North South University

Department of Civil and Environmental Engineering (DCEE)

CEE 331: Structural Analysis II

Course Outline

1 BASIC INFORMATION

1.1 COURSE DESCRIPTION

Analysis of statically indeterminate beams and frames by and Moment Distribution Method; Flexibility method; Stiffness method, stiffness matrix, member stiffness, stiffness transformations, assembly of stiffness matrices and solution for beams, frames and trusses

1.2 COURSE CONTENTS

1. Analysis of Statically Indeterminate Structures (beams, frames and trusses) by *the Force Method*
2. Displacement Method of Analysis: structural analysis of beams and frames by *Moment Distribution Method*
3. *The Stiffness Method*: Derivations of stiffness matrices for Beams, frames and trusses; their analyses

1.3 COURSE INFORMATION

1. Senior 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 approximate analysis of structures and structural analysis methods of statically determination structures
6. The course requires knowledge on Linear Algebra

1.4 PREREQUISITE COURSES:

1. CEE330: Structural analysis I
2. MAT125: Linear Algebra

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: Monday 12:00 pm – 2:00 pm., Wednesday 12:00 pm – 2:00 pm.

1.6 CLASS HOURS:

- Section 1: MW 2:40 pm – 4:10 pm (Room#SAC 304)

1.7 TEXT BOOK:

Structural Analysis (9th Edition), R. C. Hibbeler,

1.8 REFERENCE BOOKS:

1. *Structural Analysis: Using Classical and Matrix Methods, by Jack C. McCormac*

2 COURSE OBJECTIVES AND OUTCOMES

2.1 COURSE OBJECTIVES:

1. To use of force/displacement superposition for analysis of statically indeterminate structures
2. To apply linear algebra and matrix solutions of linear systems for structural analysis

2.2 COURSE OUTCOMES (COs):

2.2.1 CO1: analyze statically indeterminate beams, frames and trusses by the Moment distribution method, force method and stiffness method

2.2.2 CO2: form the stiffness matrices for beam member, truss member and frame member and assemble the matrices

2.2.3 CO3: use the methods of linear algebra to solve structural engineering problems

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	L	H											
CO2		H											
CO3					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	C5	Lecture, examples, exercises, hands-on practice, tutorials, home work	In-class exams, midterm exams, Final Exam, assignments
CO2	C5	Lecture, exercises, assignments	Exam, Assignment
CO3	C4	Lecture, problems, solution	Quizzes, take home exam

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 that are not precise in the textbook
- Follow worked examples taught in the class and provided in the textbook
- Solve exercises from the textbook and innovative problems in the assignments

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 model tests by yourself

4.2 ASSESSMENT

- Frequent 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 structural analysis to assess complete understanding
- Assignments will be given for large problems that provide a complete experience of structural analysis for "learning by doing"

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%	Force Method
Assignments II	10%	Stiffness Method
Assignments III	10%	Moment Distribution Method
Midterm I	20%	One hour
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	*Material covered*	*Textbook Chapter*
Day-1	Fundamentals of Structural Analysis	
Day-2	Force Method of Analysis: General Procedure	Chapter 10
Day-3	Force Method of Analysis: Beams	Chapter 10
Day -4	Force Method of Analysis: Beams	Chapter 10
Day-5	Force Method of Analysis: Beams	Chapter 10
Day-6	Force Method of Analysis: Trusses	Chapter 10
Day-7	Force Method of Analysis: Trusses	Chapter 10
Day-8	Force Method of Analysis: Frames	
	Midterm Exam	
Day-9	Introduction to the Moment Distribution Method	Chapter 12
Day-10	Moment Distribution for Beams	Chapter 12
Day-11	Moment Distribution for Beams	Chapter 12
Day-12	Stiffness-Factor Modifications	Chapter 12
Day-13	Moment Distribution for Frames: No Sidesway	Chapter 12
Day-14	Moment Distribution for Frames: Sidesway	Chapter 12
Day-15	The Stiffness method: fundamentals	Chapter 14
Day-16	Truss Analysis Using the Stiffness Method	Chapter 14
Day 17	Truss Analysis Using the Stiffness Method	Chapter 14
Day-18	Beam Analysis Using the Stiffness Method	Chapter 15
Day-19	Beam Analysis Using the Stiffness Method	Chapter 15
Day-20	Beam Analysis Using the Stiffness Method	Chapter 15
Day-21	Plane Frame Analysis Using the Stiffness Method	Chapter 16
Day-22	Plane Frame Analysis Using the Stiffness Method	Chapter 16
	Final Exam	

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