Astronomy 98

Introduction to Python DeCal

Fall 2024

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Faculty Sponsor:	Eugene Chiang

Time & Place:	TTh 2-3PM in 131 Campbell Hall
Office Hours:	TBD
Course Number:	98
Units:	2 units, P/NP
Prerequisites:	Physics 8A/7A/5A recommended but not required

Course Description

This course provides an introduction to the Python programming language with a focus on data analysis and research in astronomy, physics, and other sciences. Primary emphasis is placed on astronomy and physics in preparation for upper division laboratory courses and research. Students will be exposed to the command line, Git version control, code documentation comprehension, and Python software development. More advanced skills, such as image manipulation and data analysis techniques may also be explored.

The primary audience for this course are those who have no prior experience with programming. As such, if you are already well versed in software development, this may not be the class for you. However, in order to learn the wide variety of technical material we cover in the short amount of time we have, it will take time and practice. As a consequence, some—especially those new to programming—may find the workload heavier than most DeCals.

This is not intended to be an easy course. Learning to code is easier to some than it is to others. What you put in is what you will receive from the course. Facilitators are always ready to help you succeed and be confident in the skills you will gain.

Learning Objectives

Students will be introduced to basic programming concepts with the goal of becoming comfortable and proficient using the Python programming language in research settings. Using Python, students will demonstrate understanding of software structure and control flow by creating a project of their choosing. Given a set of data, students will be able to manipulate, process, analyze, and create data visualizations using Python and associated libraries such as NumPy, and Matplotlib.

Materials

Students are expected to bring and use their own computers. If you are unable, please refer to the STEP program, which allows you to rent a computer for a semester. If, for whatever reason, the STEP program doesn't work out for you, please talk to us and we will try to arrange other accommodations. Additionally, there is an optional course text written by

the previous facilitators, Imad Pasha and Christopher Agostino, available at prappleizer.github.io/textbook.pdf. While it covers the basic priniciples needed in Python, it also does not include the harder parts of the course.

Course Resources

Class related files and notifications will be posted on bCourses in the Pages and Files sections unless otherwise specified. Additionally, we will have an **EdStem** where you can ask questions and receive answers from both the course staff and your peers. We encourage you to use EdStem rather than email, as it allows us to provide a more expedient response, and may also benefit classmates with similar questions.

If you do need to email staff, please put [**Python DeCal**] or [**Astron 98**] in the subject line so that we can spot it more easily. Any **logistics** emails should be directed to Head Instructor Charlie Tolley (tolley412@berkeley.edu).

Course Expectations & Grading

Participation	10%
Homework	60%
Final Project	30%

A grade of 70% or above AND an attempt on the final project is required to pass the class.

Attendance

Class will meet twice a week, **Tuesdays and Thursdays from 2:00PM to 3:0PM**. We will have lectures for learning new materials and walking through hands-on examples. For this reason, we ask that you have your laptops with you **at all lectures** so you may walk through the examples with the instructor. We will also have discussion sections interspersed to allow for more independent/group practice with the instructors there and able to help.

If you are unable to attend lecture, you may watch the lecture from a previous semester. These videos are linked on the bCourses home page. While these are available to you, we highly recommend you attend lecture in person because the course is significantly different from previous semesters. You will earn the 10% participation grade by coming to class. Other forms of participation such as posting/answering questions on Ed could also contribute to the participation grade.

Homework

Homework will be assigned weekly covering the topics we discuss in lectures. Homework will be released on Wednesday after class and will be due before class (3pm) on the next Wednesday unless otherwise noted, so you will have a week to work on it. All homeworks are to be submitted on Gradescope through the GitHub repository that you will be making in class. It is highly recommended that you make an honest effort at the homework. We grade based on effort AND accuracy. This means that points are mainly taken off based on how much effort was put into the answer. For example, if you did not get the answer right but you were on the right track, we will give you most of the points. The homework is intended to solidify knowledge as this is a P/NP course. You are encouraged to work with other students, but everyone must submit their own individual work. Late homework will be accepted until three weeks after the homework was due.

Projects

There will only be one final project over the semester and it is intended for you to demonstrate your ability in understanding the class material. The final project is required to pass the course. Further information will be disseminated closer to when the project is assigned.

Academic Misconduct

As with all classes, cheating, plagiarism, and other forms of academic dishonesty will not be tolerated. First violations will result in a zero on the assignment, and any subsequent violations may result in administrative action in accordance with the UC Berkeley Astronomy Department Policy on Academic Misconduct.

Department Resources

- Diversity and Climate: astro.berkeley.edu/about/diversity-and-climate

- Reporting Harassment or Discrimination: astro.berkeley.edu/department-resources/reporting-harassment
- Astronomy Undergraduate Wiki: kartp.astro.berkeley.edu
- Undergraduate Climate Advisor: Charlie Tolley, Sumbal Sharif (tolley412@berkeley.edu , (sumbal@berkeley.edu)
- Undergraduate Representative: Sophie Willis (willis.sophie@berkeley.edu)
- Undergraduate Faculty Advisor: Professor Eugene Chiang (echiang@berkeley.edu, 317 Campbell Hall)

Schedule

Below is a schedule of class meetings along with a curriculum; the schedule is subject to change based on the needs of our students. The first lecture starts on January 17th, 2024.

Week	Lecture	Discussion/Lab	Topics
1	9/3	9/5	• Syllabus overview and logistics • Installing Python and VSCode on Computer • Command Line / Scripting / Github
2	9/10	9/12	• Command Line / Scripting / Github • Command Line / Scripting / Github
3	9/17	9/19	Data Types + Functions
4	9/24	9/26	• Conditionals + Loops
5	10/1	10/3	• Lists + Dictionaries • Debugging
6	10/8	10/10	• Conditionals, Loops, Lists, Dicts Cont. • NumPy Arrays
7	10/15	10/17	• NumPy + Intro Plotting
8	10/22	10/24	• Data w/ NumPy + Pandas
9	10/29	10/31	• Curve Fitting + Regression
10	11/5	11/7	• Advanced Plotting
11	11/12	11/14	• Further Data Manipulation w/ FITS • Object Oriented Programming
12	11/19	11/21	• Project Work Days
13	11/26	11/28	• Academic Holiday
14	12/3	12/5	• Presentations