MATH 340 PROGRAMMING IN MATH

COURSE INFORMATION

Class Days: MW

Class Times: 16:00-17:15

Class Location: zoom.us (online lectures)

Mode of Delivery: Lecture, LAB

Instructor: Prof. Uduak George

Office Hours: M. Th. 12:30-13:30 or by appointment

Office Hours Location: zoom.us (online meetings)

Email: ugeorge@sdsu.edu

Phone: 619-594-7247

ADDITIONAL COURSE INFORMATION

I'll try to respond within 24-48 hours to emails, my email is ugeorge@sdsu.edu. For quick questions, the turnaround time may be much shorter. For questions that involve, say, the clarification of course concept, you may want to call me in my office at (619) 594-7247, but email is to be preferred. I will available during my office hours.

Grades will be posted on Blackboard
Lectures will be posted on GitHub: https://nbviewer.jupyter.org/github/uduakgeorge/

COURSE MATERIAL

REQUIRED TEXTS: COURSE NOTES

OPTIONAL TEXT

- Scientific Computation: Python Hacking for Math Junkies, by Bruce E. Shapiro. ISBN-10: 0692452001; ISBN-13: 9780692452004. Publisher: Sherwood Forest Books
- Single Variable Calculus: Early Transcendentals 8th Edition, by James Stewart. ISBN 978-1-305-27033-6; ISBN-10: 9781305270336; ISBN-13: 978-1305270336. Publisher: Cengage

COURSE DESCRIPTION

Introduction to programming in mathematics. Modeling, problem solving, and visualization.

ENROLLMENT INFORMATION

Prerequisites: M151; M245 or equivalent; or Instructor's permission

STUDENT LEARNING OUTCOMES

The overarching outcomes in this course will be for students to, using the Python programming language, (i) Learn the `science' of computer programming. (ii) Learn the `art' of computer programming. (iii) Represent abstract mathematics as computer code and translate computer code into mathematics. (iv) Visualize and describe data. (v) Learn in what ways modern computing is done.
This will be accomplished by achieving the following.
1.   Procedural Programming in Python: Students will define and use
    i. data types

    ii. conditional statements

    iii. while and for loops

    iv. functions

Since no one of these topics is useful without the other, synthesis is critical. Problems will build in complexity from week to week as new skills are learned to promote an integrated view of programming.

2. Basic Data Structures: For storing and manipulating data, students will use

    i. NumPy arrays

    ii. lists

    iii. tuples

    iv. dictionaries

The students will use "Pythonic" data manipulation techniques such as list comprehension and lambda functions. Basic sorting techniques and their analysis will be covered and implemented. Students will be required to synthesize these techniques with other learning outcomes so that, for example, students master the use of appropriate control structures for different data types and problems involving data. Taken together with the Procedural Programming outcome, this ensures students learn the 'science' of computer programming.

3. Doing Mathematics on Computers: Throughout the course, students will practice translating problems and notation in mathematics into algorithms via the Python language. The reverse skill of translating code into mathematical notation will be studied and practiced as well. While this will be a focus throughout the course, the last third of the course is devoted to realizing abstract mathematical frameworks in the form of Python.

4. Data Visualization and Manipulation: Students will learn how to read and write to files. They will make several types of plots and use the plotting capabilities available in Matplotlib. Students will be required to synthesize various techniques in order to produce different plots of data, and written interpretations of said plots will be a part of assignments. Taken together with the Doing Mathematics outcome, students will have ample opportunity to practice the 'art' of computer programming.

5. Working in Modern Computing Environments: Students will use the features of various programming environments to solve problems and present their work. They will use stand-alone interpreters such as Canopy. They will use web-based interpreters such as Jupyter. They will use Jupyter to present results in mathematics by taking advantage of the LaTeX markup language. Thus, students will also be exposed to the breadth of ways in which programming is done.

COURSE ASSESSMENT AND GRADING

- Your final score will consist of homework (40%), two exams (30%) and a final exam (30%). One exam will be in class and one will be take-home. Homework is roughly due every week, though please pay attention to the schedule since there are exceptions to this (and every) rule.

