COLUMBIA UNIVERSITY
School of Professional Studies

Introduction to Programming with Python
July 3 – July 14, 2023
Monday – Friday, 8:00 – 11:00 AM

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Office Hours: By appointment
Response Policy: Within 12 hours

Course Overview

Python has grown into the most popular programming language utilized in a variety of applications from automation, web applications, GUI development, to robotics. The largest widespread use of Python is within the field of data science which leverages the large amounts of data for machine learning and artificial intelligence applications.

This course introduces Python through a data science lens; an accessible and practical application of Python utilized in a variety of fields including but not limited to engineering, science, finance, politics, and marketing. Students will be introduced and work through the syntax, functions, classes and methods, and packages of Python as they collect, sanitize and parse, analyze, and draw conclusions from meaningful datasets. Students will experience working with industry standard environments and packages including NumPy, Pandas, Matplotlib, Plotly, and Scikit-Learn as well as Git and LaTeX. Students will apply their skills to real-world datasets and problems through a few assignments and the course will culminate with a final project which the students will present at the end of term and showcase in their portfolios and resumes. No coding experience is required for the course but a general comfort with computers is expected.

Learning Objectives

The course will focus on the following objectives:

- Read, write, and understand Python code including, but not limited to, various data structures, functions, and classes
- Use industry standard programs and utilize packages to develop, test, debug, and collaborate on Python projects
- Set the foundations of using Python for data science applications including:
    - Collecting, parsing, sanitizing and cleaning, standardizing, and exploring datasets
    - Generating visualizations including graphics, tables, and figures
    - Determine trends using regression and machine learning and report conclusions from analysis
- A final report on a purposeful real-world dataset, documenting the code, and summarizing the analysis using industry standard tools such as Markdown and LaTeX

Required Materials

Textbook(s) and Other Readings
There are no formal textbook reading requirements for the course. Students will be provided with slides and files throughout the class and course as well as expected to research manuals and documents pertaining to utilized packages. The following materials are a great resource nonetheless for any Python learner, readily available and free:

A. Sweigart, Automate the Boring Stuff with Python: Practical Programming for Total Beginners. San Francisco: No Starch Press, 2015. Available for free: http://automatetheboringstuff.com/

"Introduction to Programming with Python — Introduction to Programming with Python." http://opentechschool.github.io/python-beginners/en/index.html (accessed Jun. 03, 2023).

J. T. Vanderplas, Python Data Science Handbook: Essential Tools for Working with Data, First edition. Sebastopol, CA: O'Reilly Media, Inc, 2016. Available for free: https://jakevdp.github.io/PythonDataScienceHandbook/

Class Supplies
Students are expected to have access to a internet-connected laptop or desktop computer operating Windows, Mac OS, or Linux with at least 8 GB of free space and installation privileges.

Resources

Columbia University Information Technology
Columbia University Information Technology (CUIT) provides Columbia University students, faculty, and staff with central computing and communications services. Students, faculty, and staff may access University-provided discounted software downloads.

Columbia University Library
Columbia's extensive library system ranks in the top five academic libraries in the nation, with many of its services and resources available online.

Program Resources
If you do not understand the course content or the instructor's expectations, please either ask during class or contact the instructor outside of class times.

For other program- and wellness-related needs, contact the Pre-College Program office at hsp-office@columbia.edu or (212) 634-2799.

Course Requirements (Assignments)

Assignments based on the material will be assigned to practice coding in Python and problem solving. A personal project will be assigned with cumulative tasks during the second week, culminating with a presentation on the work during the last day. Final evaluation will be based on student effort, overall performance, and participation. Instructions on the assignment and project will be described on the first day of the course.

Course Policies

Participation and Attendance
I expect you to come to class on time and thoroughly prepared. I will keep track of attendance and look forward to an interesting and lively discussion. If you miss an experience in class, you miss an important learning moment, and the class misses your contribution. More than one absence will affect your ability to receive a program Certification of Participation. Any disruptive behavior will not be tolerated.

Class Etiquette
To ensure the learning environment is optimal, all students should adhere to the following "netiquette" principles during the online class:

- Log into Zoom in enough time to get set up and ready to commence when the class begins. Test your audio and ensure there are no technical problems
- Participate in the class from a quiet location with minimal distractions
- Be visible via your webcam during the entire class, and dress in classroom-appropriate attire
- Actively participate via mic, online polling, responding in chat, etc
- Be prepared by completing readings and offline activities
- Communicate with all fellow students and the instructor respectfully; share perspectives and relevant examples
- Please try to debug code independently and through personal research before reaching out for assistance

Late Work
All assignments should be submitted by the due date noted in the course syllabus. Late submissions require advance notice and permission from the instructor.

Citation & Submission
All written assignments must cite sources using IEEE format and be submitted to the course website (not via email). Plagiarism, whether intentional or unintentional, will result in dismissal from the program.

School and Program Policies

Student Assessment
Columbia's Pre-College Programs for High School Students are academically rigorous; they do not carry college credit, however, nor are they graded. Upon successful completion of the program, students receive an official Columbia University Certification of Participation and written evaluations from their instructors.

