

# ANALYSIS OF ALGORITHMS\*

COP 4531/CGS 5427

Piyush Kumar

Handout #1, – Course Information

**Course Web Site.** <http://www.compgeom.com/~piyush/teach/4531/>

**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: Monday, 6:30 to 7:30pm. 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.** Monday, Wednesday at 5:15pm to 6:30pm at Love 0101.

**Exams.** Finals exams will be held on April 26<sup>th</sup> (Wed), from 5:30pm to 7:30pm in Love 0101. Midterms are scheduled on Feb 22<sup>nd</sup> in Love 0101.

**Course rationale:** Algorithms is a fascinating topic that is ubiquitous in computing. Algorithms are recipes for solving computational problems. This course aims at encouraging you to think efficient and clever solutions to problems that computer engineers and scientists attack in their day to day lives. The course also aims to teach you how to analyze the solutions you come up with (in terms of resources they use to solve the problem at hand), and to check if they are correct in a mathematically rigorous manner. This course involves understanding, creativity and analysis. I hope the course is an enjoyable learning experience.

**Course Description.** Algorithms is an integral part of computer science and mathematics. So far, you have acquired proficiency in basic data structures and programming. This course is the next step towards becoming an algorithm designer for the real world. We plan to cover the following topics in this course (tentative).

- Basic Algorithmic Analysis.
- Graph Algorithms
- Greedy Algorithms
- Divide and Conquer
- Dynamic Programming
- Network Flows:
- Complexity classes and Approximation Algorithms.
- Introduction to Computational Geometry

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\*Preliminary version. I will distribute the final version in the first class.

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

- design and implement ‘new’ algorithms in the real world.
- map problems to algorithmic problems.
- read and understand algorithms published in journals.
- develop writing skills to present your own algorithms
- collaborate and work together with other people to design new algorithms.

**Prerequisites.** See the prerequisites handout. Grade of C- or better in COP 4530. STA 4442 or STA 3032 and either MAD 3107 or MAD 3105. Finally, it is useful to have experience with C, C++, or Python. (You should be able to code in C++.) Some of the homeworks will ask you to write code. There will also be a programming project in the course.

**Textbooks.** I will assume that each of you own a copy of *Algorithm Design* (Hardcover) by Jon Kleinberg, Eva Tardos ISBN: 0321295358. You should also have access to [CLRS] book:

1. *T. Cormen, C. Leiserson, R. Rivest, and C. Stein.* Introduction to Algorithms. (2nd edition). MIT Press , McGraw-Hill, 2001.

The text book is sold out at the FSU bookstore but is available at the Bill’s on Copeland and at Bill’s on Tennessee.

## Course Policies

1. **Homeworks:** The best way to learn the material is by solving problems. You are encouraged to work in *pairs*<sup>1</sup>, because the best way to understand the subtleties of the homework problems is to argue about the answers. If you do not have a partner, let me know and I’ll try to hook you with one. If you want a divorce, you should let me know too. Don’t be a leech and let your partner do all the work. 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. Two short surprise quizzes will be given in class (without any announcement). These quizzes will count towards your Class Participation.
7. **Grading Criteria:** The class will have an optional Final Project which will be only allowed to students who score high on the first programming assignment. The grading scheme for people who opt for the final project will be different compared to the regular class.
  - **Project Option:** The grade for COP 4531 will be assigned based on the following approximate percentages for people who choose / are allowed to work towards a final project.

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<sup>1</sup>Students who have taken any of my previous courses are forbidden to be in the same pair.

	Approximate Percentage	Variable
Homework	20%	
Class Participation	5%	
Programming Assignments	5%	$h \in [0, 30]$
Midterm	15%	$e \in [0, 40]$
Final	25%	
Final Project	20%	$f \in [0, 25]$
Project Presentation	5%	

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

• **No Project Option:**

	Approximate Percentage	Variable
Homework	20%	
Class Participation	15%	$h \in [0, 35]$
Midterm	20%	$e \in [0, 50]$
Final	30%	
Programming Assignments	15%	$f \in [0, 15]$

**To Pass:**  $h \geq 18$  and  $e \geq 26$  and  $f \geq 8$ .

**Final Grades:** Your final grades (letter grades) will depend on your  $(h + e + f) \in [0, 100]$  score. There is no pre-established scale or curve. I will sort all the  $(h + e + f)$  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						

8. 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.
9. Scribing will be worth *approximately* 4 or 5 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).
10. **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.
11. **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.
12. **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.

13. **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.
14. **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.
15. **Syllabus Change Policy:** The syllabus is guide to the course and subject to change with advanced notice.

### Optional Final Project

1. You have to write a short (10 page) paper on your project. I will make the list of related projects for you to pick shortly after the beginning of the semester.
2. The paper will be due Apr 10th, 2005. You will also need to give a demonstration of your project by this date. There will be a short project presentation which I will schedule where you would explain what you did for the project and show your results.
3. The main idea behind the research project is to be creative either in designing a new algorithm, in implementing a research paper in a novel way, or developing an extension of the algorithms treated in the class. You should also make sure that you know about the relevant literature and cite it in your paper.
4. The paper should be typeset in L<sup>A</sup>T<sub>E</sub>X.
5. Try to select a project which interests you or with which you have previous experience (or both). Once you choose your project, make a plan of how to attack the chosen problem. Make a tentative project schedule with milestones and email me your milestones. 7% of your final project grade will depend on your project plan and if you abide by your plan.