COMP 305 (01) ALGORITHMS&COMPLEXITY

Fall 2023

1. Course Information

Instructor:	Deniz Yüret, dyuret@ku.edu.tr
KU Credits:	3.00
ECTS Credits:	6.00
Prerequisite(s):	COMP 202 and (ENGR 200 or ENGR 201 or MATH 211)
Class Location & Meeting Times:	SNA A52 - Tuesday, Thursday 16:00-17:10
PS (Yes/No):	Yes
DS (Yes/No):	No
Lab (Yes/No):	No
Language of Instruction:	English
Office Hours:	TBA

2. Course Description

Advanced topics in algorithms, and their computational complexity. Amortized complexity analysis. Randomized algorithms. Greedy algorithms. Dynamic programming. Linear programming. Advanced graph algorithms. Turing machines and models of computation. NP-completeness reductions.

3. Course Overview

This course assumes that students know how to analyze simple algorithms and data structures from having taken comp202. It introduces students to the design, correctness proofs and run time and space analyses of computer algorithms.

4. Course Learning Outcomes (CLOs):

CLO #	**Upon successful completion of this course, students will be able to**…
1	Describe the divide-and-conquer, dynamic programming, greedy, and incremental improvement paradigms and explain when an algorithmic design situation calls for each. Recite algorithms that employ these paradigms. Synthesize algorithms in the appropriate paradigm and be able to analyze their performance. Argue their correctness using inductive proofs and invariants.
2	Explain what amortized running time is and what it is good for. Describe the different methods of amortized analysis (aggregate analysis, accounting, potential method). Perform amortized analysis.
3	Employ indicator random variables and linearity of expectation to perform the analyses. Recite analyses of algorithms that employ this method of analysis.
4	Compare between different data structures. Pick an appropriate data structure for a design situation. Be able to augment data structures to solve algorithmic problems.
5	Explain the major graph algorithms and their analyses. Employ graphs to model engineering problems, when appropriate. Synthesize new graph algorithms and algorithms that employ graph computations as key components, and analyze them.
6	Explain P vs NP vs NP-hard vs NP-complete. Know what an approximation algorithm is, and the benefit of using approximation algorithms. Be familiar with some approximation algorithms, including algorithms that are PTAS or FPTAS. Analyze the approximation factor of an algorithm.

5. Assessment Methods

Method	Description	Weight %
Participation	In class exercises and homework	20.00
Midterm Exam		40.00
Final Exam		40.00
	Total:	100.00

6. Instructional Material and Learning Resources

- Introduction to Algorithms, Edition: 4 (ISBN: 9780262046305)
  Author: Cormen, Thomas, et al.
  Publisher: MIT Press (Year: 2022)
  Material Type: Textbook
  Material Status: Required
  Additional Notes: https://mitpress.mit.edu/books/introduction-algorithms
- Active Use of Course Page on Blackboard: No Service Available
- KOLT Tutoring: No Service Available

7. Course Schedule

Meeting Times	Subject

8. Student Code of Conduct and Academic Grievance Procedure

Student Code of Conduct

Statement on Academic Honesty with Emphasis on Plagiarism

Academic Grievance Procedure

9. Course Policies

Students are encouraged to work together as long as NOTHING WRITTEN GETS EXCHANGED.In class participation and exercises are very important, in-class work will be collected.

10. Other

Please check the course website at http://courses.ku.edu.tr/comp305 for the course schedule and additional information. Please send class related emails to comp305@ku.edu.tr.