EAS 501 Course Syllabus
Introduction to Numerical Mathematics for Data Scientists
Spring 2021

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

Prerequisites Calculus

Email Communication The subject line of any email sent to the instructor or TA *must begin* with [EAS501_SP21] followed by a description of the email (e.g. *[EAS501_SP21] Question Regarding HW 2* is a valid subject line, *[EAS501_SP21]* 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.

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.

Presentation of Material During the first week of the course there will be multiple live sessions. During these sessions the syllabus, course presentation, schedule, etc will be discussed.

All material will be presented via modules with sub-topics, see the weekly schedule. Each topic will have three pieces of information:

1. A completed set of notes.
2. A scaffolded set of notes.
3. A video where the material is presented using the scaffolded set of notes.

In each of the videos the scaffolded set of notes are filled in as if it were a regular lecture, resulting in the completed set of notes.

It is the responsibility of each student to view the materials the week they are provided. As you view the videos the instructors suggest that you note anything which is not clear to you and attend the virtual office hours to have those doubts addressed.

Kritik In this course, there will be 5 to 7 activities using Kritik.io (https://www.kritik.io/), a peer-to-peer learning platform. It is an engaging and gamified web technology that helps you develop your higher-order-thinking skills according to Bloom's taxonomy of cognitive thinking.

When you participate in Kritik activities, you will receive 3 scores: "Creation" score, "Evaluation" score and "Participation" score. Together, these will add up to 10% of your final course mark. To understand what these scores are and how they are calculated, please read the section "how scoring works" on Kritik's help center here.

An email invitation will be sent to your UB email account that contains the link to register an account on Kritik online and enroll in the course. You MUST use your university email to sign up in order to access the course. If you did not receive any email yet, please contact Kritik using the live chat on kritik.io.

How to get help: If you have any questions about Kritik, please use the live chat in the app. Please do not contact your professor with any Kritik-related concerns, as they will need to ask us for assistance anyways. A human agent will respond promptly in a few minutes during business hours. You can also visit Kritik Help Center at https://intercom.help/Kritik/en/

collections/2347837-student-guide-to-kritik, which outlines an overview to get you up and running on the system.

Homework There will be between 11 and 13 homework assignments during the semester. Homework assignments will consist of both conceptual (2 pt) and programming (5 pt) problems.

Two point problems are typically conceptual questions. All two point problems will be graded according to the following scheme:

- 2 Points: Solution is complete and correct.
- 1 Points: Solution is incomplete or incorrect, but was using correct ideas and concepts.
- 0 Points: Using incorrect ideas and concepts.

Five point problems are MATLAB code questions. Unless explicitly told otherwise you are *not* allowed to use built-in MATLAB functions or calls which accomplish or replicate the homework question.

All five point problems will be graded according to the following scheme. If the function call is incorrect or there is an infinite loop (e.g. the function never finishes) zero points will be awarded. Otherwise all points are accumulated. For the first submission:

- 1 Point: Code runs.
- 1 Point: Code does not produce extraneous output.
- 1 Point: Code has proper comments and formatting.
- 2 Points: Code produces correct result.

At the discretion of the instructors, certain coding questions may have an opportunity for re-submission. In this case, any student who makes a good faith effort and submits code by the original deadline will have an opportunity to re-submit code after initial grading. You will be informed which specific problems are eligible for a re-grade. For the second submission:

- 1 Point: Code runs.
- 1 Point: Code does not produce extraneous output.
- 1 Point: Code has proper comments and formatting.
- 1 Points: Code produces correct result.

Example A: Student A makes a good-faith effort and submits code by the initial deadline. The code follows instructions but does not run and has no comments. Student A earns 1 pt for the initial submission. Student A then re-submits the code. On re-submission the code follows directions, runs, does not produce extraneous output, has proper comments and formatting, and returns the correct result. The student would then earn 4 (of the maximum 5) points for that problem.

Example B: Student B does not submit code by the initial deadline. That student is not allowed to re-submit code and earns 0 (of the maximum 5) points for that problem.

Example C: Student C submits a function with the correct call but the function is empty. That student is not allowed to re-submit code and earns 0 (of the maximum 5) points for that problem.

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

1. An online, UBlearns, portion that must be completed within a 12-hour window.
2. A take-home portion that must be uploaded by a certain time.

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

The exams are scheduled for the following dates:

Exam #	Date	Material Covered Through
1	03-25-21	Week 7
2	05-13-21	Week 14

The specific dates are subject to change but will always occur during the given week.

A Google Form will be made available for inquiries regarding exam scores. All inquires should be made within one week of exams being graded. Inquiries made after this time may be addressed at the instructor's discretion.

Grade Policy Grades will be based on points accumulated from the course requirements. The homework score used to determine the final grade will be the summation of all points a student accumulates divided by the total number of possible points for the entire semester.

Course Requirement	Percent of Final Grade
Exam 1	22.5%
Exam 2	22.5%
Kritik	10%
Homework Assignments	45%

Exact cutoffs for specific grades will depend on the level of difficulty of exams and assignments. These cutoffs will be determined once Exam 2 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.

Computing/MATLAB Most assignments will have a computing component. MATLAB will be used throughout the course. MATLAB is available on all PCs in the SENS labs and is available through the "My Virtual Computing Lab" available to all students.

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 will be assigned approximately weekly. 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.**
- Students are encouraged to discuss assignments and share ideas, but each student must independently write and submit their own solution.
- **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

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 This course will operate with a zero-tolerance policy regarding cheating and other forms of academic dishonesty. Any act of academic dishonesty will subject the student to penalty, including the high probability of failure of the course (i.e., assignment of a grade of "F"). It is expected that you will behave in an honorable and respectful way as you learn and share ideas. Therefore, recycled papers, work submitted to other courses, and major assistance in preparation of assignments without identifying and acknowledging such assistance are not acceptable. All work for this course must be original for this course. Please be familiar with the University and the School policies regarding plagiarism.

Academic integrity violations include, but are not limited to, the use of online study tools such as Chegg, the use of solution manuals of any kind, the use of prior posted solutions, the sharing of code and text. The following are sample sanctions for common academic integrity violations. This list is not all-inclusive. Sanctions for violations not listed here will be determined on a case-by-case basis.

1. The uploading of questions to any online study tool, such as Chegg, slader, etc: Automatic "F" in the course.
2. The viewing of question solutions: Zero on the entire homework or exam.
3. Sharing of any code/solution text or receiving code/solution text: Zero on the entire homework or exam for all parties involved.

Multiple violations will result in larger sanctions. Unless otherwise stated, *discussing* code and answers between students is permitted. All instances of academic integrity violations will be reported to the University.

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

Example 1: Student A has been positively identified as posting a homework question to Chegg. That student will earn an "F" in the course and be reported to the University.

Example 2: Students B and C are working on code for a homework together. Student B finished the code but Student C is stuck and does not know how to proceed. Student B let's Student C look (either in person or electronically) at their code, which Student C then uses to complete the problem. Both Student B and Student C will earn a zero on the entire homework and be reported to the University.

Example 3: Students D and E are working on code for a homework together. Student D finished the code but Student E is stuck and does not know how to proceed. Students D and E discuss the code *but do not view each other's code.* During this Student E learns what was done wrong and how to fix it. This is *not* a violation of academic integrity and thus no sanction will apply.

Example 4: Student F's computer is non-functional and student G allows student F access to their laptop to finish a homework. While doing so student F copies code that student G has already completed. Both students will earn a zero on the entire homework or exam and will be reported to the University.

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