Summer 2019

CE 332-001: Structural Analysis

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CIVIL AND ENVIRONMENTAL ENGINEERING

NJIT New Jersey Institute of Technology

CE 332-001 STRUCTURAL ANALYSIS - Summer 2019

Time: Monday, Wednesday. 6:00 pm – 9:00 pm

Location: Central High School King Building # 204

Textbook: Hibbeler, Russell C., Structural Analysis, 10th Edition
Prentice Hall - ISBN: 978033942842

Instructor: Dr. Rajendra (Raj) Navalurkar, PE

Prerequisites: MECH 237

EXAMS/QUIZZES

Several (upto 4) class exams and a final exam will be given. These exams will be closed books. No make-up exams will be given.

HOMEWORK

Problems are given each week to be solved and turned in at the beginning of the lecture in the week following the assignment. Homework will be returned the following week. To obtain credit, you must submit the work on time and in the proper form. At least 75% of the homework must be submitted on time, and correct, to receive a passing grade in the course. No late homework is allowed.

TUTORIAL HELP

Help will be provided during the posted office hours. Students are encouraged to see the instructor during office hours. Additionally, an appointment may be made via email to meet the instructor.

GRADING

Class Exams	**75%**
Final Exam	**25%**
Total	**100%**

GRADE SCHEDULE

A	**91 to 100**		**C**	**65 to 70**
B+	**82 to 90**		**D**	**60 to 64**
B	**76 to 81**		**F**	**59 or less**
C+	**71 to 75**		**W**	**Voluntary before deadline (school**

Incomplete = given in rare instances where the student is unable to attend or otherwise do the work of the course due to illness, etc. The grade must be made up in the next semester by completing all of the missed work.

HOMEWORK INSTRUCTIONS

The following are to be observed when handling in homework for grading. Failure to do so may result in significant deductions in the homework grade.

1.	**Use 5-square per inch National Computation pad paper ONLY (sold at the NJIT Bookstore). Problems should be done on one side of the 8-1/2 x 11 pad paper.**
2.	**On the top of each page, in the space provided, Print your instructor's name, section, problem number, student's name (LAST, FIRST) date, and page number.**
3.	**The problems must be presented in numerical order as assigned, with each problem beginning on a new page. Letters and numbers must be neat, clear and legible.**
4.	**Draw neat, clear, free body diagrams as required. Use a straight edge or other drawing instruments as needed.**
5.	**Box in the final answer accompanied by its units. DO NOT HAND IN CLASS NOTES.**
6.	**Staple the problems in proper numerical order with a single staple in the upper left-hand corner.**

***The NJIT Honor Code will be upheld and any violations will be brought to the immediate attention of the Dean of Students.**

***Students will be consulted with by the instructor for any modifications or deviations from the syllabus throughout the course of the semester.**

CE 332-001 STRUCTURAL ANALYSIS Summer 2018	
CLASS SCHEDULE	
5/20	**First Day of Classes at NJIT**
5/20	Introduction, Review of Truss Analysis
5/20	Matrix Analysis of Structures; Axial Bars and Trusses
5/22	Review of Beam Bending Equations, Shear Force and Bending Moment Diagrams
5/29	Computer Analysis of Structures. Demonstration of RISA and Example Problems.
6/3	Frame Analysis: Internal Forces
6/5	Frame Analysis: Axial Force, Shear Force and Bending Moment Diagrams
6/10	Influence Lines. Direct Method, Muller Breslau principle
6/12	Influence Lines. Maximum Responses under Moving Loads
6/17	**Matrix Analysis (Axial Bars, Trusses); Frame Analysis**
6/19	Deflection of Beams. Moment Area Theorems
6/24	Deflections Using Moment Area Method
6/24	Principle of Virtual Work: Truss Deflections
6/24	Principle of Virtual Work: Beam Deflections
6/24	Principle of Virtual Work: Example Problems
6/26	**Influence Lines, Moment Area Method**
7/1	Slope Deflection Method
7/1	Moment Distribution Method - Introduction
7/8	Moment Distribution Method Examples
7/8	**Principle of Virtual Work, Slope Deflection Method**
7/10	Method of Consistent Deformations: Truss Analysis
7/10	Method of Consistent Deformations: Beam Analysis
7/15	Review
7/15	**Moment Distribution Method, Method of Consistent Deformations**

CE 332-001 STRUCTURAL ANALYSIS

Description:

Analysis of statically determinate and indeterminate beams, frames, and trusses in civil engineering practices. Influence lines, approximate structural analysis and computer analysis.

Prerequisites: MECH 237 - Strength of Materials

Textbook(s)/Materials Required: Please see above

Course Objectives:

Provide the ability to understand the behavior of structures under different loading conditions.

1. Develop the principles and equations for the analysis of statically determinate and indeterminate analysis in preparation for subsequent design courses.
2. Gain experience with commercial structural analysis/design software.

Topics:

Introduction: Stability and Classification of Structural Behavior
Analysis of Determinate Trusses: Methods of Joints and Sections
Deflection of Trusses: Virtual Work Method
Analysis of Determinate Beams and Frames
Slopes and Deflections: Conjugate Beam Method
Influence Lines: Moving Loads
Indeterminate Structures: Consistent Deformation Method
Indeterminate Structures: Slope Deflection Method
Indeterminate Structures: Moment Distribution Method
Rigid Frames: Slope Deflection and Moment Distribution Methods
Approximate Analysis of Structures

Schedule: (3-0-3)

Professional Component: Engineering Topics

Program Objectives Addressed: 1, 2

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 scholarship among our faculty and students
- to promote service to the engineering profession and society

Our program educational objectives are reflected in the achievements of our recent alumni:

1 – Engineering Practice: Alumni will successfully engage in the practice of civil engineering within industry, government, and private practice, working toward sustainable solutions in a wide array of technical specialties including construction, environmental, geotechnical, structural, transportation, and water resources.

2 – Professional Growth: Alumni will advance their 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 business and law through further education.

3 – 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.

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

1. an ability to identify, formulate and solve complex engineering problems by applying principles of engineering, science and mathematics
2. 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
3. an ability to communicate effectively with a range of audiences
4. 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
5. 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
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Revised: 2/13/18