CSE 317 Design and Analysis of Algorithms

SMCS, IBA

Spring 2024

Instructor: Jibran Rashid
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Office: Room 210, Second Floor, North Tabba Building
Office Hours: TBA

Class Location: Main Campus Auditorium
Class meeting times: Tuesday and Thursday, Sections 40577 and 40579 (10:00 – 11:15)
Sections 40601 and 40602 (11:30 – 12:45)
Tutorial meeting times: TBA
Class website: LMS
Discord: Discord Server Link for Class Discussions
Assignment submission: Gradescope Course Code: VBZJXG

1 Course Objectives

The foundational course on Algorithms is about their design and analysis. The main goal of the course is to understand paradigms and primitives that aid in designing correct, efficient algorithms for computational problems, analysis of their correctness and computational complexity. Some ideas we will discuss are: Greedy Method, Divide-and-Conquer, Dynamic Programming, Hashing, Randomization, Network Flows, Linear Programming, Computational Geometry and Fast Fourier Transform. Analytical tools will include Recurrences, Probablistic Analysis, Amortized Analysis and Potential Functions. The final course project requires students to develop a creative explanation of ideas encountered in the course. More on this and asssessment review during the semester.

2 Specific Learning Outcomes

By the end of this course, students will be able to

1. Identify commonly used algorithmic techniques.
2. Apply the above techniques to standard computational problems.
3. Apply proof techniques to analyze correctness and running time of algorithms.
4. Design and analyze new algorithms by modifying above tools and techniques.

5. Identify limitations of standard algorithm design techniques.
6. Introduced to ideas from the frontiers of theoretical computer science.
7. Communicate algorithmic ideas effectively.

3 Course Texts and Resources

There is no single main text for the course. Students are encourages to use the following resources to review the topics discussed in class.

- Introduction to Algorithms, by Cormen, Leiserson, Rivest, and Stein.
- Algorithms, by Dasgupta, Papadimitriou, and Vazirani
- Algorithm Design by J. Kleinberg and E. Tardos
- Lecture notes by Jeff Erickson at UIUC

Lecture notes from the class will be available on the course site. If necessary, additional readings will be made available online.

4 Grading Policy

Students will be graded on the following basis.

05%	Creative Explanation
05%	Assessment Review
32%	4 Problem sets, 8% each
08%	At least 4 quizzes, 2% each
25%	Midterm exam
25%	Final exam
10 %	Creative explanation
+ up to 5%	Participation bonus, *peer lecturing*, contribution in class, attendance, utilization of office hours. These are distributed entirely at discretion of the instructor on a need and merit basis.

4.1 Problem Sets

The main tool for learning the concepts we discuss in class are these problem sets. The 'personal struggle' you engage in with these problem sets will allow you to develop the skills necessary for success as a theoretical computer scientist. ***Always*** spend some time thinking about these problems on your own before asking for hints, looking up solutions etc. Do not go in search of solutions online; learning the material happens when you are working on problems rather than looking up complete solutions.

You are welcome to collaborate on problem sets, provided that (1) you write up your solutions individually, and (2) you clearly cite the names of all collaborators and sources. Failure to do so will result in zero credit. An additional key requirement is that you should be able to explain what

you submit. Inability to do so will result again in zero credit. Your solution arguments should be clearly written up using latex. It is *REQUIRED* that you use the provided latex template for writing up your problem set solutions.

Problem set submission is only through the site gradescope.

Use the entry code 'VBZJXG' to add yourselves to the course. Unless specified otherwise, the assignment deadline is always on a Monday at 11:59 pm.

Problem set 1 (Out Week 2)	Due **Feb 5 Monday 11:59 pm**
Problem set 2 (Out Week 5)	Due **Feb 26 Monday 11:59 pm**
Problem set 3 (Out Week 11)	Due **Apr 15 Monday 11:59 pm**
Problem set 4 (Out Week 14)	Due **Apr 29 Monday 11:59 pm**

4.2 Tutorials and Quizzes

The weekly tutorials will be used for the following activities:

- At least four pen and paper quizzes. It is your responsibility to ensure you do not miss these sessions.

Quiz 1	Week 3
Quiz 2	Week 6
Quiz 3	Week 12
Quiz 4	Week 15

- Worked out examples of practice problems. It is strongly recommended that you attend these sessions.

4.3 Creative Explanation

We will encounter various algorithms and algorithm design & analysis techniques over the semester. As a tangible outcome of student learning in the class, each of you is expected to design a poster that explains any idea from the class in a non-technical manner. Additional details will be discussed in class and developed over the semester.

4.4 Late Policy

No late solutions will be accepted and no make-up exams will be given. If you have a valid medical excuse, the percentage of your grade corresponding to the missed work will be shifted to the final exam. Valid excuses require supporting documentation from a doctor.

5 Attendance Policy

IBA attendance policy applies.

6 Academic Integrity

Each student in this course is expected to abide by the IBA Code of Conduct.

Scholastic dishonesty shall be considered a serious violation of these rules and regulations and is subject to strict disciplinary action as prescribed by IBA regulations and policies. Scholastic dishonesty includes, but is not limited to, cheating on exams, plagiarism on assignments, and collusion.

- **PLAGIARISM**: Plagiarism is the act of taking the work created by another person or entity and presenting it as one's own for the purpose of personal gain or of obtaining academic credit. Plagiarism includes the submission of or incorporation of the work of others without acknowledging its provenance or giving due credit according to established academic practices. This includes the submission of material that has been appropriated, bought, received as a gift, downloaded, or obtained by any other means. Students must not, unless they have been granted permission from all faculty members concerned, submit the same assignment or project for academic credit for different courses.
- **CHEATING**: The term cheating shall refer to the use of or obtaining of unauthorized information in order to obtain personal benefit or academic credit.
- **COLLUSION**: Collusion is the act of providing unauthorized assistance to one or more person or of not taking the appropriate precautions against doing so.