EAS 501 Course Syllabus
Introduction to Numerical Mathematics for Data Scientists
Spring 2024

Instructors

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Course Description

- To develop the ability to formulate and solve problems using mathematical methods and tools.
- To apply knowledge gained in lower level mathematics courses.
- To introduce concepts and methods of linear algebra.
- To introduce a broad range of numerical methods.
- To develop the ability to identify, understand, and solve algebraic equations.
- To develop the ability to identify, understand, and solve probability and statistics problems.
- To develop experience with numerical and symbolic mathematical software and their use in problem solving.
- To gain experience with MATLAB, python, and Git/Github.

Prerequisites Calculus, Familiarity with programming

Communication with Instructional Team:

In addition to in-person meetings, two methods of electronic communication are available to students:

- Email: The subject line of all emails to anyone on the instructional team *must* begin with `[EAS501 S24]` followed by description of the topic (e.g. `[EAS501 S24] Question Regarding HW 2` is a valid subject line, `[EAS501 S24]` or `Question Regarding HW 2` are not valid subject lines). Any emails which do not contain a properly formatted subject line may not be answered. You do *not* need to change the subject line when responding to an email sent to you from an instructor.
- Discord: The official EAS 501 Discord server will be announced at the beginning of the semester. When joining the server please select EAS 501 (the orange diamond) in #role-selection to have the proper role assigned.

  This is a moderated server. Any inappropriate behavior could result in a deduction of points from your overall grade.

Textbooks & Other Course Materials There are two suggested texts:

- G. Strang, Introduction to Linear Algebra, 5th ed., Wellesley-Cambridge Press, 2016.
- L. N. Trefethen, D. Bau, Numerical Linear Algebra, SIAM, 2017.

All required material will be presented via lecture notes, but these two texts will be useful references.

You may find the following other references useful, but they will not be used in the course and you are not required to purchase them.

- L. V. Fausett, Applied Numerical Analysis Using MATLAB, 2nd Ed., Prentice Hall, 2008.
- S. C. Chapra, Applied Numerical Methods with Matlab for Engineers & Scientists, 4rd Ed., McGraw-Hill, 2018.
- S. S. Rao, Applied Numerical Methods for Engineers and Scientists, Prentice Hall, 2002.
- H. Moore, MATLAB for Engineers, 4th Ed., Pearson, 2015. This book is recommended to enhance your MATLAB programming skills.
- S. J. Chapman, Essentials of MATLAB Programming, Cengage Learning, 2009.
- W. H. Press, S. A. Teukolsky, W. T. Vetterling, B. P. Flannery, Numerical Recipes: The Art of Scientific Computing, Cambridge University Press, 2007.

Lecture Notes Individual instructors may, at their discretion, share lecture notes from class. Any distribution lecture notes may stop if class attendance drops over the semester.

Homework Homework problems will be made available during the course of the semester, as appropriate. These will usually cover conceptual concepts provided in lecture. Most questions will allow for multiple submissions.

A piece of advice about homework: Homework is an opportunity for you to practice your skills before exams. It is not enough to simply get an answer, upload it, and get a score. *Almost no student will do well on the exams doing this.* It is recommended that after solutions for all of the homework is posted that you review the solutions and compare to what you have done.

Programming Problems There will be a number of MATLAB/Python programming problems students must complete during the course of the semester. Unit tests will be provided for students to test their code against on a case-by-case basis. *All programming problems must be completed individually. The discussion of, providing assistance to, or receiving assistance from any person or electronic device or service other than the instructors or teaching assistants is a violation of the academic integrity policy.*

- MATLAB Programming Problems: MATLAB is available on all PCs in the SENS labs and is available through the "My Virtual Computing Lab" available to all students or can be downloaded via UBIT. MATLAB programming problems must be completed individually. All MATLAB programming problem submission files must obey the following naming convention:
  - `ubitname1_ppN.m`,

  where `ubitname1` is the UBIT name of the student and `N` is the programming problem number. For example, if a student with UBIT names of chenjm submitted work for programing problem 4 they would submit a file called `chenjm_pp4.m`. **You must follow this naming convention, including the case of the file.**

