

CEE 303 (computational methods) lab syllabus

GSI information

NameSteven Woodruff (you may call me Steven)
Pronouns.....he/they
Email.....stevenrw@umich.edu
Lab office hours..... Mondays and Wednesdays, 2-4pm (ET).
Where to schedule office hours meeting...<https://cee303labofficehours.setmore.com/>
Zoom room for office hours.....<https://umich.zoom.us/j/99811622807>
Zoom password.....python3

Lab overview

In this lab, you will apply the topics you learned in class to solve realistic civil and environmental engineering problems. Using the coding language, Python 3, you will write codes that calculate important values and plot your results. You will submit project reports that demonstrate your thinking process and knowledge of the course material.

Lab objectives

During the course of this lab, you will be able to:

1. Write code in Python 3 that is clear and usable
2. Understand how computational methods can be used to solve engineering problems
3. Write project reports that are clear and demonstrate your proficiency in class topics
4. Use relevant Python packages (NumPy and Matplotlib) to solve problems
5. Use coding tools (Anaconda toolkit) to write and present code

Communication policy

Feel free to contact me whenever you face a problem related to the lab, want to discuss general problems or curiosity about the class subject, or need to schedule a meeting over Zoom outside of office hours. The sooner you contact me, the more likely I will be able to help you. The best way to reach me is over email (stevenrw@umich.edu). **I receive many emails in a day; to ensure that I see your email, always use the subject line: CEE 303 LAB.**

Besides email, we will be using Zoom to communicate. **To make an appointment to meet with me during office hours, fill out this form (<https://cee303labofficehours.setmore.com/>).** I am also available to meet outside of office hours, as needed (send me an email to schedule).

Office hours are Mondays and Wednesdays 2-4pm (when the labs are scheduled). Although you signed up for either a Monday or Wednesday lab, you may meet with me on either day for office hours.

Lab modality

Labs will be broken up into six modules that you will complete asynchronously on Canvas. Lab modules will open on Mondays at 9am ET and close twelve days later on Fridays at 5pm ET.

Each lab module will contain videos, documents, and code that you will need to complete the assignment.

Although you signed up for one of two lab sections, the section you are in does not affect your access to lab materials/office hours. With the asynchronous modality, the labs are effectively combined.

Software

You will use the [Anaconda software toolkit](#) to complete your lab assignments. You may access Anaconda either through the remote CAEN workstations or you may install Anaconda on your personal computer (Windows, MacOS, or Linux). In the first lab module, I will give an overview of how to access these tools. Anaconda is free for individual use and contains nearly all the open-source programs that you will need to complete your assignments, including:

1. [Python 3.8](#) (or later versions) – this program interprets Python code and will allow you to run calculations and algorithms needed to complete the labs.
2. [Spyder 4.1](#) (or later versions) – the Scientific **P**Ython **D**evelopment **E**nvi**R**onment is an integrated development environment (IDE) that essentially allows you to write, test, and debug code. The Spyder console can be configured to look like MATLAB, so there is little that you will need to adjust to if you already use MATLAB. Spyder can also check for syntax or stylistic errors that will break your code or make it unreadable.
3. [JupyterLab 2.6](#) (or later versions) – JupyterLab is an application that you will use to write project reports. Jupyter allows you to write text, generate headers, create readable math expressions with LaTeX, create plots, and run code directly in the file.
4. [NumPy 1.19](#) (or later versions) – NumPy is a Python package that contains many essential functions (e.g., sine function, array creation). You will probably use NumPy in every lab assignment.

5. [Matplotlib 3.3](#) (or later versions) – Matplotlib is a Python package that will allow you to generate plots to visualize your lab results and make strong arguments for your solution.

Links to the official documentation of each program are included (blue, underlined), which you may use to troubleshoot.

