University of Washington
AMATH 301: Beginning Scientific Computing
Winter 2019

Instructor: Benjamin Liu (benliu@uw.edu)
Teaching Assistants and Graders:

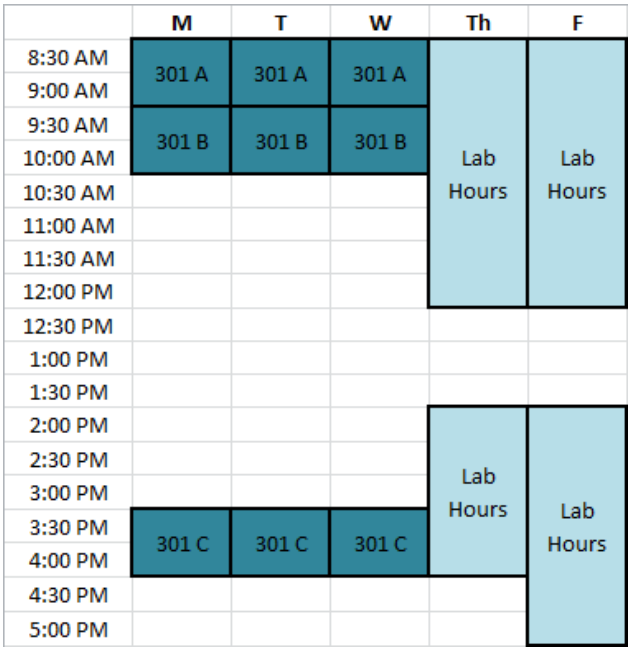
- Alanna Gary
- Curtiss Lyman
- Doris Voina
- Huasong Zhang,
- Jessica Nash
- Maple Tan

Class Location: Kane 110
Class Times:

- Section A: 8:30–9:20 MTW
- Section B: 9:30–10:20 MTW
- Section C: 3:30–4:20 MTW

Lab time / Office hours

- Thursday 8:30–12:30 and 2:00–4:30
- Friday 8:30–12:30 and 2:00–5:30
- Held in CMU, B027



Learning Objectives

By the end of this course, the successful student should be able to...

- **(Mathematical Methods)** Identify and recognize common mathematical problems and propose appropriate mathematical methods to solve them
- **(Numerical Analysis)** Explain strengths and weaknesses of mathematical algorithms and apply this knowledge when solving new problems
- **(Programming)** Write programs and code to solve mathematical problems and perform tasks using MATLAB and built-in MATLAB functions
- **(Interpretation and Presentation)** Interpret, format, and present results including visualizations of data

The above are general themes or course-level learning objectives that will appear throughout the course at every level. In addition, content-specific learning goals will be given each week. Some examples are:

- Create basic MATLAB scripts that define variables, perform computations, and save results to file (Week 1)
- Effectively search online to learn about MATLAB commands and how to use them (Week 1)
- Identify optimization problems that arise in application contexts (Week 5)
- Implement the gradient descent algorithm to solve minimization problems (Week 5)

Course Format

The course will be structured around a number of modules that each last for one to two weeks. Each module will have a different focus, but may build on previous content (e.g. loops, which are covered in the second week, will be used as a tool and appear in almost every other module).

Video lectures for AMATH 301 have been pre-recorded and will be made available for each module. Video lectures are assigned to be watched before class, in preparation for in-class activities. Refer to the Modules tab on Canvas to check which videos are required for each class.

Online quizzes are paired with each video lecture. The quizzes are designed to emphasize key points from the videos and ensure you have basic familiarity with the ideas they present. Refer to the Modules tab on Canvas to check which videos are required for each class.

In-class time will be a mixture of activities and discussion, as well as lecture and demonstrations. We will not duplicate or comprehensively introduce video lecture material. Additional *short* assignments may be assigned to prepare for in-class work.

Weekly homework is assigned on Friday and due the next Friday — except for the first homework, which is shorter and due on Friday of the first week. Homework assignments focus on writing programs and code to solve problems and generate results.

