MECH 308 – Finite Element Analysis
Course Syllabus
Mechanical & Mechatronic Engineering
Advanced Manufacturing
Fall 2020
CSU, Chico

Professor: Arash Kialashaki, Ph.D., PE
Contact: O'Connell 423 / 530-898-4070 / akialashaki@csuchico.edu

Course Description: Development of finite element formulation from fundamental governing engineering equations. Coverage includes areas ranging from elasticity, vibration, and heat transfer to acoustics and composites.

Zoom Link (only for synchronous sessions): https://csuchico.zoom.us/j/98044116313?pwd=MzQwMG1Id3FjEVZQXpKWWoveWJyZz09

Prerequisites: CIVL 311 with a grade of C- or higher; MECH 306


Class Meetings: Monday, Wednesday, Friday; 10:00 am to 10:50 am;
The class is fully online. Most of the sessions will be asynchronous. Some class meetings may be synchronous at the scheduled meeting day and time.

Course Materials: Required course materials include textbook, engineer’s pad, scientific calculator, and laptop computer. Primary software utilized will be Excel, Matlab, and SolidWorks Simulation. Also recommend Google Drive, Dropbox or a similar means of cloud-based storage of documents. Note that lost, stolen, or corrupted laptops, tablets, or flash drives is not an accepted excuse for missed work.

Blackboard Learn: This course will make use of the Blackboard Learn course management system. All PowerPoint lectures, handouts, homework solutions, grades, announcements, etc. will be available on the course Blackboard page.

Grading:

<table>
<thead>
<tr>
<th></th>
<th>25%</th>
<th>75%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tests</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Grade Scheme:

<table>
<thead>
<tr>
<th>Grade</th>
<th>A</th>
<th>A-</th>
<th>B+</th>
<th>B</th>
<th>B-</th>
<th>C+</th>
<th>C</th>
<th>C-</th>
<th>D+</th>
<th>D</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&gt;= 93.3</td>
<td>93.2 to 89.5</td>
<td>89.4 to 86.7</td>
<td>86.6 to 83.3</td>
<td>83.2 to 79.5</td>
<td>79.4 to 76.7</td>
<td>76.6 to 73.3</td>
<td>73.2 to 69.5</td>
<td>69.4 to 66.7</td>
<td>66.6 to 59.5</td>
<td>&lt; 59.5</td>
</tr>
</tbody>
</table>
Homework: Homework will be assigned regularly throughout the semester and is an integral part of the learning experience for this class. Unless otherwise specified, homework is due the second class meeting after it is assigned. For example, homework assigned on Monday is due on the following Friday; homework assigned on Wednesday is due the next Monday. This algorithm allows for questions on assigned homework during the intermediate class meeting. See the Homework Guidelines document for instructions on format, content, etc.

Tests: There will be two fifty-minute tests during the semester and a one hour and fifty-minute test during exam week. Tests will be closed book and closed note. A formula sheet will be posted to Blackboard in advance of each exam. Students are strongly encouraged to print the formula sheet to use it in the exam. Students can add any additional information they wish to the formula sheet. Handheld scientific calculators will be allowed for the exams. Laptops, tablets, smart phones, or other connected devices will not be permitted, except for downloading the test and uploading the answers.

No make-up exams will be given without documentation of a serious and compelling reason for missing the exam as defined in the University Catalog: Academic Policies and Regulations. Make-up exams must be taken within one week of the originally scheduled exam date.

Online Proctoring of Exams: To ensure the academic integrity and fairness of exams and grades, the exams will be proctored in Zoom and will be recorded. The student’s camera must be on during the exam. To take your exams, you must have access to a computer equipped with a functioning video camera and microphone. During the exams, you must also have an isolated environment with an Internet connection. You must have a functioning webcam and microphone to take the exam. Possession of these items is a requirement of the course.

Late Work: Homework is due at the beginning of the designated class period. Assignments will be accepted late the same day with a one letter grade deduction. Homework submitted after the first few minutes of class is considered late and will receive a letter grade deduction (be on time). Assignments will not be accepted after their due date. Homework cannot be submitted in stages (the initial submission is all that is accepted). I do not accept assignments via email.

Electronic Submission: All assignments will be designated for electronic submission which will be handled via Assignments in Blackboard Learn. Students are strongly encouraged to verify submissions made through Blackboard Learn. It is the student’s responsibility to ensure the correct file has been submitted for the assignment. No accommodations are made for incorrect submissions.