Python 3 resources

For those who are new to Python 3 or need a refresher, there are ample resources to help you learn and troubleshoot. In the lab modules, I will show you useful functions and coding structures that you will likely encounter in the projects. Besides that and the official program documentation linked above, here are some resource that I find useful:

- <https://www.w3schools.com/python/default.asp> - This is a website that teaches basic Python 3 coding using interactive examples.
- <https://www.tutorialspoint.com/python3/index.htm> - Similar to the one above.
- https://www.youtube.com/watch?v=Ozrduu2W9B8&list=PL4cUxeGkcC9idu6GZ8EU_5B6WpKTdYZbK – This is a YouTube channel with a large array of video tutorials.
- <https://stackoverflow.com/> - This is a website where people ask questions about coding, and users provide answers and code. I find that it is easier to get the solution to your problem by searching for your question (e.g., with Google), and finding the Stack Overflow page that will almost certainly appear at the top. Be careful, copying other people's code verbatim is a violation of the Honor Code, and it is possible that they are wrong!

If there are other resources that you find helpful, please share them with me and the rest of the class. **Know that Python is a robust coding language that can solve problems outside of what you might need for this class.** I invite you to learn more about Python, but learning concepts such as object-oriented programming, dunder methods, and third-party scripting will not be required.

Project reports

All lab modules (except for the first module) will require you to write and submit a project report. **You will write the project report using JupyterLab and submit both the Jupyter file (.ipynb) and an HTML file (.html) on Canvas.** Submitting both files decreases the time it will take for you to get feedback on your report and allows me to run code when necessary.

The report that you will write must follow the style explained in the first lab module. An example project report will also be provided to you in the first lab module.

The purpose of the project report is to help you explain how you solved the problem using effective communication tools such as technical writing, math expressions, and plots or figures. Pretend that you are writing this report to your work supervisor who is less familiar with the project than you are. This means explaining the problem you are solving, explaining which methods you will use to solve the problem, showing the steps you took to solve the problem (math expressions or code), emphasizing the solution you arrived at, and discussing/qualifying your solution (when necessary).

Grading policy

Each module will be worth 100 points.

For Module 0, there will be four assessments (a survey submission, two proficiency checks, and one question submission). Each assessment will be worth 25 points and will be graded as complete (25 points) or incomplete (0 points).

For all other modules, the only assessment will be the project reports that you will submit by the closing date of the module. Project reports will be graded according to the rubric provided in each lab module. For all reports, you will be assessed by the readability of your code, the accuracy of your result, the degree to which you follow the project report style, and spelling/grammar.

With six modules you have the opportunity to earn 600 points that factor into your final course grade (projects account for 40% of your total course grade, so **each module accounts for 6.67% of your final letter grade**).

Late submission policy

In fairness to others and to receive your grades as early as possible, **project reports will not be accepted after their due date (5pm ET every other Friday) without a valid reason**. Valid reasons for submitting a late report include, but are not limited to: your own medical emergency, death of a family member or close friend, illness of someone you are responsible for taking care of (child, parent, etc.), or inability to access technology due to reasons out of your control (e.g., extended power outage).

Should one or more of these events occur within the week that your report/assessment is due, we will talk about opportunities to make up the assignment when you are available. **If you can, please send me an email as soon as you realize you cannot submit the report/assessment on time.**

If you fraudulently create an excuse for failing to submit a report on time, I must report you to Prof. Jeffers and the Honor Council, and you will receive a zero on the lab assignment.

Collaboration policy

Discussion of lab projects with other students in this class is permitted and encouraged. **You may work with one other student in the class on your lab projects.** However, you are responsible for submitting an assignment containing your own original solution to the problem.

Copying the work of another student will be considered a violation of the Honor Code. This includes the copying and/or reuse of any portion of another student's computer code or project report. **It is your own responsibility to make sure that you do not share or receive any portion of code from another student, including a student who took the class in a previous term.** Note that you are free to reuse or modify any code provided by the GSI. **If you collaborate with another classmate, you must acknowledge them in your project report heading.**

Access to technology policy

Because this lab is centered around coding and will use video streaming, you must have access to a computer that can access high-speed internet. The College of Engineering has promised to assist students who do not have such access. Currently, laptops can be loaned at <https://its.umich.edu/computing/computers-software/sites-at-home>. If you do not have access to high-speed internet, email coe-studentaffairs@umich.edu.

