

## MTH 461 Applied Linear Algebra Syllabus - Spring 2023

**Course Website:** [mth461.ubmath.info](http://mth461.ubmath.info).

Please refer to the course website for an up-to-date version of this syllabus and all course materials.

**Lectures:** Mon, Wed 12:00 - 1:20 PM Math Building 150.

**Instructor:** Bernard Badzioch

**E-mail:** [badzioch@buffalo.edu](mailto:badzioch@buffalo.edu)

**Office Hours:** TBD

**Prerequisites.** This course is a sequel of MTH 309 Introduction to Linear Algebra, and thus we will freely use the material that is covered in MTH 309: systems of linear equations, vectors and matrices, inner products and orthogonality, determinants, eigenvalues and eigenvectors etc. However, these topics will be reviewed briefly as needed. In addition, it will be assumed that you are familiar with reading and writing mathematical proofs to the extent that is covered in MTH 311.

**Learning outcomes.** The goal of this course is to introduce some more advanced topics in linear algebra and show how they are used in practical applications. Topics that will be discussed include:

- Linear and integer programming
- Elements of spectral graph theory
- Markov chains
- Principal Component Analysis
- Singular Value Decomposition and its applications
- Iterative computation of eigenvalues and eigenvectors
- Linear algebra over complex numbers
- Linear algebra over finite fields
- Polynomial interpolation and its applications

**Textbook.** There is no textbook for this course. Instead, the course will follow lecture notes that will be posted on the course website.

**Software.** This course - lectures and homework assignments - will often use computer-based calculations. We will be using the Anaconda distribution of Python 3.9. This is free software available for Mac, Linux, and Windows. Even if you have Python already installed on your computer you should install this distribution since it includes Jupyter notebook and some Python modules we will need. It will be convenient if you install the software on a laptop, if you have one, since then you will be able to bring it to class or office hours if needed.

**Grading:**

Homework: 75%

Weekly Digests: 25%

**Homework.** Homework problems will be assigned every other week. You can collaborate on homework problems, but you must write solutions entirely on your own. Copying solutions from other students or from any other sources is a violation of the UB academic integrity policy and may result in academic sanctions (reduction of the course grade, course failure etc.).

**Weekly digest.** Each week you will be asked to submit a short (a few sentences long) writeup on your study from the previous week. For example, you can write:

- what topics you have found interesting (or boring)
- what topics you have found difficult (or easy)
- how you feel about the course
- anything else you want to share.

You will be also asked to submit a question (or questions) that you would like to see discussed during a class meeting. Asking a question is a required part of this assignment.

You can receive up to 25% credit for these writeups. You can miss one such assignment without losing any credit, but your weekly digest credit will be lowered by 5% for each subsequent missed assignment (i.e. to 20% of the first reduction, 15% for the second etc.).

I may award extra credit to students who are especially active in the course. I may also offer some extra credit opportunities for giving short presentations on some topic etc.

**Exams.** There will be no exams in this course.

**Incomplete Grades:** See the UB Catalog for the UB Incomplete Grades Policy.

**Academic Integrity:** See the UB Catalog for the UB Academic Integrity Policy.

**Accessibility Resources:** If you need accommodations due to a physical or learning disability please contact the UB Accessibility Resources Office to get help with making appropriate arrangements.