Computational Mathematics with Python
MAD 2502 Sections 1223
Monday, Wednesday, Friday, 5nd Period (11:45am-12:35pm)
Location: LIT 201
Spring 2024

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This syllabus is subject to change depending on the conditions of the class.
Please check Canvas for any changes.

Course Description: The course provides an introduction to the use of computers for solving mathematical problems. For this, basics of Python programming Language (see http://www.python.org) are introduced, and are demonstrate how a programming language can enable the solution of mathematical problems. The course does not assume prior programming experience and does not aim at an in-depth understanding of the details of Python. Rather the focus is on understanding concepts and techniques of how programming can help to expand the spectrum of tractable mathematical problems. After completion of the course you should be acquainted with the use of different data types and programming concepts. You should be able to write simple programs in Python to solve computational problems from different areas within mathematics, including analysis, number theory, combinatorics, algebra, linear algebra, numerical analysis, and probability. Finally, this course should enable you to read more advanced material on Python, and prepare you to learn other programming languages or packages that are commonly encountered in computational mathematics.

Prerequisite(s): MAC 2311 or MAC 3472, minimum grade of C.
Credit Hours: 3

Text (required): *Python Programming And Numerical Methods: A Guide For Engineers And Scientists*, *First Ed.*; **ISBN-13**: 978-0128195499
Author: Qingkai Kong, Timmy Siauw, Alexandre Bayen

Open Source Link to book:
https://pythonnumericalmethods.berkeley.edu/notebooks/Index.html

Course Objectives:

- be able to analyze problems from a computing perspective, propose and evaluate solutions to problems;
- understand the importance of and consistently use data and process abstraction;
- understand the importance of and consistently use good programming practices including good documentation;
- write simple programs in Python to solve computational problems from different areas within mathematics.
- analyze and test programs against a set of requirements;
- be able to use packages in Python that are commonly used in data science.

This is a course on how to think about and solve problems using Python and Mathematics, not a course on merely how to write programs in the Python language.

Grade Distribution:

Homework	15%
Computer Projects	12%
TopHat Attendance	5%
Discussion Board	3%
3 Exams	45%
Capstone Presentation	20%

Letter Grade Distribution:

>= 93.00	A	73.00 - 76.99	C
90.00 - 92.99	A-	70.00 - 72.99	C-
87.00 - 89.99	B+	67.00 - 69.99	D+
83.00 - 86.99	B	63.00 - 66.99	D
80.00 - 82.99	B-	60.00 - 62.99	D-
77.00 - 79.99	C+	<= 59.99	E

Course Policies:

- **General**
  - Projects will be be done using the computer language Python.
  - Exams are closed book, closed notes.
- **Grades**
  - Grades will be maintained in the Canvas course shell. Students are responsible for tracking their progress by referring to the online gradebook.
  - Your grade is your responsibility. You have exactly one week once your assignment has been returned to you to discuss that grade. After that week, the grade is final. You can discuss the content of the assignment anytime but grade disputes must be resolved within one week of the graded assignment.

- **Homework**
  - Homeworks will be short assignments given throughout the semester. A homework set will be given with each unit and told when it will be collected.
  - Some of these assignments may be purely mathematical or may be done within code.
  - Homeworks will be done individually.
- **Exams**
  - Exams will be done during class time.
  - Tentative Exam dates:
    Exam 1: Jan. 2nd, Exam 2: Mar. 8th, Exam 3: Apr. 12th
- **Computer Projects**
  - For the purpose of this course, we will use Anaconda (See:https://www.anaconda.com/) which has a free platform that manages Python with the data science packages needed for this class. You may also access Anaconda for free via UFapps (see: https://info.apps.ufl.edu/).
  - Students are required to submit their work as a .py or .ipynb file and must use Python 3.7 or greater and provide documentation within their file. We will **not** use Python 2.x since the Python 2 series is set to expire and will eventually be obsolete.
  - Projects are meant to be done in groups of at most three students.
  - Grading is based on not only the program but how you comment within and the way code is implemented. The instructions will be clear in each assignment as to what technique is needed for that assignment. For example, if the assignment states you are expected to use "Bubble Sort" then that is how you are to sort the data set. Using a different technique than the one mentioned in the assignment details will be penalized.
- **Discussion Board Participation**
  - Discussion Board Participation: Canvas is organized by modules, which pertain to each exam. Module 1 corresponds to all the material related to exam 1. Within each module, there is a discussion board where students may ask questions or post answers. This includes, homework, quizzes, exam reviews and lectures. You may earn up to 2 points for each module by:
    1. Asking a coherent mathematical question. (+1 each)
    2. Answering a fellow student's questions. (+1 each)
- **Capstone Presentation**
  - Presentations will be given at the end of the semester, where the student can showcase what they have learned and demonstrate an application. Students may work in a small group of at most 3 students. You are to use any techniques learned in this class to create a program in Python that interests you. You may be as creative as you want. For example, you can create a Python game, mine Twitter data, or automate a laborious process that you do on an computer; just to name a few examples. The main objective of this assignment is for you to create a program that is useful, interesting or fun.

