University of Washington

AMATH 301

Beginning Scientific Computing

Autumn 2020

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Teaching Assistants:

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Course Description: Introduction to the use of computers to solve problems arising in the physical, biological, and engineering sciences. Application of mathematical judgment, programming architecture, and flow control in solving scientific problems. Introduction to MATLAB and Python routines for numerical programming, computation, and visualization. Prerequisite: either MATH 125, Q SCI 292, or MATH 135. Offered: AWSpS.

Content Learning Goals:

By the end of this course, students will learn 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/or python and built-in MATLAB functions or python modules
- **(Interpretation and Presentation)** interpret, format, and present results including visualizations of data

The above are general themes or course-level learning goals that will appear throughout the course. In addition, content-specific component skills will be given each week on the Syllabus page of Canvas. Some examples are:

- Create basic MATLAB and/or python scripts that define variables, perform computations, and save results to file (Week 1)
- Program loops to execute iterative tasks (Week 2)
- Explain the benefit of LU decomposition over Gaussian Elimination (Week 3)
- Implement Jacobi iteration to solve linear systems (Week 4)

Cognitive Learning Goals:

By the end of this course, students will learn to:

- collaborate productively with others
- identify and fix their mistakes
- view mathematical concepts from both an analytical and computational perspective

Affective Learning Goals:

By the end of this course, students will:

- increase their expectations for success in mathematics
- develop a growth mindset instead of a fixed mindset
- increase their confidence in their ability to learn a new programming language on their own
- increase their interest in mathematics and its applications
- increase their comfort level in asking and answering questions in class
- continue to grow their "mathematical maturity" which is, in part, the understanding of and recognition of the interconnected nature of mathematics

Textbook: There is no required textbook for this class, but if you want an additional resource I recommend Data-Driven Modeling & Scientific Computation: Methods for Complex Systems & Big Data by J. Nathan Kutz.

Course structure: This class will be entirely **asynchronous**. The material and the lectures will be the same across all sections. By the end of the week, I will expect every student to:

- watch 2-3 video lectures with a focus on coding and ask/upvote any questions you have;
- watch 2 video lectures with a focus on theory and ask/upvote any questions you have;
- complete 1 activity per week (optionally in a group of up to 3);
- turn in 1 homework and 1 written reflection; and
- watch 1 video with clarifying questions from the week answered.

The current plan (subject to change) is that I will be available all day (9:00am – 5:00pm Pacific Time) on Tuesdays to help people with the activity if questions arise. **It is not necessary that you interact with me this day or even complete the activity on Tuesday. But if you'd like to, I will be there.** For each video lecture, there will be a place for you to ask questions about confusing parts of the video. You can also upvote or downvote other people's questions. Every Friday I will make a video addressing the top (and as many as possible) questions from throughout the week. There may be some days where I am available to discuss these topics longer (live) after this video on Friday.

Web Page: https://canvas.uw.edu/courses/1317733
Check the canvas course page regularly. Homework assignments, quizzes, course announcements, video lectures, and grades will be posted there.

Communication: The main source of communication for this course will be Canvas.

- **Course Announcements:** I will regularly post course announcements with information about where I expect you to be in the course as well as upcoming due dates and scheduling changes. You are responsible for reading all of the announcements.
- **Piazza Discussion Board:** In this class, we will use Piazza as a discussion board. Piazza allows students to ask questions about homework, course structure, and any other clarifying questions. Piazza allows students to ask questions anonymously and for students to answer each other's questions. Due to the size of the course, **all questions that are not of a personal nature should be asked on Piazza. Questions about homework, due dates, etc. will not be answered by email.** You can access Piazza directly through Piazza.com or via Canvas. You should receive an email to activate your account during the first week of class. You are encouraged to answer each other's questions, but the instructor and TAs will also regularly answer questions on the discussion board. While discussions about the homework are encouraged on the discussion board, no solutions should be posted. If a post contains code that can be copied and used for a homework submission, the post will be deleted.
- **Email:** Email should be used to reach me if you have any questions or concerns that are personal and do not belong on the discussion board. When you send an email, please include your full name, section, and UW NetID.

Lab/office Hours: There will be designated times each week for you to ask the TAs questions about homework or anything else in the course. You are strongly encouraged to start your homework early and attend lab hours early in the week. There are about 400 students enrolled in this course. The lab hours will be less busy early in the week so you will get more personalized attention. There will be a system in place for reserving a place in line to get help from the TA. A video tutorial for how to attend the Zoom lab hours will be posted during the first week of class.

