Course syllabus

Department of Industrial Technology
University of Northern Iowa
Cedar Falls, IA 50614--0178

Fall Semester 2009

330:155g Finite Element Analysis

Instructor: Dr. Nageswara Rao Posinasetti
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Course web page: www.uni.edu/~rao/Course11.htm

OFFICE HOURS: Wed 8:00 - 12:00 hrs. or by appointment

COURSE DESCRIPTION: Fundamental concepts of the finite element method for linear stress and deformation analysis of mechanical components. Development of truss, beam, frame, plane stress, and plane strain elements. Practical modeling techniques and use of general-purpose codes for solving practical stress analysis problems. Prerequisite: 330: 170.

COURSE TEXTBOOK:
Required: Zecher Jack, Finite Element Analysis Tutorial Using Algor Version 14, SDC Publications, 2003, ISBN 1-58503-112-7

Optional:

1. Saeed Moaveni, Finite Element Analysis: Theory and Applications with ANSYS, 2nd Ed., ISBN: 0-13-111202-3, Prentice Hall, 2003, 840 pp
2. Robert D. Cook, David S. Malkus, Michael E. Plesha, Robert J. Witt, Concepts and Applications of Finite Element Analysis, 4th Edition, ISBN: 0-471-35605-0, John Wiley, 736 Pages, October 2001

CLASS SCHEDULE: W 5.00 p.m. to 7.50 p.m. Evening, Room 24, ITC

Objective:
The main objective of the course is to provide the student with an understanding of the various concepts related to the application of finite element analysis procedures using any commercially available software.

COURSE ORGANIZATION:
Lecture/Demonstrations:
The scheduled class meeting time is used for instructional lectures, demonstrations, and lab activities. Lectures will focus upon the essential procedures, techniques, and other information needed to complete the assignments.
Lab Time:

You will attain the stated course objectives and master the required body of FEA knowledge through completing the scheduled laboratory periods. The majority of student work will be done in the Industrial Technology Center Computer Labs during open lab hours.

Attendance
Attendance is required in all scheduled lecture and laboratory meetings.

Statement on Cheating
When under the pressure of deadlines, some students may be tempted to copy another student's drawing and hand it in as their own. Before yielding to such temptation, the student should be aware that the University's policy statement on academic ethics permits expulsion for such an offense.

GRADING SCALE:

Grades will be determined by assigning the following weighing to each area:

Class work, Attendance, observed performance, attitude, etc.	10%
Home work assignments	35%
Design Project	15%
Midterm Examination	15%
Final Examination	25%

Grade scale:

Percentage range	Grade	Percentage range	Grade
95 – 100	A	74 – 76	C
90 – 94	A-	70 – 73	C-
87 – 89	B+	67 – 69	D+
84 – 86	B	64 – 66	D
80 – 83	B-	60 – 63	D-
77 – 79	C+	< 60	F

TENTATIVE SCHEDULE OF LEARNING ACTIVITIES

Week	Topics	Textbook	Assignment
1 (8/26)	Introduction, How FEM works, Brief history, Example case studies, Available solvers	Chapter 1	Exercises: 1, 3, 4, 5, 6
2 (9/2)	General concepts of FEM, Procedures, Linear Spring element, Assembling spring elements, Element types, Structural, Assembling matrices, Global connectivity, Boundary conditions, Solution methods, Commercial FEA systems	Chapter 2	Exercises 1, 2, 3, 4, 5, 6
3 (9/9)	General concepts of drawing in Algor, Introduction, Basic concepts, Geometry commands, Editing commands, Interaction with other CAD programs, AutoCAD (DXF option)	Chapter 3	Exercises 2 & 3

Week	Topics	Textbook	Assignment
4 (9/16)	A simple example in FEA, Geometry creation, Mesh generation, Solving and examining the results	Chapter 4	Lab Project #1
5 (9/23)	Element types and their selection, Basic elements, Types of nodes, Degrees of freedom, Interpolation, Automatic mesh generation, Selection of parameters, Boundary conditions, Specifying loading	Chapter 5	Exercises 1, 2, 3, 4 Lab Proj #2
6 (9/30)	Plane stress/strain modelling techniques	Chapt. 6	Assignment #3
7(10/7)	Trusses, Definition and stiffness matrix, Formulation using Algor, Verification of results, Some examples, 2D truss, 2D truss with different supports	Chapt. 8	Assignment #4
8(10/14)	Solving axial member problems, Beam stiffness matrix, Different loading conditions, Formulation using Algor, Verification of results, Frames, Formulation using Algor, Plane frame, Space frame, Verification of results	Chapt. 9	Assignment #5
9 (10/21)	**Mid Term Examination (10/21)**		
10 (10/28)	Post processing, Stresses, Strains, Displacement, Animation, Plotting		Design Project #1
11 (11/4)	Solving two dimensional problems, Plane stress and plane strain, Axisymmetric	Chapt. 7	Assignment #6
12 (11/11)	Plates and shells	Chapt. 10	Lab Project #8
13 (11/18)	Interfacing with CAD and 3D analysis, Modelling techniques, Solid elements, Element refinement, Formulation of problem, Interfacing with CAD systems, Examples with ProEngineer, Inventor	Chapt. 11	Design Project #2
14 (11/25)	Thanks giving break		
15 (12/2)	**Review**		
16 (12/9)	**Review**		
17 (12/16)	**Final Examination**		

All lab projects need to be submitted in the following scheduled class.

Disabilities Act

The Americans with Disabilities Act of 1990 (ADA) provides protection from discrimination for qualified individuals with disabilities. Students with a disability, who require assistance, will need to contact the office of Disability Services (ODS) for

coordination of academic accommodations. The ODS is located at 213 Student Services Center. Their phone number is (319) 273- 2676.