MEEN 4140/5800 – Finite Element Analysis

Spring 2021 (Jan 11 – May 1)

Instructor: Dr. Yunwei Xu
Email: Yunwei.xu@unt.edu
Office: Teaching Remotely
Lecture Schedule: M/W 5:30 – 6:50 PM
Lab Time: F 1:30 – 4:20 PM (F175)
Office Hours: Virtual Office Hours and Make Appointment via Email

Required Textbook:
Saeed Moaveni
Person-Prentice Hall, 2020

References:

Course Description:
A numerical technique for finding approximate solutions to engineering solids and structural problems; The displacement method of finite element analysis using the iso-parametric formulation; Geometric modeling of solids and structures; Numerical coding with MATLAB for simple structural, fluid, and thermal analyses; Practice with commercial finite element software such as ANSYS.

Pre-requisites:
MATH 3410 (Diff. Eqn.), MEEN 2332 (Mech. of Matl.), MEEN 2302 (Dynamics)
Course Learning Outcomes (CLO):
Upon successful completion of this course, students will be able to:
1. Solve ordinary and partial differential equations using the Galerkin method
2. Develop the finite element equations to model engineering problems
3. Program finite element solutions using MATLAB to formulate and solve structural, fluid, and thermal problems using finite element techniques.
4. Use a commercial finite element code such as ANSYS to formulate and solve structural, fluid, and thermal problems.

ABET Student Learning Outcomes (CO):
MEEN 4140 addresses the following ABET program outcomes:
a) an ability to apply knowledge of mathematics, engineering and science
c) an ability to design a system, component, or process to meet desired needs
e) an ability to identify, formulate, and solve engineering problems
i) a recognition of the need for, and an ability to engage in life-long learning
j) a knowledge of contemporary issues
k) an ability to use the techniques, skills, and modern engineering tools necessary for

Disability Policy:
All reasonable accommodation will be made to facilitate special needs. If special accommodations are required, the student must first meet with the staff of the Office of Disability Accommodation (ODA), (940) 565-4323. After meeting with that office, please contact me to discuss what accommodations will be necessary. For more information, see http://www.unt.edu/oda.

Homework/Quizzes:
1. Homework problems will be assigned every Wednesday. Assignments are due the following Wednesday. Homework must be turned before due date on Canvas.
2. Late homework will not be accepted. Homework turned into the office will not be accepted. Exceptions: medical emergence (student and important ones), transportation/traffic emergency; religious holidays/duty, jury duty and military duty. Documentary evidences must be submitted.
3. Pop-up quizzes, consisting of one of the exact homework problems, in-class examples, or one very similar, will be randomly given via Canvas. Grades from pop-up quizzes will be regarded as extra credits to your final grade.
4. There will be 4 quizzes. The lowest quiz grade will be dropped. Make-up quizzes are only allowed for documented University-excused absences and the instructor must be notified prior to the missed quiz.
5. Quiz dates: 1/27, 2/15, 3/17, 4/5

Exams:
1. Exam 1: 3/1
2. Exam 2: 4/21
3. The exams may be open book.
4. Make-up exams will only be given for University-excused absences. Documentation must be provided. The instructor must be notified about the absence prior to the exam.
Grade Evaluation:
Homework: 10%
Quizzes (best 3 out of 4) 25%
Exam 1 15%
Exam 2 15%
Lab Assignments 10%
Final project 25%

A – 90-100%
B – 80-89%
C – 70-79%
D – 60-69%
F - < 60%

There will be NO curve on the final grade. For example, 90% must be obtained in order to get an A; an 89.99 will be a B. Grades are based solely on your performance on the quizzes and exams. A student’s perceived effort is not taken into account.

It should be noted that extra credit will not be given at the end of the semester for individual students. Please do not request extra work at the end of the semester to boost your grade – the answer will always be no. It would be unfair to the rest of the students in the class if select individuals were given a chance to earn more points. Quizzes and exams are made to be fair and allow everyone the opportunity to do well in the course if a student prepares for them appropriately.

Re-grades:
Any requests for exam or quiz re-grades must be made the day the quiz/exam is returned. Once class is over, re-grade requests will not be accepted. It should be noted that the entire quiz/exam will be re-graded. This may result in a score lower than what was originally assigned.

