NYU STERN

Programming & Algorithms using Python

Fall 2025 Tech-UB 27, Section 2 | Tue & Thu 9:30am - 10:45am

Class Start - End: Thu, Oct 23 - Thu, Dec 11

SYLLABUS

(Aug 19, 2025 update: revised weekly topic map and course evaluation components)

IMPORTANT NOTE: This course is the recommended second course for undergrads who know the basics of Python and want to learn structured programming and algorithms.

REQUIRED PREREQUISITE:

Students MUST have completed ONE of the following courses to with a "B" be accepted into this course:

- Tech-UB 25 (Introduction to Python Programming)
- Tech-UB 23 (Introduction to Programming and Data Science)

COURSE INTRODUCTION

OVERVIEW: *WHY SHOULD YOU TAKE THIS COURSE?*

Programming & Algorithms using Python is a new course offered by NYU Stern to undergraduate students starting in Fall 2025. This course's primary objective builds on your prior introductory programming class to start your journey from a "software programmer" into a "software engineer".

In this journey, you will learn the primary engineering components of modern software: data structures, algorithms, Object Oriented Programming, software solution design, and code management. Our approach to this journey will focus on the key concepts behind the code using non-technical and visual explanations before transforming these ideas into working software.

Learning these primary software engineering concepts are advantageous for several reasons, including:

1. you will have an engineer's eye for business opportunities enabled with software and fluency for working with tech teams[1];
2. you will be a superior manager of LLM-based "AI coders" giving you an edge over competitors[2]; and,
3. you will possess new analytical frameworks for understanding and solving complex business problems, even without software[3].

[1] Non-tech executive's software fluency is a critical differentiator for digital business success as described in the New Yorker's December 2018 article entitled, "The Friendship that Made Google Huge."

[2] This benefit was recently discussed by technology visionary and software reference book publisher Tim O'Reilly in his February 4, 2025 essay entitled, "The End of Programming as We Know It."

[3] Successful AI software entrepreneur Kunal Gupta expands on this idea in his April 3, 2025 essay entitled, "The End of Coding?"

COURSE CONTENT: *WHAT TOPICS WILL YOU LEARN?*

In starting your journey from a software programmer to a software engineer, we will use Python to cover these topics:

- Primary data structures: lists, stacks, queues, trees, graphs
- Primary algorithms: search methods, bubble sort, tree and graph traversal
- Analyzing algorithm complexity (Big O notation)
- Object Oriented Programming (OOP): classes, methods, attributes
- Problem-solving methods: analysis, planning and testing/debugging
- Code organization: project file structures, version control (Git)

However, unlike more traditional Computer Science courses, we will NOT cover these topics:

- Advanced OOP concepts in languages such as C++ and Java
- Advanced sorting algorithms such as merge sort
- In-depth study of trees, graphs and their underlying theory
- Data types beyond the primary structures
- In-depth study of recursive programming
- Functional Programming (FP) in Python

Course Instruction Team:

- **Professor:** Guthrie Collin (NYU Stern bio, LinkedIn profile)
  - **Office Location:** KMC 8-171
  - **Office Hours by appointment after 5pm on Tue, Wed, Thu as availability allows**. Please request 1 day in advance and seek Teaching Fellow's consultation BEFORE consulting professor. The Teaching Fellow will provide context on your needs/questions to the professor.
- **Teaching Fellow:** will be announced closer to course start date

COURSE DETAILS

REFERENCES: *WHAT MATERIALS WILL YOU READ?*

This course will assign readings from the following references:

- Open Educational Resources in the form of technical documentation on the web:
  - Python: https://docs.python.org/3/
  - Git: https://git-scm.com/docs
  - GitHub: https://docs.github.com/en
- REQUIRED readings:
  - "Grokking Algorithms, 2nd Edition" by Aditya Bhargava (available as a free NYU Bobst ebook)
    - labeled as "Grokking" in the course topic map

REQUIRED DEVICES: *WHAT TECH DO YOU NEED?*

Students are required to have access to a laptop for coding assignments, required readings on the web, and required readings through NYU Bobst library's online access. The laptop will require the latest version of Python 3.x to be installed.

The laptop will not be necessary for class since classroom instruction will focus on exploring the conceptual topics supporting the software code. We will also review the answers to software code assignments during class but not as an interactive demonstration. Instead, assigned readings, homework and supplementary videos will guide you in software coding at your own pace.

