ME 2016: Computing Techniques
Summer 2026

Class **12:30 pm - 2:40 pm** **Monday/Wednesday** **MRDC 2404 / Online**

Course Objectives

- To learn numerical analysis techniques for solving engineering problems
- To learn how to implement various numerical methods in MATLAB
- To understand modeling and simulation methods
- To develop good programming practices

Web Page / Online Participation

- Course materials, homework assignments, etc., will be posted to Canvas
- The Zoom link to join the course remotely is provided at the top of the Canvas Media Gallery (lecture recordings will be stored in the same location)

Textbook

Numerical Methods for Engineers (8th edition) by Steven C. Chapra and Raymond P. Canale, McGraw-Hill, 2021

Pre/Co-requisites

Calculus, Linear Algebra, Ordinary Differential Equations (co-req), Algorithm Development, Familiarity with MATLAB.
CS1371 or equivalent must be completed before starting this course!

Topics

Modeling and computational methods in mechanical engineering
Introduction to MATLAB environment and programming
Numerical error analysis
Root finding
Curve fitting using regression methods
Polynomial interpolation
Numerical integration
Ordinary differential equations
Optimization

Software

MATLAB version 2021 (or newer). Can be downloaded from Georgia Tech's MATLAB portal or accessed through VLab (see matlab.gatech.edu for instructions).

Instructor

Dr. Vanessa Smet
GTMI 340
Phone: 404-290-9303
vanessa.smet@me.gatech.edu
Office Hours: Wed, 5pm (online only); or by appointment
Office Hours Location: Teams link to be provided

Graduate Teaching Assistant

Christian Molina-Mangual, cmolinam3@gatech.edu
Ramón Sosa, rsosa6@gatech.edu
TA Teams Office Hours (also by appointment): TBD

Grading

Homework:	50%
Mid-Term Exam:	25%
Final Exam:	25%

Grading Scale

90 – 100	A
80 – 89	B
70 – 79	C
60 – 69	D
0 – 59	F

Attendance Policy

Class attendance will not be taken. However, active class participation (in person or online) is strongly encouraged and will foster your learning. If you do miss class, it is your responsibility to watch the recorded lecture and to make sure that you have access to all handouts (digital) and are aware of all announcements made in class.

Accommodations for Students with Disabilities

If you wish to request accommodation due to a documented disability, please inform your instructor and contact Disability Services as soon as possible. They can be reached at dsinfo@gatech.edu, http://disabilityservices.gatech.edu/, or 404-894-2563 (voice)/ 404-894-1664 (TDD).

Getting help (outside of the classroom)

- Your first avenue for getting help should be instructor and/or GTA office hours. This is the most efficient way to get your questions answered.
- If your schedule does not permit the 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 GTA 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 GTA 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 might be a Shell tutor available for our course. This tutor will not be familiar with your specific assignments but is a good resource for general questions about numerical methods and MATLAB programming. Please check if a Shell tutor is available this semester and find the associated schedule/location here: https://www.me.gatech.edu/tutoring-0

Course materials and announcements

- All course materials and most MATLAB files used in class will be posted to the course canvas site shortly after the lecture.
- 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. It is highly recommended to set your Canvas Announcement preferences to “NOTIFY ME RIGHT AWAY” to get notified by e-mail.
- Woodruff School faculty own the copyright to all course materials created for ME 2016. This includes (but is not limited to) notes, assignments, exams, and the solutions to these assignments and exams. Any such material provided to you in any form, including those posted on Canvas, is for the exclusive use of students enrolled in the course. Students are not allowed to reproduce, distribute, or publicly post course materials without express written permission from the Woodruff School faculty. In particular, marketing, selling or reposting 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 (see section D92), and it is a copyright violation. If such illicit postings of intellectual property are discovered, these violations will be reported to the Office of Legal Affairs and to the Dean of Students.