- Students who work in groups must clearly explain how each student contributed to the presentation.
- After a project topic has been reached by a group, please come see me as soon as possible so that we can discuss what is expected for full credit. Since each group is exploring different topics, it is essential to come see me to make sure you optimize the amount points you earn.
- Your grade is determined by your presentation and the submitted program.
- If you need help picking a topic, please come see me.

- **Attendance and Absences**

  We will be using the Top Hat (https://tophat.com/) classroom response system in class. You will be able to submit answers to in-class questions using Apple, Android smartphones, tablets, laptops, or through text message.

  You can visit the Top Hat Overview
  https://success.tophat.com/s/article/Student-Top-Hat-Overview-and-Getting-Started-Guide
  within the Top Hat Success Center which outlines how you will register for a Top Hat account, as well as providing a brief overview to get you up and running on the system.

  The Course Join Code is: 771664 and the unique course URL is
  https://app.tophat.com/e/771664

  Top Hat may require a paid subscription, and a full breakdown of all subscription options available can be found here: https://app.tophat.com/billing/course/771664/checkout/. Should you require assistance with Top Hat at any time, due to the fact that they require specific user information to troubleshoot these issues, please contact their Support Team directly by way of email (support@tophat.com), the in app support button, or by calling 1-888-663-5491.

Academic Honesty Policy Summary:

Introduction

The University of Florida aims to teach students not just skills and knowledge, but appropriate ethical and professional standards of conduct as well. The Academic Honesty Policy exists to inform students and faculty of their obligations in upholding the highest standards of professional and ethical integrity. All student work is subject to the Academic Honest Policy. Any attempt to deceive a faculty member or to help another student to do so will be considered a violation of this standard.

Instructor's Intended Purpose

The student's work must match the instructor's intended purpose for an assignment. The instructor will establish the intent of each assignment, but it is up to each student to obtain clarification from the instructor when there is any question concerning that assignment's intent.

Authorship

The student must clearly establish authorship of a work. Referenced work must be clearly documented, cited, and attributed, regardless of medium or distribution. Even in the case of work licensed as public domain, the student must provide attribution of that work in order to uphold the standards of intent and authorship. (See, for example, http://creativecommons.org/)

Declaration

Online submission of, or placing one's name on, an exam, assignment, or any course document constitutes a statement that the student has complied with the Academic Honesty Policy in completing that work; in particular, that the student has not received or given inappropriate assistance.

Honor Pledge

We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment."

Software Use

All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Consequences of violations

The webpage https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/ specifies a number of behaviors that are in violation of the Student Honor Code and the possible sanctions. Furthermore, students are obligated to report to appropriate personnel any condition that facilitates academic misconduct. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Students with Disabilites:

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the Disability Resource Center by visiting https://disability.ufl.edu/get-started/. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

Student Feedback:

"Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/."

Health and Wellness:

- *U Matter, We Care*: If you or a friend is in distress, please contact umatter@ufl.edu or 352 392- 1575 so that a team member can reach out to the student
- *Counseling and Wellness Center*: https://counseling.ufl.edu/, 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.
- *Sexual Assault Recovery Services (SARS)*: Student Health Care Center, 392-1161

Diversity and Inclusion:

It is my intent that students from all diverse backgrounds and perspectives be well served by this course, that students' learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength, and benefit. It is my intent to present materials and activities that are respectful of diversity: gender, sexuality, disability, age, socioeconomic status, ethnicity, race, religion, and culture. Your suggestions are encouraged and appreciated. Please let me know ways to improve the effectiveness of the course for you personally or for other students or student groups. In particular, I will gladly honor your request to address you by an alternate/ preferred name or gender pronoun. Please advise me of this preference early in the semester so I may make appropriate changes to my own records.

Weekly Schedule:

Material	Weeks Covered
Chapter 1: Python Basics	1
Chapter 2: Variable and Basic Data Structure	1
Chapter 3: Functions	1
Chapter 4: Branching Statements	1
Chapter 5: Iteration	1
Chapter 6: Recursion	1
Chapter 7: Object Oriented Programming	2
Chapter 8: Complexity	1
Chapter 9: Representation of Numbers	1
Chapter 10: Errors, Good Programming Practices and Debugging	1
Chapter 11: Reading and Writing Data	1
Chapter 12: Visualization and Plotting	1
Chapter 16: Least Squares Regression	1
Chapter 19: Root Finding	1
Chapter 21: Numerical Integration	1

*Please note: The main purpose of the course is to cover chapters 1 through 12. The material after chapter 12 may change depending on the needs of the class.