 9: Individual work and teamwork

Function effectively as an individual and as a member or leader of diverse teams as well as in multidisciplinary settings.

3.1.10 PO – 10: Communication

Communicate effectively about complex engineering activities with the engineering community and with society at large. Be able to comprehend and write effective reports, design documentation, make effective presentations and give and receive clear instructions.

3.1.11 PO – 11: Project management and finance

Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work as a member or a leader of a team to manage projects in multidisciplinary environments.

3.1.12 PO – 12: Life-long learning

Recognize the need for and have the preparation and ability to engage in independent, life-long learning in the broadest context of technological change.

3.1.13 PO – 13: Contemporary Issues

Demonstrate sound knowledge on global and local contemporary civil engineering issues.

4 COURSE ASSESSMENT

4.1 TEACHING/LEARNING STRATEGIES

4.1.1 Lectures

- Attend all classes punctually
- Learn methods provided in the textbook, and solve practical problems
- Follow worked examples taught in the class
- Frame innovative problems in the assignments and learn realistic designs

4.1.2 Tutorials & Group work

- Contact teaching assistant whenever required
- Come to the tutorial sessions
- Be guided by course notes from the previous semesters from senior students
- Work with peers to solve problems, discuss with friends

4.1.3 Private study

- Review lecture material and textbook
- Perform designs of real reinforced concrete structures by yourself

4.2 ASSESSMENT

- A few quizzes will be taken to check if you are following the lectures attentively to check the basic knowledge
- In-class exams of duration around 15 minutes will be taken to check your ability in solving a problem following a certain method
- Midterm exam and final exam will contain comprehensive design problems to assess complete understanding on the design process
- Assignments will be given for practical design problems

4.3 EVALUATION:

Distribution of numerical scores		
Class attendance	5%	
Quizzes	10%	Surprise quizzes (all not counted)
In-Class Exams	10%	Declared in the previous class
Assignments I	10%	Design of Beams
Assignments II	10%	Design of slabs
Midterm I	20%	One hour fifteen minutes
Final Exam	25%	One hour thirty minutes

4.4 GRADING POLICY:

Generally, NSU grading policy will be followed. However, minor deviation is still possible depending on the situation.

4.5 EXAM POLICY:

No makeup for quiz and in-class exam is possible. MAKE UP for MID-TERM OR FINAL EXAM WILL BE ARRANGED UNLESS AN ABSOLUTELY UNAVOIDABLE VALID REASON FOR ABSENCE IS FOUND. For such unavoidable circumstances, written explanation of the situation must be submitted before the exam. If any class test or mid-term exam cannot be held on the due date, the exam will be automatically shifted to the very next available class, unless otherwise announced.

5 LECTURE SCHEDULE

* One Day = 1.5 lecture hours, Total 22 lecture = 33 lecture hours

Day*	Outcome/ Material Covered	Reference Reading	Activity	Due
Day-1	Reinforced Concrete Materials	Chapter 2	Lecture	
Day-2	Reinforced Concrete Materials	Chapter 2	Lecture	
Day-3	Concrete and reinforced concrete	Chapter 1	Quiz + Lecture	
Day-4	Loads, load factor, load combination	Chapter 1	Lecture	
Day-5	Design Philosophies	Chapter 1	Quiz + Lecture	
Day-6	Fundamental Assumptions of reinforced concrete behavior	Chapter 3	Lecture	
Day-7	Reinforced Concrete beam behavior	Chapter 4	Quiz + Lecture	
Day-8	Beam design for bending moment	Chapter 4	Problem Solving	
Day-9	Design of Doubly Reinforced Beams	Chapter 4	Lecture + Problems	
Day-10	Design of T beams	Chapter 4	Lecture + Problems	
Day-11	Shear and diagonal tension	Chapter 5	Lecture	
Day-12	Design of Stirrups	Chapter 5	Lecture + Problems	
Day-13	Bond, anchorage and development length	Chapter 6	Lecture + Problems	Assig
Day-14	Detailing of beams	Chapter 6	Hands in practice	nment
Day-15	Design of Beams for Torsion	Chapter 8	Lecture	1
Day-16	Midterm Exam			
Day-17	Analysis of reinforced concrete slabs	Chapter 12	Lecture	
Day-18	Design of One way slabs	Chapter 12	Lecture + Problems	
Day-19	Behavior of two way slabs	Chapter 13	Lecture + Problems	
Day-20	Design of two-way slabs by ACI coefficients	Chapter 13	Lecture + Problems	
Day-21	The Direct design method	Chapter 13	Lecture	
Day-22	Design of two way slabs by Direct Design Method	Chapter 13	Lecture + Problems	
Day-23	The Equivalent Frame Method	Chapter 13	Lecture	
Day-24	Design of two way slabs by the Equivalent Frame Method	Chapter 13	Lecture + Problems	Assig nment
Day-25	Design of flat plates and flat slabs	Chapter 13	Lecture + Problems	2
Day-26	Shear Design in flat plate and flat slabs	Chapter 13	Lecture + Problems	
	Final Exam (As per schedule declared by NSU)			

6 CODE OF CONDUCT

- It is highly requested to maintain discipline in the class like not to be late, refrain from making noise during lecture time, not to leave the class early.
- Adopting unfair means in the exams will be considered as a serious crime and the student shall be placed to the university disciplinary committee.
- All materials should be neat and clear, and demonstrate professionalism
- Direct duplication of the work of another is a big offense
- Paraphrasing another person's work with very minor changes keeping the meaning is also plagiarism