  Most programming problems will be graded using the following rubric:
  - 0.5 Point: Code runs.
  - 0.5 Point: Code does not produce extraneous output – Only if code runs to completion.
  - 0.5 Points: Code has appropriate comments.
  - 0.5 Points: Code has proper formatting.
  - 2 Points: Code produces correct result – Only if code runs to completion.

  If the file name is incorrect, there is an infinite loop (e.g. the function never finishes), or if it is clear that the student did not make a valid attempt at a solution, zero points will be awarded. Unless explicitly told otherwise you are *not* allowed to use built-in MATLAB functions or calls which accomplish or replicate the homework question. Any submission which uses non-allowable function calls will be awarded zero points.

  Simple programing problems may be worth a total of two points:
  - 0.25 Points: Code runs.
  - 0.25 Points: Code does not produce extraneous output – Only if code runs to completion.
  - 0.25 Points: Code has appropriate comments
  - 0.25 Points: Code has proper formatting.
  - 1 Points: Code produces correct result – Only if code runs to completion.
- Python Programming Problems: All Python programming problems will utilize GitHub Classroom. A link for each problem will be provided to students, which will clone the template repository in your GitHub account. Each Python programming problem will specify the file name. Python programming problems will be auto-graded when changes are pushed to your repository. Each Python problem will be awarded three points if

it passes the automated unit test. Any good-faith submissions that do not pass the automated unit test will be awarded one point.

Only submissions which demonstrate a good-faith effort will be awarded points. Those submissions which do not, such as only including comments, will earn zero points. Any submission where it is clear that student did not attempt to run their code before submitting will also earn zero points. Points may be deducted at the discretion of the instructors.

Exams There will be two exams during the semester. These exams will consist of two parts:

1. An in-person component.
2. A take-home portion that must be uploaded to Brightspace by a certain time. Any submissions with incorrect file names, a function that has an infinite loop (e.g. the function never finishes), or if it is clear that the student did not make a valid attempt at a solution or did not attempt to run their submission will be awarded zero points.

If you are not able to make an exam you must make **prior** arrangements. The rescheduling of an exam is up to the discretion of the instructors.

The exams are scheduled for the following dates:

Exam #	**Date**
1	March 6, 2024
2	May 14, 2024

Questions about Homework/Programming Problems/Exam Points All questions regarding the grading of problems on homework, programming problems, or exams must be submitted (in order of preference) in-person, via email, or via Discord. At the instructor's discretion all requests made via email or Discord may be required to be presented during office hours. All questions must be submitted within one week of the material score being made available to the student. Any requests past this point will be honored at the instructor's discretion.

Grade Policy Grades will be based on points accumulated for each course component. At the discretion of the instructors students who are within 0.5% of a grade cutoff may be eligible for the next higher grade if all work has been submitted for the semester and there are no academic integrity violations by the student. Any student who requests such an increase to any instructor or TA will have a lower chance of having the increase being applied.

There is *no* extra credit work in this class. Any student who requests extra credit work may have points deducted from their final grade.

Course Requirement	**Percent of Final Grade**
Exam 1	30%
Exam 2	30%
Homework	20%
Programming Problems	20%

The actual weight of each component may be modified as necessary based on circumstances outside the control of the instructors, or if student behavior requires it.

Exact cutoffs for specific grades will depend on the level of difficulty of exams and assignments. These cutoffs will be determined once all work has been graded. However, the cutoffs will not exceed the following:

Percentage	**Final Grade**
93.3	A
90	A-
86.7	B+
83.3	B
80	B-
76.7	C+
73.3	C
70	C-
60	D
<60	F

In certain cases, students may be eligible to receive a temporary incomplete ("I") grade. Students may only be given an "I" grade if they have a passing average in course work that has been completed and establish well-defined parameters to complete course requirements. Prior to the end of the semester, students must initiate the request for an "I" grade and receive the instructor's approval.