Exam Submission Policy

- Exams will be administered online via the Assignments module in Canvas.
- Exams will become available at the beginning of the regularly scheduled lecture (or the final exam time slot) and will remain open for submission for the next 24 hours.
- Students enrolled in the in-person section should not come to the classroom on the exam days
- The completed exam should be submitted in Canvas as a PDF file. Feel free to use a scanner or one of the smartphone image-to-PDF apps (CamScanner, Office Lens, etc.). Make sure to show ALL your work if you want your submission to be considered for partial credit.

- It is the responsibility of the students to check their submissions in Canvas and to confirm that all files were successfully submitted and that all documents will open correctly once downloaded for grading.
- **The exam is to be completed individually, with no collaboration of any kind.**

Homework Submission Policy

- All Homework assignments will be posted on the course Canvas site.
- An electronic copy of the homework is to be turned in to Canvas by the due time on the due date.
- Your submission should include a PDF report containing all hand calculations, results, and discussion, as well as any Matlab files used to generate the results.
- For submissions with multiple files, all files should be in a folder titled "HW***n***_FamilyName_FirstName.zip" (replace ***n*** by the number of the homework assignment; FamilyName and FirstName are YOUR names). For submissions with just one file, use the same naming convention, but there is no need to zip the file.
- It is the responsibility of the students to check their submissions in Canvas and to confirm that all files were successfully submitted and that all documents will open correctly once downloaded for grading.
- Assignments are due by the deadline designated for that activity unless otherwise stipulated. Late assignments without a justified and documented excuse will be accepted with the following grade penalty:
    - Up to 24 hours late - 25% penalty
    - Up to 48 hours late - 50% penalty
    - More than 48 hours late - no credit given
- For justified and documented excuses, a new due date must be negotiated with the course instructor immediately.
- 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) will be available in Canvas (you are not required to use these templates, but you should meet the professionalism requirements in all submissions).
- No make-up homeworks will be given, but your lowest homework grade will be dropped (not counted toward the final grade).
- Collaboration is encouraged. Discussing the assignments with your peers will help you to develop a deeper understanding of the material. You are encouraged to discuss how to approach the problem, which MATLAB functions to use, or how to interpret the results. However, it is expected that each student will turn in a report and MATLAB code that reflects the student's individual work. Do not copy code from another student, from electronic documents, or from online robots. To avoid any confusion, each homework solution should explicitly identify the students with whom you collaborated, what the extent of the collaboration was, and any online resources used. Any copying on homework will have severe consequences and will be reported to the Dean of Students.

Academic Dishonesty

Students are expected to do their own work on all course assignments including quizzes, exams, etc. except when otherwise assigned by the instructor. Do not allow anyone to copy any portion of your homework, exams, quizzes (if applicable), or any computer files you create for this class as a part of any assignment or required project during this course or any time in the future semesters after having

taken this course. The Georgia Tech Academic Honor Code (http://www.catalog.gatech.edu/policies/honor-code/) will be used as the standard for this class. Any student suspected of cheating or plagiarizing on a quiz, exam, or assignment will be reported to the Office of Student Integrity, which will investigate the incident and identify the appropriate penalty for violations.

Grading

- Homework and Exams scores will be posted on Canvas roughly one week after submission.
- Re-grade Requests: All re-grade requests or grade protests must be submitted in writing with an explanation of why the grade should be adjusted within one week of receiving the grade. Please provide an explanation for why the assigned scores are incorrect. The entire assignment may be re-graded. Each area of protest must be explained for consideration.

Midterm Evaluation

In accordance with Georgia Tech policy for 1000- and 2000-level courses, midterm grades (Satisfactory/Unsatisfactory) will be issued to the Registrar.

Extra Credit

There will be announced opportunities to earn extra credit. The extra credit opportunities will be announced along with the maximum extra credit to be received, the due date, and the grading category it will apply to. The maximum grade in any category with extra credit cannot exceed 100%.

