

MAT 331: COMPUTER-ASSISTED MATHEMATICAL PROBLEM SOLVING
SPRING 2017
GENERAL INFORMATION

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Office hours: Tuesdays and Thursdays 1:00-2:30pm in Math Tower 4-120.

TA. Nancy Hong

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Office hours: Wednesdays 12:00-1:00pm in MLC.

Lectures. Tuesdays & Thursdays 11:30–12:50pm in Mathematics S-235.

Blackboard. Grades and some course administration will take place on Blackboard. You will also use Blackboard to submit the projects and homework. Please log in using your NetID at <http://blackboard.stonybrook.edu>.

Courses Description. 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. Interesting applications of mathematics to computer science are also discussed. Some of the specific topics that we will try to study this semester include linear algebra, graph theory and Markov chains, number theory and cryptography, dynamical systems, fractals, differential equations and computer graphics.

Prerequisites. C or higher in MAT 203 or 205 or 307 or AMS 261.

TECH Objective. MAT 331 fulfills the "Understand Technology (TECH)" objective:

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.

WRTD Objective. Students may use two of their MAT 331 projects to satisfy part of the Upper Division Writing Requirement for the major, or the "Write Effectively within One's Discipline (WRTD)" objective for the Stony Brook Curriculum (SBC):

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.

Students who want to use two of the MAT 331 projects for this purpose should sign up for MAT 459: *Write Effectively in Mathematics* as a zero-credit course, with me as instructor.

Software. Most lectures will be held in the Math computer lab (Math Tower S-235). No previous experience with computers is needed.

We will use *Mathematica*, which is a computational software program developed by Wolfram Research and used in many scientific, engineering, mathematical and computing fields, based on symbolic mathematics. *Mathematica* has a comprehensive documentation, also available online at <http://reference.wolfram.com/language/>.

Mathematica 10 is available for most operating systems (Windows, Macintosh, Linux, etc.). Stony Brook students can download the Windows/Mac/Linux version of *Mathematica* from

Softweb: <http://softweb.cc.stonybrook.edu/>. You need your Stony Brook netID and netID password to log in to Softweb. To obtain an Activation Key for *Mathematica* you must visit the Wolfram User Portal <https://user.wolfram.com/portal/login.html>. If it's your first time visiting the Wolfram User Portal, you must create a Wolfram ID and follow the steps in there to request an Activation Key.

In addition, you can use any of the campus SINC sites, or you can access the Virtual SINC site at <http://it.stonybrook.edu/services/virtual-sinc-site>.

Reading resources. We will try to follow several sources, depending on the topic which we are covering. A set of notes written by Scott Sutherland and Santiago Simanca is available online at <http://www.math.stonybrook.edu/~scott/Book331/331book.pdf>. For the first part of the course we will use a set of lecture notes written by Raluca Tanase and Remus Radu about *The Mathematics of Web Search*, available at <http://www.math.cornell.edu/~mec/Winter2009/RalucaRemus/>. Other useful materials and lecture notes will be posted on the course website on Blackboard as we advance in the semester.

Grading policy. There will be no exams. Grades will be computed using the following scheme:

- Lab 15%
- Homework 20%
- Projects 65%

Students are expected to attend class regularly and to keep up with the material presented in the lecture and the assigned reading. There will be roughly five homework assignments (containing short exercises involving mathematical proofs and *Mathematica* code) as well as three or four projects. You may work together on your homework assignments and projects, and you are encouraged to do so. **However, all solutions must be written up independently.** A project is more like a term paper and you will be expected to devote a significant amount of time to doing it, as well as taking care with the presentation. The project should contain a detailed description of the problem or topic, what means were used to solve it, the mathematical solution and the computer program (interactive model in *Mathematica*). The last project of the class may include also a short oral presentation at the end of the semester.

Extra Help. You are welcome to attend my office hours and the TA's office hours and ask questions about the lectures and about the homework. In addition, math tutors are available at the Math Learning Center (MLC): <http://www.math.stonybrook.edu/MLC>.

Information for students with disabilities. If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Disability Support Services, ECC (Educational Communications Center) Building, Room 128, (631) 632-6748, or at the following website <http://studentaffairs.stonybrook.edu/dss/index.shtml>. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential.

Academic integrity. 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/uaa/academicjudiciary>.

Critical Incident Management. 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.