Email: In the event I need to contact members of the class or make urgent announcements regarding tests, class cancellations, etc., it will be done via your WildcatMail email account. I plan to use this method of communication frequently, and I expect that information sent this way will be received. University policy requires students to monitor their WildcatMail accounts. If you have another preferred email provider, you may set up automatic forwarding of your WildcatMail to that address. Details are available at www.csuchico.edu/itss/.
Office Hours: Monday: 5:00 PM to 5:30 PM  
Wednesday: 5:00 PM to 5:30 PM  
Office hours will be online through my personal meeting room in Zoom. A link to my personal meeting room will be available on the Blackboard Learn. Also, you can click here to be directed to my Zoom personal meeting room during the office hours.

Academic Integrity: Academic integrity is taken seriously at the University, in this College, and Department, and by your professor. Violations include, but are not limited to, sharing of electronic data and copying from solution manuals. Violations will be referred to student judicial affairs and can result in penalties ranging from failure of the course to long term suspension from the university. See the Academic Integrity document for additional information.

Virtual Classroom Protocol: All students are expected to conduct themselves in a professional manner. Disruptive behavior which interferes with a positive learning environment will not be tolerated. Examples of such behavior include but are not limited to any hostile, abusive, disruptive, or discriminatory verbal or physical conduct.

This online course will be taught online with combined synchronous and asynchronous instructions. The video lectures will be posted prior to the class meeting time. This is to ensure that all the students have access to lecture materials in case of internet problem, etc. Each video lecture will be approximately 40 to 50 minutes. You will need to have watched each video by its scheduled time.

The class time (MWF 10:00am-10:50am) must be reserved for this class. Therefore, please block this time in your calendars, as there will be tests or announcements for which you need to be online during the class time.

Time management is critical to keep up with the class pace.

Dropping and Adding: You are responsible for understanding the policies and procedures about add/drops, academic renewal, etc. that can be found in the CSU Chico University Catalog. Students who do not attend the first day of class will be dropped if there is a waiting list. It is your responsibility to take the appropriate action to drop or withdraw from the course if you are no longer going to attend, otherwise a failing grade will be assigned.

COVID-19 Face Mask Requirement: In compliance with the California Department of Public Health state mandate, Chico State requires that all students, staff, and faculty, wear a face covering in all indoor spaces on campus, including classrooms, labs, studios, and offices, and outside when physical distancing is not possible. Failure to comply with this requirement will result in a referral to Student Conduct, Rights, and Responsibilities and disciplinary action being taken against you by the University.
Individuals unable to wear a face covering due to a medical condition should contact the Accessibility Resource Center by phone at (530) 898-5959 or by email at arcdept@csuchico.edu.

For more information about the state mandate, please visit the Chico State COVID-19 News & Information page.

Americans with Disabilities Act: If you need course adaptations or accommodations because of a disability or chronic illness, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. Please also contact Accessibility Resource Center (ARC) as they are the designated department responsible for approving and coordinating reasonable accommodations and services for students with disabilities. ARC will help you understand your rights and responsibilities under the Americans with Disabilities Act and provide you further assistance with requesting and arranging accommodations. ARC is located at Student Services Center 170 and may be reached at 530-898-5959 or arcdept@csuchico.edu.

Tentative Outline of Topics

Stiffness method; 1D spring element
Non-homogeneous boundary conditions
Bar elements; Coordinate transformations
Stress in bar elements
Equation solving in Excel & Matlab
SW Simulation Part I – Truss Analysis
Test I
Beam equations
Distributed loading; Comparison to exact solutions
Complete beam element
2D Elements: plane stress, plane strain, axisymmetric
SW Simulation Part II – Beam Analysis
SW Simulation Part III – Stress Equations - 2D Analysis - Mesh Quality and Controls
Test II
SW Simulation Part IV – Axisymmetric Analysis – Shell Elements
1D Heat transfer elements
2D heat transfer elements
3D Elements
SW Simulation Part V – 3D Modeling - Adaptive Mesh Refinement - Symmetry
SW Simulation Part VI – Assembly Modeling - Linear Static FEA - Final Project
SW Simulation Part VII – Thermal Analysis - Thermal Stress Analysis
Test III (during exam week)