

Python for Engineers
EML4930, Class # 22321 EML6934, Class # 12834
Academic Term: Fall 2022
Class Periods: T 8-9, R 9
Location: Online via [Zoom Conferences](#)

Instructor

Salil Bavdekar

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Canvas messaging is highly preferred. For email, please include course code (EML4930/EML6934) in the subject.

Office Hours

On campus: MF 8, W 9, room NEB 138

Virtual: MF 9, W 8 via [Zoom meeting](#). Students must [reserve a slot](#) (may reserve as a group) for Zoom office hours.

Teaching Assistant

James Zhao (message on Canvas only)

Office Hours: F 9, room NEB 138

Discord Server

The class [discord server](#) will serve as a supplementary communication platform. Usage is optional; Canvas is the official method of distribution for course content. Please do NOT private message the instructor or TA on discord.

Course Description

This course is designed to teach Python as a tool for engineers to perform numerical and scientific calculations and communicate their results through effective visualizations. The course will emphasize on the fundamentals of the programming language, and its utility in performing scientific and statistical calculations. Libraries regularly used in engineering and data science will be covered with basic examples, and students are expected to dive deeper into those that are relevant to their work/interests through a project.

Course Pre-Requisites / Co-Requisites

Engineering graduate student or undergraduate student of junior standing or higher.
COP 2271 or equivalent

Course Objectives

The main objective of this course is to provide a foundation in the Python programming language, so that students are comfortable using it to solve problems in future courses and in their career. Students will learn Python syntax and semantics, in order to use Python libraries to solve engineering problems. The course is envisioned as a bridge between a students' basic programming knowledge (usually in MATLAB) and the fundamentals of Python, to prepare them for future courses or a career that requires knowledge of the language.

This course is not intended to be a deep dive into Python or its many numerical and data science libraries (NumPy, SciPy, Matplotlib, Pandas, Scikit-learn, etc.). Instead, it is aimed at generating a fundamental understanding of the language and develop competency in applying these tools. Students will develop the confidence and competency in the language to use any library they need in their work or research, with the help of the documentation.

Relation to Program Outcomes (ABET):

Outcome	Coverage*
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	Medium
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	

3. An ability to communicate effectively with a range of audiences	Medium
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	Low
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	Low
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	High

*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered or assessed in the course.

Required Textbooks and Software

- Software
 - Anaconda 3: <https://www.anaconda.com/products/distribution>.
- No required textbooks
- Lecture notes are derived from the following online resources
 - <https://cs50.harvard.edu/python/2022/>
 - <https://scipy-lectures.org/>
 - <https://www.w3schools.com/python/>
 - <https://www.geeksforgeeks.org/python-programming-language/>
 - <https://www.programiz.com/python-programming>
 - <https://realpython.com/>
 - <https://automatetheboringstuff.com/>

Recommended Materials

- Automate the Boring Stuff with Python
 - Al Sweigart, 2nd edition, November 2019
 - ISBN-13: 978-1593279929
 - Free to read online at <https://automatetheboringstuff.com/#toc>
- Python Crash Course
 - Eric Mathes, 2nd edition, May 2019
 - ISBN-13: 978-1593279288
- SciPy Lecture Notes: <https://scipy-lectures.org/>
- Official documentation for the libraries covered in the course
 - Python Standard Library: <https://docs.python.org/3/library/>
 - Pytest: <https://docs.pytest.org/en/stable/>
 - NumPy: <https://numpy.org/doc/stable/>
 - SciPy: <https://scipy.github.io/devdocs/>
 - Matplotlib: <https://matplotlib.org/stable/>
 - SymPy: <https://docs.sympy.org/latest/>
 - Pandas: <https://pandas.pydata.org/docs/>
 - Seaborn: <https://seaborn.pydata.org/>
 - Statsmodels: <https://www.statsmodels.org/stable/index.html>
 - Scikit-learn: <https://scikit-learn.org/stable/>
 - Plotly: <https://plotly.com/python/>
 - Conda: <https://docs.conda.io/projects/conda/en/latest/>
 - Git: <https://git-scm.com/doc>

Course Schedule

(subject to revision during the semester by instructor)

Week	Date	Topic	Assignments
Fundamentals of Python			
1	Aug 25	Introduction to the course, syllabus, Python basics, installation, Anaconda, IDEs,	
2	Aug 30	Data types, Collections, Indexing, Operators, Keywords	HW1: Data types and control flow
		Control Flow - Loops, Conditions, List Comprehension	
	Sep 1	Functions	
3	Sep 6	Scripts, modules, packages, and the standard library	
		File I/O and directory access	
	Sep 8	Classes	HW1 due
4	Sep 13	Code reusability, argument parsing, configuration files	HW2: Classes and functions
		Exception handling and testing	
	Sep 15	Python best practices, PEP, type hinting	
Numerical and Scientific Computing with Python			
5	Sep 20	NumPy: Basics, the array object, operations	
	Sep 22	SymPy: Symbolic math	HW2 due
6	Sep 27	Matplotlib: Plotting	
	Sep 29	CLASS CANCELLED	HW3: NumPy, SymPy & plotting
7	Oct 4	SciPy: Basics, operations, signal processing	
	Oct 6	SciPy, and Matplotlib: Other plots and images	
8	Oct 11	Virtual Environments, Conda, PyPI, Pip	HW3 due
		Version control: Git and GitHub	
	Oct 13	<i>Final project and graduate assignment discussion</i>	HW4: SciPy and plotting
Data Science with Python			
9	Oct 18	Pandas: Basics, the DataFrame object, operations	
	Oct 20	Seaborn: Advanced plotting with DataFrames	