Mental Health and Wellness

As a student you may experience a range of issues that can cause barriers to learning, such as the current pandemic, strained relationships, increased anxiety, alcohol/drug problems, depression, difficulty concentrating, and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or 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 using the confidential mental health services available on campus:

- GT CARE (www.care.gatech.edu, 404-894-3498)
- Counseling Center (www.counseling.gatech.edu, 404-894-2575)
- Consultation may be available with Satellite Counselor in Woodruff School Student Services Office (MRDC 3111, Shiraz Karaa, shiraz.karaa@studentlife.gatech.edu). Students may email Shiraz to request a virtual appointment or drop-in for a consultation that lasts about 15 minutes during these hours:

  Tuesdays: 12 pm – 1 pm

  Thursdays: 11 am – 12 pm

Face Covering Policy

The following statement was issued by the Georgia Tech Coronavirus Task Force: “We encourage everyone in the Georgia Tech community to follow the Centers for Disease Control and Prevention's (CDC) recommendations, vaccinate, and wear a mask in campus buildings.”

Student Illness or Exposure to Covid-19

If you test positive for Covid-19, begin to have symptoms of Covid-19, or are not up to date with your Covid-19 vaccinations and are exposed to someone with Covid-19, you must take immediate action for your own health and for the safety of others. To help limit the transmission of the Covid-19 virus, visit the Isolation and Quarantine Guidelines page for guidance on isolation and quarantine protocols including duration and masking recommendations.

Changes

When appropriate or necessary, the instructor may adjust, amend, or otherwise modify the information presented in the syllabus. Changes will be made in a manner to minimize disruption and in the interest of fostering learning. Every effort will be made to ensure that all changes are brought to the attention of students – so as to minimize inconvenience.

CLASS SCHEDULE: (tentative)

Week	Date	Topic**
1	**Modeling, computers, and error analysis (Part 1)**	
	5/18	**L1:** Course overview; Intro to numerical methods (Ch.1)
	5/18	**L2:** MATLAB Review (Ch. 1-2 & MATLAB Help Center)
	5/20	**L3:** Computer representation of numbers; floating point representation; roundoff error (Ch. 3)
2	5/27	**L4:** Taylor series, truncation error (Ch. 4)
3	**Roots of equations (Part 2)**	
	6/01	**Institute Holiday, Memorial Day – No Lecture**
	6/03	**L5:** Bracketing methods (Bisection, False-Position) (Ch. 5)
4	6/08	**L6:** Open methods (Fixed-point theory, Newton-Raphson, Secant) (Ch. 6)
	Curve fitting (Part 5)	
	6/10	**L7:** Linear least-squares regression (straight line, general) (Ch. 17)
5	6/15	**L8:** Polynomial interpolation (Newton, Lagrange) (Ch. 18)
	6/17	**L9:** Spline Interpolation (ch. 18)
6	**Numerical integration (Part 6)**	
	6/22	**L10:** Newton-Cotes Integration (Trapezoidal, Simpson's) (Ch. 21)
	6/24	**L11:** Integration of Equations (Ch. 22)
7	6/29	**L12:** Review
	7/01	**Midterm Exam**
8	**Ordinary Differential Equations (Part 7)**	
	7/06	**L13:** Initial Value Problems - Euler and Heun Methods (Ch. 25)
	7/08	**L14:** Initial Value Problems - Runge-Kutta Methods (Ch. 25, 26.1)

9	7/13	**L15:** Boundary Value Problems – shooting methods (Ch. 27)
	7/15	**L16:** Boundary Value Problems – finite difference method (Ch. 27)
10	**Optimization (Part 4)**	
	7/20	**L17:** Unconstrained optimization (Ch.13, 14)
	7/22	**L18:** Constrained optimization; Matlab built-in functions
11	7/27	**L19:** Final Instructional Day - Review
	TBD	**Final Exam:** July 30 11:20 AM - 2:10 PM

***All dates, topics, and deadlines are subject to change by the instructor.*