JOHN A. REIF, JR. DEPARTMENT OF
CIVIL AND ENVIRONMENTAL ENGINEERING

NJIT
New Jersey Institute of Technology

CE 332 – 002 Structural Analysis	Spring 2025

Texts:	Hibbeler, Russell C., <u>Structural Analysis,</u> 11th Edition, Prentice Hall Rental: ISBN-10 0-13-802625-4; ISBN-13 978-0-13-802625-7 Print Offer: ISBN-10 0-13-802628-9; ISBN-13 97800-13-802628-8 You can access a cost saving eBook for $10.99per/month here: https://www.pearson.com/en-us/subject-catalog/p/structuralanalysis/P200000009697/9780138026394
Instructor:	Dr. M. Ala Saadeghvaziri, Room 260 Colton Hall, Tel: 973-596-5813, ala@njit.edu ; Office hours: Mondays & Wednesdays 1:00-2:30PM, other times by appointment. Please, do not be shy and come and see me when you need help! TA: Sami Ullah hu32@njit.edu; office hours TBD and announced.

Prerequisite: MECH 237 with a grade of C or better. A working knowledge of free body diagrams, equilibrium conditions for force systems and moments. The primary objective is an understanding of the various methods of analyzing determinate and indeterminate beams, frames, and trusses encountered in practice.

"Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf.

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. **Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university.** If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu"

Weekly Schedule – to the extent possible:

Week	Topics	Module	Chapter	Notes

1	Introduction, Stability and Classification of Structural Behavior & Analysis		1, 2	Homework TBA
2	Analysis of Simple and Compound Beams including Shear and Moment Diagrams	1	2, 4	in class
3	Analysis of Simple Frames including Shear and Moment Diagrams	2	4	
4, 5	Influence lines, Moving Loads, Shear and Moment Envelops	3	6	
6	Review, Test I	Includes Modules 1-3		
7	Introduction to Approximate Analysis of Structures	4	12	Term Project Assigned
8, 9	Deflections: Diagram and Elastic Curve, Moment area, and integration methods	5	7	
10	Deflections: Diagram and Elastic Curve, Moment area, and integration methods	6	7	
11	Deflection of Trusses: Virtual Work Method (Unit Load Method)	7	3, 8	
12	Review, Test II	Include modules 1-6		
13	Indeterminate Structures: Consistent Deformation Method	8	9	
14	Review, Test III	Includes Modules 1-8		
15	FINAL EXAM	Includes Modules 1-8		

Course Modules / Topics

I expect you to learn and demonstrate mastery in the following topics/modules:

1. Find reactions and draw shear and moment diagrams for simple and compounded beams (beams with hinges)
   - You must know simple beam analysis – covered in statics and strength of materials
2. Find reactions and draw shear and moment diagrams for simple frames – with and without hinge(s).
3. Understand the concept of influence lines, draw it for basic beam, and use it to determine maxima as asked – maximum shear or moment for beams.
4. Perform approximate analysis (hand solution) of frames and use a software to analyze the same
5. Determine deflection of beams using double integration method
6. Determine deflection of beams using moment area method
7. Determine deflection of trusses using unit load method (energy method)

- You must know truss analysis – covered in statics and strength of material
8. Analyze and draw shear and moment diagrams for continuous indeterminate beams

Make sure you review your statics and strength of materials notes. Make sure you always draw free-bodydiagram when solving structural analysis problems.

Course Grade

	Assessment Opportunities				
	Classwork	Test I	Test II	Test III	Final
Modules 1 through 3	☒	☒	☒	☒	☒
Modules 4 through 6	☒	☐	☒	☒	☒
Modules 7 and 8	☒	☐	☐	☒	☒

Course grade is based on sum of modules grade.
Each Module will have 11-points. For a total of 88 points.
You must demonstrate your mastery on all modules (i.e. score 60% or better). However, if overall score is higher than 60 then two modules can have a score lower than 60 but not less than 30.

NOTE: Last performance in each module NOT best counts as your grade for that module.

Computer Project – 10 points

Homework / class participation – 5 points

- The <u>minimum</u> requirements for final letter grades are as follows:
  A = 90.0%, B+ = 85.0%, B = 80.0%, C+ = 75.0%, C = 70.0%, D = 60.0%, F < 60.0%
- The NJIT Honor Code will be upheld, and any violations will be brought to the immediate attention of the Dean of Students.

General Information

Students will be notified well in advance, should there be any modifications or deviations from the syllabus throughout the course of the semester.

Communication: Communication by the Instructor will be done in person during class and/or through Canvas. It is your responsibility to check with a classmate if you missed a class and check e-mail, and the course page on Canvas regularly.

