

## AMS345/CSE355: Computational Geometry, Fall 2017

**Instructor:** Joe Mitchell, Math Tower P-139A, 632-8366, [joseph.mitchell@stonybrook.edu](mailto:joseph.mitchell@stonybrook.edu)  
Office hours (tentative): Mon (2:30-3:30); Thurs (2:30-3:30), or by appointment/email, or drop by whenever (don't be shy!)

**Course Web Site:** Refer to Blackboard for homework, handouts, slides, etc. There is also a course website with some additional links, etc: <http://www.ams.stonybrook.edu/~jsbm/courses/345/ams345.html>

### Teaching Assistants:

Yuege Chen ([Yuege.Chen@stonybrook.edu](mailto:Yuege.Chen@stonybrook.edu)); Tues/THurs 4:00-5:00 (in the AMS Help Room, Harriman 132), or by appointment/email

Jamie Kunzmann ([Jamie.Kunzmann@stonybrook.edu](mailto:Jamie.Kunzmann@stonybrook.edu)); Mon/Wed 9:30-10:30 (in the AMS Help Room, Harriman 132), or by appointment/email

Yuying Su ([Yuying.Su@stonybrook.edu](mailto:Yuying.Su@stonybrook.edu)); Wed 1:00-3:00pm (in the AMS Help Room, Harriman 132), or by appointment/email

Yue Wang ([Yue.Wang.5@stonybrook.edu](mailto:Yue.Wang.5@stonybrook.edu)); Fri 9:00-11:00am in Math 1-125, or by appointment/email

**Lectures:** Mon/Fri 1:00-2:20 in ESS (Earth and Space Science) 001 (video recorded via Echo360: see the Echo Center on Blackboard)

**Text:** There are two textbooks, and reading assignments and problems will come from both: *Discrete and Computational Geometry*, by Devadoss and O'Rourke, and *Computational Geometry in C (2nd ed)*, by O'Rourke. These books and several other related books are on reserve in the Math/Physics Library.

**Prerequisites:** I will try to keep the prerequisites to a minimum and will review material as needed. You will find basic concepts of combinatorics (counting, graphs, recursion) to be very useful; AMS 301 or similar is good background. Knowledge of basic design and analysis of algorithms is also very useful. Finally, it is helpful to have some experience with some programming language (e.g., Java, C, C++, Python, Matlab, etc). We will occasionally look at simple code fragments (usually in C), as examples of algorithm implementations; however, you do not need to be an experienced "programmer" (in C or any other language) to take this course.

**Homeworks:** There will be (approximately) 8 (equally-weighted) homework sets due throughout the semester. Tentative due dates are 9/15, 9/25, 10/6, 10/13, 11/3, 11/10, 11/20, 12/4 I will drop the lowest score before computing your average. Some homework sets may have optional extra credit problems (of either a theoretical nature or an implementation nature); thus, it may be possible to obtain a home score higher than "100%" (which will impact the overall course average accordingly). Homework sets will often have "practice problems"; these are meant for your practice – please attempt them, and better yet, solve them and write them up. You are not to submit the practice problems; you will be able to check your answers yourself, against the solutions, which will be distributed. You will be responsible for material on all of the practice problems – this can appear on the midterm/final!

**Homework Policy:** **Homework due dates are strictly enforced;** with instructor approval for an *extenuating circumstance*, you can submit at most **one** late homework, provided it is submitted before solutions are posted. You may discuss homework problems with other students taking the course and with the instructor and teaching assistants. If you do collaborate with another student(s), you must indicate this on the cover of your hw, giving the name(s) of your collaborators. **The work that you turn in should always be *your own* write-up, and you should show that you personally understand everything**

**that you write.** You are **not** to view other student writeups or use them (or use internet resources) while writing your own solution. **Please make certain that your writing is neat and clear, and that you have expressed your reasoning.** Please staple your pages!

Submitted homework must be legibly written. Problems that ask you to “prove” or “explain” something—*i.e.*, those that require words—must be written logically and in complete sentences. Parts of a solution should not be crossed out or located discontinuously on the page; you should instead rewrite your solution to make it easy to read. **Homework that does not meet these expectations will not be graded and will not receive credit.**

**Class Participation:** Students are expected to attend and participate in class. **Please silence your mobile devices to avoid disrupting class!** Participation will be assessed via Blackboard “assignments” associated with each class, which will become available/visible at the beginning of class and will be due the same day, shortly after class ends, after which they will disappear from view—pay attention to the due time!