GENERATIVE AI USAGE POLICY:

Use of ChatGPT and related generative AI tools is allowed in this class assignments only as specified in each assignment. When you use any of these tools, you must include a note describing how you used them for the assignment inclusive of the prompting text you created and how you modified the output. Use of ChatGPT and related tools is not permitted for use when taking class quizzes or exams.

CAUTION: Given this class's examination restriction and the growing experimental evidence of generative AI's reasoning limitations[4], each student must strive for a solid understanding of the course content and not rely on generative AI tools.

[4] The Wall Street Journal described Apple's experimental results proving the limitations of Generative AI in the Jun 13, 2025 article entitled, "Why Superintelligent AI Isn't Taking Over Anytime Soon."

COURSE GRADING

EVALUATION: *HOW WILL YOUR GRADE BE CALCULATED?*

Evaluation Item	% of Evaluation
In-Class Final Exam (handwritten answers, no ChatGPT, et al. or digital devices permitted)	**30%**
6x Coding assignments (ChatGPT and related tools permitted, no late submissions)	**30%**
6x In-Class Quizzes (handwritten answers, no ChatGPT, et al. or digital devices permitted and no makeup quizzes)	**30%**
Class Attendance and Participation	**10%**

COURSE CONTENT MAP BY SESSION

NOTE: The sequence of course content described below is the intended timing and may change while the course is underway based on how students progress through the topics.

(Class #) Day, Date	Topic	Quiz	HW
(1) Thu, Oct 23	Course Introduction and Python Basics Review		1
(2) Tue, Oct 28	Python Programming Part 1: User Defined Functions In-Depth	1	
(3) Thu, Oct 30	Python Programming Part 2: Debugging		2
(4) Tue, Nov 4	Python Programming Part 3: Structuring Code Projects with User Defined Modules, and overview of Git/Github code management	2	
(5) Thu, Nov 6	Algorithmic Problem Solving Part 1: Big O analysis and Binary Search (“Grokking” Ch. 1)		3
(6) Tue, Nov 11	Algorithmic Problem Solving Part 2: Selection Sort and Advanced List Operations (“Grokking” Ch. 2)	3	
(7) Thu, Nov 13	Algorithmic Problem Solving Part 3: Recursion, Quicksort, and Pseudocode (“Grokking” Ch. 3-4)		4
(8) Tue, Nov 18	Data Structures Part 1: Hash Maps (“Grokking” Ch. 5)	4	
(9) Thu, Nov 20	Data Structures Part 2: Graphs (“Grokking” Ch. 6, partial Ch. 9)		5
(10) Tue, Nov 25	Data Structures Part 3: Trees (“Grokking” Ch. 7-8)	5	
Thu, Nov 27	No Class - Thanksgiving Holiday		
(11) Tue, Dec 2	Object Oriented Programming Part 1: Object Analysis and Classes	6	
(12) Thu, Dec 4	Object Oriented Programming Part 2: Methods and Attributes		6
(13) Tue, Dec 9	Course Review		
(14) Thu, Dec 11	FINAL EXAM		

ADDITIONAL COURSE POLICIES

ACADEMIC INTEGRITY

Our undergraduate Academics Pillar states that we take pride in our well-rounded education and approach our academics with honesty and integrity. Indeed, integrity is critical to all that we do here at NYU Stern. As members of our community, all students agree to abide by the NYU Academic Integrity Policies as well as the NYU Stern Student Code of Conduct, which includes a commitment to:

- Exercise integrity in all aspects of one's academic work including, but not limited to, the preparation and completion of exams, papers and all other course requirements by not engaging in any method or means that provides an unfair advantage.
- Clearly acknowledge the work and efforts of others when submitting written work as one's own. Ideas, data, direct quotations (which should be designated with quotation marks), paraphrasing, creative expression, or any other incorporation of the work of others should be fully referenced.
- Refrain from behaving in ways that knowingly support, assist, or in any way attempt to enable another person to engage in any violation of the Code of Conduct. Our support also includes reporting any observed violations of this Code of Conduct or other School and University policies that are deemed to adversely affect the NYU Stern community.

