

Python and Applications to Business Analytics (DRAFT)

Fall 2018, Module 1.

Monday/Wednesday, 5:00-6:20pm, Room: Sachar International Center 116

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Office: MW, 2:00 - 4:00pm or by appointment.

TA: TBD

OVERVIEW

Python is a computer programming language that has gained wide popularity throughout the software development field. Python has achieved massive appeal due to its ease-of-use, its quick learning curve, and its robust library of modules available through a large community of developers. Whether a person or firm builds software for pleasure, computational automation, or basic computing support for business decisions, the need for people to properly design, code, test, and deploy Python computer solutions is mandatory within today's data driven business world.

This course is designed to be relevant to any business student that wishes to build a skillset that can harness the power of the computer, computer science, and data analysis to various applications in business analytics. A set of these applications in business analytics that are relevant is data analysis (statistics, machine learning), data visualization (charting), algorithms (optimization, numerical methods, linear algebra), and forecasting (time series analytics, stochastic methods).

LEARNING GOALS

Computer programming, much like a spoken language, can be mastered only through continuous, hands on repetition. Python is no different and this course stresses, above all, a need for students to code, code, and code. Only through constantly programming can a student gain a sufficient mastery of Python.

At the end of this course, the student should be able to:

- Understand the basic syntax and constructs of the Python computer programming language.
- Develop an intuitive feel of how to model a business process to a computer-recognizable, Python form.
- Design, code, test, and deploy modular, scalable, maintainable Python applications using Python packages along with object-oriented programming methods.
- Implement Python applications in business analytics. All assignments will be tailored to applications in the field of business analytics.

Success in this course is based on the expectation that students will spend a minimum of nine hours of study time per week in preparation for class.

COURSE REQUIREMENTS

Required Book: There is one book that is required for this course.

- Python for Data Analysis, Wes McKinney, O'Reilly Media, Inc., 2018.
- Learning Python, Mark Lutz, O'Reilly Media, Inc., 2013.

Tutorials

- <https://docs.python.org/3/tutorial/index.html>
- <https://www.w3schools.com/python/>
- <https://www.tutorialspoint.com/python/index.htm>
- <https://www.codecademy.com/learn/learn-python>
- <https://www.learnpython.org/>

Please note that there are numerous books and online resources to learn nearly everything about Python. However, please become familiar with the following sites:

- <https://www.python.org/> Portal to everything Python from the keepers of the technology.
- <https://stackoverflow.com/> Search for solutions when encountering

Prerequisite: No computer programming background is required, although all students should have access to a computer and obviously know how to use it.

Class Participation: Class participation is expected of **everyone** in this course, and **class attendance is required**. Each class will have new hands-on demonstrations and/or discussions of previous assignments.

Programming Assignments: Assignments must be done in groups of no more than two students. Grades on each assignment are assigned to all members of the team (although I reserve the right to alter individual grades in certain circumstances, e.g., when it is clear to me that an individual did not contribute to the assignment in a consistent and meaningful way). Students can choose their own partners and it is expected that all assignments are completed equally by both team members.

Special Accommodation. If you are a student with a documented disability on record at Brandeis and wish to have a reasonable accommodation made for you in this class, please see me immediately. Please keep in mind that reasonable accommodations are not provided retroactively.

Final Exam: This course will have a final exam. If you have obligations that will prevent you from being in class on the examination day, you should not take this class!

Grading

- Class Participation 10%

Programming Assignments:

- Six assignments 50%

Final Examination:

- In-class 40%

Class Format. For the first class session, there will be an inspiring introduction to what Python is and is not. A thorough demonstration of Python through applications will be presented. Beyond the first class session, all sessions will follow a standard format. The first quarter of the class session will be open to students to ask questions regarding anything from the lectures, assignments, or just follow-up on previously taught topics. The remaining three quarters of the class is for the instructor to lecture and show examples of Python topics and its applications to business analytics.

Academic Honesty. You are expected to be honest in all of your academic work. Please consult Brandeis University [Rights and Responsibilities](#) for all policies and procedures related to academic integrity. Students may be required to submit work to TurnItIn.com software to verify originality. Allegations of alleged academic dishonesty will be forwarded to the Director of Academic Integrity. Sanctions for academic dishonesty can include failing grades and/or suspension from the university. Citation and research assistance can be found at [LTS - Library guides](#).

