AMS545/CSE555: Computational Geometry, Fall 2008

Instructor: Joe Mitchell, Math Tower 1-109, 632-8366, jsbm@ams.sunysb.edu; http://www.ams.sunysb.edu/~jsbm/; Office hours (tentative): Tue (1:00-2:30), Wed (3:00-4:00), or by appointment, or drop by whenever (don't be shy!)

Course Web Site: http://www.ams.sunysb.edu/~jsbm/courses/545/ams545.html

Lectures: Tuesday and Thursday, 11:20 – 12:40 in Light Engineering 152

Teaching Assistant: TBA.

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. A useful reference is the "classic" book, *Computational Geometry*, by Preparata and Shamos.

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 may involve implementing a program in C (or C++ or Java) and is encouraged for those who want a "hands-on" experience in computational geometry.

Homeworks: Homework will be assigned regularly (about 8 assignments over the semester). I will drop the lowest score. You are expected to write up your solutions *on your own*; you are welcome to discuss problems with me, the TA, and classmates, but **must do the writeup entirely on your own**.

Exams: There will be a final exam in the assigned time slot (Period 2: 11:00-1:30, Dec 18).

Optional Project: There will be a variety of optional projects for students to do. Each will involve an implementation (in C, C++, or Java) of a geometric algorithm from a list of possible projects that will be distributed (or one of your choosing, with my permission).

Grades: Your total average score will be the *maximum* of the following two weighted averages: 50% homework, 50% final; **OR** 35% homework, 35% final, 30% project.,

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

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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.sunysb.edu/ehs/fire/dis

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http://www.stonybrook.edu/uaa/academicjudiciary/.

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