

# TED UNIVERSITY, COURSE SYLLABUS

<b>Faculty</b>	Engineering	<b>Department</b>	CMPE
----------------	-------------	-------------------	------

<b>Course Code &amp; Number</b>	CMPE 223 (242)	<b>Course Title</b>	Data Structures and Algorithms I
<b>Type of Course</b>	<input checked="" type="checkbox"/> Compulsory <input type="checkbox"/> Elective	<b>Semester</b>	2024-2025 <input type="checkbox"/> Fall <input checked="" type="checkbox"/> Spring <input type="checkbox"/> Summer
<b>Course Credit Hours</b>	(3+0+0) 3	<b>Number of ECTS Credits</b>	6
<b>Pre-requisite</b>	N/A	<b>Co-requisite</b>	N/A
<b>Mode of Delivery</b>	<input type="checkbox"/> Face-to-face <input checked="" type="checkbox"/> Distance learning	<b>Language of Instruction</b>	<input checked="" type="checkbox"/> English <input type="checkbox"/> Turkish
<b>Course Coordinator</b>	Prof. Tolga Çapın	<b>Course Lecturer(s)</b>	Asst. Prof. Venera Adanova Prof. Tolga Çapın
<b>Required Reading</b>	Robert Sedgewick and Kevin Wayne, <i>Algorithms, 4th Edition</i> , 2011.	<b>Recommended Reading</b>	M. A. Weiss, <i>Data Structures and Algorithm Analysis in Java</i> , 3rd edition, Pearson, 2012.

<b>Course Catalog Description</b>	Analysis of algorithms. Stacks and queues. Elementary sorts. Mergesort. Quicksort. Priority queues. Elementary symbol tables. Binary search trees. Balanced search trees. Geometric applications of BSTs. Hash tables. Searching applications.
<b>Course Objectives</b>	This course aims to help students to understand the basic data types in computer science. The course allows students to use these data types to create compound data types and mathematically model problems. The course also enables students to identify tree structures and set operations.
<b>Course Learning Outcomes</b>	Upon successful completion of this course, students will be able to <ol style="list-style-type: none"> <li>1. Identify fundamental abstract data structures,</li> <li>2. Use basic data types such as linked list, stack, queue and tree structures to model problems,</li> <li>3. Apply different algorithm design methodologies such as divide and conquer,</li> <li>4. Construct efficient operations on basic ADT,</li> <li>5. Analyze different data structures and algorithms in terms of time and space complexity.</li> </ol>
<b>Course Contents</b>	Design and Analysis of algorithms. Stacks and queues. Elementary sorts. Mergesort. Quicksort. Priority queues. Heaps. Symbol tables. Binary search trees. Balanced search trees. Hash tables.

<b>Teaching Methods &amp; Learning Activities</b>	<input type="checkbox"/> Brainstorming <input type="checkbox"/> Case Study/Scenario Analysis <input type="checkbox"/> Collaborating <input type="checkbox"/> Concept Mapping <input type="checkbox"/> Demonstrating <input type="checkbox"/> Discussions / Debates <input type="checkbox"/> Drama / Role Playing <input checked="" type="checkbox"/> <b>Experiments</b> <input type="checkbox"/> Field Trips <input type="checkbox"/> Guest Speakers <input checked="" type="checkbox"/> <b>Hands-on Activities</b> <input type="checkbox"/> Inquiry <input type="checkbox"/> Microteaching	<input type="checkbox"/> Oral Presentations / Reports <input type="checkbox"/> Peer Teaching <input type="checkbox"/> Predict-Observe-Explain <input checked="" type="checkbox"/> <b>Problem Solving</b> <input checked="" type="checkbox"/> <b>Questioning</b> <input checked="" type="checkbox"/> <b>Reading</b> <input type="checkbox"/> Scaffolding / Coaching <input type="checkbox"/> Seminars <input type="checkbox"/> Service Learning <input type="checkbox"/> Simulations & Games <input type="checkbox"/> Telling / Explaining <input type="checkbox"/> Think-Pair-Share <input checked="" type="checkbox"/> <b>Video Presentations</b> <input type="checkbox"/> Web Searching <input checked="" type="checkbox"/> Other(s):... <b>Programming Assignments</b>
<b>Assessment Methods</b> (Formal & Informal)	<input checked="" type="checkbox"/> <b>Test/Exam</b> <input checked="" type="checkbox"/> <b>Quiz/Homework</b> <input type="checkbox"/> Oral Questioning <input type="checkbox"/> Performance Project <input type="checkbox"/> Written <input type="checkbox"/> Oral	<input type="checkbox"/> Observation <input type="checkbox"/> Self-evaluation <input type="checkbox"/> Peer Evaluation <input type="checkbox"/> Portfolio <input type="checkbox"/> Presentation (Oral, Poster) <input checked="" type="checkbox"/> Other(s): ..... <b>Programming Assignments</b> .....

