Draft Syllabus for CSCI E-7 - Introduction to Programing in Python

Instructor: Jeff Parker

On-Line Course – Prerecorded lectures will be made available each week. There will be a live Section meeting each week and live Office Hours with the instructor and with Teaching Fellows. Students will submit weekly assignments. Graduate students submit a final project.

Course Description

Python is a language with a simple syntax and a powerful set of libraries. It is an interpreted language, with a rich programming environment, including a robust debugger and profiler. While it is easy for beginners to learn, it is widely used in many scientific areas for data exploration. This course is an introduction to the Python programming language for students without prior programming experience.

Our objective is to help students learn to use the Python programming language to solve problems of interest to them. We encourage students to come to class on the first day with a goal: a project they would like to accomplish. We may not be able to realize the most ambitious projects, we hope to start you on the path to achieving your goals.

We cover data types, control flow, and introduce the analysis of program performance. The examples and problems used in this course are drawn from diverse areas such as text processing, simple graphics, and elementary analysis of DNA. Students enrolled for graduate credit implement a final project of their own design.

We will be using Python 3, the current version of the language, and version 3.8.

Course Methodology

I believe that students learn best by doing. Writing Python programs to solve relevant problems is the focus of the course. My goal is to make you comfortable writing programs to do interesting things. To meet that goal, we will have weekly assignments, and we will spend class time each week discussing different solutions to the problems. There is rarely a single way to solve any problem, and studying different approaches gives you a broader perspective.

It is also helpful to study incomplete and incorrect solutions. Beginners often struggle to understand why their programs fail. Successful programmers do not expect to write a program and have it run: they write it in stages, testing their work before proceeding. They expect bugs: they learn to notice problems, track them down to their source, and fix them before going on. I will spend class time modeling this behavior. This, more than the details of Python, is the key skill that I hope to pass on.

Skills Checklist

Basic computer skills, including comfort with the command line interface, as described at the URL below, and the ability to create a text file with a text editor.

> learnpythonthehardway.org/book/appendixa.html

We will use the command line to run programs and explore the system. The command line provides an easy way for a user to convey information to a program and to explore files on your computer.

Please complete the assignment “Before the First Day” before class starts. This will prepare you for the first week of class.

Expectations on Attendance and Participation

There will be weekly programming problem assignments that will be collected before the next class. For the benefit of other students, I will review solutions on the due date, so I will not be able to accept late assignments.

Each problem comes with Unit Tests, which you can use to test your solutions. While the Unit Tests will not find all the errors, they will identify solutions that don’t solve the simple cases.

Students will be expected to solve the problem sets each week. It is difficult to catch up after missing a single week of assignments, and almost impossible after missing two. The course will be offered again. If you fall off the wagon, try to climb back on, but if you can’t, remember that there will be another wagon next semester and another next year.

Given the rapid pace of the class and the large number of students, we may only have time to evaluate some of the problems assigned. We think attacking all of the problems will be important for your mastery of the subject, but you might be graded on a subset of each assignment.

Graduate students will write a final project of the student’s choice of topic. We will collect a proposal well in advance.

Textbooks

Required Text: Think Python, by Allen B. Downey, second edition, O'Reilly, Sebastopol, California.

Downey has produced a very short book that covers the bulk of the language.

The book has been well received by students and faculty, and has gone through multiple versions.
I have ordered copies for the bookstore: you may wish to purchase a copy there, or checkout the free versions listed below. We will be using the second edition, which covers Python 3. The text we will be using is available online at the URL below

greenteapress.com/wp/think-python-2e/

Additional Sources: Online Books

How to think like a Computer Scientist, by Brad Miller and David Ranum.

interactivepython.org/runestone/static/thinkcspy/index.html

You may find the title to be off-putting: don't be alarmed. This is an online version of a translation into Python of Downey's original book by that title, which used the Java language. The outline and general focus are the same as the version we will be using. This version goes into greater detail, and includes an interactive workspace that is very helpful.

