Quantitative Economics

ECO-4465 | Spring 2025
Dr. Alfonso Rodriguez

Course Description

This course will serve as an introduction to modern computational methods and numerical analysis in economics using Python and the Python Scientific Computing (*SciPy*) stack.

We will use computational techniques to solve common economic models you should already be familiar with. The lectures will consist of a blend between theory and application, all within the framework and flexibility afforded by the Python programming language.

Course Objective

The objective of this course is three fold:

1. for students to learn how to use Python;
2. for students to get hands on experience with computational methods; and,
3. for students to learn how to perform numerical analysis.

Learning Outcomes

By the end of this course the you will have a solid understanding of

- Python,
- the Python Scientific Computing libraries,
- how to use Python to analyze economic models, and
- how to use Python for econometric analysis.

Contact Information

If you need to contact me, I can be reached via e-mail at asymptotic.efficiency@gmail.com. Please include in the e-mail subject line the course number, in this case ECO4465. Otherwise, your e-mail will, most likely, end up in my spam folder.

Do not message me through Canvas as I do not check the Canvas Inbox, I only check my email.

I will hold office hours on Tuesdays and Thursdays from 7:00AM till 7:50AM in my office, DM313A. I will also be available, if the need arises, by appointment.

So, If you are having issues with the course material and/or need to meet with me one-on-one please stop by during office hours or contact me so we can schedule a meeting.

Prerequisites

The prerequisites for this course are: Calculus I (MAC2311) or Calculus for Business (MAC2233); Intermediate Microeconomics (ECO3101); Intermediate Macroeconomics (ECO3203), and Introduction to Econometrics (ECO4421). A passing grade for each of the above courses is required before taking this course.

Required Software

Anaconda - Python Version

- You can download Anaconda for Windows, macOS, or Linux from www.anaconda.org
- See instructions on installing Anaconda for your operating system here.

Resources

- Discroll, Michael, "Python 101," https://leanpub.com/py101
- Gaddis, Tony, "Starting Out With Python," 5th Edition, *Pearson Education Inc.*, (2021).
- Blanchard, Oliver, "Macroeconomics," 5th Edition, *Pearson Education Inc.*, (2009).
- Chiang, Alpha C., "Fundamental Methods of Mathematical Economics," 4th Edition, *McGraw Hill Publishing*, (2005).
- Serrano, Roberto, and Allan M. Feldman, "A Short Course in Intermediate Microeconomics with Calculus," 2nd Edition, *Cambridge University Press*, 2020.
- Wooldridge, Jeffrey M., "Introductory Econometrics: A Modern Approach," 7th Edition *Nelson Education*, 2020.

Grades

Your grade in this course will be based on the following:

- Homework assignments: 25% of grade
- Exam: 25%
- Economic modeling project and presentation: 25% of grade
- Data analysis project and presentation: 25% of grade

The grade distribution for the course is as follows:

Grade	Range
A	95-100
A-	90-94
B+	87-89
B	83-86
B-	80-82
C+	77-79
C	70-76
D	60-69
F	0-59

Please note, it is of the utmost importance that you do not miss an assignment|exam. Those who do will receive a failing grade on the assignment|exam, no exceptions.

Projects

Your first project will consist of choosing an economic model that is of interest to you. Then you will be tasked with programming it in Python. You will then be required to present your model to the class and detail how you went about implementing it in Python, carefully going over your code.

For your second project, you will be given a dataset and will be tasked with performing a complete analysis of the data, using Python and the techniques covered in class. Each group will have to present their analysis and discuss its implementation.

Tentative Course Outline

- Introduction
  - Installing Anaconda
  - Getting up and running with Python
  - Jupyter notebooks, and Spyder
- Coding with Python
  - Basic syntax
  - Variables, strings, numbers, and casting
  - Operators
  - Tuples, lists, sets, and dictionaries
  - Loops, and if-statements
  - Functions, and lambda functions
- Working with data structures
  - NumPy basics
  - Pandas basics
  - Matplotlib basics
- Working with json and geojson files
  - Geopandas and Folium basics
- Symbolic mathematics
  - SymPy basics
  - Symbolic algebra, optimization, and constrained optimization
- Interactivity
  - Working with IpyWidgets and Bokeh
- Economic Models using Python:
  - IS-LM
  - Market model with government regulation
  - Consumer choice and intertemporal consumption
  - Duopoly
  - Price discrimination
  - Solow growth model
- Data analysis using Python

- OLS regression analysis
    - Inference
    - Simultaneous equation model
    - Binary response models (LPM, Probit, and Logit)
    - Economic Applications
- Machine Learning
    - Naive Bayes
    - Decision Tree (classifier, regression)
    - Random Forest (classifier, regression)
    - K-Nearest Neighbor
    - Economic Applications

Academic Misconduct

Please read over and be aware of FIU's Code of Conduct and Academic Integrity. Any violation thereof constitutes academic misconduct and may result in disciplinary action including, but not limited to, a failing grade, disciplinary probation, or expulsion from the university.

Accommodating Disabilities

If you have a disability and need assistance, please contact the Disability Resource Center (University Park: GC-190; 305.348.3532). Upon contact, the Disability Resource Center will review your request and contact your instructor or other personnel to make arrangements for appropriate modification and/or assistance.