Lectures/Class: This is a face-to-face class, except for first two weeks. Please be attentive, participate in discussions, and ask questions at any time. Please turn all cell phones off during class and be respectful to the course instructor and your classmates.

The instructor will assign homework problems and the project. In addition, the students are encouraged to solve many additional problems in the textbook and use many other resources available online.

Application of a Structural Analysis Software: During the term, each student is required to complete the following requirements in addition to the requirements previously mentioned.

    1. Use of a software of your choice to perform basic analysis.
   a. An intro to Robot will be provided.
      i. This is an analysis and design module within Rivet.
      ii. Download for free from Autodesk, or
      iii. Access department's remotely
   b. This is a free and easy one: https://structural-analyser.com/ with a tutorial by an ex-student https://mediaspace.njit.edu/media/Structural+Analysis+Project/1_r1gwoxb7, or
   c. Use any program of your choice.

AI statement: The use of artificial intelligence (AI) is permitted in this course only when explicitly stated in assignments. If students use AI for any course-related work, they must cite it according to the guidelines provided on the NJIT Library AI Citation page. If you have any questions about AI use in this course, please contact the course instructor before submitting any assignments. In cases where AI use is not allowed, students are expected to complete work without AI assistance to develop their skills in this subject area.

Useful Links: Mastery of subjects in statics and basic algebra and geometry is critical to the success in this course. If for any reason you are "rusted" with these subjects, please start to remedy the shortcomings immediately. You are welcome to see me and/or your TA for help. You should also utilize online resources. There are many great sources online and share with me anything that you find helpful. The following are some useful links. I specifically recommend the free course on statics for those who think they need to do a good review:

https://www.coursera.org/learn/engineering-mechanics-statics   Statics – free online

https://www.khanacademy.org   For every student, every classroom, real results!

https://www.coursera.org/learn/mastering-statics   Mastering Statics

https://www.coursera.org/learn/engineering-mechanics-statics-2   Applications in Engineering Mechanics

https://www.coursera.org/learn/beam-bending   Mechanics of Materials III: Beam Bending

https://www.coursera.org/learn/mechanics-1   Mechanics of Materials I: Fundamentals of Stress & Strain and Axial Loading

Outcomes Course Matrix – CE 332 Structural Analysis

Strategies, Actions and Assignments	ABET Student Outcomes (1-7)	Program Educational Objectives	Assessment Measures
Student Learning Outcome 1: Provide the ability to understand the behavior of structures under different loading conditions.			
Illustrate basic structural applications and static analysis.	1	1	Weekly homework and quizzes.
Discuss the design of structures.	1	1, 2	Weekly homework and quizzes.
Student Learning Outcome 2: Apply the principles and equations for the analysis of statically determinate and indeterminate analysis in preparation for subsequent design courses.			
Develop various methods of analysis.	1	1, 2	Weekly homework and quizzes.
Provide distinct and detailed examples of how these methods are utilized.	1, 2	1, 2	Weekly homework and quizzes.
Student Learning Outcome 3: Use structural analysis/design software.			
Discuss software tools.	3	1	Lab report.
Analyze assignments using software tools.	1, 7	1	Review of analysis problems.

CEE Mission, Program Educational Objectives and Student

Outcomes

The mission of the Department of Civil and Environmental Engineering is:

- to educate a diverse student body to be employed in the engineering profession
- to encourage research and scholarships among our faculty and students
- to promote service to the engineering profession and society

Program Educational Objectives

Our **Program Educational Objectives** are reflected in the achievements of our recent alumni:

- **Engineering Practice:** Alumni will successfully engage in the ethical practice of civil engineering within industry, government, and private practice, working towards safe, practical, resilient and sustainable solutions in a wide array of technical specialties including construction, environmental, geotechnical, structural, transportation, and water resources.
- **Professional Growth:** Alumni will advance their technical and interpersonal skills through professional growth and development activities such as graduate study in engineering, research and development, professional registration and continuing education; some graduates will transition into other professional fields such as academia, business, and law through further education.
- **Service:** Alumni will perform service to society and the engineering profession through membership and participation in professional societies, government, educational institutions, civic organizations, charitable giving and other humanitarian endeavors.

Student Outcomes

Our **Student Outcomes** are what students are expected to know and be able to do by the time of their graduation:

- an ability to identify, formulate and solve complex engineering problems by applying principles of engineering, science and mathematics
- an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety and welfare, as well as global, cultural, social, environmental and economic factors
- an ability to communicate effectively with a range of audiences
- an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental and societal contexts
- an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks and meet objectives
- an ability to develop and conduct appropriate experimentation, analyze and interpret data and use engineering judgment to draw conclusion
- an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

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