ME 2016 Syllabus

Computing Techniques (3 credits)

Section A (M/W 3:30-4:45 PM), Fall 2026

Manufacturing Related Disciplines Complex, Room 2407

Instructor Information

Instructor: Ruoyu Yang

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General Course Information

Description:

This course is an introduction to the use of computers and MATLAB programming for the solution of mechanical engineering problems. Topics include: basic numerical methods, sources of error in computing, numerical error analysis, modular software design, MATLAB computing environment, root finding, curve fitting using regression methods, polynomial interpolation, numerical integration, numerical solutions of ordinary differential equations, numerical solutions of optimization problems.

Course Learning Outcomes:

Upon successful completion of the course, you should be able to:

- use mathematical models and numerical methods to facilitate finding solutions to mechanical engineering problems
- explain the mathematical foundations of several numerical methods
- implement those numerical methods using modular programming in MATLAB
- identify sources of numerical error and how error impacts computations
- communicate numerical results from MATLAB in a professionally-formatted written report

Pre- and/or Co-Requisites:

Students should have familiarity with Calculus, Linear Algebra, Ordinary Differential Equations (co-req), Algorithm Development, and MATLAB. *CS 1371 (or equivalent) must be completed before starting this course!*

Required Course Materials:

We will use the textbook, *Numerical Methods for Engineers (8th edition) by Steven C. Chapra and Raymond P. Canale* (McGraw-Hill, 2021) *[7th edition is also fine]*, which can be found in the Georgia Tech bookstore or a retailer of your choice.

MATLAB version 2025 (or newer) can be downloaded from Georgia Tech's MATLAB portal or accessed through VLAB (visit GT MATLAB Portal).

Grading Policy:

Your final grade out of 100% will be calculated according to the following distribution:

Midterm 1	15 %
Midterm 2	15 %
Final Project	20 %
Homework	50 % (your 9 highest homework grades @ 50/9 % each)

Your final letter grade will be determined according to the following criteria:

A	final grade ≥ 90 %
B	80 % ≤ final grade < 90 %
C	70 % ≤ final grade < 80 %
D	60 % ≤ final grade < 70 %
F	final grade < 60 %

Homework/Exam scores will be posted on Canvas roughly one week after submission. Any issues with grading on Homework should be brought to the attention of the grader(s) within *one week* of the grade being posted. Any issues with grading on the Exams/Project should be brought to the attention of the instructor within *one week* of the grade being posted.

Description of Graded Components:

Homework:

- There will be a total of 10 homework assignments based on relevant engineering problems that are designed to make you think through the algorithms discussed in class and reinforce key concepts.
- Unforeseen exceptions notwithstanding, the written due date/time on the assignments are rigid. After the due date/time, 20% will be deducted from your homework grade for each day late (up to 3 days). Submissions received beyond 3 days of the due date will receive a 0.
- Up to 20% of each homework grade will be based on professional formatting. Specific professionalism requirements will be specified in the homework handout. MATLAB script/function templates and a report template (Word) are available on Canvas.

- No make-up Homeworks will be given, but your lowest homework grade will not be counted toward your final grade (i.e., out of 10 homework assignments, only your 9 highest homework grades will count toward your final grade).

Exams:

- There will be 2 Midterm Exams designed to test your understanding of the concepts covered in class. Both exams will be closed book and closed notes.
- Use of one (2-sided) sheet of formulae (8.5" x 11") is permitted for each Midterm Exam.
- Absence from any exam without prior consent of instructor will result in zero credit for that exam. There will be no make-up exams, except in the event of a last-minute emergency, for which the student will need to submit appropriate documentation about the emergency (e.g., illness, accident) to the Dean of Students.

Final Project :

- The project will primarily involve computation and coding in MATLAB, which will help you strengthen your understanding of the course material and build practical competency in the numerical algorithms introduced throughout the semester. In this project, you will solve a real-world problem in the mechanical engineering domain. You are required to submit all developed MATLAB code along with a final report that clearly explains your methodology, results, and key findings.

Course Policies

Attendance and/or Participation

Class attendance will foster your learning. If you do miss class, it is your responsibility to make sure that you have all handouts and are aware of all announcements made in class. It is not the responsibility of the instructor to provide individual tutoring for students that miss class. Students who need to miss a deadline or exam due to official GT activities or religious observance will be permitted to make up the missed work within an established timeframe, provided the student provides me with written documentation within the first two weeks of class.

Please, do not come to class if you are feeling ill. In the case of illness and/or family emergencies, it may be necessary for you to delay exams or you may need additional time to complete homework assignments. In these cases, please provide documentation that supports your situation to the Dean of Students. If the illness or family emergency is deemed serious enough, the Dean's office will then contact me and your other instructors with recommendations on how to proceed.

