

## ME 2016 Syllabus

Computing Techniques, Section B, and Credits 3.0

Fall 2026

### Instructor Information

---

**Instructor: Ferdous Alam**

**Email: [ferdous@gatech.edu](mailto:ferdous@gatech.edu)**

### General Course Information

---

#### Description

An introduction to numerical methods for the solution of mechanical engineering problems. Topics of interest include: Introduction to mathematical modeling and the numerical solution of engineering problems, Numerical errors: Computer representation of real numbers. Accuracy, precision, and round-off error, Taylor series and truncation error. Root finding: Bisection and Newton-Raphson methods. Convergence. Curve fitting: Least-squares regression, polynomial interpolation, piecewise cubic splines. Numerical integration: Trapezoidal rule and Simpson's 1/3 rule. Order of convergence. Ordinary differential equations: Euler's method, Runge-Kutta methods (second and fourth order). Order of convergence. Initial value problems. Boundary value problems. Applications of numerical methods to engineering problems using programming languages. Additional topics may be covered including introduction to optimization algorithms, introduction to scientific computing etc.

#### Course Learning Outcomes

*Outcome 1:* The student will develop a working knowledge of several numerical methods and their analytical basis.

- 1.1 The student will demonstrate a basic understanding of several numerical methods.
- 1.2 The student will demonstrate an ability to use a Taylor series to approximate functions, derivatives, and integrals, and to determine the order of the truncation error.

1.3 The student will demonstrate an understanding of finite-precision arithmetic, round-off error, and relative and absolute errors.

*Outcome 2:* The student will gain experience in applying numerical methods to practical engineering problems.

2.1 The student will demonstrate the ability to translate a numerical algorithm into an efficient code e.g. MATLAB/Python program.

2.2 The student will demonstrate the ability to work with simple mathematical models of engineering problems.

2.3 The student will demonstrate an ability to communicate computational results in printed and graphical form using programming languages (e.g. Python/Matlab) and to incorporate those results into written reports.

### **Required Course Materials**

Textbook: Numerical Methods for Engineers (7th edition) by Steven C. Chapra and Raymond P. Canale, McGraw-Hill, 2010. [8th edition is also fine

*Software: Python. If you prefer you can use MATLAB (Can be downloaded from Georgia Tech's MATLAB portal: <https://www.matlab.gatech.edu/> or accessed through VLab)*

### **Grading Policy:**

Distribution	
Component	Weight
Homework	50%
Midterm 1	12.5%
Midterm 2	12.5%
Final Exam	25%
Total	100%

### **Final letter grades:**

A: 90% <= Final grade

B: 80% <= Final grade < 90%

C: 70% <= Final grade < 80%

D: 60% <= Final grade < 70%

F: Final grade < 60%

## **Description of Graded Components**

### ***Homework:***

Submission: An electronic copy of the homework is to be turned into Canvas by 11:59 PM on the date it is due. Your submission should include a report containing all hand calculations, results, and discussion, as well as any code files (e.g. Python/MATLAB) used to generate the results. For submissions with multiple files, all files should be in a folder titled "HWn\_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.

Professionalism: Up to 20% of each homework grade will be based on professional formatting. Specific professionalism requirements will be specified in the homework handout. You should be professional in both writing your code and mathematical solutions. As a computing class, we must value good code-writing practices. I will demonstrate many of these policies as we go along with the course. In general, you should 1) make sure your code functions properly and produces the desired output, 2) follow good variable naming practices, 3) add sufficient comments to make your code readable, 4) make your code clean, and 5) make your code reasonably efficient. In your mathematical solutions, please write your problem formulation clearly with necessary details, and then clearly show step by step solution process for full points.

### ***Exam:***

There will be 2 Midterm Exams and 1 Final Exam. All exams will be closed books and closed notes. Use of one (2-sided) sheet of formulae (8.5" x 11") is permitted for each Midterm Exam. Use of two (2-sided) sheets of formulae (8.5" x 11") is permitted for the Final 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 of the emergency (e.g., illness, accident) to the Dean of Students.

### ***Grading:***

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

## 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 date due to official GT activities (e.g., athletics, band) 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.

### **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 quiz, exam, or assignment 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 in order 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.

### **Pre- &/or Co-Requisites**

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

### **Collaboration, Group Work, and Use of Generative AI**

Collaboration is encouraged. Discussing the 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, but I do expect each student to turn in a report and MATLAB code that reflect the student's individual work. Do not copy code from another student, from electronic documents, or 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 be reported to the Dean of Students. GenAI should not be used to write your code or homework. Having said that, there may be part of homework that specifically tells you to use GenAI for learning purposes and understanding their capabilities and limitations for engineering applications.

### **Extensions, Late Assignments, & Re-Scheduled/Missed Exams**

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), where days round up (i.e., if you submit even 1 minute late, you will lose the full 20% for a 1-day late submission). Submissions received beyond 3 days of the due date will receive a 0. No make-up homework will be given, but your lowest homework grade will not be counted toward your final grade.

### **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 \(gatech.edu\)](#)). 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 the website, <https://mentalhealth.gatech.edu/>