COURSE OUTLINE

CLASS 1 – Wednesday, August 29, 2018

Introduction to Python and Demonstration of Python-Written Applications

Reading: Lutz, Chapters 1 - 3.

In this introductory lecture we will answer the following questions, which will provide the foundation for our remaining sessions:

- What is Python?
- What tools do I need to install to have a working Python development studio?
- What makes a good software application?
- What is the software development cycle?
- How does the Python interpreter work?

Demo of some Python applications that shows the rich domain of business analytics and technology tools that Python has.

CLASS 2 – Wednesday, September 5, 2018

Types, Assignments, Operations, If, and Iterative

Reading: Lutz, Chapters 4 - 7, 11 - 14. Please note that all programming would build upon itself, so although a lot of reading, this can be read over the entire course.

We look to understand the basic constructs of variable types and how assignment, making decisions, and iteration is used to create a working Python application.

- Variable Types
- Assigning variables and literals
- Making decisions with the if-then-else clause
- Iterating over a block of code

I will demonstrate these uses in a hands-on demonstration of a Python application utilizing the above mentioned constructs.

CLASS 3 - Thursday, September 6, 2018

Lists and Dictionaries

Reading: Lutz, Chapter 8.

Python has built-in data structures which are used to store and manipulate data. I will demonstrate the use of lists (equivalent to a mutable array) and dictionaries (equivalent to a key-value lookup table) and how to model data structures within your application.

CLASS 4 - Wednesday, September 12, 2018

Tuples and Sets

Reading: Lutz, Chapters 9.

As a follow-up to the previous class, we will extend the concept of data structures to fixed length immutable lists (known as a tuple) and a list of unique items, in which the list contents are unique within the list (known as a set).

CLASS 5 - Monday, September 17, 2018

Functions and Modules

Reading: Lutz, Chapters 22 - 24.

To modularize code and manage the complexity of software development, functions and modules will be introduced on how code functionality should be partitioned into a simple, reusable form and then packaged into a module for deployment.

CLASS 6 - Tuesday, September 25, 2018

Designing Python Applications

Reading: In class slides.

We will be introduced to a proposed large-scale business analytics application. We will design its major components taking due consideration for the application's use cases, user interface, complexity, performance, coding, testing, deployment and maintenance.

CLASS 7 – Wednesday, September 26, 2018
Classes and Object Oriented Programming 1

Reading: Lutz, Chapters 26 - 29.

We will learn to understand the underlying principles of Object Oriented Programming (OOP). The ability to design and model classes with both state, behavior, and event processing.

CLASS 8 – Wednesday, October 3, 2018
Classes and Object Oriented Programming 2

Reading: Lutz, Chapters 26 - 29.

As a continuation of the previous class, we will further continue our discussion of OOP and how proper problem domain abstraction can help minimize software complexity.

CLASS 9 – Monday, October 8, 2018
Exception Handling

Reading: Lutz, Chapters 33 - 36.

To understand the use of exceptions to handle errors within Python code. Errors will always occur, with the majority being user error. Error types will be discussed, and exception handling will be coded to gracefully manage the exception.

CLASS 10 – Wednesday, October 10, 2018
Python for Data Analysis

Reading: McKinney, Chapters 1 - 5.

The Python community has developed wonderful modules that can be used for simple or robust Data Analysis. We will look at NumPy, SciPy, and pandas and how these modules can be used.

CLASS 11 – Monday, October 15, 2018
Data Analysis, Statistics, and Data Visualization

Reading: McKinney, Chapters 6 - 8.

Utilizing the pandas module, we will perform data analysis and visualize the resulting metrics within matplotlib, a Python module for plotting and general data visualization.

CLASS 12 – Wednesday, October 17, 2018
Time Series Analysis

Reading: McKinney, Chapters 11.

A large set of data comes in a time series form. We will delve into the use of Python time series analysis.

CLASS 13 - Monday, October 22, 2018
Review for Examination

Reading: In class discussion.