

# COMPUTATIONAL GEOMETRY

CIS 5930 (Section 1)\*  
Piyush Kumar

Handout #1, – Course Information

**Course Web Site.** <http://www.compgeom.com/~piyush/teach/5930/>

**Class Mailing List.** Announcements for the course, homeworks, reading assignments, programming projects will be available using the blackboard (<http://campus.fsu.edu>). Make sure you check both the course web site and the blackboard at least once in two-three days throughout the semester.

**Instructor.** Piyush Kumar.

URL: <http://www.compgeom.com/~piyush>.

Office Hours: Tuesday, 3:15pm to 4:15pm on Tuesdays.

Alternatively, you may schedule an appointment, either by email or by phone.

Phone: 645-2355

Email: [piyush@acm.org](mailto:piyush@acm.org)

Venue: Office Hours will be held at Love 161 (My Office)

**Lectures.** Tuesday, Thursday from 2:00 to 3:15pm at Love 0103.

**Exams.** Finals exams will be held on April 27th, Monday, 10:00 to 12:00pm. In class Midterm on Feb 17th, 2009.

**Course rationale:** This is an introductory course to computational geometry and its applications.

**Course Description.** We will discuss techniques needed in designing and analyzing efficient algorithms for problems in geometry, including

- Introduction to Convexity. Computing Convex hulls.
- Polygon triangulations
- Voronoi diagrams and Delaunay triangulations.
- An introduction to Linear Programming in fixed dimensions.
- Geometric approximation algorithms. Introduction to VC-Dimension and  $\epsilon$ -nets.
- Geometric data structures like range searching data structures, quadtrees, interval trees.
- Level of detail and visibility data structures for game programming.
- Motion planning.

**Learning Objectives.** The objective of this course is to encourage you to learn how to :

- design ‘new’ geometric algorithms.
- map problems to computational geometric problems.
- read and understand algorithms published in journals.
- develop writing skills to present your own geometric algorithms

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\*Course Reference Number 00508

- collaborate and work together with other people to design new geometric algorithms.

**Prerequisites.** A Grade of B or better in COP 4531 or CGS 5427 or an equivalent course. Come and talk to me if you do not have the prerequisite and you still want to take the course. 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. Finally, it is useful to have experience with C, C++, or Python. (You should at least be able to read a C/C++ program and understand it.) Some of the homeworks will ask you to write some small portions of code. And there will be one small programming assignment.

**Textbooks.** Roughly 60% of the material is covered in *Computational Geometry: Algorithms and Applications* by deBerg, Kreveld, Overmars, Schwarzkopf. My lectures will often draw from the following (optional) texts.

1. *Lectures on Discrete Geometry* by J. Matousek.
2. *Computational Geometry: An Introduction Through Randomized Algorithms* by K. Mulmuley
3. Robert Sedgewick, *Computational Geometry in C* by J. O'Rourke.

I have requested the above material to be put on reserve in the library. The text book is available at the FSU bookstore.

### Course Policies

1. **Homeworks:** The best way to learn the material is by solving problems. You are encouraged to work in pairs, because the best way to understand the subtleties of the homework problems is to argue about the answers. Unless you learn how to solve problems, I *promise* that you will get burned on the exams and thus for your final grade.
2. Your solutions should be handed in *Stapled together*.
3. Your solutions should be *very neatly written*. If your solution is unclear, sloppy, or if your solution is hard to understand, you will have points deducted even if your solution is correct. One of the best way to make your solutions clear is to *include pictures and examples*.
4. Homework assignments will be due at the *beginning of class* and I will hand out the solutions immediately. **Late assignments will not be accepted** because the solutions will be available.
5. It is extremely important that you *start homework assignments early*. The homeworks are very challenging, and if you get behind in your work, you may find it too difficult to catch up. Out of all the graded homework sets, I will drop the min score before calculating the total homework score towards the final grade. Since I drop the lowest score, missing one homework due to an illness should not be a problem.
6. **Grading Criteria:** The grade for COP 4531 will be assigned based on the following approximate percentages.