Policy on respect and inclusion

The greatest resources we have as engineers are the knowledge, experience, and wisdom of the members of our team. I will work to ensure that students from all background and perspectives are treated equitably and have the respect they deserve as engineers and human beings. This includes the chance to share your personal pronouns with me (if you feel comfortable and safe to do so) or to share your concerns with me about other issues in private.

Your responsibility as a student is to uphold the values of diversity, equity, and inclusion by being respectful and welcoming to other students and the instruction team. I encourage you to start brave conversations with your peers and instructors when you see actions or hear statements that harm members of our community.

Student mental health and wellbeing

The pandemic is a stressful time for everyone, especially for those with mental illness. If you feel overwhelmed, I implore you to seek help from friends, family, or professionals. The University of Michigan is committed to advancing the mental health and wellbeing of its students. Free

mental health services are available to you. For help, contact Counseling and Psychological Services (CAPS) at 734.764.8312 or at <https://caps.umich.edu/>. Counselors are available throughout the university campus and remotely, 24/7. CAPS can also assist you with finding off-campus mental health resources, if necessary.

You may also contact the University Health Service (UHS) for mental health services at 734.764.8320 or at <https://uhs.umich.edu/mentalhealthsvcs>. For resources related to drug or alcohol concerns, see <https://uhs.umich.edu/aodresources>.

Students requiring accommodation

As a person with disabilities, I understand the frustration and fear that comes with seeking accommodation in classes. I have chosen an asynchronous lab modality to add flexibility to your schedule. I recommend meeting with the Services for Students with Disabilities (SSD) office to receive documentation of your accommodation needs that you may share with me. Know that you have the right to choose whether or not to disclose your accommodation needs with me. I encourage you to meet with me to discuss your needs if you believe they will affect your experience in the class. I am always eager to learn more about student's needs, so feel free to communicate to me any changes I can make to my videos, documents, figures, etc.

Indigenous land acknowledgement statement

I acknowledge the university's origins in a land grant from the Anishinabewaki ᐱᐢᓂᓂᓴᓇᓂᓴᓴᐱᓴ (including Odawa, Ojibwe, and Boodewadomi) and Wyandot. I also acknowledge that the Department of Civil and Environmental Engineering sits on land historically occupied by members of the Meškawahki·aša·hina (Fox), Peoria, Anishinabewaki ᐱᐢᓂᓂᓴᓇᓂᓴᓴᐱᓴ, and Bodéwadmíkiwen (Potawatomi) nations. I further acknowledge that the land I occupy, like almost all property in the United States, stands on lands obtained, generally in unconscionable ways, from indigenous people. The resources I benefit from as a member of the university were originally gained through exploitation of others. Knowing where I live and work does not change the past, but a thorough understanding of the ongoing consequences of this past can empower me in my work to create a future that supports human flourishing and justice for all individuals. For more information about indigenous land occupation, visit <https://native-land.ca/>.

Lab schedule (subject to change)

Week #	Project #	Topic	Method	Project Area	Module opens*	Module closes*
1		No lab				
2	0	Introduction to Anaconda	Overview of programs, syntax, debugging, & report formatting	No project	1/25/2021	2/5/2021
3						
4	1	Root finding	Bisection	Catenary arch (Structures)	2/8/2021	2/19/2021
5						
6	2	Initial-value problem solving	4 th -order Runge-Kutta method (RK4)	Backwater profile (Hydrology)	2/22/2021	3/5/2021
7						
8	3	Numerical integration & ad hoc optimization	Trapezoidal rule	User-equilibrium on a road network (Transportation)	3/8/2021	3/19/2021
9						
10	4	Boundary-value problem solving & tridiagonal solver	Finite differences & Thomas algorithm	Plug-flow reactor (Environmental)	3/22/2021	4/2/2021
11						
12	5	Parabolic PDE solver	Explicit finite-differences	Concrete placement scheduling (Construction)	4/5/2021	4/16/2021
13						
14		No lab				

* Modules will open on Mondays at 9am and close on Fridays at 5pm ET