ME 2060 - MEMS1060 Numerical Methods
University of Pittsburgh
Spring 2025

Description: Introduction to numerical techniques for the solution of linear and non-linear equations, numerical integration and differentiation, interpolation, ordinary and partial differential equations, and eigenvalue problems.

Prerequisite: Experience with computer programming with one of the major languages (e.g. Matlab, Python, Julia, C/C++, Java or Fortran), linear algebra, differential equations.

Instructor:

Prof. Inanc Senocak
Office: BEH 1105
e-mail: senocak@pitt.edu

Class Time: Wednesdays 10:00am–12:30pm
Location: 318 Benedum Hall

Office hours
Friday: 10:30am–12pm

Send an email to the instructor before noon on the day of the virtual office hours if you plan to attend it. Office hours for that day will be cancelled if no student informs the instructor of their plan to attend.

Zoom links to join the office hours will be available through Canvas

Textbooks:

Fundamentals of Numerical Computation (Julia Edition) by Tobin A. Driscoll and Richard J. Braun. SIAM Textbooks

https://my.siam.org/Store/Product/viewproduct/?ProductId=41831895

Learning Objectives: Derive and solve numerical problems in natural science and engineering. This includes:

1. From a given set of laws in physics or engineering, write down the governing equations in appropriate forms that can be solved numerically.

2. Be familiar with different numerical methods that are used to solve mathematical problems arising in science and engineering, including but not limited to solving linear and nonlinear

system of equations, solving eigenvalue problems, curve fitting and interpolation, numerical differentiation, and integration, and solving ordinary differential equations.

3. Understand the consistency accuracy, and stability of common numerical methods, being able to analyze a given scheme and be aware of its requirements and limitations.

4. To provide the foundation for graduate research in science and engineering that require numerical modeling and computations and understand connections to other graduate course.

Unix & Linux

https://ryanstutorials.net/linuxtutorial/
https://www.linux.org/forums/#linux-tutorials.122
https://www.tutorialspoint.com/unix/index.htm
http://www.ee.surrey.ac.uk/Teaching/Unix/

Grading Policy:

		Weight
In-class participation	Requires programming during a timed session.	10%
Midterm exam	In class written exam (March 19th)	20%
Projects	One midterm, one final project	40%
Assignments	6 homework assignments	30%

The following grading scale will be adopted:

Letter Grade	Percentage	Quality Points
A+	**97+**	**4.0**
A	**90-97**	**4.0**
A-	**89-87**	**3.75**
B+	**86-83**	**3.25**
B	**82-80**	**3.0**
B-	**79-77**	**2.75**
C+	**76-74**	**2.25**
C	**73-70**	**2.0**
D	**69-58**	**1.0**
F	**57-**	**0.0**

Project and Homework policy:

NOTE: *The instructor reserves the right to revise this syllabus during the semester*

The instructor will share a OneDrive folder with each student. Student can only upload their work. Instructor will receive automatic emails when the work is uploaded. Students are required to follow the subscription instructions per each assignment.

The written report, if required, must be developed electronically. No handwritten work will be accepted. All figures, charts, and tables must be of publication quality. Students are required to follow technical writing standards adopted in professional journals using the MS Word or the LaTex typesetting system. A LaTex template will be available for you to adopt.

10% grade reduction per day will be applied to late assignments.

Topics (the order might change based on the progress of the class)

Interpolation
Integration & Differentiation
Linear System of Equations
Data Fitting & Regression
Matrix Analysis
    Eigenvalues
    Singular Value Decomposition (SVD)
Initial Value Problems
Solution of Nonlinear Equations
Boundary Value Problems (if time permits)

Make-up Policy

You are eligible for a make-up test if you miss a scheduled test because of a death in the immediate family, serious illness or military service, *Students are responsible to inform the instructor of their excused absence as soon as possible and your excused absence must be officially verified and documented in writing to the instructor.* Make-up tests cannot be given to accommodate travel plans, job interviews, weddings etc. If your excuse is acceptable, then you will be given a programming assignment for each test you have missed.

Academic Integrity

All students are expected to adhere to the standards of professional conduct and academic honesty. Any student engaged in cheating, plagiarism, or other acts of academic dishonesty would be subject to disciplinary action. Any student suspected of violating this obligation for any reason during the semester will be required to participate in the procedural process, initiated at the instructor level, as outlined in the SSOE Academic Integrity Policy found at: https://www.engineering.pitt.edu/Academic-Integrity-Guidelines/

To learn more about Academic Integrity, visit the Academic Integrity Guide for an overview of the topic. For hands- on practice, complete the Understanding and Avoiding Plagiarism tutorial.

NOTE: *The instructor reserves the right to revise this syllabus during the semester*

You are allowed to interact with your classmates on projects and homework assignments, but you must develop your own computer program. You cannot use code from external resources unless allowed by the instructor. Instructor may invite you to explain your code. Copying all or parts of someone else's code is considered a violation of academic integrity. A minimum sanction of a zero score for the assignment or the test will be enforced.

Disability Services

If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and Disability Resources and Services (DRS), 140 William Pitt Union, (412) 648-7890, drsrecep@pitt.edu, (412) 228-5347 as early as possible in the term. DRS will verify your disability and determine reasonable accommodations for this course.

Statement on Classroom Recording

To ensure the free and open discussion of ideas, students may not record classroom lectures, discussion and/or activities without the advance written permission of the instructor, and any such recording properly approved in advance can be used solely for the student's own private use.

Diversity and Inclusion

The University of Pittsburgh does not tolerate any form of discrimination, harassment, or retaliation based on disability, race, color, religion, national origin, ancestry, genetic information, marital status, familial status, sex, age, sexual orientation, veteran status or gender identity or other factors as stated in the University's Title IX policy. The University is committed to taking prompt action to end a hostile environment that interferes with the University's mission. For more information about policies, procedures, and practices, see: http://diversity.pitt.edu/affirmative-action/policies-procedures-and-practices. I ask that everyone in the class strive to help ensure that other members of this class can learn in a supportive and respectful environment.

If there are instances of the aforementioned issues, please contact the Title IX Coordinator, by calling 412-648-7860, or e-mailing titleixcoordinator@pitt.edu Reports can also be filed online: https://www.diversity.pitt.edu/make-report/report-form. You may also choose to report this to a faculty/staff member; they are required to communicate this to the University's Office of Diversity and Inclusion. If you wish to maintain complete confidentiality, you may also contact the University Counseling Center (412-648-7930).

Student Opinion of Teaching Surveys

Students in this class will be asked to complete a Student Opinion of Teaching Survey. Surveys will be sent via Pitt email and appear on your CourseWeb landing page during the last three

weeks of class meeting days. Your responses are anonymous. Please take time to respond thoughtfully, your feedback is important to the instructor.

Religious Observance

The observance of religious holidays (activities observed by a religious group of which a student is a member) and cultural practices are an important reflection of diversity. As your instructor, I am committed to providing equivalent educational opportunities to students of all belief systems. At the beginning of the semester, you should review the course requirements to identify foreseeable conflicts with assignments, exams, or other required attendance. If at all possible, please contact me within the first two weeks of the semester to allow time for us to discuss and make fair and reasonable adjustments to the schedule and/or tasks.

NOTE: *The instructor reserves the right to revise this syllabus during the semester*