COMP 305: ALGORITHMS AND COMPLEXITY
(Spring 2023 Syllabus)

Instructor: Alptekin Küpçü

TA(s): Ismayil Ismayilov, Ephrem Admasu.

Office Hours: Check course calendar.

Webpage: `http://courses.ku.edu.tr/comp446`

E-mail: Always send email to `comp446ta@ku` for course-related questions. **All other emails will be ignored!**

Prerequisite: Data Structures, Algorithm Analysis, and Discrete Probability. COMP 202 and ENGR 200 need to be successfully finished before this course.

Topics:

- Algorithm correctness, randomized algorithms.
- Divide and Conquer approach, sorting.
- Number theoretic algorithms, graph algorithms.
- Greedy algorithms, Dynamic Programming, Amortized Analysis.
- Linear Programming and optimization.
- P, NP, NP-completeness reductions, approximation algorithms.

Course Objectives:

1. To expose you to various algorithm design techniques.
2. To teach you how to analyze time and space complexity, as well as to prove correctness of an algorithm.
3. To provide you with the knowledge of basic complexity classes and their practical implications.

Learning Outcomes: At the end of this course, when you come across an engineering and/or research problem, you

1. can identify the computational complexity class of the problem,
2. know or can find out about related algorithms and data structures,
3. can integrate them into an efficient algorithm and analyze the performance and correctness of your solution.

Text Book: Cormen, Leiserson, Rivest, and Stein. "Introduction to Algorithms", 3^{rd} edition, McGraw-Hill, ISBN: 978-0262533058. (required)
Goodrich and Tamassia, "Algorithm Design", Wiley, ISBN: 978-0471383659. (recommended)
Dasgupta, Papadimitriou, Vazirani, "Algorithms", McGraw-Hill, ISBN: 978-0073523408. (recommended)

Grading: Assignments/Quizzes (20%), Midterm Exam (40%), Final Exam (40%).

- You have to obtain at least 40/100 out of each exam to pass the course.
- Catalog-like system, no curve grading. This means, others' performance does not affect your grade.
- Grading objection must be done within the announced time period.

- If you have an approved health report for midterm exam, your final exam grade will be counted as your midterm exam grade as well.
- If you have an approved health report for the final exam, please apply for the remedial exam.
- You have to request makeup by indicating your approved health report.
- Any change will be announced during the semester.

Code of Conduct:

Attendance: Please do not step in and out of the classroom when the lecture/lab is in progress (in important cases, ask for my permission *ahead of time*). TAs have the same authority as the instructor, and hence you must follow their rules as well.

Device Use: Use of devices such as laptops, cell phones, or similar devices is **strictly forbidden** in the classroom.

Assignments: **Late assignments will not be accepted unless you have my permission well ahead of time** with a valid excuse. Do not ask for an extension when it is close to the deadline; such requests will not be granted. Hand-written solutions will be accepted as long as they are legible. It is our right to cut off grade points if we cannot read your answer.

Mandatory: For each assignment, you must sign the following (otherwise your assignment will not be graded):
"I hereby declare that I have completed this individually, without support from anyone else. I hereby accept that only the below listed sources are approved to be used:
(i) Course textbook,
(ii) All material that is made available to me via Blackboard for this course,
(iii) Notes taken by me during lectures.
I have not used, accessed or taken any unpermitted information from any other source. Hence, all effort belongs to me."
ID Number, Name Surname, Date, Signature (all written with blue pen).

Cheating: Do not cheat. We employ **cheating detection tools** that can easily detect cheating. By national and university-wide rules, any cheating *attempt* may be penalized with **one semester suspension** from the university. The Koç University Student Code of Conduct includes, but is not limited to, the following: Your work needs to be your own. It cannot be joint work with any other person (in the class or not). You cannot have someone do the assignment for you (paid or not). You cannot submit an assignment that is based on submissions in earlier semesters. You cannot use a solution manual, or an online solution to the question. To get a grade (other than F) in this course, you must fully comply with the Koç University Student Code of Conduct:
`https://apdd.ku.edu.tr/en/academic-policies/student-code-of-conduct/`
Attending any Koç University course means you have read and agreed to this conduct, the course syllabus, and honor codes. Failure to comply will result in **a direct F for your letter grade for the course and disciplinary action**.

How to Succeed:

1. You need to do **lots of reading**. Do not expect to understand hard topics without reading from *multiple* sources.

2. The only way to become a good algorithm designer goes through experience: hence, you have to **solve lots of exercises**, other than the ones assigned or taught in class. Referenced books are good resources.
3. You need to solve **more exercises than the ones assigned**. The assignments will help, but they will **not** be enough to guarantee success.
4. Make sure to do the assignments yourself, without finding the solution somewhere else.
5. To understand algorithm design, you have to **design yourself**. Reading and understanding a given algorithm is much easier than designing one yourself.
6. If you did not understand a particular topic, **ask** before we switch to the next topic. **Work regularly**. It is nearly impossible to succeed in this course by just studying for exams at the last minute.
7. Failure to notice an announcement is not an excuse. It is your responsibility to keep up-to-date with the course material.
8. Your learning will improve if you join in-class discussions.
9. **Do not cheat.**