

Syllabus

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Description

This [module](#) is also available as a concatenated page, suitable for printing or saving as a PDF for offline viewing.

MET CS 521

Information Structures with Python

This course presents an effective approach to learn Python. With extensive use of graphical illustrations, it will build understanding of Python and its capabilities by learning through many simple examples and analogies. The class will involve active student participation, discussions, and programming exercises. This approach will help build a strong foundation in Python programming that can be used effectively in real-job situations and future courses.

Prerequisites

Familiarity with at least one programming language. Understanding of key language constructs and methods. Ability to formulate quantitative information symbolically and numerically.

Technical Notes

The table of contents expands and contracts (+/- sign) and may conceal some pages. To avoid missing content pages, you are advised to use the next/previous page icons in the top right corner of the learning modules.

This course requires you to access files such as word documents, PDFs, and/or media files. These files may open in your browser or be downloaded as files, depending on the settings of your browser.

Learning Objectives

By successfully completing this course students will be able to:

- Use Python programming language constructs to implement a variety of analytical and computational methods (searching and sorting)
- Explain tradeoffs between different Python methods and data structures in computation

- Apply acquired skills in diverse settings by completing a course project of their choosing
- Present both symbolic and visual results their course project
- Articulate the advantages and limitations of using Python

To accomplish this goal, course materials are divided into a set of mini-modules

corresponding to particular topic(s). These mini-modules will typically include the following:

- Course material with many examples
- Self-test questions
- Sample programming problems including typical Python job interview questions (collected from various sources in the internet)

Instructional Team

Instructor: Marc Lowenthal

Computer Science Department

Metropolitan College

Boston University

marc10is@bu.edu



Marc Lowenthal received his BA in both Information Systems and Accounting from Syracuse University and MBA in both Information Systems and Finance from Pace University. The majority of his career has been in the investment industry, with a primary focus on quantitative finance. Along with teaching at MET, Marc works as an angel investor to over a dozen companies and continues to develop quantitative software.

Original Course Developer: Eugene Pinsky, Ph.D.

Computer Science Department
Metropolitan College
Boston University
1010 Commonwealth Avenue



Eugene Pinsky received his B.A. in Mathematics from Harvard University and his Ph.D. in Computer Science from Columbia University. He has taught extensively both in academia and industry. His research interests are in performance analysis and computational algorithms in data science and machine learning with emphasis on computational finance and programmatic advertising.