Students are evaluated on the basis of the effort they put in, their progress over the duration of the class, and their potential for future work in the pertinent field and in college.

Successful participation is determined by the instructors in consultation with program administration. Attendance, class participation, satisfactory completion of assignments and adherence to the program's community standards are all considered as part of the evaluation process.

Class attendance is carefully monitored. Students must attend all classes unless they are ill. A student who misses multiple class sessions may not receive a Certification of Participation even if those absences are excused.

Copyright Policy
Please note—Due to copyright restrictions, online access to this material is limited to instructors and students currently registered for this course. Please be advised that by clicking the link to the electronic materials in this course, you have read and accept the following:

The copyright law of the United States (Title 17, United States Code) governs the making of photocopies or other reproductions of copyrighted materials. Under certain conditions specified in the law, libraries and archives are authorized to furnish a photocopy or other reproduction. One of these specified conditions is that the photocopy or reproduction is not to be "used for any purpose other than private study, scholarship, or research." If a user makes a request for, or later uses, a photocopy or reproduction for purposes in excess of "fair use," that user may be liable for copyright infringement.

Academic Integrity
Columbia University takes matters of intellectual integrity very seriously. Plagiarism is not tolerated. Plagiarism includes, but is not limited to, submitting work done by another person or purchased from any source; failure to document ideas found in sources, whether print or electronic, with appropriate notes and bibliographical references; failure to enclose borrowed phrases or sentences within quotation marks; and turning in the same assignment for two courses without advance permission from both teachers.

Plagiarism, whether intentional or unintentional, will result in dismissal from the program. Students who are unsure about the proper presentation of their work should consult their course instructor.

Class Participation
Class attendance is mandatory. A student who misses multiple class sessions will not receive a Certification of Participation, even if those absences are excused. Unexcused absences can lead to dismissal from the program.

Students are expected to engage seriously in their courses through both class participation and completion of assigned work. Disruptive behavior will not be tolerated.

Camera On
We strive to maintain a safe and secure online experience for our Immersion community. In addition to secure sign-on, we require students to keep their cameras on during class time, office hours, and student life activities unless otherwise instructed by a faculty or staff member. Our program staff and faculty need to be able to verify the identity of anyone in our online space

in accordance with our Protection of Minors policy. Parents/guardians are not permitted to attend a class or activity on behalf of their student. Only registered students should be logged in to their course.

Additionally, students should ensure their background is appropriate for a classroom setting. We encourage students to maintain a clear and distraction free background or utilize one of the digital Zoom backgrounds provided.

If a student needs to be excused from keeping their camera on, their parent or guardian should contact the Student Services office to formally make arrangements.

Community Standards
The Community Standards are designed to ensure the safety and well-being of the students and the integrity of the University. They are strictly enforced and failure to abide by them results in dismissal from the program, normally on the first offense.

The determination as to whether a student has violated the Community Standards is made by program staff, instructors, and administrators.

Students who are dismissed from the program do not receive evaluation letters or Certifications of Participation. No portion of the program cost will be refunded to a student who has been dismissed.

Protection of Minors at Columbia
Columbia University is committed to promoting a safe environment for minors who participate in our programs and activities. You can read the University's policy and access other helpful resources University's website on protection of minors.

Discrimination, Harassment or Gender-based Misconduct
Columbia University is committed to fostering an environment that is free from gender-based discrimination and harassment, including sexual assault and all other forms of gender-based misconduct. The University recognizes its responsibility to increase awareness of such misconduct, prevent its occurrence, diligently investigate reports of misconduct, support students and others who experience gender-based misconduct, and respond fairly and firmly when students violate University policy. The University is also committed to supporting students accused of gender-based misconduct who go through the disciplinary process. In addressing issues of gender-based misconduct, all members of the University must respect and care for one another in a manner consistent with our deeply held academic and community values.

Please review the Program's Discrimination, Harassment or Gender-Based Misconduct policy.

Accessibility
Columbia is committed to providing equal access to qualified students with documented disabilities. A student's disability status and reasonable accommodations are individually determined based upon disability documentation and related information gathered through the intake process. For more information regarding this service, please visit the University's Health Services website.

Course Schedule/Calendar

The following table describes the schedule for the course and might be altered based on class performance:

Day	Class Topics and Activities	Assignment
0		Check computer specifications Sign up for GitHub Student
1	Introductions Syllabus Review Introduction to Programming Environment Setup and Git Hello World and Running Python	Assignment 0
2	Objects and Expressions	Assignment 1
3	Loops and Conditionals	Assignment 2
4	Packages, NumPy, and Pandas	Assignment 3
5	Graphing: Matplotlib and Plotly	Assignment 4
6	Beautiful Soup, and APIs	Project
7	Scikit-Learn: Regression, ML 1	Project
8	Scikit-Learn: ML 2	Project
9	Documentation: Markdown and LaTeX	Project
10	Final Class: Conclusions and Presentations	