A Programming Primer in Python

Instructors: Mark Stoykovich and Jonathan Skone

Date: September 25 - 27, 2018

Time: 9:00 am - 12:00 pm

Location: ERC 201B on Sept. 25; ERC 301B on Sept. 26; ACC 211 on Sept. 27 -- University of Chicago, Chicago IL

Course Description

This short course is intended to be a primer for the Engineering Analysis course (MENG 26030), for the purpose of introducing core programming concepts. The Python programming language will be used throughout the course for introducing all programming concepts.

Python is an interpreted language that offers powerful libraries, simple syntax, a rich programming environment, and a robust debugger and profiler. We will cover data structures, lists, arrays, inputs/outputs, loops, functions, packages, and more. The examples used in this course are drawn from topics relevant to engineering analysis problems. Our primary objective is to empower students to use the Python programming language to solve problems applicable to their course of study.

Course Materials

Git repo: https://gitlab.com/uchicago-ime/python-programming-primer/tree/master

Site web address: MENG 26030 course page on canvas.uchicago.edu

Useful Reference Texts:

- Think Python (2nd Ed.) by Allen B. Downey O'Reilly
- How to think like a Computer Scientist by Brad Miller and David Ranum
- Learn Python the Hard Way by Zed Shaw
- Fundamentals of Python: First Programs by Kenneth Lambert

Useful Web Content:

- The Python Tutorial (https://docs.python.org/3/tutorial/): This is the official tutorial from the Python website. No more authoritative source is available.
- Code Academy Python Track (http://www.codecademy.com/tracks/python): Often cited as a great resource, this site offers an entertaining and engaging approach and in-browser work.
- https://learnxinyminutes.com/docs/python3/

- Lynda.com (https://www.lynda.com) Online courses and training for software and business skills. The University of Chicago has a subscription for this content.

Technology Requirements

Students should come to class equipped with a laptop.

Course Objectives

The main objective of this short course is to teach the basic concepts and techniques of programming with the Python language. The material will better prepare the students for the computational tasks they will encounter in the fall quarter of the MENG 26030 Engineering Analysis course.

At the completion of this short course students should be familiar with and have working knowledge to:

1. Characterize/Identify a problem and design a program to solve it
2. Comprehend Python lexical features and syntax
3. Understand Python structures and code flow control
4. Create and use functions to facilitate code reuse
5. Work with lists and arrays
6. Use Python modules and packages
7. Handle file I/O
8. Plot and visualize data
9. Troubleshoot errors and exceptions
10. Make use of scientific Python libraries

Course Structure

Morning Review: 30 minutes of every morning will be spent reviewing the previous days concepts, with student directed discussion of the previous days' assignments. If it is determined to be necessary up to 45 minutes will be spent to make more concrete the concepts/topics under review.

Morning Lecture and Hands on Exercises: The remaining 2.5 hours in the morning will be used to introduce the next set of topics. This will be comprised of mixed hands on and lecture instruction.

Course Policies

This course if voluntary, however, if you sign up for the course you are expected to attend all days of the course, since the structure of the course is built around active participation.

Schedule and Daily Learning Objectives

The following schedule is tentative and subject to change. The learning goals below should be viewed as the key concepts you should grasp after each day.

Day 01 | 09/25		Day 02 | 09/26	
Course introduction	15	Review	30
Git & Jupyter	15	Python packages	30
(navigation, code cells, markdown syntax, etc.)		Functions	45
Overview of Python	15	File I/O	30
Data structures	45	Plotting and visualization	45
Manipulating lists and arrays	45		
Loops and Control flow	45		
Day 03 | 09/27			
Review	30		
Structuring a program	45		
Scientific Python Libraries:			
Numpy	60		
Scipy	30		
Course Conclusion & Evaluation	15		