

**San Jose State University**  
**Department of Mechanical Engineering**  
**ME 273-Finite Element Methods in Engineering, Fall 2021**

**Course and Contact Information**

<b>Class Days/Time:</b>	No days/time; i.e. asynchronous with few optional in-person sessions
<b>Optional Discussion Sessions:</b>	Tu & Th 16:30-17:30 via Zoom: <a href="https://sjsu.zoom.us/my/armani">https://sjsu.zoom.us/my/armani</a>
<b>Classroom:</b>	Engineering 213/215 for in-person sessions
<b>Prerequisites:</b>	BSME or Instructor Consent
<b>Instructor:</b>	Dr. Amir Armani
<b>Office Location:</b>	Engineering 310E
<b>Telephone:</b>	408-924-8354
<b>Email:</b>	amir.armani@sjsu.edu
<b>Office Hours:</b>	Tu & Th 15:30-16:30 via Zoom: <a href="https://sjsu.zoom.us/my/armani">https://sjsu.zoom.us/my/armani</a>
<b>Grader:</b>	Mr. Kaushik Katti
<b>Email Address:</b>	kaushiklaxminarayan.katti@sjsu.edu

**Course Format**

This is a hybrid class, with mostly asynchronous online sessions and a few optional in-person sessions. It requires use of the Canvas learning management system, accessed via <https://sjsu.instructure.com>. Course materials, including syllabus, lecture videos, slides, assignments, and projects will be gradually uploaded on Canvas. Successful completion of course requirements necessitates accessing the course website frequently, typically at least twice a week on a regular basis. Technical support for Canvas is available at <http://www.sjsu.edu/at/ec/canvas>. Important communications regarding this class may be sent via Canvas or to email addresses listed in MySJSU, and thus each student is expected to maintain up-to-date contact information in both systems.

**Course Description** <http://info.sjsu.edu/web-dbgen/catalog/courses/ME273.html>

Introduction into various finite element methods for developing stiffness equation. Truss, beam, 2-D, 3-D and axisymmetric elements. Applications and case studies.

**Course Learning Outcomes**

Upon successful completion of this course, students will be able to:

1. Describe the Finite Element Analysis (FEA) procedure.
2. Identify the application and characteristics of FEA elements such as bars, beams, planar elements, and common 3-D elements.
3. Develop the stiffness equation for common FEA elements, and assemble element stiffness equations in to a global equation.
4. Identify and apply suitable boundary conditions to a global structural equation, and reduce it to a solvable form.
5. Apply existing 3-D computer-aided design (CAD) skills to prepare models for finite element analysis.
6. Set up and solve 1-D, 2-D, and 3-D structural problems using commercial FEA tools.
7. Optimize engineering parts using FEA.
8. Interpret results obtained from FEA, not only in terms of conclusions, but also awareness of limitations.

## Program Learning Outcomes

The following program learning outcomes (PLOs) are designated for ME 273:

1. A strong foundation beyond the undergraduate level in their chosen focus area as well as in mathematics, basic science and engineering fundamentals, to successfully compete for technical engineering positions in the local, national and global engineering market, advance in their current position or pursue doctoral studies.
2. Professional and lifelong learning skills to be able to apply and extend theory to solve practical contemporary engineering problems.
3. The expertise necessary to design mechanical engineering systems with possible specialization in areas such as: energy systems, electronics cooling, electronics packaging & reliability, finite element analysis & CAD, mechatronics & MEMS, product design, robotics, automation & manufacturing.

## Required Textbook

*A First Course in the Finite Element Method*, 6th ed., by D. L. Logan, Cengage Learning, 2017, ISBN 9781305635111.

## Supplementary Textbooks

1. *Finite Element Modeling and Simulation with ANSYS Workbench*, by X. Chen & Y. Liu, CRC Press, 2014, ISBN 9781439873847.
2. *Finite Element Simulation with ANSYS Workbench 17*, by H. Lee, SDC Publications, 2017, ISBN 9781630570880.

