

USC Viterbi

School of Engineering

DATA SCIENCE PROGRAM

DSCI 510: Principles of Programming for Data Science (4 units) Spring 2024

Syllabus as of Jan. 8, 2024 (updated TA/CP/grader info)

Instructor: Ulf Hermjakob, Ph.D. ulf@isi.edu or ulf@usc.edu

Teaching Assistant: Venkat Narayana vsnaraya@usc.edu

Course Producer/Grader: Krushang Satani satani@usc.edu

Graders: Raj Maharajwala maharajw@usc.edu, Atharva Joshi atharvaj@usc.edu

When emailing, please put "DSCI510" in the subject line

Lecture

Day: Wednesday

Time: 2:00pm-3:50pm

Room: [Taper Hall \(THH\)](#) 212

Lab

Day: Friday

Time: 2:00pm-3:50pm

Room: THH 212

To better serve class objectives, the distribution between lectures and labs may be adjusted for some weeks, e.g. the first part of the Lab time block on a Friday might be used for lectures, or the last part of the Lecture time block on a Wednesday might be used for lab sessions. Any such change will be announced in advance.

First day of class at USC: Monday, January 8, 2024

For **Zoom links** for all lectures, labs and office hours, go to <https://blackboard.usc.edu>, then select this class, and finally select "Zoom meetings".

Textbook (available on the web for free; available as a paperback for about \$10-\$15)

[Python for Everybody: Exploring Data in Python 3](#), by Charles R. Severance, plus other materials

You may also wish to consult [Think Python \(2nd edition\)](#), by Allen B. Downey

Course communication

<https://blackboard.usc.edu>

Used for announcements, Zoom links, lecture material, lab material, and submissions.

<https://piazza.com/usc/spring2024/20241dsci510hermjakob/home>

Used for questions and answers.

Office hours: see <https://blackboard.usc.edu>

Although this is not required, students are advised to make appointments with the instructor ahead of time in any event and be specific with the subject matter to be discussed. Students should also be prepared for their appointment by bringing all applicable materials and information.

Catalogue Description:

Introductory programming course for non-Computer Science majors. Programming in Python for retrieving, searching, and analyzing data from the Web. Learning to manipulate large data sets.

Expanded Course Description:

This course is designed to serve as an introduction to computer science concepts and basic programming skills that are specifically geared toward Informatics, and forms a part of the introductory coursework for the program in Communication Informatics. The main objective of this course is to introduce the fundamental concepts behind general computer science and programming, and to give students practical hands-on experience reading and writing computer programs, in order to give them the tools to manipulate large data sets.

The course is designed to be accessible to non-Computer Science major students with little or no programming experience, and emphasizes writing programs that are capable of retrieving and manipulating large amount of data. The first half of the course focuses on Python as a first programming language, while the second half of the course covers selected advanced topics including data visualization, web scraping, database access, and more.

The course will combine lectures, labs, in-class discussion and problem solving, readings, written homework assignments, a mid-term exam, and a final project.

Course Objectives:

The objective of this course is to train students to write computer code capable of manipulating large data sets. Specifically, students successfully completing this course will achieve two main objectives:

1. Acquire basic concepts in computer science and programming.
2. Develop sufficient proficiency in Python to write applications capable of retrieving, searching, manipulating, analyzing, and displaying data.

Methods of Teaching:

The primary teaching methods will be discussion, case studies, and lectures. Students are expected to perform directed self-learning outside of class which encompasses, among other things, a considerable amount of programming practice.

There will a midterm exam. There will also be homework assignments and a final project. There will be weekly lab meetings.

Students are expected to have access to a computer that can run the Python programming language and a web browser, and to bring it to class. Beyond that, no special computing facility, hardware or software will be necessary for this course.

Grading Scheme (subject to change):

Lab: 25% (weekly assignments)

Homework Assignments: 20%

The approximately four homework assignments will be more substantial than lab assignments.

The last homework assignments also serve as the first steps towards the final project.

Midterm Exam: 30%

Final Project 25%

Total 100%

Grades will range from A through F. The following is the rough breakdown for grading:

94 - 100 = A	74 - 76.99 = C
90 - 93.99 = A -	70 - 73.99 = C-
87 - 89.99 = B+	67 - 69.99 = D+
84 - 86.99 = B	64 - 66.99 = D
80 - 83.99 = B-	60 - 63.99 = D-
77 - 79.99 = C+	Below 60 is an F

Grading for the course will be based on four or five major components:

1. LABS – There will be laboratory assignments given [roughly] every week. These assignments reinforce the content discussed in lecture. They are to be completed individually, during the lab session. Unless explicitly stated otherwise, late submissions are not permitted.