Lab time has been reserved for long stretches of times for the convenience of as many students as possible. Lab time is held in the Instructional Computing Lab (ICL), located in room B027 in the basement of the Communications building. The lab has 28 computers equipped with MATLAB, and you are welcome to bring your own laptop. During lab times the instructor and/or a TA will be available to answer questions and assist with homework. Lab hours are like office hours: attendance is completely optional, but is encouraged if you are struggling with any problems.

Midterm and final exams will test identification of mathematical problems, knowledge of mathematical methods, programming comprehension, interpretation of programs and data, and other concepts. Exams will focus less on writing programs than homework assignments due to time constraints.

Grading

Homework	65%	Midterm date	TBA (tentative February 13)
Quizzes and in-class participation	10%	Final date	March 19 (Section A)
Midterm Exam	10%		March 20 (Section B)
Final Exam	15%		March 21 (Section C)

Late work will not be accepted and make-up exams will not be given unless class is missed by an unavoidable cause (`http://www.washington.edu/admin/rules/policies/SGP/ScholRegCH112.html#1`). Proper documentation must be provided. If you are unable to meet a deadline due to an illness, emergency, or other extenuating circumstances, contact the instructor as early as possible so that we can determine whether the due date can be adjusted for you.

Homework

Homework assignments will generally have two types of problems: Scorelator problems and Writeup problems.

- Scorelator is an online system that runs your MATLAB script and compares its output to an answer key. I have compiled a separate guide for Scorelator that can be found on the Canvas page.
- Writeup problems require you to generate plots (using MATLAB) or give short written answers. Your answers to Writeup problems must be submitted through Canvas as PDF files.

MATLAB

We will use MATLAB extensively throughout the course. MATLAB is a programming language and environment that is used extensively in math, physics, engineering, and many other STEM fields. There are several ways to obtain MATLAB

- MathWorks student license: $99 (with toolboxes) or $49 (unbundled, with no toolboxes)

  `https://www.mathworks.com/academia/student_version.html`

- UWare student license: $35 for a one-year license with toolboxes. The license is *valid from July 1 through June 30* with a one month grace period.

  `https://itconnect.uw.edu/wares/uware/matlab/`

- 30 day free trial through MathWorks.

  `https://www.mathworks.com/campaigns/products/trials.html`

- The Mechanical Engineering department has several remote desktop servers with MATLAB.

  `https://www.me.washington.edu/computing/remotedesktop`

- The ICL computer lab that we have reserved during lab hours has MATLAB on all computers.

Notes:

This course does not require extra MATLAB toolboxes. Some instructors require use of extra toolboxes (optimization, curvefitting, and image processing toolboxes, and possibly others). To reduce the cost of purchasing MATLAB I have reworked the course content so that assignments do not depend on toolboxes (the $49 student version should work fine). If you use MATLAB in other courses or in research you will probably want to use some of these toolboxes.

This course does not have a required textbook, but you may consider the purchase of this software as a comparable investment and requirement.

It is each student's responsibility to manage their access to MATLAB. What this means is that if you choose to access MATLAB for free (by trial or using the mechanical engineering remote desktops) then it is your responsibility to figure out how to do so.

Academic Misconduct

All students are expected to abide by the University's Student Conduct Code (`http://www.washington.edu/cssc/for-students/student-code-of-conduct/`) including the avoidance of academic misconduct as defined in Student Governance Policy, Chapter 209 Section 7.C (`http://www.washington.edu/admin/rules/policies/SGP/SPCH209.html#7`). Any instances of academic misconduct will be reported.

Access and Accommodations

Your experience in this class is important to me. If you have established accommodations with Disability Resources for Students (DRS), please communicate your approved accommodations to me at your earliest convenience so that we can discuss your needs in this course.

If you have not yet established services through DRS, but have a temporary health condition or permanent disability that requires accommodations (conditions include but are not limited to: mental health, attention-related, learning, vision, hearing, physical or health impacts), you are welcome to contact DRS at 206-543-8924 or uwdrs@uw.edu or disability.uw.edu. DRS offers resources and coordinates reasonable accommodations for students with disabilities and/or temporary health conditions. Reasonable accommodations are established through an interactive process between you, your instructor(s) and DRS. It is the policy and practice of the University of Washington to create inclusive and accessible learning environments consistent with federal and state law.