Materials

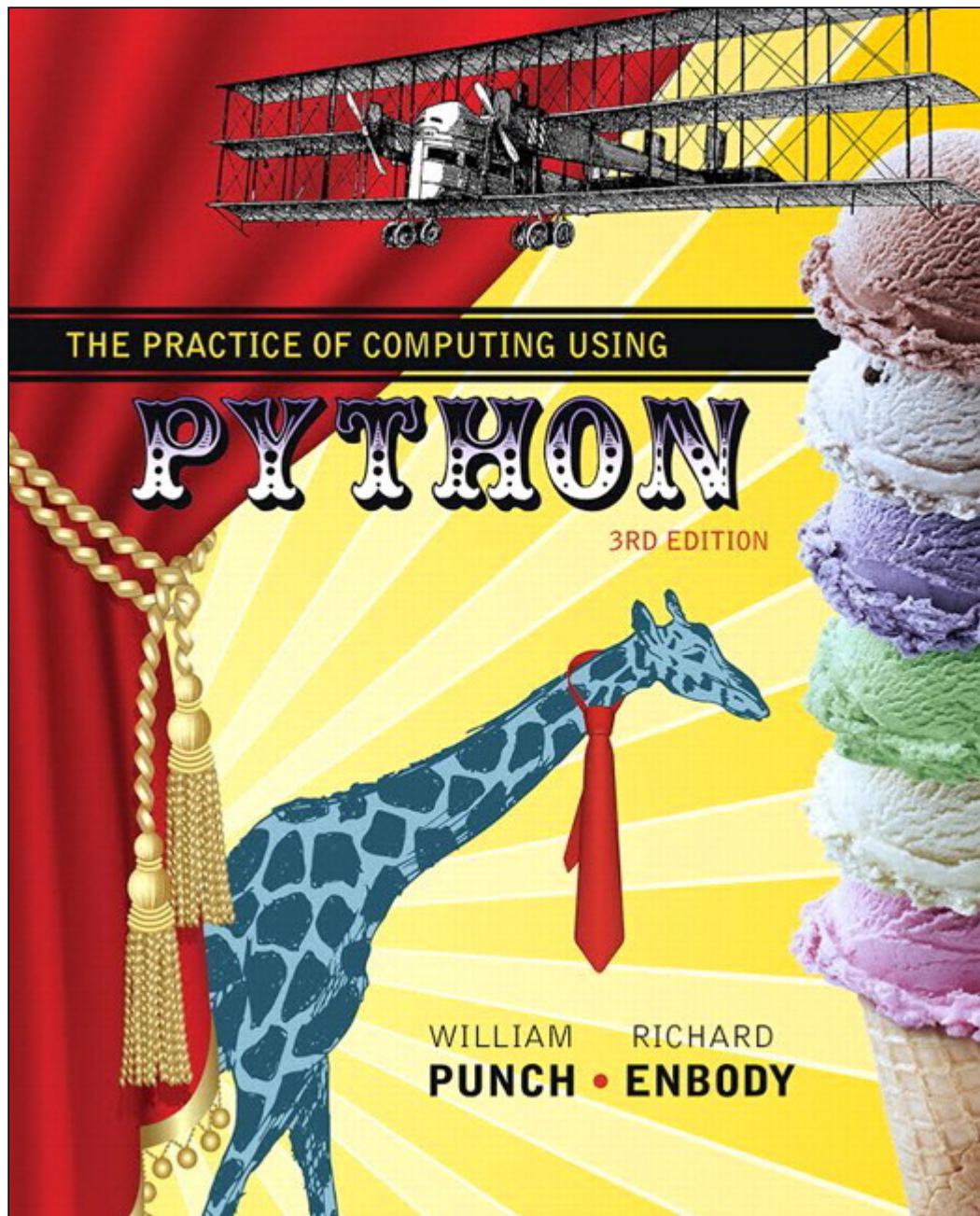
Required Book

Contemporary programming languages like Python enjoy rich online documentation. Indeed, they are built on the premise that programmers are continually in contact with such documentation, and are not expected to memorize any but a small fraction of it. The textbook for the course is below. There will be readings from the text weekly. The text will be used in conjunction with the online course modules and online Python documentation.

Punch, W. and Enbody, R. (2016). *The Practice of Computing Using Python* (3rd ed.).

Pearson.

ISBN-13: 978-0-13-437976-0



This book can be purchased from [Barnes and Noble at Boston University](#). An e-book is available at [Vitalsource.com](#). An e-book is available through the BU bookstore.

Note: You do not need to purchase the textbook "with access," also referred to as the "lab" portion of this text. It will not be used in this course.

Running Python Programs

We will be using Spyder IDE (Integrated Development Environment) and Anaconda Python Distribution. We have these installed in our virtual lab. MET Virtual Labs (VLAB) provide students with all required software. Most of the examples presented in class will be run in this environment. You can familiarize yourself with the virtual labs with the information from our website: <http://www.bu.edu/metit/services/#vlab-target>

Additional Resources:

There are many online resources available. This is a partial list:

1. <http://www.pythontutor.com/visualize.html> - this website is very useful and allows to run simple Python programs and visualize the execution. Many of the illustrations in the course notes were generated using this

website.

2. <https://docs.python.org/2/tutorial> - an official Python tutorial
3. <https://www.tutorialspoint.com/python> - a detailed tutorial with many simple examples
4. <https://www.learnpython.org> - free, interactive tutorial
5. <https://www.python.org/community/sigs/current/edu-sig/> - contains links to learning resources, including two free books

Boston University Library Information

Boston University has created a set of videos to help orient you to the online resources at your disposal. An introduction to the series is below:

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All of the videos in the series are available on the [Online Library Resources](#) page, which is also accessible from the Campus Bookmarks section of your Online Campus Dashboard. Please feel free to make use of them.

As Boston University students, you have full access to the BU Library. From any computer, you can gain access to anything at the library that is electronically formatted. To connect to the library, use the link <http://www.bu.edu/library>. You may use the library's content whether you are connected through your online course or not, by confirming your status as a BU community member using your Kerberos password.

Once in the library system, you can use the links under "Resources" and "Collections" to find databases, eJournals, and eBooks, as well as search the library by subject. Some other useful links follow:

Go to <http://www.bu.edu/library/research/collections> to access eBooks and eJournals directly.

If you have questions about library resources, go to <http://www.bu.edu/library/help/ask-a-librarian> to email the library or use the live-chat feature.

To locate course eReserves, go to <http://www.bu.edu/library/services/reserves>.

Teaching Approach and Goals

I am a strong believer in learning by using many illustrated examples. These examples will help us build the fundamental understanding of Python and how to use it to solve real problems. Many exercises presented in the course will help you develop skills that are needed to use Python effectively in your workplace and more advanced courses.

