**CIS 675: DESIGN AND ANALYSIS OF ALGORITHMS**

Spring 2021

***Course Description:***

Asymptotic analysis and recurrences; classical numeric algorithms; advanced data structures; graph algorithms; divide-and-conquer, greedy choice, dynamic programming, and other computational strategies; NP-completeness.

***Course Meetings:***

The course meets Tuesday/Thursday 2:00pm-3:20pm. We will meet in the Blackboard Collaborate room, which you can access through the course’s Blackboard page. Lectures will generally be recorded, but there are sometimes tech issues, so you should not fully rely on this.

***Instructor:***

Prof. Sucheta Soundarajan

Office hours: Tuesdays 12:30-1:30pm (except during breaks)

Office: Blackboard Collaborate

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***TAs:***

Zeinab (Sara) Saghati Jalali

Office hours: Friday 2-3pm

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***Textbook:***

Sanjoy Dasgupta, Christos Papadimitriou, Umesh Vazirani. Algorithms. 1st Edition. 2006.

ISBN: 978-0073523408

***Course Objectives:***

By the end of this course, you should be able to do the following:

* Be able to design algorithms to solve a variety of problems.
* Understand techniques such as greedy algorithms, divide-and-conquer, linear programming, network flows, and dynamic programming. You should understand the limitations and applicability of these techniques, and be able to determine when they are suitable.
* Provide rigorous proofs of running time and correctness for the algorithms that you create.
* Understand Big-O notation and use it to describe and prove the running time of an algorithm.
* Understand computational complexity, and determine, with proofs, the complexity class of various problems.
* Understand the difference between exact algorithms, approximation algorithms, and heuristic, and be able to determine when it is appropriate to use a certain type of algorithm.
* Apply amortized running time analysis to obtain bounds on the overall running time of an algorithm.

***Grading:***

Homeworks: 30%. There will be 7 homeworks. I will drop the lowest score.

Exams: 70%. There will be 3 exams consisting of 2 questions each. The lowest question will be dropped. Your grade will be computed as the total of the remaining 5 questions.

Homework and exam make-ups will only be permitted in case of a documented emergency, such as illness.

I will drop the lowest homework score.

**Homework:** Homework will typically be due 1-2 weeks after it is posted. Assignments must be submitted in pdf through the Blackboard website. I recommend using LaTeX to write your answers. For each assignment I will select one or more problems to grade, and base your score on these problems.

Many homework problems will require you to prove some sort of formal claim (e.g., that your algorithm is correct). For these proofs, clearly state the claim that you are trying to prove. Treat these proofs as standard mathematical proofs, and make sure you include all relevant details.

If we cannot understand your algorithms or proofs, you will receive 0 points for that problem.

You may work with others, but must write-up your own solutions. If you work with other students, then make a note of this on your homework. Directly copying solutions from other people, the internet, textbooks, or other sources is considered plagiarism.

**Exams:** There are three exams. They are not explicitly cumulative, but material later in the semester builds on material from earlier in the semester. Exams will be conducted as oral exams. You will be given problems a week in advance, and will schedule a 20-30 minute session with the professor or a TA. During that session, you will be asked to present your solution to two randomly selected problems, answer questions about your solution, and explain how to change your solution in response to a problem modification. You are permitted to work with others to come up with your solutions; however, during the oral exam itself, no assistance from others is permitted, and you are not allowed to refer to notes, your book, or other sources.

***Other Information:***

**Academic Integrity:** All members of the Syracuse University community-faculty, staff, and students-are expected to exhibit and promote academic integrity in all situations. As a member of this community, you should also be familiar with the University's academic-integrity policy, which is available at:<http://academicintegrity.syr.edu>

I expect all students to behave with academic integrity: **do not CHEAT, plagiarize, or commit fraud.** Fraud includes altering previously graded work; plagiarism includes using someone else's work without proper credit. If I discover any instances of cheating, fraud, or plagiarism, I will give the guilty parties **failing grades for the course** and report the culprits to the program director and the Office of Academic Integrity. If you are unsure whether a certain action constitutes cheating, fraud, or plagiarism, assumes that it does: you may ask us for clarification at any time.

I *highly recommend* the following (inexpensive!) book to help you successfully navigate the academic-honesty waters during your collegiate career:

Charles Lipson, *Doing Honest Work in College: How to Prepare Citations, Avoid Plagiarism, and Achieve Real Academic Success,* Second Edition, The University of Chicago Press, Chicago, Illinois, 2008.

This book introduces the three basic tenets of academic honesty, and also provides excellent suggestions for studying for exams, working in groups, writing research papers, and other tasks you’ll encounter as a college student.

Every student must read and sign a copy of the course Honor Policy, which details your obligations to behave ethically. Students will receive zeroes on all coursework until this sheet is turned in.

## Accommodations: Our community values diversity and seeks to promote meaningful access to educational opportunities for all students. Syracuse University and I are committed to your success and to supporting Section 504 of the Rehabilitation Act of 1973 as amended and the Americans with Disabilities Act (1990). This means that in general no individual who is otherwise qualified shall be excluded from participation in, be denied benefits of, or be subjected to discrimination under any program or activity, solely by reason of having a disability.

If you believe that you need accommodations for a disability, please contact the Office of Disability Services (ODS), [http://disabilityservices.syr.edu,](http://disabilityservices.syr.edu/) located at 804 University Avenue, Room 309, or call 315-443-4498 for an appointment to discuss your needs and the process for requesting accommodations. ODS is responsible for coordinating disability-related accommodations and will issue students with documented disabilities "Accommodation Authorization Letters," as appropriate. Because accommodations may require early planning and generally are not provided retroactively, please contact ODS as soon as possible.

**Religious Observances:** SUs religious observances policy, found at [http://supolicies.syr.edu/emp\_ben/religious\_observance.htm,](http://supolicies.syr.edu/emp_ben/religious_observance.htm) recognizes the diversity of faiths represented among the campus community and protects the rights of students, faculty, and staff to observe religious holydays according to their tradition. Under the policy, students are provided an opportunity to make up any examination, study, or work requirements that may be missed due to a religious observance provided they notify their instructors before the end of the second week of classes. For fall and spring semesters, an online notification process is available through MySlice/Student Services/Enrollment/My Religious Observances from the first day of class until the end of the second week of class.