San Jose State University
Department of Mechanical Engineering

Course: **ME 160 Introduction to Finite Element Method**
Semester: Spring 2016
Class Number: 21674
Prerequisites: CE 112, ME 130 with a C- or better in each.
Class Hours: MW 10:30 -11:45 AM
Class Room: E213, Engineering Building
Instructor: Dr. Tai-Ran Hsu, E117(A), Tel: 924-3905, E-mail: tai-ran.hsu@sjsu.edu
Office Hours: Thursdays 01:30 – 4:00 PM, or by appointment.

Textbook:** "The Finite Element Method in Thermomechanics," by T.R. Hsu, Allen & Unwin, Boston, 1986. ISBN 0-04-620013-4 (SJSU Library: TA418.58 H78 1986 at 8th Floor with one reserved copy at 1st Floor)
E-version available @ http://www.springer.com/gp/book/9789401/60001 at a price of 67.82€

References:** "Computer-Aided Design: an integrated approach" by Tai-Ran Hsu and Dipendra Sinha. West Publishing Company, St. Paul, Minnesota, 1992. ISBN: 0-314-80781-0. Chapters 6 and 7 (SJSU Library: TA174.H77 1992 at 8th Floor with one reserved copy at 1st Floor)

** The instructor will post his slides used in the class instructions on his SJSU webpage for his students in the ME 160 class.

Grading Scheme:

Homework:	20%
Midterm exam:	20% (Monday, April 4, 2016) Room 213
Term Project:	25% (with team of approximately 3 students)
Final examination	35% (Tuesday, May 24, 2016, 9:45AM-12:00 noon, Room E213)

□ Grading Scheme:
Letter grades will be assigned for the course according to the following scheme:

Mark Range (%)	Assigned Grades
95-100	A+
90-94	A
85-89	A-
80-84	B+
70-79	B
65-69	B-
60-64	C+
50-59	C
40-49	C-
30-39	D
Below 30	F

□ Both mid-term and final examinations will be of the format of "open books." Students may bring to the exams any written materials and references as they wish.

□ Students are encouraged to use pocket electronic calculators and handbooks for solutions to problems in mid-term and the final examination. But they must show the proper procedures used in solutions, and specify the sources of the information.

□ This is an engineering course. As such, students are expected to be ***precise*** and *concise* in the solution to problems in the mid-term and final examination. Some partial marks will be given to these examinations with incorrect answers but only if correct method is used in solution procedure.

NOTE: (1) There will be **NO** make-up mid-term or final examination for students in this class, except for individuals with serious medical reasons such as immobility, high fever, etc. A medical doctor's certificate is required to support such request. Requests for rescheduling mid-term or final examination with supporting documents must be submitted to the instructor 48 hours prior to or one day after the originally scheduled mid-term or final examination.

(2) Calculators and written materials are allowed in mid-term and final examinations. Students are not allowed to share these devices and written materials with others in mid-term and final examinations.

(3) *Late submission of homework past the due time and dates WILL NOT be accepted.*

(4) Students are encouraged to ask questions at all times in the classroom and during the office hours. Special arrangements can also be made for consultations and advice with the instructor.

Academic Integrity

Students in this course are expected to maintain high ethical standards in all matters pertaining to the course, including, but not limited to, examinations, homework, course assignments, presentations, writing, laboratory work, team work, treatment of class members, and behavior in class. Cheating and plagiarism are violations of the SJSU Policy on Academic Dishonesty (S98-1) and will not be tolerated in the class.

Students are expected to have read the Policy, which is available at:

http://www2.sjsu.edu/senate/S04-12.pdf

Plagiarism is defined as, *the use of another person's original (not common-knowledge) work without acknowledging its source*.[1] Thus plagiarism includes, but is not limited to[2]:

- copying in whole or in part, a picture, diagram, graph, figure, etc. and using it in your work without citing its source
- using exact words or unique phrases from somewhere without acknowledgement
- putting your name on a report, homework, or other assignment that was done by someone else

Students are expected to familiarize themselves with how to avoid plagiarism. Several helpful resources can be found at: http://www.stanford.edu/dept/vpsa/judicialaffairs/students/plagiarism.sources.htm

[1] Definition adapted from "Defining and Avoiding Plagiarism: The WPA Statement on Best Practices," http://www.ilstu.edu/~ddhesse/wpa/positions/WPAplagiarism.pdf; and "What is Plagiarism?," http://www.stanford.edu/dept/vpsa/judicialaffairs/students/plagiarism.sources.htm.

[2] Adapted from, "Avoiding Plagiarism," http://owl.english.purdue.edu/handouts/research/r_plagiar.html.

Course Description

Introduction to finite element methods, matrix algebra, and interpolation functions. Deflection and stress analysis, using truss, beam, plate, and axisymmetric elements.

Course Goals

1. To learn the basic principles of finite element method with modeling and analyses of mechanical engineering problems.
2. To learn how to apply finite element solution to problems in mechanical engineering.
3. To learn how to use commercially available FE code, such as the ANSYS code to solve mechanical engineering problems.

Student Learning Objectives

By the end of the course, each student should be able to:

1. Describe the discretization principle in the finite element analysis (FEA) and the procedure of the analysis
2. Develop finite element equations for heat conduction in axisymmetric solid elements
3. Develop stiffness equations for spring, beam, and 2-D solid elements
4. Assemble element stiffness equations to a global equations for overall structures
5. Identify and apply boundary conditions to a global structural matrix and reduce it to a solvable form
6. Identify the application and characteristics of spring, beam, 2-D solid and 3-D solid elements
7. The application of commercial finite element code, the ANSYS code for heat conduction and stress analysis of solids of complex geometry subject to complex boundary and loading conditions.

Course Outline:

Chapter 1 Fundamentals of finite element Method
Chapter 2 Finite Element Formulation by Variational Principle
Chapter 3 Steps in Finite Element Analysis
*Guest Lectures No. 1: Use of ANSYS Code (at about late February 2016)
Chapter 4 Finite Element Analysis in Stress Analysis of Solid Structures
Chapter 5 Finite Element Analysis of Heat Conduction
Chapter 6 Finite element Formulation of Thermoelastic Stress Analysis
*Guest Lectures No. 2: Case Simulations by ANSYS Code (at about mid-April 2016)

*May be offered off campus at the HQ of ANSYS Corporation in San Jose after 5 PM instead of regular class times