Expectations of Students

- Students are expected to act in a professional manner. A student's grade may be reduced due to unprofessional or disruptive behavior.
- Homework assignments are due at the assigned date and time.
- At the discretion of the instructor, late submission of assignments may receive a grade of zero.
- Under no circumstances are students allowed to utilize online study tools including but not limited to Chegg, slader, online, printed, or written solution manuals, prior solutions, etc. Students who have been determined to use such resources will have appropriate sanctions placed upon them. Please read the Academic Integrity policy below.
- Makeup exams will be given in the following circumstances only:
  1. You contact the instructor prior to the exam, and
  2. You have a valid and documented reason to miss the exam. Serious illness or family emergency are acceptable reasons. Sleeping in, lack of preparation, ennui, grogginess, etc. are not acceptable excuses.
- The number one indicator of student performance is class attendance. Student who do *not* attend lecture have historically performed much worse than students who do attend lecture.

Accessibility Services and Special Needs If you have a disability and may require some type of instructional and/or examination accommodation, please inform your instructor early in the semester so that we can coordinate the accommodations you may need. If you have not already done so, please contact the Office of Accessibility Services (formerly the Office of Disability Services) University at Buffalo, 25 Capen Hall, Buffalo, NY 14260-1632; email:

stu-accessibility@buffalo.edu Phone: 716-645-2608 (voice); 716-645-2616 (TTY); Fax: 716-645-3116; and on the web at http://www.buffalo.edu/accessibility/. All information and documentation is confidential. The University at Buffalo and the School of Engineering and Applied Sciences are committed to ensuring equal opportunity for persons with special needs to participate in and benefit from all of its programs, services and activities.

Mental and Behavioral Health The personal safety and well-being of each and every student is vastly more important than any assignment or grade in a course. Students experiencing stress, depression, anxiety, fear, grief, relationship difficulties, eating problems, substance abuse, or other personal or social problems are strongly encouraged to contact the Student Life Counseling Services at 716-645-2720 for help. Counseling sessions are private, confidential, and free to all undergraduate and graduate students. In a crisis, contact the Erie County 24-hour crisis hotline at 716-834-3131 or text "GOT5" to 741-741. (Data usage while texting the Crisis Text Line is free and the number will not appear on a phone bill.)

Academic Integrity Academic integrity is a fundamental university value. Through the honest completion of academic work, students sustain the integrity of the university while facilitating the university's imperative for the transmission of knowledge and culture based upon the generation of new and innovative ideas. The UB graduate academic integrity policy is available at
https://www.buffalo.edu/grad/succeed/current-students/policy-library.html#academic-integrity.

The sharing or posting of material related to EAS 501, and requests for help or answers on any electronic tool, such as Chegg and Course Hero, is considered a violation of the academic integrity policy. Consequences of violating the academic integrity policy may range from zero points to expulsion from the university, depending on the seriousness of the violation.

Any use of generative AI (e.g., ChatGPT) is prohibited in this class and will be considered a violation of UB's academic integrity policy. If the use of generative AI is allowed for a specific assignment or programming problem it will be explicitly and clearly stated that it is allowed. Details of what resources are allowed will be provided for each assignment. If you are unsure if a resource or tool is allowable, be sure to ask.

All Academic Integrity violations will be reported to the Office of Academic Integrity. Multiple violations of the Academic Integrity policy will result in an escalation of the imposed sanction.

Follow good cyber-security practices. Do not provide physical or electronic access to your computer or accounts! If another student gains or is provided access to your computer or on-line account and they violate the Academic Integrity Policy, you will be held responsible!

By submitting work for a grade, students are accepting the academic integrity policy.