Homework, Grading, and Exams

Overall Grading Percentages	
Quizzes	15%
Homework Assignments	35%
Project	20%
Final Exam	30%

Quizzes

There are six 30-minute quizzes (one for each Module). All exams are multiple choice. Quizzes are closed book and will consist of typical Python questions that one can expect at a job interview.

Homework Assignments

This is a programming class and it is essential that students have practice. Most homework assignments will consist of programming problems from the textbook.

Project

The project is open ended and the topics can be chosen by students. In this project, students will frame and solve problems using quantitative capabilities of Python. Students will present their projects in the final week of the course.

Final Exam

There will be a proctored Final Exam in this course using a proctor service called Examity. Detailed instructions regarding your proctored exam will be forthcoming from the Assessment Administrator. You will be responsible for scheduling your own appointment.

The exam will be closed book and will take two hours. The exam will consist of typical Python questions that one can expect at a job interview.

Homework Assignment Evaluation Criteria

The evaluation criteria for assignments are shown below--otherwise, stated with the assignment.

Letter Grade	Approximate Percentage Grade Range	When To Give
A	95-100	The student's submission is excellent and without defect. The submission demonstrates mastery of the material.
A-	90-94.9	The student's submission is excellent with some minor defects. The submission demonstrates a solid grasp of the material.
B+	85-89.9	The student's submission is good with a few defects. The submission demonstrates a solid grasp of most but not all of the material.
B	80-84.9	The student's submission is above average with some defects. The submission demonstrates a solid grasp of some aspects of the material.
B-	75-79.9	The student's submission is approaching average. The submission demonstrates a grasp and understanding of some aspects of the material.
C+	70-74.9	The student's submission is average and has some moderate defects. The submission demonstrates a minimal grasp and understanding of the material.
C	65-69.9	The student's submission is average and has some major defects. The submission demonstrates a basic understanding of the material but nothing more.
C-	60-64.9	The student's submission is below average and has some major defects. The submission demonstrates a barebones understanding of the material but nothing more.

D	50-59.9	The student's submission is poor. Sections may be missing from the submission. The submission does not demonstrate an understanding of the material at even a basic level.
F	0-49.9	The student's submission is unacceptable. Sections may be missing from the submission. The submission does not demonstrate an understanding of the material in any fashion.

Study Guide

Module 1 Study Guide and Deliverables

Theme: Introduction to Computing with Python

Readings:

- Chapter 1 (pp. 37-53), Chapter 9 (pp. 456-463), and Appendix A
- Module Lecture Notes

Topics: Introduction to Computing, Program Structure, Running Python, Input/Output, Variable Scopes and Modules

Assignments Assignment 1 due on Wednesday, July 15 at 6:00 PM ET

Assessments Quiz 1:

- Available Friday, July 10 at 6:00 AM ET
- Due on Tuesday, July 14 at 6:00 AM ET

Live Classrooms:

- Wednesday, July 8, 6:00 - 7:30 PM ET
- Monday, July 13, 6:00 - 7:30 PM ET
- Group Facilitator Sessions: Thursday, July 9, 8:00-9:30 PM ET

Please note that you are not to post attachments of the required or other readings in the water cooler or other areas of the course, as it is an infringement on copyright laws and department policy. All students have access to the library system and will need to develop research skills that include how to find articles through library systems and databases.

Free Tutoring Service



Free online tutoring with Smarthinking is available to BU online students for the duration of their courses. The tutors do not rewrite assignments, but instead teach students how to improve their skills in the following areas: writing, math, sciences, business, ESL, and Word/Excel/PowerPoint.

You can log in directly to Smarthinking from Online Campus by using the link in the left-hand navigation menu of your course.



Please Note

Smarthinking may be used only for current Boston University online courses and career services. Use of this service for purposes other than current coursework or career services may result in deactivation of your Smarthinking account.