Getting help (outside of the classroom):

- Your *FIRST* avenue for getting help should be instructor and/or grader *OFFICE HOURS*. This is the most efficient way to get your questions answered. Your graders took the course with me previously and did very well – they are an excellent resource.

- If your schedule does not permit attendance of any of the available office hours, or you need an individual meeting for non-homework/exam related discussions, please e-mail the instructor or grader to schedule an appointment.
- The "Discussion" feature on the course Canvas site is also a great resource but should not replace office hours attendance. "Discussions" should be used for clarifications/questions that could benefit all and can be answered without much back-and-forth. Please reserve questions that require detailed discussions for office hours.
- It is not appropriate to ask the instructor or graders if your homework solution is correct. Instead, indicate why you think your solution might be incorrect, where you think it might have gone wrong, or where any confusion is coming from so that we can better help improve your understanding.
- There is often a Shell tutor for our course. This tutor may not be familiar with your specific assignments but is a good resource for general questions about numerical methods and MATLAB programming. Please check to see if a Shell tutor is available this semester and find the associated schedule/location here: https://www.me.gatech.edu/tutoring-0.

Posted Course Materials:

- All course notes and *most* MATLAB files used in class will be posted to the course Canvas site shortly after the lecture.
- All Homework assignments will be handed out in class and posted on the course Canvas site.
- Homework and Exam solutions will be posted to the course Canvas site shortly after everyone has submitted the assignment or finished the exam.
- Announcements may be posted on Canvas from time to time and may contain critical notifications. I highly recommend setting your Canvas Announcement preferences to "NOTIFY ME RIGHT AWAY" to get notified by e-mail.
- I own the copyright to all course materials that I have created for ME 2016. This includes (but is not limited to) my notes, my assignments, my exams, and the solutions to these assignments and exams. Any such material provided to you by me in any form, including posted on Canvas, is for the exclusive use of students enrolled in the course. Students are not allowed to reproduce, distribute, or publicly post my course materials without my express written permission. In particular, marketing, selling or re-posting of any of these documents on any website is strictly forbidden - it constitutes academic misconduct, is a violation of the Georgia Tech Student Code of Conduct, and it is a copyright violation. If I discover such illicit postings of my intellectual property, I will report these violations to the Office of Legal Affairs and to the Dean of Students.

Academic Integrity

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. Review Georgia Tech's Honor Code and the student Code of Conduct.

Any student suspected of cheating or plagiarism on a Homework or Exam will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services (404-894-2563) as soon as possible to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible if we need to set up a time to discuss your learning needs.

Student-Faculty Expectations Agreement

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. The Student-Faculty Expectations articulate some basic expectations that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.

Collaboration, Group Work, and Use of Generative AI

Discussing the Homework assignments with your peers will help you to develop a deeper understanding of the material. I encourage you to discuss how to approach the problem, which MATLAB functions to use, or how to interpret the results. I also recognize that in some circumstances the ethical, responsible use of artificial intelligence (AI) tools can support and enhance your learning and use of such tools is permitted to enhance rather than replace your learning. I expect each student to turn in a report and MATLAB code that reflect the student's *individual work*. You should not copy code from another student, from electronic documents, or artificial intelligence (AI) tools. To avoid any confusion, each Homework submission should explicitly identify the students and/or AI tools with which you collaborated and what the extent of the collaboration was. Upon my request, you should also be able to demonstrate understanding of the content of any work submitted.

Campus Resources for Students

Undergraduate Student Academic Success Resources:

A list of resources for undergraduate students' academic success and information about advising can be found at Success at Tech.

Academic Success and Advising (a unit in the Office of Undergraduate Education & Student Success) provides free support for your courses. Students can attend scheduled supplemental review (PLUS) sessions, stop by Drop-In Tutoring, or schedule a one-on-one appointment through Knack. To explore what options work best for you, please visit us online at success.gatech.edu/tutoring, email us at tutoring@gatech.edu, or come see us at Clough Undergraduate Learning Commons, Suite 283.

Student Well-Being:

At Georgia Tech, we are concerned about your overall physical, social, and mental well-being. A comprehensive list of wellness related resources has been compiled and maintained by the Office of the Vice President for Student Engagement and Well-being (student-resource-guide).

Mental Health and Wellness:

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, depression, difficulty concentrating, and/or lack of motivation. These stressful events may compromise mental health and can lead to diminished academic performance and reduce your ability to participate in daily activities. GT offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know is experiencing any of the issues noted above, consider contacting the Center for Mental Health Care & Resources to ask about mental health and well-being services available on campus. Services at the CMHCR are confidential. You may call or walk in to schedule an appointment using the following information:

To schedule an appointment, call (404) 894-2575 or visit us at the Smithgall Student Services (Flag) Building, Suite 238 Mon - Fri 8 a.m.-5 p.m. After hours (nights & weekends), call (404) 894-2575 and select the option to speak to an after-hours counselor. For more information, visit our website, https://mentalhealth.gatech.edu/.