Downey approved of the book and thought that Python was better than Java for beginners. He rewrote his original book, and titled it Think Python. The first edition of that book used Python 2: we are using the second edition, which uses Python 3.

Additional Sources: Bound Books

Learn Python the Hard Way, by Zed Shaw, Addison-Wesley

If you are struggling with Downey, you might take a look. Shaw breaks everything down into very small bites. He has strong opinions, strongly expressed. I agree with many of them, if not his attitude. He has versions for Python 2 and Python 3. You want the version for Python 3.

Introducing Python, by Bill Lubanovic, O'Reilly

This has a nice collection of applications, including Data Bases, Web programming, Concurrency, and Networking. While he doesn't go into great detail on these advanced topics, he points you in the right direction.

The Python 3 Standard Library by Example, Doug Hellmann, O'Reilly

Each chapter discusses a useful component of the Python Standard Library – extensions of the language. Hellmann also maintains a blog. I subscribe, and get mail about a different module each week. This is a big book, and does not try to introduce you to the language.

https://pymotw.com/3/

The Harvard Library gives you access to Safari, the online version of the O'Reilly books.

Coverage

We plan to cover most of the material Think Python. This will include an introduction to Turtle Graphics, Iteration and Recursion, the File System, Dictionaries, and extensive experiments with a dictionary of English words.

We will review a number of libraries from Doug Hellman's Python 3 Module of the week:

https://pymotw.com/3/

We will review other topics and libraries as time permits. Let me know if you have a particular area that interests you, and I will try to fit it in.

Grading

Graduate students will plan and submit a final project of their own choice. The grading scale for the graduate students is approximately

75% of the grade will be based on weekly assignments.

10% will be based on in class mastery quizzes.

15% Final project

The scale for undergraduates is similar, without the final project.

85% of the grade will be based on weekly assignments.

15% will be based on in class mastery quizzes.

Each homework comes with Unit Tests, which reveals problems with a proposed solution, so students can correct their work before submitting. As a result, the scores are often high. We do not use a predefined grading scale. While the most common grades are A or A-, be warned that the course cutoffs are often higher than the standard values.

School Policies

As a student in the Extension school, you will have many opportunities. You also have responsibilities. Please familiarize yourself with the school policies https://www.extension.harvard.edu/resources-policies/student-conduct

Videos will be available for later viewing, but it is important that you keep up, learning the material as it is presented. We try to teach, but you will need to actively engage to learn.

Academic Integrity

One of the important school policies is maintaining Academic Integrity. While we encourage you to consult outside sources, you need to cite anything that you copy. The Harvard Student Handbook states:

> ”All work submitted to meet course requirements is expected to be a student’s own work. In the preparation of work submitted to meet course requirements, students should always take great care to distinguish their own ideas and knowledge from information derived from sources. Whenever ideas or facts are derived from a student’s reading and research the sources must be indicated. The term ”sources” includes not only published primary and secondary material, but also information and opinions gained directly from other people. The responsibility for using the proper forms of citation lies with the individual student. Quotations must be placed within quotation marks, and the source must be credited. All paraphrased material also must be completely acknowledged.”
>
> https://www.extension.harvard.edu/resources-policies/student-conduct/academic-integrity

If you consult a book to check the syntax of a statement, you do not need to cite it. You will not need to cite examples given in class: we expect you to use them in your work.

But if you copy an example, or even borrow ideas from another student or resource for the solution of problem, please give us a citation at the head of your submission.

You will be working with other students in class, but we expect you to learn the material on your own. All work on homework submissions and quizzes should be your own work.

Accessibility

Students who would like to request accommodations for disabilities should contact the Accessibility Services office at Accessibility@dcemail.harvard.edu or 617-998-9640

See this website for more information:

https://www.extension.harvard.edu/resources-policies/accessibility-services