CE 582 - ADVANCED STRUCTURAL MECHANICS[1]

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REFERENCES (required textbook is the first on the list)

A. Kassimali, *Structural Analysis*; PWS-Kent; Cincinnati, OH, 1999. (**K in course syllabus**)

Kenneth M. Leet and Chia-Ming Uang, *Fundamentals of Structural Analysis*, McGraw-Hill, New York, NY, 2002. (**L & U in course syllabus**)

James K. Nelson and Jack C. McCormac, *Structural Analysis: Using Classical and Matrix Methods*, John Wiley & Sons, Hoboken, NJ, 2003 (**N & M in course syllabus**)

W. McGuire, R.H. Gallagher and R.D. Ziemian, *Matrix Structural Analysis*, Second Edition, John Wiley and Sons, 2000.

A. Kassimali, *Matrix Analysis of Structures*, Brooks/Cole, Cincinnati, OH, 1999.

William Weaver, Jr. and James M. Gere, *Matrix Analysis of Framed Structures*, Second Edition, D. Van Nostrand, New York, NY, 1980.

M. Hoit, *Computer-Assisted Structural Analysis and Modeling*, Prentice-Hall, Englewood Cliffs, NJ, 1995.

T.R. Tauchert, *Energy Principles in Structural Mechanics*, McGraw-Hill, NY, 1974.

COURSE GOALS AND OUTCOMES

CE 582 is designed to introduce students to modern topics for analyzing statically indeterminate structures, particularly matrix structural analysis for two-dimensional frame structures. For example, the displacement method of analysis is the overwhelming analysis tool used in modern structural analysis programs. This course will introduce you to this analysis tool and modeling of structural systems and boundary conditions. Furthermore, this course is a prerequisite to the graduate level courses CE 682 – Advanced Structural Analysis, CE 684 – Slab and Folded Plate Structures, CE 687 – Advanced Metal Structures, and CE 782 – Dynamics of Structures.

At the conclusion of the course, you should be able to:

- Use the force (flexibility) method to analyze statically indeterminate structures.
- Use the force method of analysis to solve influence line problems for statically indeterminate structures.

[1]The prerequisite for this course is CE 382 – Structural Mechanics

- Use the displacement (stiffness) method to analyze statically and kinematically indeterminate structural systems.
- Apply and understand static structural analysis for two-dimensional frame structures including symmetry and antisymmetry boundary conditions.

Such knowledge and capabilities are highly valued in the aerospace, telecommunications, and up-to-date structural engineering offices.

COURSE GRADE

If class participation and attendance are satisfactory, the course grade will be decided using the following weights:

Homework	25%[2]
Exam #1	35%
Exam #2	40%
Total	100%

ENGINEERING ETHICS

It will be assumed that each student subscribes to a professional code of ethics that is the basis for their behavior in class. All exam work, including but not limited to formulation of ideas and methods of approach, must be the work of the student taking the exam. Any and every case where these ethics are violated will be dealt with according to the provisions in the Student Code. The minimum penalty specified by the Student Code for cheating is an E in the course.

TEAMS

Each student must join a team of two student members. Each team is expected to collaborate and work together on all homework assignments. The team concept will provide students with an opportunity to develop small group interaction skills, mimic the working profession, and should enhance student learning. The instructor will provide you with the team member list next week.

HOMEWORK POLICY

Homework assignments will be made periodically throughout the semester. All homework assignments involving the solution of problems will be submitted in teams. Each member of the team will submit the completed homework assignment and the team will bundle the completed homework assignments with a paperclip. **NOTE: Only one copy of any frame analysis output is required for each team.** The teaching assistant will first verify that each team member has submitted a solution for each problem. Solutions that are not submitted or are incomplete will be graded as an n (n = 0 points) for the individual team member who earned that grade. Then, the teaching assistant will select one problem solution to grade for each assigned homework problem

[2] Five percent of the homework grade for graduate students will be based on the Steel Bridge Design Project.

for the team. Each team member who has completed the assigned problem will receive the grade given on the evaluated solution.

All homework must be submitted at the start of class on the assignment date. Late homework is not acceptable except for unusual circumstances, e.g., an excused absence. Problem solving homework and written text summary homework assignments will be given. No homework will be due on the day of an exam. Homework will be graded using a letter grade system. The letter grade system is:

a = 4 out of 4 points: correct procedure and calculations
b = 3 out of 4 points: correct procedure with some calculation errors
c = 2 out of 4 points: partially correct procedure and calculations
n = 0 out of 4 points: insufficient knowledge or not submitted
+ = additional ½ point, e. g., b+ = 3.5 out of 4 points

SEMESTER EXAMS[3]

Two semester exams will be given. Exam #1 will last 75 minutes and the expected exam date is Thursday, October 16. Exam #2 will be given during the final exam period on Thursday, December 18 from 10:30 AM to 12:30 PM. Exam topics are listed on the course syllabus. **Each exam will be open book and notes.** Both exams will be given in FPAT 265.

GRADUATE STUDENT PROJECT

Graduate students enrolled in CE 582 must belong to one of the teams in CE 682 – Advanced Structural Analysis to analyze and design a three-dimensional steel bridge to meet the specifications of the AISC/ASCE National Steel Bridge Building Competition. This assignment will constitute 5% of the course grade.

SEMESTER GRADING

Letter grade scales follow the usual University standard, i.e.

A: 90 – 100
B: 80 – 89
C: 70 – 79
D: 60 – 69
E: 0 – 59

However, the instructor reserves the right to adjust these grades downward depending on the grade grouping at the end of the semester.

[3] It will be the instructor's policy not to return exams in this course. Rather, you are encouraged to come to his office and review the exam.

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Topic	Course Material	Exam
Introduction Review of Linear Algebra	Appendix B (K)	1
Force Method of Analysis	Chapter 13 (K), Chapter 11 (L & U) & Handouts	1
Influence Lines for Indeterminate Structures	Section 14.1 (K), Chapter 14 (N & M) & Handouts	1
Moment Distribution Analysis	Chapter 16 (K)	1
Displacement Method of Analysis Two-Dimensional Structures	Sections 16.2 – 16.3 (L & U), Chapter 17 (K), Chapter 20 (N & M) & Handouts	2
Symmetry-Antisymmetry	Chapter 10 (K) & Handouts	2
Special Analysis Techniques	Handouts	

COURSE DESCRIPTION

CE 582 focuses on the flexibility and stiffness methods of analysis using matrix techniques for two-dimensional structures.