MARMARA UNIVERSITY - FACULTY OF ENGINEERING

2022-2023 Fall

CSE4077 Advanced Data Structures

COURSE DESCRIPTION FORM

Offering Department	Department of Computer Engineering		Technical Elective
Course Code	CSE4077		
Course Name	Advanced Data Structures		
Language of Instruction	English		
ECTS	5		
Contact Hours	Theoretical (T): 3	Practice (P): 0	Laboratory(L): 0
Pre-requisites	CSE2225 – Data Sructures		
Instructor	**Name**	Fatma CORUT ERGİN	
	E-mail	fatma.ergin@marmara.edu.tr	
Course Materials	**Mandatory**	Advanced Data Structures, Illustrated Edition by Peter Brass	
	Recommended	1. Data Structures and Algorithm Analysis in C++, Fourth Edition by Mark Allen Weiss 2. Introduction to Algorithms, Third Edition by Cormen, Leiserson, Rivest, and Stein	
Course Objectives	The course is intended to provide students with a thorough understanding of data structure design, analysis, implementation, and theory. A variety of traditional and modern data structures will be explored. By the end of the course, the students will have learned several sophisticated problem-solving techniques.		
Course Content	Range Minimum Queries data structures – Sparse Tables, Cartesian Trees; String Processing data structures – Tries, Suffix Trees, Suffix Arrays; Data Compression – Huffman Trees, LZW Algorithm; Fibonacci Heaps; Cuckoo Hashing; Probabilistic data structures – Bloom Filters; Dynamic Connectivity in Graphs – Euler Tour Tree, Dynamic Trees		
Learning Outcomes	**LO1**	Design and analyze different data structures to solve range minimum query problem.	
	LO2	Use and analyze different data structures for string processing problems.	
	LO3	Explain different data compression methods.	
	LO4	Learn advanced hashing and heap data structures.	
	LO5	Analyze data structures for solving the problem of dynamic connectivity in graphs.	

Program Outcomes		**LO1**	**LO2**	**LO3**	**LO4**	**LO5**		
PÇ14	Knowledge about data structures and algorithm analysis (a), database management systems, (b) operating systems (c), software engineering (d), computer architecture (e) and automata theory (f) in computer engineering.	a	a	a	a	a		

	No	**Week**	**Subjects**	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**		
Subjects (Knowledge, Skills and Behaviours), Contributions of Subjects to Learning Outcomes, Assessment Methods	**S1**	1-2-3	Range Minimum Query Problem data structures	MF, Q, P						
	S2	4-5-6-7	String Processing data structures		MF, Q, P					
	S3	8-9	Data Compression			MF, Q, P				
	S4	10	Fibonacci Heaps				MF, Q, P			
	S5	11	Cuckoo Hashing				MF, Q, P			
	S6	12	Bloom Filters				MF, Q, P			
	S7	13,14	Dynamic Connectivity in Graphs					MF, Q, P		

	No	**Type**	**Weight**	**Implementation Rule**	**Make-up Rule**
Assessment Methods and Weights	**MF**	Midterm, Final	%60	It is allowed to have an A4 size handwritten cheat sheet in the exams. Any kind of calculators or communication devices are not allowed.	Marmara University regulations will be followed for make-up exams.
	P	Project	%30	3 projects are assigned. The deadline for the projects is 2 weeks after the assignment.	Project can be submitted up to 5 days after the due date with a penalty of 10% for each late day. The grade for unsubmitted project is zero.
	Q	Quiz	%10	There are 2-3 pop-up quizzes. Any kind of notes, calculators or communication devices are not allowed.	There is no make-up for the quizzes. The lowest grade is excluded for the average quiz grade.
	TOTAL		%100		

Determining Letter Grades

- The letter grades will be determined based on the midterm and final exams, quizzes and project.
- In order to determine the letter grade, a curve or catalog based method will be followed based on the total average scores of the students.
- The final exam score and the total average score of the student must be at least 35 to pass the course.
- According to Marmara University Undergraduate regulations, the weight of the final exam must be at least 40 out of 100.

Assessment	Midterm	Project	Quiz	Final	TOTAL
Weight	20	30	10	40	100

Teaching Method, Student Work Load

Time Applied by Instructor

No	Method	Explanation	Hours
1	Lectures	Lectures are given in class using the board or via presentations. Example questions are solved to enhance the concepts.	14x3=42
2	Problem Session/ Practice	Problems related to the course topics are solved on the board.	-
3	Laboratory	Experiments are done in the laboratory or theoretical concepts covered during the lectures are practiced using computer exercises.	-
4	Interactive Courses	Questions are asked to students during lectures and they are encouraged to guess the answers (peer learning is also in this category)	-
5	Field Work	Students attend activities outside the campus.	-
6	Midterm	Midterm exam is given during the midterm week.	2
7	Final	Final exam is given during the final exam week.	2

Estimated Time to be Allocated by a Student

8	Poject	The students carry out research about the problem given in the project, design and implement their solution and prepare a report.	2x24=48
9	Homeworks	The students solve the problems given as homework.	
10	Pre-class learning of Course Material	The students study and learn the new subjects from course materials.	14
11	Review of Course Material	Students review the course subjects from course materials to prepare for the exams and homeworks.	14
12	Office Hour	Students ask questions to the instructor or the assistant during office hours.	2
TOTAL			124

Academic Honesty

Violations of scholastic honesty include, but are not limited to cheating, plagiarizing, fabricating information or citations, facilitating acts of dishonesty by others, having unauthorized possession of examinations, submitting work of another person or work previously used without informing the instructor, or tampering with the academic work of other students.

In case academic dishonesty is observed, the first authority is the instructor of the course. The instructor may decide to give the student zero for the homework(s)/lab(s)/exam(s), give the letter grade FF, or may take disciplinary action.