

Syllabus

ECON 294A: Python for Finance

UC Santa Cruz · Spring 2026

This course aims to offer students a comprehensive introduction to Python, with a special emphasis on its applications within Economics/Finance and Data Science. Our objective is to build foundational programming skills and then progress to a broad selection of Python packages for data analysis, econometrics, and machine learning, equipping students to leverage Python for a wide range of applied quantitative work.

Administrative Information

- **Instructor:** Yuchao/Frank Li
- **Office Hours:** Tues and Thurs, 2:30 PM - 3:30 PM at E2-405C
- **Contact:** yli852@ucsc.edu
- **Lecture:**
 - Section 1: Tuesdays, 5:20 PM - 6:55 PM at Thimann Lab 101
 - Section 2: Thursdays, 5:20 PM - 6:55 PM at Thimann Lab 101
- **Course Website:** Canvas
- **Coding Platform:** [Google Colab](#)

Grade Breakdown

- **Lecture Attendance (10%):** lecture attendance is a key part of instruction. Students are allowed up to two absences without penalty.
- **Midterm (40%):** The midterm will be in-person during week 6. It primarily focuses on basic Python syntax.
- **Final Project (50%):** The final assessment is a take-home project.

Optional References

The following books are available free of charge through the UCSC library and cover a broader range of topics than we can address in lectures. Moreover, consulting a book or package documentation, alongside resources such as Stack Overflow and ChatGPT, offers a more structured and comprehensive perspective.

- **Matthes, Eric.** *Python Crash Course. 3rd edition.*
 - [Access the Resource](#)
- **Chen, Daniel.** *Pandas for everyone : Python data analysis.*
 - [Access the Resource](#)
- **Ng, Andrew & Ma, Tengyu.** *Stanford CS229 – Machine Learning Lecture Notes.*
 - [Access the Resource](#)
- **Gallatin, Kyle & Albon, Chris.** *Machine Learning with Python Cookbook : practical solutions from preprocessing to deep learning.*
 - [Access the Resource](#)
- **Géron, Aurélien.** *Hands-on Machine Learning with Scikit-Learn, Keras & TensorFlow. 3rd edition.*
 - [Access the Resource](#)

Below are the official documentation links for several common packages. If you're unsure about a function's logic, checking its documentation is often the most effective approach.

- **NumPy:** <https://numpy.org/doc/stable/index.html>
- **Pandas:** <https://pandas.pydata.org/docs/index.html>
- **Matplotlib:** <https://matplotlib.org/stable/>
- **Seaborn:** <https://seaborn.pydata.org/>
- **SciPy:** <https://docs.scipy.org/doc/scipy/>
- **Statsmodels:** <https://www.statsmodels.org/stable/index.html>
- **Linearmodels:** <https://bashtage.github.io/linearmodels/>
- **Arch:** <https://arch.readthedocs.io/en/latest/>
- **Scikit-learn:** <https://scikit-learn.org/stable/>
- **PyTorch:** <https://pytorch.org/docs/stable/index.html>

Tentative Schedule

- **Part I: Python Basics** (*Python Crash Course, Ch 1–10*)

- **Lecture 1:** PCC Ch 1–3
 - * Setting Up the Environment
 - * Variables and Simple Data Types
 - * Introducing Lists
- **Lecture 2:** PCC Ch 4–5
 - * Working with Lists
 - * if Statements
- **Lecture 3:** PCC Ch 6–7
 - * Dictionaries
 - * User Input and while Loops
- **Lecture 4:** PCC Ch 8
 - * Functions
- **Lecture 5:** PCC Ch 9–10
 - * Classes
 - * Files and Exceptions

- **Midterm Exam**

- **Week 6:** In-person, during lecture time. Covers core Python syntax (PCC Ch 1–9).

- **Part II: Data Analysis, Econometrics, and Machine Learning**

Applied throughout to real financial data (Fama–French factors, industry portfolios, and the S&P 500).

- **Lecture 6:** Numerical Computing and Data Wrangling
 - * NumPy: arrays, vectorization, broadcasting
 - * Pandas: Series and DataFrames, indexing, group-by, merging, time series
- **Lecture 7:** Data Visualization
 - * Matplotlib
 - * Seaborn
- **Lecture 8:** Econometrics in Python
 - * Statistical foundations: descriptive statistics, correlation, hypothesis tests (SciPy)
 - * Linear regression; robust, clustered, and HAC standard errors; diagnostics (Statsmodels)
 - * Panel data, fixed effects, instrumental variables, and Fama–MacBeth (Linear-models)

- * Volatility modeling: ARCH/GARCH (Arch)
- **Lecture 9:** Machine Learning and Deep Learning
 - * The ML workflow: train/test split, cross-validation, and pipelines (Scikit-learn)
 - * Regularization (Ridge/Lasso); regression and classification
 - * Decision trees, random forests, and gradient boosting
 - * Introduction to deep learning: tensors, autograd, and neural networks (PyTorch)

Note: Lectures 6, 8, and 9 are longer than a single class meeting and are designed to span two sessions. The schedule is tentative and may be adjusted as the quarter progresses.