Algorithm Design and Analysis
CSC 301
Course Syllabus

Spring 2023

Instructor: Dr. Grey Ballard
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Office: Manchester 234
Office Hours: 11-12:15 Tues and 2-3:15 Thurs, or by drop-in or appointment
Teaching Assistant: Sam Shafer
TA Office Hours: 5-7pm Tues, Manchester 017
Class: 11–12:15 MW, Manchester 229
Text: *Algorithms* by Dasgupta, Papadimitriou, Vazirani (McGraw-Hill 2008)
Course Schedule: http://users.wfu.edu/ballard/teaching/CSC301/

1   Course Description

Study of algorithms, algorithm design strategies, and the derivation of time complexity bounds. Case studies illustrate greedy algorithms, divide and conquer, backtracking, and dynamic programming techniques. An introduction to the classes P, NP, NP-complete, and Turing decidability is included.
Here are the big questions we'll tackle in this class:
Given an algorithm,

- is it correct?

- how long does it take?

- can we do any better?

Given a problem or computation, how do we come up with an efficient algorithm for solving it? What algorithmic techniques might be effective?

2   Learning Outcomes

By the end of this course, students should be able to:

1. analyze algorithms using asymptotic complexity analysis (Big-Oh and related notation);

2. prove correctness of algorithms using rigorous techniques such as mathematical induction and proof by contradiction;

3. design efficient algorithms for combinatorial problems, using approaches that include

   - divide and conquer,
   - dynamic programming,
   - greedy methods, and
   - parallelization;

4. identify NP-complete problems and devise strategies to deal with them.

This class is a theoretical computer science class; there will be both proofs as well as programming. Compared to CSC 201, there will be much more rigor in the theoretical analysis of algorithms.

3   Assessment

There will be weekly homework or programming assignments, quizzes, a midterm, and a final exam.

Homework assignments will focus on the design and analysis of algorithms and will include writing pseudocode and mathematical proofs. Programming assignments will reinforce the design and implementations of algorithms.

Quizzes will be in-class and last 10 minutes. They will be announced about a week in advance. The lowest quiz score will be dropped. The midterm and final will both be in-class. The midterm will cover material from the first half of the semester and the final will focus on material from the second half. Make-up tests and quizzes will be administered only if excused in advance.

4   Grading

Course grades are determined using the following weightings:

- 50% homework and programming assignments
- 10% quizzes
- 20% midterm
- 20% final

Letter grades are assigned based on the following categorization:

A	93 or above	**C**	73–76.99
A$^-$	90–92.99	**C**$^-$	70–72.99
B$^+$	87–89.99	**D**$^+$	67–69.99
B	83–86.99	**D**	63–66.99
B$^-$	80–82.99	**D**$^-$	60–62.99
C$^+$	77–79.99	**F**	below 60

5 Contacting Me

In general, email is the best way to reach me, and I'm happy to take questions over email. The easiest way to find me in person is to stop by my office during office hours, though please feel free to drop by any time. If you want to be sure to find me then you can also email ahead to schedule a time; it helps to propose a few times that work for you so that I can choose one that works for me too. Please contact me as soon as possible if you know you will miss class due to a university-sponsored activity, such as athletics.

6 Academic Integrity

All tests and quizzes are to be done independently and without outside resources. Programming assignments and homework assignments may be discussed with other students (this is encouraged!), however the work submitted must be your own work and reflect your understanding of the material. If you find helpful resources online or in print and use ideas that are not your own, you must cite your sources. Copying of work from other students or from online resources is not acceptable and will be dealt with through the Honor System. I recommend that you retain drafts of your homework assignments and programs until the end of the semester in case a question arises as to authorship.

7 Center for Learning, Access, and Student Success

Wake Forest University provides reasonable accommodations to students with disabilities. If you are in need of an accommodation, then please contact me privately as early in the term as possible. Retroactive accommodations will not be provided. Students requiring accommodations must also consult the Center for Learning, Access, and Student Success (118 Reynolda Hall, 336-758-5929, `class.wfu.edu`).

8   Supporting Fellow Students in Distress

As members of the Wake Forest community, we have a personal responsibility to ensure that this classroom and the campus as a whole remains a healthy and safe environment for learning. Occasionally, you may come across a fellow classmate whose personal behavior concerns or worries you, either for the classmate's wellbeing or yours. If this should occur, you are encouraged to send your concern to the Wake Forest CARE Team at `http://careteam.wfu.edu/how-to-make-a-report/`. By utilizing your insights and observations, we can work together to help individuals get connected to appropriate resources and keep our community safe.

9   Emergency Preparedness Policy

In the event of a major disruption of normal university activities (such as might result from a health emergency or other disaster), a course continuation contingency plan will be enacted in order to allow completion of the course. During this time, we will convert to a remote learning environment, and students should continue with the reading and other assignments listed on the syllabus and monitor email, Canvas, and the WFU website for information. If students have questions or are in doubt about how to proceed, they should contact the instructor by email if available, otherwise they should contact by phone.

10   Grievance Procedure

For complaints in the academic (i.e., classroom) setting, the student should talk personally with or send a written complaint explaining the concern directly to the instructor. Should the student and instructor be unable to resolve the conflict, the student may then turn to the chair of the involved department (in the Wake Forest School of Business, this would be the dean) for assistance. The chair (or dean) will communicate with both parties, seek to understand their individual perspectives, and within a reasonable time, reach a conclusion and share it with both parties. If the student's complaint is not resolved by these procedures, the student should consult with the Office of Academic Advising for assistance. The Associate Dean for Academic Advising will consult with the parties to obtain a resolution. Finally, a student may appeal to the Committee on Academic Affairs which will study the matter, taking input from all parties, and reach a final decision concerning resolution. `https://bulletin.wfu.edu/undergraduate/wake-forest-college/student-complaints/`