

CS 456: Advanced Algorithms

Instructor: Thoshitha Gamage, Ph.D.
Southern Illinois University at Edwardsville

Fall 2014 Syllabus

Course Information:

Title: CS 456: Advanced Algorithms (3 Credits)
Location: EB 0140
Time: T & R 12:30 – 01:45 p.m.
Course Web site: <http://www.cs.siu.edu/~tgamage/CS456>

Contact Information:

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Web Site 📄: <http://www.cs.siu.edu/~tgamage>
Office Hours: M & W 10:30 – 12:00 p.m.
T & R 02:00 – 03:30 p.m. *or by appointment*

1 Course Objectives

This is an upper level undergraduate class in Algorithms. There are four objectives of this course. These are:

1. To learn advanced algorithmic techniques and put them into practice;
2. To build on the basic skills developed in CS 340;
3. Learn and apply algorithm complexity and correctness analysis techniques;
4. Develop written communication skills within the context of computer science.

By the end of the semester, students are expected to be proficient in algorithmic analysis, complexity analysis, and correctness analysis of computer programs.

2 Course Prerequisites

CS340 (Data Structure and Algorithms) or the instructor's permission. Also *fluency and significant experience* in programming (C++,Java, etc..) and Unix will be essential. If you do not meet these prerequisites, you **MUST** come and talk with me the first week of class. I reserve the right to drop you from the course if it becomes obvious that you do not meet the prerequisites.

3 Textbooks

[Required] : **[KT1e]** “*Algorithm Analysis*” 6th ed., Kleinberg and Tardos, Addison-Wesley, ISBN 0321295358

[Optional/Supplemental] :

[CLRS3e] “*Introduction to Algorithms*”, 3rd ed., Cormen, Leiserson, Rivest, and Stein, MIT Press, ISBN: 0262033844

- **Additional Reading** : I will assign additional paper readings as the course evolves through the semester

My presentation slides and the corresponding lecture notes (which will be posted online on the course website as we move along) are heavily based on the textbooks mentioned above and other related research papers.

4 Assigned Work and Tentative Grading Policy

There will be one mid-term exam and one final examination; the final exam will be comprehensive. There will be ~3-4 homework assignments given out. You will be also assigned a project with three development stages which will be evaluated separately. I will give you the option to choose a language of your choice for programming (though C++ or Java is recommended) but the development platform is fixed to Unix/Linux.

The following allocation of grade percentages is *tentative*, and may change during the semester. Unless the circumstances change, I am not planning on curving the final grade.

Grading Allocation		Final Letter Grade	
Exams	50%	90-100	A
Midterm	20%	80-89	B
Final (<i>comprehensive!!</i>)	30%	70-79	C
Attendance	5%	60-69	D
Homework	15%	below 60	F
Programming Assignments	30%		

4.1 Exams

All exams and quizzes will be held in the lecture room.

- **Midterm** : Thursday October 16th 12.30 - 01.15 p.m.
- **Final** : Wednesday December 10th 12.00 - 01.40 p.m.

5 Tentative Schedule*

***Subject to adjustment.** I reserve the right to change topics or add an item of related interest. All change will be announced in class.

Week	Dates	Topic	References	Assignments/Exams	ABET Outcomes
1	Aug. 19, 21	Introduction and Administrivia	Ch.01		
2	Aug. 26, 28	Algorithm Analysis	Ch.02		
3	Sep. 02, 04	Greedy Algorithms	Ch.04		
4	Sep. 09, 11	Greedy Algorithms (<i>continued..</i>)	Ch.04		
5	Sep. 16, 18	Divide and Conquer	Ch.05		
6	Sep. 23, 25	Dynamic Programming	Ch.06		
7	Sep. 30, Oct. 2	Dynamic Programming (<i>continued..</i>)	Ch.06		
8	Oct. 7, 9	Graph Algorithms	Ch.03		
9	Oct. 14, 16 [‡]	Graph Algorithms (<i>continued..</i>)	Ch.03	Oct. 16: Midterm exam	
10	Oct. 21, 23	Network Flow	Ch.07		
11	Oct. 28, 30	Network Flow (<i>continued..</i>)	Ch.07		
12	Nov. 4, 6	NP Completeness	Ch.08		
13	Nov. 11, 13	NP Completeness (<i>continued..</i>)	Ch.08		
14	Nov. 18, 20	Approximation Algorithms	Ch.11		
	Nov. 25, 27	Thanksgiving Break			
15	Dec. 02, 04	Randomized Algorithms	Ch.13		
16	Dec. 09 [§]	TBA	Ch.xx		
16	Dec. 10	Final Exam: 02.00 - 03.40 p.m.			