## Course Requirements and Assignments

SJSU classes are designed such that in order to be successful, it is expected that students will spend a minimum of forty-five hours for each unit of credit (normally three hours per unit per week), including preparing for class, participating in course activities, completing assignments, and so on. More details about student workload can be found in University Policy S12-3 at <http://www.sjsu.edu/senate/docs/S12-3.pdf>.

- **Programming Project:** Students are responsible for working in a team to write an FEA code using any programming language. Details will be provided via separate documentation.
- **ANSYS Project:** Students are responsible for working in a team to do a project using ANSYS. Details will be provided via separate documentation.
- **ANSYS Presentation:** Students are responsible for working in a team to give a presentation about the topic of their project. Details will be provided via separate documentation.
- **Homework:** Homework problems will be assigned corresponding to lecture topics and reading assignments from the textbooks. Late submission receives zero credit. See “Exceptions” below regarding petition for extenuating circumstances.
- **Participation Tasks:** Students are expected to watch all the lecture videos within one week from their upload date.
- **Exams:** There are one midterm and one final exam. Exams will be proctored and students are expected to turn on their cameras. If cheating is suspected, the proctored videos may be used for further inspection and may become part of the student’s disciplinary record. All students are expected to complete exams as scheduled. There are no make-up exams, but for truly unavoidable and extenuating circumstances with firm documentation, a student may petition to have weight redistributed to the final exam. Disability accommodations must be coordinated through the Accessible Education Center <http://www.sjsu.edu/aec>.

## Grading Policy

The course grade will be weighted as follows:

10% for Programming Project

15% for ANSYS Project

10% for ANSYS Presentation

10% for Homework  
5% for Participation Tasks  
20% for Midterm Exam  
30% for Final Exam

The overall course grade is calculated from a weighted sum of all graded components. Graded percentage points correspond to letter grade as follows:

93.0-100 A | 90.0-92.9 A- | 87.0-89.9 B+ | 83.0-86.9 B | 80.0-82.9 B-  
77.0-79.9 C+ | 73.0-76.9 C | 70.0-72.9 C- | 0-69.9 F

Exceptions: Any grading appeals or late petitions must be petitioned promptly in writing (or email). Exceptions will normally be evaluated at the very end of the semester in context with semester track record and all other exceptions class-wide. Special consideration for truly unavoidable and extenuating circumstances will depend on timing and strength of supporting documentation (e.g., doctor's note, jury summons, military orders).

University Policy F13-1 at <http://www.sjsu.edu/senate/docs/F13-1.pdf> states: "All students have the right, within a reasonable time, to know their academic scores, to review their grade-dependent work, and to be provided with explanations for the determination of their course grades."

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## University Policies

### General Expectations, Rights and Responsibilities of the Student

As members of the academic community, students accept both the rights and responsibilities incumbent upon all members of the institution. Students are encouraged to familiarize themselves with SJSU's policies and practices pertaining to the procedures to follow if and when questions or concerns about a class arises. See University Policy S90-5 at <http://www.sjsu.edu/senate/docs/S90-5.pdf>. More detailed information on a variety of related topics is available in the SJSU catalog, at <http://info.sjsu.edu/web-dbgen/narr/catalog/>. In general, it is recommended that students begin by seeking clarification or discussing concerns with their instructor. If such conversation is not possible, or if it does not serve to address the issue, it is recommended that the student contact the Department Chair as a next step.

### Dropping and Adding

Students are responsible for understanding the policies and procedures about add/drop, grade forgiveness, etc. Refer to the current semester's Catalog Policies section at <http://info.sjsu.edu/static/catalog/policies.html>. Add/drop deadlines can be found on the current academic year calendars document on the Academic Calendars webpage at [http://www.sjsu.edu/provost/services/academic\\_calendars/](http://www.sjsu.edu/provost/services/academic_calendars/). The Late Drop Policy is available at <http://www.sjsu.edu/aars/policies/latedrops/policy/>. Students should be aware of the current deadlines and penalties for dropping classes.

