AMS545/CSE555: Computational Geometry, Spring 2017

Instructor: Joe Mitchell, Math Tower P-139A, 632-8366, joseph.mitchell@stonybrook.edu
Office hours (tentative): Tues (10:00-11:00), Wed (2:30-4:00), or by appointment, or drop by whenever (don't be shy!)

Course Web Site: http://www.ams.sunysb.edu/~jsbm/courses/545/ams545.html; Refer to Blackboard, where handouts, solutions and slides will be posted, and videos of lectures available through EchoCenter.

Lectures: Tuesday and Thursday, 2:30 – 3:50 in Frey Hall 201.

Teaching Assistant: Qian Li (qian.li.1@stonybrook.edu); office hours Wed 5:00-6:00, Thurs 10:00-11:00, in Math 2-110.

Text: The main text is *Computational Geometry: Algorithms and Applications (3rd Edition)*, by de Berg, Cheong, van Kreveld, and Overmars. Also recommended is the excellent book, *Computational Geometry in C*, Second Edition, by Joe O'Rourke. We will also refer to excellent notes by David Mount, linked from the course webpage (http://www.cs.umd.edu/class/spring2007/cmsc754/Lects/754lects.pdf).

Prerequisites: I will assume some knowledge of basic design and analysis of algorithms and data structures (e.g., efficient sorting algorithms); some of this material is reviewed in the first chapter of O'Rourke's book. You should have the ability to do mathematical reasoning at the level of an undergraduate course on analysis.

There will be an *optional* project (see below) that generally involves implementation and experimentation and is encouraged for those who want a "hands-on" experience in computational geometry.

Exams: There will be 5 short in-class quizes (20 minutes) on dates to be announced, based directly on the homework problems; the lowest of the 5 scores will be dropped before computing the quiz average. There will be a final exam in the assigned time slot (Period 2: 11:15-1:45pm, Monday, May 15).

Homeworks: Homework problems will be assigned regularly and submitted via Blackboard. You are expected to write up your solutions *on your own*, **without referring to other students' writeups or to solutions you may find on the web**; you are welcome to discuss problems with me, the TA, and classmates, but **must do the writeup entirely on your own**. Peer assessment (via Blackboard) may be used to assess some of the homework problem submissions.

Optional Project: There will be a variety of optional projects for students to do. Each will involve an implementation (e.g., in C, C++, Java, Python) of a geometric algorithm from a suggested list of possible projects (or one of your choosing, with my permission), and a presentation/demo. **Due dates:** Report and presentations/demos in class on Tuesday, May 2 (tentative).

Grades: Your total average score will be the *maximum* of the following two weighted averages: 10% homework, 40% quizes, 50% final; **OR** 10% homework, 20% quizes, 30% project, 40% final.

I will use your total average score to assign a letter grade; there is no pre-established scale or curve.

Tentative Course Topics:

- Introduction: What is computational geometry?
- Convex hulls of point sets in the plane
- Computing/detecting intersections among a set of line segments
- Polygons, triangulation, visibility
- Linear programming in low dimensions
- Range searching: Find the points in a query box
- Point location search: Find a query point in a subdivision
- Voronoi diagrams and Delaunay triangulations
- Arrangements of lines, hyperplanes
- Geometric duality, polarity
- Visibility graphs, shortest paths, motion planning
- Binary space partitions
- Randomized algorithms
- Geometric optimization, approximation algorithms

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.

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/`

University Policy: 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.