COMP 4030: Algorithm Design & Analysis

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Web: Canvas
Class Hours: 9:40–11:05 TR
Class Room: 206 Psychology Building

Course Description & Objectives

This course explores the fundamental principles of algorithm design and analysis, serving as a cornerstone for computer science theory and practice. Students will study efficient methods for solving computational problems, focusing on the rigorous mathematical analysis of their correctness and performance (time and space complexity). Core topics include asymptotic analysis, divide and conquer, dynamic programming, greedy algorithms, graph algorithms, and the theory of NP-completeness. By the end of the course, students will possess the analytical tools to select, design, and justify appropriate algorithms for complex, real-world software challenges.

Required Materials

- **Course Materials:** Handout notes and practice/review materials will be available on Canvas.
- **Textbooks (Optional):**
  - *Algorithms* by Jeff Erickson.
  - *Introduction to Algorithms* by Cormen, Leiserson, Rivest, and Stein (CLRS).

Prerequisites

- COMP 2150 or COMP 4001, and
- COMP 2700

Course Schedule (Tentative)

Week	Topic	Grading Item
1	Asymptotics, measuring runtime, math tools	Quiz 1
2	Recursion, recurrences, divide & conquer	Quiz 2, Hw 1
3	Sorting & selection	Quiz 3
4	Hashing & amortized analysis	Quiz 4
5	Greedy algorithms	Quiz 5, Hw2
6	Graphs I: representations, BFS/DFS	Quiz 6
7	Graphs II: topo sort, union-find	Quiz 7, Hw3
8	*Spring Break*	
9	Shortest paths	Midterm (Scope: W1-7)
10	DP I: fundamentals, coin change, knapsack	Quiz 8
11	DP II: LCS, edit distance	Quiz 9, Hw4
12	Network flow & matching	Quiz 10
13	NP-completeness & reductions	Quiz 11, Hw5
14	Approximation algorithms	Quiz 12
15	Randomized algorithms	Final (Comprehensive)

Course Requirements & Grading

Homework (40%)

There will be 5 assignments consisting of a mixture of coding and theoretical algorithm analysis.

Midterm Exam (15%)

The midterm covers topics from Week 1 to Week 7. It will be an in-class, closed-book, pen-and-paper exam.

Final Exam (20%)

The final exam is comprehensive, covering the entire semester. It is a closed-book, pen-and-paper exam.

Quiz (15%)

Weekly quizzes will be posted on Canvas. While these are designed to reflect the form and type of questions found on the midterm and final exams, the total credit earned from quizzes is capped. The overall quiz grade is calculated as the sum of all quiz scores, capped at a maximum of 15% of the final course grade.

Attendance (10%)

Attendance is mandatory. Students are encouraged to actively participate in the various in-class learning activities.

Submission & Late Policy

All assignments are due by **23:59** on the specified due date. We understand that unforeseen circumstances arise; therefore, the following late policy applies to all submissions:

- **Grace Period (0–12 hours late):** No penalty. Submissions are accepted as on time.
- **12–24 hours late:** 10% deduction from the total possible score.
- **24–48 hours late:** 25% deduction from the total possible score.
- **48–72 hours late:** 50% deduction from the total possible score.
- **Beyond 72 hours:** Submissions will not be accepted.

Communication: The instructor expects early communication in light of any anticipated delays or absence. If unexpected emergencies arise, please follow up with the instructor as soon as possible.

Grading Scale

We compute final letter grades in two ways, and each student receives the **higher** of the two.

Fixed scale (absolute cutoffs).

A	94–100%	**A**−	90–<94%	**B**+	87–<90%	**B**	84–<87%	**B**−	80–<84%	**C**+	77–<80%
C	74–<77%	**C**−	70–<74%	**D**+	67–<70%	**D**	64–<67%	**D**−	61–<64%	**F**	<61%

Curved scale (top-percentage, approximately normal). We map *class percentiles* (based on the total score distribution) to letter grades using bins that approximate a normal curve:

A	top 7%	**A**−	next 9%	**B**+	next 14%	**B**	next 20%	**B**−	next 14%	**C**+	next 12%
C	next 10%	**C**−	next 7%	**D**+	next 4%	**D**	next 2%	**D**−	next 1%	**F**	remaining

Notes.

- Ties on percentile cutoffs are resolved in favor of the higher grade.
- For small classes, minor boundary adjustments may be made for fairness and consistency.
- The instructor may assign an **A**+ for truly exceptional performance or an **F** for lack of effort, independent of the curve, when clearly warranted in writing.

Course Policies

Academic Integrity

Plagiarism or cheating in any form is unethical, detrimental to proper education, and will not be tolerated. All work submitted by a student (projects, programming assignments, lab assignments, quizzes, tests, etc.) is expected to be the student's own work. Plagiarism occurs when any part of another's work is presented as your own without proper attribution, leading the reader to believe it is your own effort.

Students are allowed and encouraged to discuss concepts and look up resources in the literature; however, appropriate references must be included for materials consulted, and citations must be made when material is taken verbatim.

If plagiarism or cheating occurs, the student will receive a failing grade on the assignment and, at the instructor's discretion, a failing grade in the course. The instructor may also refer the incident to the Office of Student Accountability for disciplinary action. For further information on the UofM code of student conduct, please refer to http://www.memphis.edu/studentconduct/misconduct.htm.

AI & Foundation Models

Within this class, you are welcome to use foundation models (ChatGPT, Gemini, DALL-E, Claude, Midjourney, GitHub Copilot, etc.) in an unrestricted fashion. However, please note that Large Language Models (LLMs) have a tendency to hallucinate incorrect facts and fake citations. Similarly, code generation models may produce inaccurate or insecure output.

You remain fully responsible for any inaccurate, biased, offensive, or otherwise unethical content you submit, regardless of whether it originated from you or a foundation model. If you use a foundation model, its contribution must be acknowledged in your submission; failure to do so will result in a penalty. Despite these disclaimers, the use of foundation models is encouraged, as they can enable you to produce higher-quality work in less time.