Mathematical Programming in Python

Math 1800: Special Topics
Spring 2023 Semester
Student Guidelines and Syllabus

`https://people.sc.fsu.edu/~jburkardt/classes/mpp_2023/syllabus/syllabus.pdf`

Description: This course introduces the use of computation to define, program, and solve a variety of mathematical problems, and to create reports and plots of the results. Students will be expected to write and run programs on their personal laptops. A series of mathematical topics will be presented for which computational techniques can be applied. The mathematical topics and the necessary computational skills be be presented at an introductory level: the emphasis is on training students in how to use computation to advance their mathematical studies. The class is aimed for undergraduate and graduate students in mathematics; students from other scientific disciplines should also be able to handle all the material. For lectures and coursework, the Python programming language will be introduced; students are not required to have previous computational experience, but a student who prefers another computer language will be permitted, within reason, to use that in preference to Python. Each topic will be accompanied by a number of exercises and students will have some choice as to which exercises to work on based on their experience, confidence, and daring.

Mathematical Topics: Topics to be covered in this class include

- Chance
- The Collatz Conjecture
- Differential Equations
- Gradient Descent
- Graph Theory
- Iteration
- Linear Algebra
- Polynomials
- Quadrature
- Simulation
- Triangles
- Triangulations

Prerequisite: Students should have taken Math 0220 (Calculus I) and one of Math 0280 (Introduction to Matrices and Linear Algebra), MATH 1180 (Linear Algebra I), or MATH 1185 (Honors Linear Algebra), with a grade of C or better. No prior knowledge of Python is required, and the mathematical topics will be explained as presented.

Grading: There will be no exams. After each mathematical topic is completed, there will be a set of corresponding computational exercises. Students will propose to work on some subset of these exercises, and will be graded on the quality of their correct understanding, careful implementation, and concise presentation of results.

Text: A textbook is not required for this course. Some material presented in class will come from *Python Programming and Numerical Methods* by Kong, Siauw, Bayen, or from *Learning Scientific Programming with Python* by Christian Hill. A student planning a career that includes scientific programming will find either book very helpful.

Early start: Students interested in getting an early start before the class begins can install Python on their laptop, available at

https://www.anaconda.com/products.individual

and then working through the first four sections of the *Python Tutorial* at

https://docs.python.org/3/tutorial/

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Getting Help: The Pitt IT Help Desk may be able to assist you if you have trouble installing Anaconda on your laptop. Send email to

helpdesk@pitt.edu

or check their web page at

https://www.technology.pitt.edu/247-it-help-desk

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Office Hours: Your instructor will announce the office hours for this class. Your instructor's office is room 618, Thackeray Hall. Your instructor's email is `jvb25@pitt.edu`

Disability Resource Services: If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and the Office of Disability Resources and Services, 216 William Pitt Union (412) 624-7890 as early as possible in the term.

Academic Integrity: Cheating and plagiarism will not be tolerated. Students suspected of violating the University of Pittsburgh Policy on Academic Integrity will incur a minimum sanction of a zero score for the work in question. Additional sanctions may be imposed, depending on the severity of the infraction.