Grading Information

Module 2 Study Guide and Deliverables

Theme: Basic Building Blocks for Python Programs

Readings:

- Chapter 1 (pp. 49-73), Chapter 2 (pp. 109-122), Chapter 9 (pp. 456-463), and Chapter 16 (pp. 709-722)
- Module Lecture Notes

Topics: Data Types, Hashing, Mutability, Python Ranges, Copying Objects

Assignments Assignment 2 due on Wednesday, July 22 at 6:00 PM ET

Assessments Quiz 2:

- Available Friday, July 17 at 6:00 AM ET
- Due on Tuesday, July 21 at 6:00 AM ET

Live Classrooms:

- Wednesday, July 15, 6:00 - 7:30 PM ET
- Monday, July 20, 6:00 - 7:30 PM ET
- Group Faciliator Sessions: Thursday, July 16, 8:00-9:30 PM ET

Module 3 Study Guide and Deliverables

Theme: Building Python Projects

Readings:

- Chapter 2 (pp. 122-140), Chapter 4, Chapter 6 (pp. 271-276), Chapter 14 (pp. 645-665)

- Module Lecture Notes

Topics: Strings, Collections, Control Flow, Iterations, Files, Lists

Assignments Assignment 3 due on Wednesday, July 29 at 6:00 PM ET

Assessments Quiz 3:

- Available Friday, July 24 at 6:00 AM ET
- Due on Tuesday, July 28 at 6:00 AM ET

Live Classrooms:

- Wednesday, July 22, 6:00 - 7:30 PM ET
- Monday, July 27, 6:00 - 7:30 PM ET
- Group Faciliator Sessions: Thursday, July 23, 8:00-9:30 PM ET

Module 4 Study Guide and Deliverables

Theme: Collections in Detail

Readings:

- Chapter 7 and Chapter 9
- Module Lecture Notes

Topics: Sets, Tuples, Dictionaries, Stacks, Queues, Singly Linked Lists, Doubly Linked Lists, Sorting, Searching

Assignments Assignment 4 due on Wednesday, August 5 at 6:00 PM ET

Assessments Quiz 4:

- Available Friday, July 31 at 6:00 AM ET
- Due on Tuesday, August 4 at 6:00 AM ET

- Live Classrooms:**
- Wednesday, July 29, 6:00 - 7:30 PM ET
 - Monday, August 3, 6:00 - 7:30 PM ET
 - Group Faciliator Sessions:
Thursday, July 30, 8:00-9:30 PM ET

Module 5 Study Guide and Deliverables

Theme: Functions in Detail

- Readings:**
- Chapter 6 (pp. 282-285), Chapter 14 (pp. 667-672), Chapter 5, Chapter 8, Chapter 15, and Chapter 16 (pp. 724-736)
 - Module Lecture Notes

Topics: Exceptions, Introduction to Functions, Parameter Passing, Generators, Recursive Functions, Functional Programming

Assignments Assignment 5 due on Wednesday, August 12 at 6:00 PM ET

- Assessments** Quiz 5:
- Available Friday, August 7 at 6:00 AM ET
 - Due on Tuesday, August 11 at 6:00 AM ET

- Live Classrooms:**
- Wednesday, August 5, 6:00 - 7:30 PM ET
 - Monday, August 10, 6:00 - 7:30 PM ET
 - Group Faciliator Sessions:
Thursday, August 6, 8:00-9:30 PM ET

Module 6 Study Guide and Deliverables

Theme: Classes in Detail

Readings:

- Chapters 11, 12, and 13
- Module Lecture Notes

Topics: Introduction to Classes, Assignment and Copy, Static vs. Instance Variables, Data Encapsulation, Overloading, Inheritance and Polymorphism, Multiple Inheritance and Abstract Classes

Assignments Assignment 6 due on Wednesday, August 19 at 6:00 PM ET

Assessments Quiz 6:

- Available Friday, August 14 at 6:00 AM ET
- Due on Tuesday, August 18 at 6:00 AM ET

Live Classrooms:

- Wednesday, August 12, 6:00 - 7:30 PM ET
- Monday, August 17, 6:00 - 7:30 PM ET
- Group Facilitator Sessions: Thursday, August 13, 8:00-9:30 PM ET

Module 7 Study Guide and Deliverables

Topics: Final exam and project presentations

Final Project and Video: Due: Saturday, August 22, 11:59 PM ET

Final Exam Details

The Final Exam is a proctored exam available from **Wednesday, August 19 at 6:00 AM ET to Saturday, August 22 at 11:59 PM ET**. The Computer Science department requires that all final exams be administered using an online proctoring service called Examity that you will access via your course in Blackboard. In order to take the exam, you are required to have a working webcam and computer that meets Examity's system requirements. A detailed list of those requirements can be found on the How to Schedule page. Additional information regarding your proctored exam will be forthcoming from the Assessment Administrator. You will be responsible for scheduling your own appointment within the defined exam window.

The Final Exam will be **closed book/closed notes** and is accessible only during the final exam period. You can access it from the Assessments section of the course. Your proctor will enter the password to start the exam.

Final Exam duration: **two hours**

Boston University Metropolitan College