[†]Labor Day Holiday

[‡]Midterm Exam

[§]Last day of class. Final project due

6 Course Requirements and Policies

6.1 Attendance Policy

Your attendance accounts for 5% of your final grade, thus I expect you to attend each and every class. I will either take a roll call or handout a mock quiz to account for your attendance. If you miss a class, it is *your* responsibility to find out what happened and to collect any material that was handed out in the class.

However, I understand that for unforeseen circumstances there will be times when you are unable to attend the lecture. Thus, I allow you to miss at most 2 classes for the semester yet still earn the full 5% for attendance. Medical emergencies are outside this “2 missed class allowance”, but should be accompanied by properly documented proof of medical services that were obtained to avoid being dropped from the class. For planned absences, assignments should be turned in before the absence, rather than after.

6.2 Class Participation

You are expected to **proactively** participate in in-class discussions. This aids your learning and that of your classmates, and provides valuable feedback on the lecture. In preparation, I will assign regular reading assignments from **PR6e** and other sources that should be completed before the assigned date (usually before class). For example, mock quizzes will be strictly based on your reading assignments. You are also strongly encouraged to take jot down any questions you encounter on your reading assignments and bring those to the class as discussion points. I reserve the right to lower the grade of any student who is markedly deficient in attendance and/or in in-class participation.

I expect *you* to *own* your degree of success in this class *and*, I expect you to contribute to the success of others. Examples:

- If a lecture point is unclear, ask a question, either in class, during office hours or by e-mail. You are probably not alone in your confusion. I enjoy engaging in technical conversations with students with the goal of helping them create an accurate understanding of course material. Participating in such conversations is very favorable for your class participation grade. *I strongly discourage you getting into discussions with me about grades and how you can get a better one;*
- If another student is confused, help him or her out;
- If I am systematically doing something that inhibits your learning, tell me.

You are *required* to check your SIUE assigned student email and the course website regularly for important class announcements.

6.3 Academic Dishonesty: <http://www.siue.edu/policies> (3C1 & 3C2)

Do your own work. Your exams, homeworks, and programming projects are subject to the academic honor code. **DO NOT CHEAT IN ANY WAY: DO YOUR OWN WORK!** Following activities will be considered academic dishonesty:

- Submitting work (such as homework assignments and projects) done by somebody else (this includes any human/electronic sources (such as web sites));
- Watching and copying your neighbors' solutions during quizzes and/or exams;
- Using materials not allowed during quizzes and exams;
- Using materials not allowed for the programming projects.

It is quite acceptable to ask others things like “Have you gotten this exception before?,” and even have them look briefly at your stack trace and its code. It is quite unacceptable, on the other hand, to have them spend hours helping develop or seriously rearrange your program's logic. And, of course, it is unacceptable for two or more people to collaboratively develop the solution for a project. If you are tempted to collaborate on projects, **DON'T!!**

6.3.1 Responsibilities of Learning

I expect you to

- a demonstrate critical thinking across the spectrum of course work.

- b cooperate with other students and to pull your share in class discussions. Respect that different people in your group may have different ways of learning and different strengths. Seek ways of taking advantage of those differences
- c engage in *proactive learning*: speak up when you don't understand, question assumptions, relate course material to your experience outside class, seek out additional experience and reading related to the class. You must *construct* your understanding of the material
- d promptly review feedback you receive from me or other students; to actively clarify the feedback if the material is still unclear; and to incorporate the feedback in your future work.
- e spend adequate time on the course. Adequate time includes getting enough rest so that time you spend on course tasks is well-spent time. Adequate time includes proofreading and reviewing your assignments before you hand them in.
- f have high expectations of yourself: set goals for yourself and try to do your very best. Consciously think about the balance between what you do to earn a grade and what you do to learn. (If I'm doing something that puts these in opposition to each other please let me know.)
- g know and observe the **SIUE Student Conduct Code (3C1) and Student Academic Code (3C2)**. Copying of other students' work, working together on individual assignments, plagiarism of published sources and other forms of academic dishonesty will result in zero credit on the assignment for all students involved and a lower grade in the class. A second offense (across the University) will result in an automatic **F** in the course and exposes the violator to University sanctions up to and including expulsion. All offenses will be reported to Student Affairs.

6.3.2 Advice

- a Don't wait until the last minute to do homework or projects. Labs get busy, computers break down, and people get sick. These are not sufficient excuses for an extension.
- b Save early; save often!
- c Contact me if you are confused. Don't wait for office hours; send an email.

6.4 Disability Support Services: <http://www.siue.edu/dss>

Any student inquiring about academic accommodations because of a disability should contact Disability Support Services so that appropriate and reasonable accommodative services can be determined and recommended. Disability Support Services is located in Student Success Center, Room 1270. Their phone number is 650-3726 and their email is disabilitysupport@siue.edu.