Syllabus

This is a single, concatenated file, suitable for printing or saving as a PDF for offline viewing. Please note that some animations or images may not work.

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)

Instructor and the Course Developer

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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

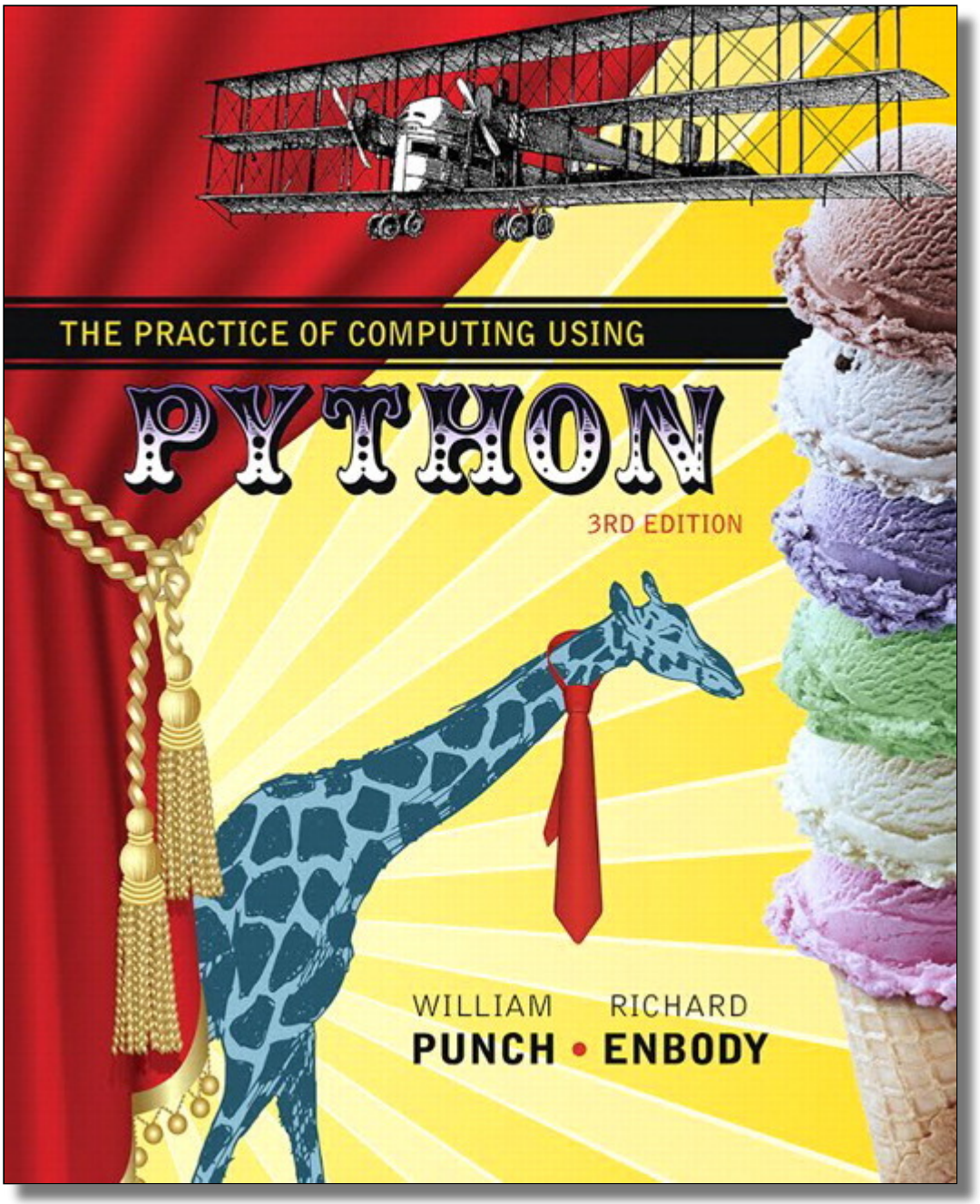
Contemporary programming languages like Python enjoy rich online documentation. Indeed, they are built on the premise that programmers are continually in contact with such documentation, and are not expected to memorize any but a small fraction of it. The textbook for the course is below. There will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

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

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 Tuesday, November 10 at 6:00 PM ET

Assessments Quiz 1:
- Available Friday, November 6 at 6:00 AM ET
- Due on Tuesday, November 10 at 6:00 PM ET

Live Classrooms:
- Tuesday, November 3, 6:00 - 7:30 PM ET
- Thursday, Novermber 5, 6:00 - 7:30 PM ET
- Facilitator Session: Friday, November 6, 6:30-8:00 PM ET

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 Tuesday, November 17 at 6:00 PM ET
Assessments	Quiz 2: • Available Friday, November 13 at 6:00 AM ET • Due on Tuesday, November 17 at 6:00 PM ET
Live Classrooms:	• Tuesday, November 10, 6:00 - 7:30 PM ET • Thursday, November 12, 6:00 - 7:30 PM ET • Facilitator Session: Friday, November 13, 6:30-8:00 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 Tuesday, November 24 at 6:00 PM ET
- Final Project Topic due on Wednesday, November 25 at 6:00 PM ET

Assessments Quiz 3:
- Available Friday, November 20 at 6:00 AM ET
- Due on Tuesday, November 24 at 6:00 PM ET

Live Classrooms:
- Tuesday, November 17, 6:00 - 7:30 PM ET
- Thursday, November 19, 6:00 - 7:30 PM ET
- Facilitator Session: Friday, November 20, 6:30-8:00 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 Tuesday, December 1 at 6:00 PM ET

Assessments Quiz 4:
- Available Friday, November 27 at 6:00 AM ET
- Due on Tuesday, December 1 at 6:00 PM ET

Live Classrooms:	• Tuesday, November 24, 6:00 - 7:30 PM ET • Thursday, November 26, 6:00 - 7:30 PM ET • Facilitator Session: Friday, November 27, 6:30-8:00 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 Tuesday, December 8 at 6:00 PM ET
Assessments	Quiz 5: • Available Friday, December 4 at 6:00 AM ET • Due on Tuesday, December 8 at 6:00 PM ET
Live Classrooms:	• Tuesday, December 1, 6:00 - 7:30 PM ET • Thursday, December 3, 6:00 - 7:30 PM ET • Facilitator Session: Friday, December 4, 6:30-8:00 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 Tuesday, December 15 at 6:00 PM ET
Assessments	Quiz 6: • Available Friday, December 11 at 6:00 AM ET • Due on Tuesday, December 15 at 6:00 PM ET
Live Classrooms:	• Tuesday, December 8, 6:00 - 7:30 PM ET • Thursday, December 10, 6:00 - 7:30 PM ET • Facilitator Session: Friday, December 11, 6:30-8:00 PM ET

Module 7 Study Guide and Deliverables

Topics:	Final exam and project presentations
Final Project and Video:	Due: Saturday, December 19, 11:59 PM ET

Final Exam Details

The Final Exam is a proctored exam available from **Wednesday, December 16 at 6:00 AM ET to Saturday, December 19 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