Information about the latest changes and news is available at the Advising Hub at <http://www.sjsu.edu/advising/>.

### Consent for Recording of Class and Public Sharing of Instructor Material

University Policy S12-7, <http://www.sjsu.edu/senate/docs/S12-7.pdf>, requires students to obtain instructor's permission to record the course and the following items to be included in the syllabus:

- "Common courtesy and professional behavior dictate that you notify someone when you are recording him/her. You must obtain the instructor's permission to make audio or video recordings in this class. Such permission allows the recordings to be used for your private, study purposes only. The recordings are the intellectual property of the instructor; you have not been given any rights to reproduce or distribute the material."
- "Course material developed by the instructor is the intellectual property of the instructor and cannot be shared publicly without his/her approval. You may not publicly share or upload instructor generated material for this course such as exam questions, lecture notes, or homework solutions without instructor consent."

## **Academic integrity**

Your commitment, as a student, to learning is evidenced by your enrollment at San Jose State University. The University Academic Integrity Policy S07-2 at <http://www.sjsu.edu/senate/docs/S07-2.pdf> requires you to be honest in all your academic course work. Faculty members are required to report all infractions to the office of Student Conduct and Ethical Development. The Student Conduct and Ethical Development website is available at <http://www.sjsu.edu/studentconduct/>.

## **Campus Policy in Compliance with the American Disabilities Act**

If you need course adaptations or accommodations because of a disability, or if you need to make special arrangements in case the building must be evacuated, please inform me in writing as soon as possible (email acceptable). Presidential Directive 97-03 at [http://www.sjsu.edu/president/docs/directives/PD\\_1997-03.pdf](http://www.sjsu.edu/president/docs/directives/PD_1997-03.pdf) requires that students with disabilities requesting accommodations must register with the Accessible Education Center (AEC) at <http://www.sjsu.edu/aec> to establish a record of their disability.

## **Student Technology Resources**

Computer labs for student use are available in the Academic Success Center at <http://www.sjsu.edu/at/asc/> located on the 1st floor of Clark Hall and in the Associated Students Lab on the 2nd floor of the Student Union. Additional computer labs may be available in your department/college. Computers are also available in the Martin Luther King Library. A wide variety of audio-visual equipment is available for student checkout from Media Services located in IRC 112. These items include DV and HD digital camcorders; digital still cameras; video, slide and overhead projectors; DVD, CD, and audiotape players; sound systems, wireless microphones, projection screens and monitors.

## **SJSU Writing Center**

The SJSU Writing Center is located in Clark Hall, Suite 126. All Writing Specialists have gone through a rigorous hiring process, and they are well trained to assist all students at all levels within all disciplines to become better writers. In addition to one-on-one tutoring services, the Writing Center also offers workshops every semester on a variety of writing topics. To make an appointment or to refer to the numerous online resources offered through the Writing Center, please see <http://www.sjsu.edu/writingcenter>.

## Tentative Course Schedule

<b>Week</b>	<b>Topics</b>
1	Course organization; Introduction
2	Linear Algebra; FEA Procedure (Chapter 1)
3	Stiffness Method (Chapter 2); Spring Element (Chapter 2)
4	Spring Element (Chapter 2); Trusses (Chapter 3)
5	Trusses (Chapter 3)
6	Beams (Chapter 4)
7	Introduction to 2D Elasticity; Plane Solids (Chapter 6)
8	Plane Solids (Chapter 6)
9	Review and Midterm Exam
10	Practical Considerations (Chapter 7); Sensitivity Analysis and Optimization
11	ANSYS
12	ANSYS
13	ANSYS
14	ANSYS
15	Project Presentation

The Final Exam will be held on **Thursday, December 9, 17:15-19:30.**