

Autumn 2020

## AMATH 352: Applied Linear Algebra and Numerical Analysis

Location: Online

Instructor: Amin Rahman; Office: Remote; Email: [arahman2@uw.edu](mailto:arahman2@uw.edu)

TA: To Be Announced. Online Office hours: To Be Announced + by appointment

Website: <http://faculty.washington.edu/arahman2>

Prerequisites: MATH 126 or MATH 136.

Textbook: Applied Linear Algebra by Peter J. Olver and Chehrzad Shakiban (free e-book through UW libraries)

Syllabus:

Topics
Basic MATLAB programming
Basics of solving linear systems of equations (Gaussian elimination, pivoting strategies, QR factorization)
Basic linear algebra theory (linear transformations, consistent linear systems, least-squares problems, vector spaces, norms)
Eigenvalues and eigenvalue computation (power method, QR algorithm)
Applications to regular and nonlinear dynamics as time allows

**Course Grade:** Coding Projects (30%), Homeworks (20%), Midterm (20%), Final Exam (30%)

**Tentative Curve:** > 95%: 3.9 – 4.0, 90 – 95: 3.5 – 3.8, **87 – 89: 3.2 – 3.4**, 83 – 86: 2.9 – 3.1, 80 – 82: 2.5 – 2.8, **77 – 79: 2.2 – 2.4**, 73 – 76: 1.9 – 2.1, 70 – 72: 1.5 – 1.8, **67 – 69: 1.2 – 1.4**, 63 – 66: 0.9 – 1.1, 60 – 62: 0.7 – 0.8, < 60: 0.0

**Course Description:** Analysis and application of numerical methods and algorithms to problems in the applied sciences and engineering. Applied linear algebra, including eigenvalue problems. Emphasis on use of conceptual methods in engineering, mathematics, and science. Extensive use of MATLAB for programming and solution techniques.

**Learning Objectives:** In this course you will implement methods and tools from linear algebra. You will learn to:

- Understand and apply theorems from linear algebra
- Implement fundamental algorithms from linear algebra

Many students enjoy the dual nature of this course --- both theory (linear algebra) and computation (MATLAB). But with this luxury comes potential complications. It is possible to understand linear algebra but struggle with the MATLAB component of the course, and vice versa. So, it is imperative to make use of all resources that are available (instructor, TA, etc.).

**Coding Projects:** Five coding projects will be assigned throughout the quarter. These require the implementation of ideas from lecture.

Your code will be turned in via Scorelator (<https://carajillo.amath.washington.edu>).

Instructions are provided here:

[http://courses.washington.edu/am301/scorelator/Scorelator\\_Instructions.pdf](http://courses.washington.edu/am301/scorelator/Scorelator_Instructions.pdf).

A Youtube tutorial by Professor Nathan Kutz can be found here:

<https://www.youtube.com/watch?v=NTsRwPzBUZM&feature=youtu.be>.

Matlab can be downloaded here: <https://itconnect.uw.edu/wares/uware/matlab/#students>

A tutorial by Professor Tom Trogdon can be found here:

<http://faculty.washington.edu/trogdon/352/html/intro.html>

**Written Homework:** Weekly written homework will be assigned, which will be graded via Canvas.

Additional practice problems will be assigned. It is expected that you complete these problems in addition to those you turn in.

**Midterm Exam:** A “take home” style Midterm will be given half way through the term. You will be given three days to complete the exam. The Midterm will test you on the theory only; no coding will be expected. In certain special circumstances a makeup exam may be given after the student follows all university protocol.

**Final Exam:** A “take home” style Final will be given in the final week of the term. You will be given three days to complete the exam. The Final will test you on the theory only; no coding will be expected. In certain special circumstances a makeup exam may be given after the student follows all university protocol.

## University policies

1. **UW Student conduct policy:** <https://www.washington.edu/studentconduct/>
2. **Academic integrity:** <https://www.washington.edu/cssc/facultystaff/academic-misconduct/>
3. **Observance of religious holy day:** Washington state law requires that UW develop a policy for accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW’s policy, including more information about how to request an accommodation, is available at Faculty Syllabus Guidelines and Resources. Accommodations must be requested within the first two weeks of this course using the Religious Accommodations Request form available at: <https://registrar.washington.edu/students/religious-accommodations-request/>
4. **Disability resources:** <https://depts.washington.edu/uwdrs/>
5. **Safety:** <https://www.washington.edu/safecampus/>