Academic Dishonesty/Cell Phone Policy:
Cell phone use will not be allowed during quizzes and exams. If a student is caught using a cell phone during a quiz or exam, a score of zero will be given for that assignment. There are no exceptions to this rule.

Students are expected to do their own work on quizzes, homework, and exams. If it is determined that a student is talking during an exam, copying off from other students’ papers, sharing an equation sheet, turning in homework solutions from online sources, etc., a score of zero will be given for that assignment. There are no exceptions to this rule. Students caught violating this policy two times will automatically be given an F in the course. All students caught cheating will be reported to Academic Integrity Office.

Procedure on Quiz/Exam Days:
On quiz/exam days:
- Problems will be released on Canvas
- Exam/quizzes must be turned before due date on Canvas.
- Late submission will not be accepted.
• Make sure other people (TAs and graders) can read your work. Blurred handwriting will not be accepted.

Professionalism:
One of the goals of this course is to teach students about professionalism, including the standards and expected behavior of your chosen profession. With this in mind, students are expected to demonstrate a behavior consistent with the conduct of an individual practicing in the engineering profession. Students are expected to: (1) come prepared for class; (2) respect faculty and peers; (3) demonstrate responsibility and accountability for your own actions; (4) sensitivity and appreciation for diverse cultures, backgrounds, and life experiences; (5) offer and accepts constructive criticism in a productive manner; (6) demonstrate an attitude that fosters professional behavior among peers and faculty; (7) be punctual to class meetings; (8) maintain a good work ethic and integrity; and (9) recognize the classroom as a professional workplace.

MEEN department Program Educational Objectives
The educational objectives of the Mechanical & Energy Engineering program are to produce graduates who will:
• Graduates are successfully employed in mechanical and/or energy engineering positions and other related fields.
• Graduates engage in lifelong learning demonstrated by advanced education, professional development activities and/or other career-appropriate options.
• Graduates are prepared to successfully demonstrate technical and leadership competence through ethical conduct, teaming, communication, and/or problem-solving skills learned in our program.

ABET Student Outcomes
• An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
• An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
• An ability to communicate effectively with a range of audiences.
• An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
• An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
• An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
• An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Classroom Inclusivity Statement:
I consider this classroom to be a place where you will be treated with respect, and I welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender
expressions, national origins, religious affiliations, sexual orientations, ability – and other visible and nonvisible differences. All members of this class are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class.

Use of Solutions Manuals/online resources like Chegg:
It is common knowledge that solutions manuals to all widely-used textbooks are available online. I realize that students like to utilize these resources but please use them in the correct way. Simply copying what is in the solutions manual is not beneficial to you, in fact, it is detrimental to your grade. To use these resources properly you should attempt all problems on your own. If you get stuck, work on it some more. You should only go to the provided solutions once you have obtained a solution of your own. You can then check your work and find your mistakes. Once you have found the mistakes, you should figure out why you made those errors and then learn how to fix them. Your goal in doing the practice problems is to learn how to apply the material learned in class to a variety of problems. The only way to do this is to work through problems on your own.

Calculators:
All students will need their own calculator on quiz/exam days. You will not be allowed to share a calculator with another student under any circumstance. Graphing calculator will not be allowed during quizzes and exams. Only NCEES-approved calculators can be used (http://ncees.org/exams/calculator/)
Acceptable calculator are:
- **Casio:** All fx-115 and fx-991 models (Any Casio calculator must have “fx-115” or “fx-991” in its model name.)
- **Hewlett Packard:** The HP 33s and HP 35s models, but no others
- **Texas Instruments:** All TI-30X and TI-36X models (Any Texas Instruments calculator must have “TI-30X” or “TI-36X” in its model name.)

Important event: (class will be canceled)

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<thead>
<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>January 11, 2021</td>
<td>First Class Day (Monday)</td>
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<tr>
<td>January 18, 2021</td>
<td>MLK Day (no classes; university closed)</td>
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<tr>
<td>April 2, 2021</td>
<td>No Classes</td>
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<td>April 21-22, 2021</td>
<td>Pre-finals Days</td>
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<td>April 22, 2021</td>
<td>Last Class Day</td>
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<td>April 23, 2021</td>
<td>Reading Day (no classes)</td>
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<td>April 24-May 1, 2021</td>
<td>Finals</td>
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