2. HOMEWORK – There will be a number of assignments given throughout the semester. Assignments may include exercises from the textbook, and may include additional questions from other sources. Each student is expected to submit the completed assignment when due. All homework assignments are to be submitted individually and students will receive individual scores. Guidelines and additional information will be developed to provide a common vernacular for the assignments. It is crucial that students turn in whatever they have completed on the due date. NO assignment will be accepted late. An incomplete grade will be granted only under the conditions called out in the student handbook, SCAMPUS, which is available online, <http://scampus.usc.edu>.

3. MID-TERM EXAM – A written exam, roughly halfway through the term, covering material taught up to that point.

The midterm will be “pen on paper”, i.e. without computers or any other electronic devices. (Rationale: Students will show with this midterm format that they have mastered basic Python programming skills, without cheating. Programming without the reliance on external tools will also help students become more efficient programmers and better prepare students for job interviews. To compensate, students will be allowed to use a single-page “*cheat sheet*” during the midterm and grading will be more lenient with respect to any superficial syntax errors.)

4. FINAL PROJECT – A final project that builds on the techniques taught in class. The final project will be a programming assignment that addresses a data informatics task. The project will be assigned by week 11, so that students will have about 4 weeks to complete the project.

Class Structure & Schedule:

Class sequence, dates and topics are subject to change as the semester proceeds. Any revisions will be noted and announced in class in advance.

Week	Topics/Activities	Book Chapters
1	Intro to programs, variables, conditionals, iteration, types.	1, 2
2	Types, type coercion, Boolean/logical expressions, review conditional execution, exceptions, functions.	3, 4
3	Exceptions, "is" vs. "=", iterations (while, for, etc.), strings.	5, 6
4	Python tracebacks, "repr" vs. "print", file I/O, lists.	7, 8
5	Dictionaries, tuples, combinations thereof.	9, 10
6	Regular Expressions (part 1), Python objects, inheritance, operator overloading, creating multiple/dynamic objects.	11, 14
7	*args, **kwargs, dynamic object creation, <code>__main__</code> and modules. Python review.	1-11, 14
8	Midterm.	
9	The DOM, the requests library, web scraping with BeautifulSoup.	12
10	XML, JSON, web APIs.	13
11	Intro to databases, intro to SQL, multi-DB design, normalization, foreign keys, SQL joins, many-to-many relationships, Twitter spidering, an iTunes XML DB example.	15
12	More about databases and SQL.	15
13	Pandas, and if we have time, SQLAlchemy ORM.	—
14	Regular Expressions (part 2), advanced web scraping.	11
15	(If time allows.) Course review, final discussion, project presentations.	—
	Final project.	

Statement on Academic Conduct and Support Systems

Academic Conduct

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Section 11, *Behavior Violating University Standards* <https://policy.usc.edu/wp-content/uploads/2021/04/SCampus-Part-B.pdf>. Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, <https://policy.usc.edu/research-and-scholarship-misconduct>.

Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the *Office of Equity and Diversity* <https://eeotix.usc.edu/> or to the *Department of Public Safety* <https://dps.usc.edu/contact/report>. This is important for the safety of the whole USC community. Another member of the university community – such as a friend, classmate, advisor, or faculty member – can help initiate the report, or can initiate the report on behalf of another person. *Sexual Assault Prevention and Survivor Services* <https://sites.usc.edu/clientservices> provides 24/7 confidential support.

Support Systems

A number of USC’s schools provide support for students who need help with scholarly writing. Check with your advisor or program staff to find out more. Students whose primary language is not English should check with the *American Language Institute* <http://dornsife.usc.edu/ali>, which sponsors courses and workshops specifically for international graduate students. *The Office of Students Accessibility Services* <https://osas.usc.edu/> provides certification for students with disabilities and helps arrange the relevant accommodations. If an officially declared emergency makes travel to campus infeasible, *USC Emergency Information* <https://www.usc.edu/emergency> will provide safety and other updates, including ways in which instruction will be continued by means of blackboard, teleconferencing, and other technology.