10	Oct 25	SciPy: Statistics, optimization, and curve fitting	HW4 due
	Oct 27	Statsmodels: Regression	HW 5: Statistics
11	Nov 1	Scikit-learn: Regression	<i>Project proposal due</i>
	Nov 3	Plotly: Creating interactive plots	<i>Graduate assignment topic due</i>
12	Nov 8	Scikit-learn: Classification, model performance	HW5 due
	Nov 10	CLASS CANCELLED	HW6: Machine Learning
Presentations and some other Python Concepts			
13	Nov 15	<i>Graduate assignment presentations</i>	<i>Meet with instructor to discuss project progress</i>
	Nov 17		
14	Nov 22	Extra office hours, Q&A, etc.	HW6 due
15	Nov 29	Requested and missed topics: Classes and OOP, multiprocessing, pythonic code	HW7: Make up
	Dec 1	<i>Project presentations, with feedback and Q&A</i>	
16	Dec 6		HW7 due at the end of the week
	Dec 13	Finals' week	<i>Final project due</i>

Evaluation of Grades

Assignment	Percentage of Final Grade (Undergraduate)	Percentage of Final Grade (Graduate)
Homework (6)	50%	35%
Graduate Presentation		15%
Project Proposal	5%	5%
Project Presentation	10%	10%
Project Code	35%	35%
	100%	100%

Homework is assigned on a bi-weekly basis. The lowest graded (or non-submission) homework will be discarded in computing the final grade.

Attendance Policy, Class Expectations, and Make-Up Policy

Live attendance is highly encouraged. However, lectures will be recorded and can be watched later if attendance is not possible. Students are responsible for knowledge of all scheduling and policy announcements made in class. All assignments and projects should be written in a professional manner and illustrate that you understand the core concepts being covered while meeting the following guidelines.

- All homework will be turned in electronically via the class Canvas web site. Only files that are uploaded will be graded. Assignments that are submitted after the due date and time, but before the assignment closure date and time (usually, but not always, 4 days after the due date) will be deducted 10% per day. Assignments submitted after the closure date will not be graded. All submissions must be your own work produced exclusively for this course.
- All assignments require submission of code, which must be easy to read and run using Python 3.8+. You may submit a .py file or a Jupyter Notebook (.ipynb). Code must be well commented so that a layperson is able to run it without any trouble. Points will be lost if code cannot be run or easily understood.
- Surveys for extra credit may be offered at the beginning and end of the course, as well as at the end of each module. These surveys are optional and often anonymous, except for the one at the beginning of the course.
- Assignments that are missed due to excused absences in compliance with the university policies defined in the Undergraduate Catalog (link below) will be granted special accommodations for make-up work. To qualify, appropriate documentation is required.

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies. Click here to read the university attendance policies:

<https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/>

Grading Policy

Percentage	Grade	Grade Points
92.0 – 100	A	4.00
88.0 – 91.9	A-	3.67
84.0 - 87.9	B+	3.33
80.0 - 83.9	B	3.00
77.0 – 79.9	B-	2.67
73.0 - 76.9	C+	2.33
70.0 - 72.9	C	2.00
67.0 - 69.9	C-	1.67
63.0 - 66.9	D+	1.33
60.0 - 62.9	D	1.00
50.0 - 55.9	D-	0.67
0 - 50.0	E	0.00

Note for graduate students: In order to graduate, graduate students must have an overall GPA and an upper-division GPA of 3.0 or better (B or better). A B- average is equivalent to a GPA of 2.67, and therefore, it does not satisfy this graduation requirement.

More information on UF grading policy may be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

Students Requiring Accommodations

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the Disability Resource Center by visiting <https://disability.ufl.edu/students/get-started/>. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

Course Evaluation

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

In-Class Recording

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

University Honesty Policy

UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Conduct Code (<https://sccr.dso.ufl.edu/process/student-conduct-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. If you have any questions or concerns, please consult with the instructor.

Commitment to a Safe and Inclusive Learning Environment

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- Jennifer Nappo, Director of Human Resources, 352-392-0904, jpennacc@ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

Software Use

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All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <https://registrar.ufl.edu/ferpa.html>

Campus Resources:

Health and Wellness

U Matter, We Care:

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center: <https://counseling.ufl.edu>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Discrimination, Harassment, Assault, or Violence

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

Sexual Assault Recovery Services (SARS)

Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

COVID-19

- You are expected to wear approved face coverings at all times during class and within buildings even if you are vaccinated.
- If you are sick, stay home and self-quarantine. Please visit the UF Health Screen, Test & Protect website about next steps, retake the questionnaire and schedule your test for no sooner than 24 hours after your symptoms began. Please call your primary care provider if you are ill and need immediate care or the UF Student Health Care Center at 352-392-1161 (or email covid@shcc.ufl.edu) to be evaluated for testing and to receive further instructions about returning to campus.
- If you are withheld from campus by the Department of Health through Screen, Test & Protect, you are not permitted to use any on campus facilities. Students attempting to attend campus activities when withheld from campus will be referred to the Dean of Students Office.
- UF Health Screen, Test & Protect offers guidance when you are sick, have been exposed to someone who has tested positive or have tested positive yourself. Visit the [UF Health Screen, Test & Protect website](#) for more information.
- Please continue to follow healthy habits, including best practices like frequent hand washing. Following these practices is our responsibility as Gators.

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu.
<https://lss.at.ufl.edu/help.shtml>.

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling; <https://career.ufl.edu>.

Library Support, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.
<https://teachingcenter.ufl.edu/>.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers.
<https://writing.ufl.edu/writing-studio/>.

Student Complaints Campus: <https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>;
<https://care.dso.ufl.edu>.

On-Line Students Complaints: <http://www.distance.ufl.edu/student-complaint-process>.