	Approximate Percentage	Variable
Homework	15%	
Programming Assignment	15%	$h \in [0, 30]$
Final Project Presentation	10%	
Final Project	15%	$p \in [0, 25]$
Midterm	20%	$f \in [0, 45]$
Final	25%	

**To Pass:**  $h \geq 16$  and  $f \geq 22$  and  $p \geq 13$ .

**Final Grades:** Your final grades (letter grades) will depend on your  $(h + p + f) \in [0, 100]$  score. There is no pre-established scale or curve. I will sort all the  $(h + p + f)$  scores for those who pass and assign letter grades to different non-overlapping intervals (The highest level being A and decreasing thereof). I will at my discretion, use clustering to generate the intervals or the following intervals (Whichever yields you a *better* grade).

Percent	Letter	Percent	Letter	Percent	Letter	Percent	Letter
94-100	A+	84-87	B+	74-77	C+	64-67	D+
90-93	A	80-83	B	70-73	C	60-63	D
88-89	A-	78-79	B-	68-69	C-	57-59	D-
0-56	F						

7. I reserve the right to modify these numbers uniformly by 5% each. I reserve the right to de-emphasize the homework grades if there is evidence of students who copy instead of doing the homework themselves.
8. Scribing will be worth *approximately* 3 or 4 percentage points of extra credit (This option is only for people who know L<sup>A</sup>T<sub>E</sub>X and XFig or are willing to put the effort to learn it).
9. **Missed exam Policy:** A missed exam will be recorded as a grade of zero. We will follow the university rules regarding missed final exams (see [http://registrar.fsu.edu/dir/class/fall/exam\\_schedule.htm](http://registrar.fsu.edu/dir/class/fall/exam_schedule.htm)), for all the exams, including the final exam.
10. **Grade of ‘I’ Policy:** The grade of ‘I’ will be assigned only under the following exceptional circumstances:
  - The final exam is missed with an accepted excuse for the absence. In this case, the final exam must be made up during the first two weeks of the following semester.
  - Due to an extended illness or other extraordinary circumstance, with appropriate documentation, the student is unable to participate in class for an extended period. In this case, arrangements must be made to make up the missed portion of the course prior to the end of the next semester.
11. **Academic Honor Code:** Because a primary goal of the course is to teach professionalism, any academic dishonesty will be viewed as evidence that this goal has not been achieved, and will be grounded for receiving a grade of F (You must read the FSU Academic Honor Code in the Student Handbook and abide by it). Copying/Modifying other people’s programs/code will be treated the same as copying in an exam.
  - Every student must write his/her own code and homework. Showing your code or homework to members of other teams, giving it to them, or making it accessible to them (e.g., by making the files world-readable) is academic dishonesty.
  - You are responsible for ensuring that your code/documentation/results/homeworks are adequately protected and not accessible to others. Change permissions of your working directory to 0700 (chmod 0700 {directory}).
  - Consulting code from a textbook, or from the Internet, in order to understand specific aspects of your assignment is fine. However, *copying entire code or large parts of such code will be considered academic dishonesty*. If you borrow small parts of code from these sources, you must acknowledge this in your submission and additionally you must clearly understand and be able to explain how the code works.

Once again: There is no excuse for cheating in any circumstances. See me before you even *contemplate* cheating.
12. **Accommodation for Disabilities:** If you have a physical, psychological, medical or learning disability that may impact on your ability to carry out assigned course work, I would urge that you contact the staff in the Student Disability Center and bring a letter to the instructor indicating the need for accommodation. The Student Disability Resource Center will review your concerns and determine, with you, what accommodations are necessary and appropriate. All information and documentation of disability is confidential. They can be contacted at (850) 644-9566.
13. **Attendance Policy:** The university requires attendance in all classes, and it is also important to your learning. The attendance record may be provided to deans who request it. If your grade is just a little below the cutoff for a higher grade, your attendance will be one of the factors that we consider, in deciding whether to “bump” you up to the higher grade. Missing three or fewer lectures will be considered good attendance. In rare cases, such as medical needs or jury duty, absences may be excused with appropriate documentation. You should let me know in advance, when possible, and submit the documentation I seek. You should make up for any materials missed due to absences.
14. **Syllabus Change Policy:** The syllabus is guide to the course and subject to change with advanced notice.