The Stern Code of Conduct and Judiciary Process applies to all students enrolled in Stern courses. For undergraduates, information can be found here: https://www.stern.nyu.edu/portal-partners/current-students/undergraduate/community/community-expectations

To help ensure the integrity of our learning community, prose assignments you submit to NYU Brightspace will be submitted to Turnitin. Turnitin will compare your submission to a database of prior submissions to Turnitin, current and archived Web pages, periodicals, journals, and publications. Additionally, your document will become part of the Turnitin database.

GENERAL CONDUCT & BEHAVIOR

Students are also expected to maintain and abide by the highest standards of professional conduct and behavior. Please familiarize yourself with Stern's Policy in Regard to In-Class Behavior & Expectations for Graduate and Undergraduate students. (https://www.stern.nyu.edu/portal-partners/registrar/policies-procedures/general-policies/code-conduct) (http://www.stern.nyu.edu/portal-partners/current-students/undergraduate/resources-policies/academic-policies/index.htm) and the NYU Student Conduct Policy (https://www.nyu.edu/about/policies-guidelines-compliance/policies-and-guidelines/university-student-conduct-policy.html).

UNDERGRADUATE GRADING GUIDELINES

At NYU Stern, we strive to create courses that challenge students intellectually and that meet the Stern standards of academic excellence. To ensure fairness and clarity of grading, the Stern faculty have agreed that

for elective courses the individual instructor or department is responsible for determining reasonable grading guidelines.

STUDENT ACCESSIBILITY

If you will require academic accommodation of any kind during this course, you must notify me at the beginning of the course and provide a letter from the Moses Center for Student Accessibility (212-998-4980, mosescsa@nyu.edu) verifying your registration and outlining the accommodations they recommend. If you will need to take an exam at the Moses Center for Student Accessibility, you must submit a completed Exam Accommodations Form to them at least one week prior to the scheduled exam time to be guaranteed accommodation. For more information, visit the CSA website:
https://www.nyu.edu/students/communities-and-groups/student-accessibility.html

STUDENT WELLNESS

Our aim is for students to be as successful academically as they can, and to help them overcome any impediments to that. Bookmark the NYU Stern Well-being Resource Hub (https://www.stern.nyu.edu/wellbeing) for existing services at NYU and Stern covering a wide variety of topics including financial well-being, relationship well-being, mental well-being, and more. Any student who may be struggling and believes this may affect their performance in this course is urged to contact the Moses Center for Student Accessibility (see also the Student Accessibility section of this syllabus) at 212-998-4980 to discuss academic accommodations. If
mental health assistance is needed, call the NYU's 24/7 Wellness Exchange hotline 212-443-9999. Furthermore, please approach me if you feel comfortable doing so. This will enable me to provide relevant resources or referrals. There are also drop in hours and appointments. Find out more at
http://www.nyu.edu/students/health-and-wellness/counseling-services.html

NAME PRONUNCIATION AND PRONOUNS

NYU Stern students now have the ability to include their pronouns and name pronunciation in Albert. I encourage you to share your name pronunciation and preferred pronouns this way. Please utilize this link for additional information: Pronouns & Name Pronunciation

RELIGIOUS OBSERVANCES AND OTHER ABSENCES

NYU's Calendar Policy on Religious Holidays states that members of any religious group may, without penalty, absent themselves from classes when required in compliance with their religious obligations. You must notify me in advance of religious holidays or observances that might coincide with exams, assignments, or class times to schedule mutually acceptable alternatives. Students may also contact religiousaccommodations@nyu.edu for assistance.

NYU Stern is committed to ensuring an equitable educational experience for all students regardless of identity or circumstances and strives to recognize the obligations its students have outside of Stern. Please review all class dates at the start of the semester and review all course requirements to identify any foreseeable conflicts

with exams, course assignments, projects, or other items required for participation and attendance. If you are aware of a potential conflict,
please contact me as soon as possible to discuss any potential conflicts to determine whether/how they can be accommodated.

LAPTOPS, CELL PHONES & OTHER ELECTRONIC DEVICES

The use of electronic devices (e.g., tablets or laptops), for the purpose of note-taking only, is permitted. However, students should make every effort to avoid distracting their classmates or disrupting the class, including arriving early and choosing a seat that is less distracting for peers.

INCLUSION STATEMENT

This course strives to support and cultivate diversity of thought, perspectives, and experiences. The intent is to present materials and activities that will challenge your current perspectives with a goal of understanding how others might see situations differently. By participating in this course, it is the expectation that everyone commits to making this an inclusive learning environment for all.