UPDATED Syllabus/Course Policies for MAT 331: Computer-Assisted Mathematical Problem Solving, Spring 2020

Lecture 1: Tues, Thur 1:00pm - 2:20pm
Lecture 2: Tues, Thur 2:30pm - 3:50pm

Last updated: March 23, 2020

Course webpage: `http://www.math.stonybrook.edu/~bdozier/mat331-spr20/`

Instructor:
Dr. Benjamin Dozier
Email: `benjamin.dozier@stonybrook.edu`
Course Office Hours (via Zoom): **Thur 4:30-6:30pm**, also by appointment
OH Zoom link: `https://stonybrook.zoom.us/j/8165119894?pwd=RytyTnRtU0cxTW1pVEo3ZTVBTlBDQT09`
MLC Office Hour (delivery method TBD): **Tues 4:30-5:30pm**

TA/Grader
Mu Zhao
Email: `mu.zhao@stonybrook.edu`
Course Office Hours: **Mon 12-1pm**, also by appointment
OH Zoom link: `https://stonybrook.zoom.us/j/5231743109?pwd=a3Y2amlCK2xEYXcraHdKMXZtclNzQT09`
MLC Office Hours (delivery method TBD): **Thur 1:30-3:30pm**

TA/Grader:
Zhuang Tao
Email: `zhuang.tao@math.stonybrook.edu`
Course Office Hours: **Fri 11:00am-12:00am**, also by appointment
OH Zoom link: `https://stonybrook.zoom.us/j/235821079?pwd=SWpqdU5OcTVheG1VR2hvK0FtL1hjdz09`
MLC Office Hours (delivery method TBD): **Tues 5-7pm**

NEW Delivery Method: Due to the move to online learning, starting March 31 lectures will be delivered via Zoom during the scheduled lecture times. For the lectures, a recurring Zoom meeting has been set up which enrolled students can access through the Zoom section of Blackboard. The lectures will be recorded and posted in the Zoom section of Blackboard.

Prerequisites: Multivariable calculus: C or higher in MAT 203 or 205 or 307 or AMS 261. (Though we will not actually be using much if any calculus in this course). You do NOT need to have prior experience programming. You will gain such experience by taking this course.

Course Description:
From Course Bulletin: "Exploration of the use of the computer as a tool to gain insight into complex mathematical problems through a project-oriented approach. Students learn both the relevant mathematical concepts and ways that the computer can be used (and sometimes misused) to understand them. The particular problems may vary by semester; past topics have included cryptography, fractals and recursion, modeling the flight of a glider, curve fitting, the Brachistochrone, and computer graphics. No previous experience with computers is required."

First we will go over the basics of programming. This requires a new way of thinking, so it is not easy, but it can be quite fun and rewarding! Of course, it is also very useful.

Then we will focus on three different areas of math where computers are useful:

- Cryptology: making and breaking codes (substitution ciphers, one-time pads, modular arithmetic, prime numbers, public-key cryptography, RSA cryptosystem)

- Fractals (Cantor set, trees, Sierpinski carpet, Apollonian gasket, Julia sets, Mandelbrot set)

- Probability (Random walks, Law of Large Numbers, Central Limit Theorem, Poisson distribution, Random graphs, Connected components)

Software: We will use `SageMath`, a free, open-source, cross-platform mathematics software system. It is based on `Python`, which is a flexible, widely-used, general-purpose programming language. Sage's functionality is similar to that of commercial packages such as Mathematica, Maple, or Matlab, but its open-source nature gives it several advantages. In class we will primarily use Sage via the interactive Jupyter notebook that runs in a web browser.

Projects and Homework: There will be no exams in this course. Your grade will be based on homework and projects. There will be three projects, each of which will have programming and writing components. There will be homework due every week, except for the weeks the projects are due. You will have at least a week to work on each homework assignment.

The only way to learn to program is by programming, so the homework will be essential. Many of the homework problems will require considerable thought rather than being slight variations of problems done in class. The workload for this course will be fairly evenly distributed throughout the semester; it will not be possible to "cram" at the end of the semester.

Grading:

- Homework will count for 25% of your grade. Your lowest homework score will be dropped.

- The three projects will each count for 25%.

Since solutions will be posted, late work will generally not be accepted.

MAT 459 (Write Effectively in Mathematics): You may in conjunction enroll in the 0-credit course MAT 459 in order to fulfill a writing requirement for certain majors. In this case, for each of the three projects you will receive a PASS/FAIL grade on the writing component. Students who receive a PASS for writing on at least two of the three projects will receive a PASS for MAT 459.

Learning outcomes: MAT 331 fulfills the "Understand Technology (TECH)" objective of the Stony Brook Curriculum. This has the following learning outcomes:

1. Demonstrate an ability to apply technical tools and knowledge to practical systems and problem solving.

2. Design, understand, build, or analyze selected aspects of the human-made world. The "human-made world" is defined for this purpose as "artifacts of our surroundings that are conceived, designed, and/or constructed using technological tools and methods."

MAT 459 fulfills the "Write Effectively within Ones's Discipline (WRTD)" objective, which has the following learning outcome:

1. Collect the most pertinent evidence, draw appropriate disciplinary inferences, organize effectively for one's intended audience, and write in a confident voice using correct grammar and punctuation.

University mandated syllabus statements:

Student Accessibility Support Center (SASC) Statement: If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Student Accessibility Support Center, ECC (Educational Communications Center) Building, Room 128, (631)632-6748. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential.

Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and the staff at the Student Accessibility Support Center (SASC). For procedures and information go to the following website: `http://www.stonybrook.edu/ehs/fire/disabilities`

Academic Integrity Statement: Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty is required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty please refer to the academic judiciary website at:

`http://www.stonybrook.edu/commcms/academic_integrity/index.html`

Critical Incident Management Statement: Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of University Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.

Course Evaluation: Each semester Stony Brook University asks students to provide feedback on their courses and instructors through an online course evaluation system. The course evaluation results are used by the individual faculty, department chairs and deans to help the faculty enhance their teaching skills and are used as part of the personnel decision for faculty promotion and tenure. No individually identifiable data are ever reported back to the university or instructor. Students who have completed previous evaluations can view all faculty ratings at: `classie-evals.stonybrook.edu`.