- Homework Policy: Work you submit should be as stand-alone Python files or in Jupyter notebooks per the request of the problem. Late work is not accepted unless you make arrangement with me in advance.

- Homework will be submitted via Google Drive. Students must adhere to the format for naming Jupyter notebook files when handing in their homework.

- You are encouraged to work with one another to solve homework problems, but you should write solutions individually. Do not allow someone else to copy your work. If you suspect a student of cheating please inform me. The Mathematics and Statistics Department expects academic honesty from our students, as laid out in the University Policies below. Violations will be reported to the Center for Student Rights and Responsibilities.

- Attendance to all lectures is required. Attendance will be recorded. Due to COVID-19 and lectures moving online, we **will not** reward students for class attendance.

- The following grading scale will be used:

A 93% - 100%	A- 90% - 93%		
B+ 87% - 90%	B 83% - 87%	B- 80% - 83%	
C+ 76% - 80%	C 72% - 76%	C- 68% - 72%	
D+ 64% - 68%	D 60% -64%	D- 55% - 60%	F Below 55%

Course Schedule

WK	Dates	Schedule	HW & Exam
1	Jan 20-Jan 24	Course Overview; Python programming: Introduction; Jupyter Notebook HW 1 assigned	
2	Jan 27-Jan 31	Python programming: Introduction; Approximations; Taylor Series HW 2 assigned	HW1 Due 01/29
3	Feb 3-Feb 7	Taylor Series; Taylor's Remainder Theorem HW 3 assigned 02/04 - Last day for students to add, drop, or change grading basis	HW2 Due 02/05
4	Feb 10-Feb 14	Conditionals; While Loops HW 4 assigned	HW3 Due 02/12
5	Feb 17-Feb 21	Bessel Functions; While Loops; For Loops In-class Exam 02/15 Last day for students to add, drop, or change grading basis HW 5 assigned	Exam 1 02/19 HW4 Due 02/20
6	Feb 24-Feb 28	For Loops; Fibonacci Sequence HW 6 assigned	HW5 Due 02/26
7	Mar 2-Mar 6	Loops Review; Zeros of Functions; Integration; Parametric Equations HW 7 assigned	HW6 Due 03/04
8	Mar 9-Mar 13	Root Finding Problems; Integration; Parametric Equations HW 8 assigned	HW7 Due 03/11
9	Mar 16-Mar 20	Work on HW 8	
10	Mar 23-Mar 27	Simpson Rule; Trapezoid Rule HW 9 assigned Exam 2 assigned	HW8 Due 03/25
11	Mar 30-Apr 3	Spring Recess March 31-Holiday	
12	Apr 6-Apr 10	Quadrature; Lagrange Interpolation	Exam 2 Due 04/08
13	Apr 13-Apr 17	Hermite Interpolation; Divided Differences HW 10 assigned	HW9 Due 04/15
14	Apr 20-Apr 24	Splines HW 11 assigned	HW10 Due 04/22
15	Apr 27-May 1	Floating Point Arithmetic	HW11 Due 04/29
16	May 4-May 7	Review; 05/07-Last day of classes 05/03- Final Exam Assigned (Take-home Exam)	
17	May 11		Final Exam due 5:30PM in Blackboard
18	May 22	Last day of spring semester. Grades due from instructors.	

Students with Disabilities

If you are a student with a disability and believe you will need accommodations for this class, it is your responsibility to contact Student Ability Success Center at (619) 594-6473. You can also learn more about the services provided by visiting the [Student Ability Success Center](#) website. To avoid any delay in the receipt of your accommodations, you should contact Student Ability Success Center as soon as possible. Please note that accommodations are not retroactive, and I cannot provide accommodations based upon disability until I have received an accommodation letter from Student Ability Success Center.

ACADEMIC HONESTY

The University adheres to a strict policy prohibiting cheating and plagiarism. Examples of academic dishonesty include but are not limited to:

- copying, in part or in whole, from another's test or other examination;
- obtaining copies of a test, an examination, or other course material without the permission of the instructor;
- collaborating with another or others in work to be presented without the permission of the instructor;
- falsifying records, laboratory work, or other course data;
- submitting work previously presented in another course, if contrary to the rules of the course;
- altering or interfering with grading procedures;
- assisting another student in any of the above;
- using sources verbatim or paraphrasing without giving proper attribution (this can include phrases, sentences, paragraphs and/or pages of work);
- copying and pasting work from an online or offline source directly and calling it your own;
- using information you find from an online or offline source without giving the author credit;
- replacing words or phrases from another source and inserting your own words or phrases.