- **Location:** All lab/office hours will be held through Zoom.
- **Hours: TBD.** TAs will be available for at least 20 hours per week based on their own schedule. We will try to schedule these so that people outside of Washington state can attend office hours at a reasonable time for them. The times for the lab hours will be posted during the first week of class.

Grading: This year things are quite different from previous years. Usually, we have a midterm and a final, but that will not happen as usual this year. I will be administering a poll in the first week of the course to see how students would prefer to replace the midterm and final. Therefore, the following grade makeup is **subject to change.**

Homework	40%
In-class Activities and Surveys (graded for completion)	10%
Written reflections	10%
Midterm Exam / project	20%
Final Exam / project	20%

The grades for this course will not be curved. Your total score will be given as a percentage and then converted to a 4.0 scale by

90%	at least 3.5
80%	at least 2.5
70%	at least 1.5
60%	at least 0.7

Your GPA can be calculated for percentages in between those given above by linear interpolation. This grade scale may change, but it will only get better for you, it will not become harsher.

Exams: TBD by the students. There are three options for how this will work out:

1. An extended (difficult) homework for the midterm and final.
2. A project of some type, to be completed individually.
3. No midterm or final. Instead, all homework assignments will increase in length/difficulty slightly.

Homework: Homework assignments will be assigned weekly and typically due on Friday at 11:59pm PT. The assignments will be posted to Canvas. Homework assignments will typically consist of two types of problems - coding problems and write up problems. Both will be submitted online through Gradescope. Writeup problems will sometimes be graded statistically (e.g., 1 out of the 2 problems randomly chosen to be graded, the other graded for completion).

Late Work and Make Up Policy: I understand that this school year will be especially taxing for most, if not all, students in this course. For this reason, **the two lowest homework scores for each student will be dropped.** Note that this policy is to account for any illness, physical or mental, that students may be experiencing this quarter. **Please do not contact me asking for an extension on a homework if you have turned in every homework this quarter. This policy is to account for missed homework assignments.** If you are at risk of missing more than two homework assignments, please contact me directly and quickly so we can figure out how to accommodate you.

Academic Misconduct: All assignments in this class (except for the activities where you are permitted to work in groups) **must be completed individually.** All homework, code or written, must be your own work. Copying or submitting work that is identical to a classmate's work or online solution, in part or in whole, is academic misconduct. You may discuss ideas about *how* to approach a problem or *how* to overcome certain roadblocks, but **at no time should you share code, show another student your code, or provide specific detailed instructions to another student**. Violations of this policy include, but are not limited to:

- Working as a partner with another student on an assignment.
- Showing another student your solution to an assignment or looking at another student's solution, for any reason.
- Having another person walk you through an assignment, describe in detail how to solve it, or sit with you as you code. This includes current or former students, tutors, friends, paid consultants, online coding resources, or anyone else. Similarly, it is a violation if you walk a fellow student in this course through an assignment.
- Copying or sharing any amount of code (even just a few lines) from anywhere or any person other than resources posted or explicitly allowed by the instructor.
- Posting your homework solution (including code), in part or in whole, online to ask others for help. This includes public message boards, code repositories, forums, file sharing sites and services, or any other online system.

Under this policy, a student who gives inappropriate help is equally as responsible as one who receives it. Please contact the instructor if you are unsure whether a particular behavior is a violation of the policy.

This policy is enforced by running all submissions through sophisticated similarity detection software. Your solutions will be compared to the solutions of all current and former AMATH 301 students. Students who are found responsible for violating this policy will receive a zero on the assignment and will be reported to the appropriate Dean's representative through the web page for Community Standards and Student Conduct. This can lead to a mark on your permanent academic record or more serious punishments. Other consequences, including a failing grade in the course, will be determined based on the seriousness of the offense or if there are multiple offenses, at the instructor's discretion.

Computing Policy: MATLAB or python will be used heavily in this course so you will need access to one of them. Python is available for free here. Matlab licenses for students can be obtained for free from UWare. If you do not have a computer that can run Matlab or python, you should rent a computer from the Student Technology Loan Program. If you need help setting this up, please contact me.

Access and Accommodations: Your experience in this class is important to me. If you have already established accommodations with Disability Resources for Students (DRS), please communicate your approved accommodations to me at your earliest convenience so 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.

Religious Accommodation Policy It is important to me that our classroom be a welcoming and accommodating classroom for all. This means that if you have expected absences or hardship due to reasons of faith or conscience or for organized religious activities, I will be happy to accommodate you.

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 Religious Accommodations Policy (https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/). Accommodations must be requested within the first two weeks of this course using the Religious Accommodations Request form (https://registrar.washington.edu/students/religious-accommodations-request/).

Also, if you feel comfortable telling me about any required accommodations please let me know via email.