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CE 630 - 102: MATRIX ANALYSIS OF STRUCTURES

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CE 630: Matrix Analysis of Structures
(3 credits)

Lectures:	Monday 6:00pm – 8:50pm CKB, Room 214
Instructor:	Sunil Saigal, Ph.D., P.E. Colton Hall, Room 235 saigal@njit.edu (973) 596-5443
Office Hours:	Wed: 11:30 am -1:30 pm, *or by appointment* I am available in person or by WEBEX at the link below at the posted office hour times.
Zoom Link:	https://njit.webex.com/meet/saigal
Prerequisite:	An undergraduate course in structural analysis and computer programming.
Textbook:	McGuire, William, Richard H. Gallagher, and Ronald D. Ziemian. *Matrix Structural Analysis*. 2nd Edition. Wiley, Middletown, DE. 2015. ISBN: 978-1507585139.
Software:	*MATLAB*. Version 2022b or later. Mathworks, Inc., Natick, MA. Released 11 November 2022. Available at: http://ist.njit.edu/software/download.php

Course Description *(from NJIT's course catalog)*

A review of matrix operation and energy method, and development of flexibility and stiffness methods used in linear-elastic structural analysis. Behavior of continuous beams, plane trusses, space trusses, and frames will be studied.

Course Topics

No.	TOPIC
1	Matrix Algebra and Linear Equations
2	Basic Structural Theorems
3	Truss Bar Element
4	Beam and Plane Frame Elements
5	Nonuniform and Curved Beam Finite Elements
6	Free Vibrations of Truss Bar, Beam, and Plane Frame Finite Elements
7	Buckling and Large Deflection of Column and Plane Frame Finite Elements
8	Plane Stress and Plane Strain Finite Elements
9	Axisymmetric and General Solid Finite Elements
10	Numerical Integration and Curved Isoparametric Elements
11	Plate Elements in Bending

<u>POLICIES & PROCEDURES</u>

Academic Integrity: 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.

Communication: All mass communication by the instructor will be done through Canvas. Individual correspondence can be sent directly to the instructor by e-mail (saigal@njit.edu). It is your responsibility to check e-mail and the course page on Canvas daily.

Attendance: Attendance at all lecture/class periods is expected. Students are expected to participate through the class period. Chronic lateness or leaving of class for extended periods of time will result in poor performance. Regular attendance in class will greatly increase your ability to perform well on the exams, homework, and class exercises. Make-ups for missed classes will be allowed if the student gets an excused absence from the dean of students. If a student had a serious medical issue, death in the family, or other excusable emergency absence, the student is required to obtain an excused absence from the Dean of Students prior to asking for a make-up.

Prerequisites: It is assumed that you have a background in undergraduate structural analysis, mechanics of materials, and statics. Further, basic understanding of computer programming and matrix operations is expected. You will not necessarily be given every piece of information you need to solve a problem, but enough to be able to solve it with some looking up of expressions or conducting analyses.

Homework: Homework will be assigned to encourage further reading, to extend the material presented in lectures, and to provide practice in arriving at engineering solutions to problems. Completion of the homework is an essential part of the learning process. All homework is to be turned in individually unless specified otherwise on the assignment. If you collaborate with a classmate (or two) be sure to state that collaboration and their names at the top of your assignment.

Homework Format: It is expected that all homework be presented in an organized manner; use green, yellow, or white engineering paper, one side of each page (clear side, not grid side); begin each problem on a new page and number all pages; have your name written clearly on the front page.

Late Homework: Homework will be due at the beginning of class on the date that it is due. Late homework submissions will be accepted up to two days (48 hours) after the due date with a 10% reduction for each day the assignment is late. After that time, assignments will not be accepted.

Homework Solutions: Homework solutions will be posted three days (72 hours) after the homework is due. It is your responsibility to make sure you understand how to solve the problems by attending office hours with the instructor and/or asking questions in class. As with many engineering problems, multiple solutions may be possible. This means that rational solutions to the assignments that follow the methods and procedures covered in this course, and of the particular assignment, will be accepted.

Homework Grading: Homework questions will be graded in terms of a nine-point scheme.

Format

One (1) point will be awarded if the solution is formatted with a problem statement and a statement on what is required in the solution

One (1) additional point will be awarded if the engineering solution is presented in an organized and neat fashion that is easy to follow along.

One (1) additional point will be awarded if the solution is completed with a boxed-in answer, including a properly formatted drawing if it is requested in the problem statement.

Concept

One (1) point will be awarded if the solution has major errors in the conceptual basis of the solution.

Two (2) points will be awarded if the solution has minor errors in the conceptual basis of the solution.

Three (3) points will be awarded if the solution has no errors in the conceptual basis of the solution.

Execution

One (1) point will be awarded if the solution has two or more math or execution errors.

Two (2) points will be awarded if the solution has one math or execution error.

Three (3) points will be awarded if the solution has zero math or execution errors.

If you believe that an error was made in grading the homework, you should write a short justification of your claim and submit a regrade request. Your homework will be reviewed to address your concern. The deadline for submitting a re-grade request is one week after the homework is returned.

Exams: There will be one midterm examination and one final examination. Both examinations will have a written component.

Missed examinations will not be allowed to be made up without prior consent from the instructor or an excused absence from the Dean of Students. If a student will be missing an examination, please contact the instructor at least 24 hours prior to missing the exam. If you have an emergency and miss an exam without prior approval from the professor, you must contact the Dean of Students who will review your case and determine whether an absence should be allowed.

Calculation of Course Grade: A weighted average grade will be calculated as follows:

Homework	33%
Midterm Exam	33%
Final Exam	34%

The <u>minimum</u> requirements for final letter grades are as follows:

A = 90%, B+ = 84%, B = 77%, C+ = 71%, C = 65%, F < 65%

Your performance depends only on how you do and how much you learn, not on how everyone else in the class does. It is therefore in your best interest to help your classmates, while acting within the bounds of the stated academic integrity policy (i.e., NJIT's Code of Academic Integrity).

Instructor Commitment: You can expect the instructor to be courteous, punctual, organized, and prepared for lecture and other class activities; to answer questions clearly; to be available during office hours or to notify you beforehand if he is unable to keep them; to provide a suitable guest lecturer when they are traveling; and to grade uniformly and consistently.

Students with Documented Disabilities: NJIT is committed to providing students with documented disabilities with equal access to programs and activities. If you have, or believe that you may have, a physical, medical, psychological, or learning disability that may require accommodations, please contact the Coordinator of Student Disability Services located in the Center for Counseling and Psychological Services, in Campbell Hall, Room 205, (973) 596-3414. Further information on disability services related to the self-identification, documentation and accommodation processes can be found on the webpage at: (http://www.njit.edu/counseling/services/disabilities.php)