The California State University system requires instructors to report all instances of academic misconduct to the Center for Student Rights and Responsibilities. Academic dishonesty will result in disciplinary review by the University and may lead to probation, suspension, or expulsion. Instructors may also, at their discretion, penalize student grades on any assignment or assessment discovered to have been produced in an academically dishonest manner.

STUDENT PRIVACY AND INTELLECTUAL PROPERTY

The Family Educational Rights and Privacy Act (FERPA) mandates the protection of student information, including contact information, grades, and graded assignments. I will not post grades or leave graded assignments in public places. Students will be notified at the time of an assignment if copies of student work will be retained beyond the end of the semester or used as examples for future students or the wider public. Students maintain intellectual property rights to work products they create as part of this course unless they are formally notified otherwise.

RELIGIOUS OBSERVANCES

According to the University Policy File, students should notify the instructors of affected courses of planned absences for religious observances by the end of the second week of classes.

MEDICAL-RELATED ABSENCES

Medical-related absences: Students are instructed to contact their professor/instructor/coach in the event they need to miss class, etc. due to an illness, injury or emergency. All decisions about the impact of an absence, as well as any arrangements for making up work, rest with the instructors. Student Health Services (SHS) does not provide medical excuses for short-term absences due to illness or injury. When a medical-related absence persists beyond five days, SHS will work with students to provide appropriate documentation. When a student is hospitalized or has a serious, ongoing illness or injury, SHS will, at the student's request and with the student's consent, communicate with the student's instructors via the Vice President for Student Affairs and may communicate with the student's Assistant Dean and/or the Student Ability Success Center.

TECHNICAL SUPPORT FOR BLACKBOARD

Student support for Blackboard is provided by the Library Computing Hub, located on the 2nd floor of Love Library. They can be reached at 619-594-3189 or hub@mail.sdsu.edu

TURNITIN

Students agree that by taking this course all required papers may be subject to submission for textual similarity review to Turnitin.com for the detection of plagiarism. All submitted papers will be included as source documents in the Turnitin.com reference database solely for the purpose of detecting plagiarism of such papers. You may submit your papers in such a way that no identifying information about you is included. Another option is that you may request, in writing, that your papers not be submitted to www.turnitin.com. However, if you choose this option you will be required to provide documentation to substantiate that the papers are your original work and do not include any plagiarized material.

SDSU ECONOMIC CRISIS RESPONSE TEAM

SDSU Economic Crisis Response Team: If you or a friend are experiencing food or housing insecurity, or any unforeseen financial crisis, visit sdsu.edu/ecrt, email ecrt@sdsu.edu, or walk-in to Well-being & Health Promotion on the 3rd floor of Calpulli Center.

RESOURCES FOR STUDENTS

A complete list of all academic support services--including the Writing Center and Math Learning Center--is available on the Student Affairs' Academic Success website. Counseling and Psychological Services (619-594-5220) offers confidential counseling services by licensed therapists; you can Live Chat with a counselor at http://go.sdsu.edu/student_affairs/cps/therapist-consultation.aspx between 4:00pm and 10:00pm, or call San Diego Access and Crisis 24-hour Hotline at (888) 724-7240.

CLASSROOM CONDUCT STANDARDS

SDSU students are expected to abide by the terms of the Student Conduct Code in classrooms and other instructional settings. Prohibited conduct includes:
- Willful, material and substantial disruption or obstruction of a University-related activity, or any on-campus activity.
- Participating in an activity that substantially and materially disrupts the normal operations of the University, or infringes on the rights of members of the University community.
- Unauthorized recording, dissemination, or publication (including on websites or social media) of lectures or other course materials.
- Conduct that threatens or endangers the health or safety of any person within or related to the University community, including
  1. physical abuse, threats, intimidation, or harassment.
  2. sexual misconduct.

Violation of these standards will result in referral to appropriate campus authorities.