In each class I will pose questions, to promote thought and discussion, usually related to your homework problems. One or two of these will be highlighted as the “question(s) of the day”; each will have a short answer response (often multiple choice or very short phrase or sentence). If you are paying attention, the question of the day will be easy for you to answer. Jot it down and enter into Blackboard: there will be an “assignment” associated with each class meeting for entry. **You are to answer these questions entirely on your own.** (There will be discussion about them in class.)

You are encouraged to ask questions in class, particularly if you do not understand something or if you spot errors that I make in class – yes, I will make mistakes, and I hope you and I hope we will all learn from them! I will always do my best to answer thoughtfully, politely and clearly; if you do not understand my response, ask again for clarification. If you do raise a question during class, or you point out an error during class, you can earn extra “participation credit” by entering your question, or the point you raised in class, as part of the “assignment” associated with the class meeting. (I will have a record of the questions/points raised by students in class, but I will not necessarily know your name, so entering it on Blackboard will give me a means of giving you credit for participation.)

**Exams:** There will be two equally-weighted exams: a midterm (tentatively given on Oct 20) and a (non-cummulative) final (given during the first half of the assigned final exam period (Wed, Dec 20, 2:15pm-5:00pm). For each of the exams, practice exams will be made available, along with solutions, and we will have dedicated review in class, to help students prepare.

During the second half of the final exam period, you will have the option to take a “Second-Chance Midterm”. If you take the second-chance midterm, the new midterm score will be  $0.8x_{high} + 0.2x_{low}$ , where  $x_{high}$  is the higher of the two scores (original and second-chance) and  $x_{low}$  is the lower of the two scores.

**Grades:** Your total average score will be based on 40% for each exam (midterm and final), 10% class participation, and 10% homework (after dropping lowest score).

I will use your total average score to assign a letter grade; there is no pre-established scale or curve. (Typical letter grade distribution: About 1/3 A’s, 1/3 B’s, and 1/3 lower grades. Median letter grade is typically “B-” or “B”.)

#### **Tentative Course Topics:**

- Polygons, triangulation, visibility, art gallery problems
- Convex hulls
- Voronoi diagrams, Delaunay diagrams, proximity problems
- Point location search
- Arrangements of lines, hyperplanes; geometric duality

- Visibility graphs, shortest paths, motion planning
- Intersection problems
- Curves, polyhedra

**Information Dissemination:** Announcements and email communications will be done via Blackboard, with emails to your Stony Brook University email address. You are responsible for checking your email regularly. Exceptions will not be granted if you forward your Stony Brook emails to another account and a message is missed.

Course materials will be posted on Blackboard, including:

- This syllabus (updated, as needed).
- Homework assignments and solution notes (posted after the hw is due).
- Class participation mini-assignments (the “problems of the day”).
- Practice exams, and solutions.
- Other handouts and examples.

**Disability Policy:** 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. 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 Disability Support Services. For procedures and information go to the following website: <http://www.stonybrook.edu/ehs/fire/disabilities>

**Academic Integrity Policy:** 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 are 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 Judicial Affairs 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.

**Electronic Communication Statement:** Email and especially email sent via Blackboard (<http://blackboard.stonybrook.edu>) is one of the ways the faculty officially communicates with you for this course. It is your responsibility to make sure that you read your email in your official University email account. For most students that is Google Apps for Education (<http://www.stonybrook.edu/mycloud>), but you may verify your official Electronic Post Office (EPO) address at <http://it.stonybrook.edu/help/kb/checking-or-changing-your-mail-forwarding-address-in-the-epo>. If you choose to forward your official University email to another off-campus account, faculty are not responsible for any undeliverable messages to your alternative personal accounts. You can set up Google Mail forwarding using these DoIT-provided instructions found at <http://it.stonybrook.edu/help/kb/setting-up-mail-forwarding-in-google-mail>. If you need technical assistance, please contact Client Support at (631) 632-9800 or [supportteam@stonybrook.edu](mailto:supportteam@stonybrook.edu).

**Student Technology Services:** TLT provides academic technology support to all students. If you require assistance with Blackboard or other academic technologies, please contact TLT at: [helpme@stonybrook.edu](mailto:helpme@stonybrook.edu); Phone: 631.632.9602; Chat; <http://www.stonybrook.edu/helpme> or visit a SINC Site.

Students who need assistance with their personal devices can contact DoIT's service desk at: 631.632.9800, submit an online request, or visit the Walk In Center on the 5th floor of the Melville Library (West Campus), Room S-5410. For more information, visit: <https://it.stonybrook.edu/students>