MEEN 3250 – Analytical Methods
Summer 2019 (10W)

Instructor: Dr. Yunwei Xu
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Office: F102F
Class Schedule: T/Th 10:00 – 11:50 AM, Room B140
Office Hours: T/Th 12:00 – 2:30 PM, or by appointment

Required Textbook:
Numerical Method for Engineers and Scientists, 3rd Edition
Amos Gilat and Vish Subramaniam
ISBN: 978-1-118-55493-7

Course Description:
Applications of mathematical methods and computational techniques to typical engineering problems. Topics include analysis of linear systems, numerical integration of ordinary differential equations, conditions for optimality and an introduction to finite element analysis.

Pre-requisites: MATH 3410 and MEEN 2240
Required for the BS degree in Mechanical and Energy Engineering at UNT.

Course Objectives:
Upon successful completion of this course, students will be able to:
1. Solve nonlinear equations using a variety of numerical methods such as Newton’s Method, Taylor’s series expansions (Ch. 3)
2. Numerically solve a system of linear equations (Ch. 4)
3. Solve for eigenvalue and eigenvector problems (Ch. 5)
4. Apply curve fitting and interpolation techniques to data sets (Ch. 6)
5. Numerically differentiate using finite difference and Lagrange polynomials (Ch. 8)
6. Numerically integrate using techniques such as Newton-Cotes Formulas and Simpson’s rules (Ch. 9)
7. Solve initial value problems using a variety of numerical methods (Ch. 10)
8. Understand numerical Fourier methods* (Ch. 7)
9. Solve boundary value problems using numerical techniques* (Ch. 11)

*time permitting

ABET Criteria:
MEEN 3250 addresses the following ABET program outcomes:
(a) Apply knowledge of mathematics, engineering and science
(b) Identify, formulate and solve engineering problems
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 Thursday. Assignments are due the following Thursday. Homework must be turned in at the beginning of class.
2. Homework requiring MATLAB must be submitted on Canvas by the deadline.
3. Late homework will not be accepted. Homework turned into the office will not be accepted.
4. Pop-up quizzes, consisting of one of the exact homework problems, in-class examples, or one very similar, will be randomly given in the class. Grades from pop-up quizzes will be regarded as extra credits for your final grade.
5. 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.
6. Quiz dates: 6/13, 6/27, 7/18, 8/1

Format of Homework Policy:
1. Use engineering paper only (noncompliance: 20 points off; cumulative)
2. Only solve one problem per page of engineering paper (noncompliance: 10 points off; cumulative). You may extend that problem into another page but then should begin the next problem on a new page if you require more room. If more than one page is needed for a solution you should number each page and the first page should be marked with a “continued on next page” note on the bottom.
3. Done in pencil, no ink. (noncompliance: 10 points off; cumulative)
4. No cross outs, use an eraser. (noncompliance: 10 points off; cumulative)
5. Homework set number, name, date, course number, and page number(s) on the top of the page. (noncompliance: 10 points off; cumulative)
6. Solution – provide all the details so that anybody can easily follow your solutions and problem-solving approach. All intermediate values should be identified with the variable name and units (e.g., \( F_1 = 50 \text{ N}; X_c = 2.1 \text{ m} \)) if any. (noncompliance: 10 points off; cumulative)
7. Answer – the Final Answer at the end of the problem should be identified inside a box. Include an arrow (from the far-right side of the page) pointing to each final answer. (noncompliance: 10 points off; cumulative)

Example:

\[
\begin{align*}
F_1 &= 50 \text{ N} \\
X_c &= 2.1 \text{ m}
\end{align*}
\]
Exams:
1. Midterm: 7/9
2. Final: 8/13
3. The exams may be open-book or closed-book. For the closed book section, students will only be allowed to bring in calculators and pencils. For the open book section, students can bring notes but no textbooks. Scratch paper will be given.
4. No cell phone usage during the exam.
5. 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:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance</td>
<td>5%</td>
</tr>
<tr>
<td>Homework</td>
<td>20%</td>
</tr>
<tr>
<td>Quizzes (best 3 out of 4)</td>
<td>25%</td>
</tr>
<tr>
<td>Midterm Exam</td>
<td>25%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>25%</td>
</tr>
</tbody>
</table>

A – 90-100%
B – 80-89.9%
C – 70-79.9%
D – 60-69.9%
F - < 60%

There will be NO curve on the final grade. For example, 90% must be obtained in order to get an A; an 89.8 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 of 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.

Classroom Procedure on Quiz/Exam Days

On exam days:

- Seats will be randomly assigned by the instructor
- All phones, tablets, other electronic devices must be placed in a bag
- All bags must be placed at the front or back of the room
- Students will only be allowed to bring in calculators and pencils for the exams. I will provide equation sheets, tables, and scratch paper.
- Students will not be allowed to leave the room during exams and quizzes. Exams/quizzes will be collected and considered finished if a student leaves the room.

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.

Attendance

There is a positive correlation between attendance and performance in the class. Students that come to every class and participate by taking notes, asking questions, etc. typically outperform students who regularly miss classes and those that attend class but do not participate. Lecture notes will not be put on Blackboard to encourage attendance. If you miss a class, it is your responsibility to get the notes from another student.

The REEF polling system will also be used to check attendance and encourage participation in class.

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.)