Professor: Dr. Arash Kialashaki

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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.

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

Textbook: Logan, D.L., A First Course in the Finite Element Method, Sixth Edition, Cengage Learning, ISBN 13: 978-1-305-63511-1

Class Meetings: Monday, Wednesday, Friday; 10:00 to 10:50; Plumas 102

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:

Homework	20%
Tests	60%
Project	20%

Grade Scheme:

A	A-	B+	B	B-	C+	C	C-	D+	D	F
>= 93.3	93.2 to 89.5	89.4 to 86.7	86.6 to 83.3	83.2 to 79.5	79.4 to 76.7	76.6 to 73.3	73.2 to 69.5	69.4 to 66.7	66.6 to 59.5	< 59.5

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 three fifty minute tests, two during the semester and one 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 and bring it to 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.
Project:	The course will conclude with a comprehensive project on a topic of the student's choosing. The project is intended to reinforce concepts from the course and illustrate their application to a real world engineering application. Project submission will be in the form of a written report.
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:	Certain 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 do not plan to use this method of communication frequently, but I do 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; Wednesday: 11:00 AM to 12:00 PM
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.

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)