<b>Student Workload</b> (Total 182 Hrs)	<input checked="" type="checkbox"/> Lectures ..... <b>42..</b> hrs <input checked="" type="checkbox"/> Course Readings ..... <b>10..</b> hrs <input type="checkbox"/> Workshop ..... hrs <input type="checkbox"/> Online Discussion ..... hrs <input type="checkbox"/> Debate ..... hrs <input type="checkbox"/> Work Placement ..... hrs <input type="checkbox"/> Field Trips/Visits ..... hrs <input type="checkbox"/> Observation ..... hrs <input type="checkbox"/> Lab Applications ..... hrs <input type="checkbox"/> Hands-on Work ..... hrs <input checked="" type="checkbox"/> Quizzes and Homeworks.... <b>70..</b> hrs <input checked="" type="checkbox"/> Midterm I..... <b>20..</b> hrs <input checked="" type="checkbox"/> Midterm II..... <b>20..</b> hrs <input checked="" type="checkbox"/> Final..... <b>20..</b> hrs	<input type="checkbox"/> Resource Review ..... hrs <input type="checkbox"/> Research Review ..... hrs <input type="checkbox"/> Report on a Topic ..... hrs <input type="checkbox"/> Case Study Analysis ..... hrs <input type="checkbox"/> Oral Presentation ..... hrs <input type="checkbox"/> Poster Presentation ..... hrs <input type="checkbox"/> Demonstration ..... hrs <input type="checkbox"/> Web Designs ..... hrs <input type="checkbox"/> Mock Designs ..... hrs <input type="checkbox"/> Team Meetings..... hrs <input type="checkbox"/> Other ..... hrs
--	--	--

<b>COURSE POLICIES</b>
------------------------

**Attendance:**

**At least 70% of class attendance is mandatory.** Course attendance will be recorded at each lecture. Your attendance level will be assessed by the percentage of the attendance handouts that you have signed.

## **Hands-On Activities**

You will be assigned a hands-on activity each week. You are expected to submit your answers to hands-on activities (you are expected to upload your answers to Moodle for online sessions, or submit your work for face-to-face lectures). The hands-on activities are ungraded but they will be used to assess your active participation in the lectures.

## **Class Readings**

Class readings are necessary but not mandatory. The material covered in class by your instructors will only provide a fundamental understanding of the general context. If you are willing to effectively learn a topic, you must actively work on it yourself. Reading is one of the most successful ways of learning about a topic.

## **Missed Work**

Make ups for midterm and final exams will be provided if the student can provide a legal document confirming a significant health issue at the time of the examination or with the approval of the instructor.

## **Assignment Rules**

All assignment works must be done individually, unless explicitly stated in the homework assignment. A student can submit only one work. In case of multiple submissions, only the latest submission will be considered. Students cannot submit work on other students' behalf.

## **Late Assignment Submission**

Assignments are expected to be completed by due date. **For every day (24 hrs.) that the assignment is late after due date, 20% of the maximum will be deducted** from the assignment score. No assignments will be accepted once they are four or more days late.

## **Extra Credits**

Extra credits will not be provided.

## **Plagiarism**

All of the following are considered plagiarism:

- turning in someone else's work as your own
- copying words or ideas from someone else without giving credit
- failing to put a quotation in quotation marks
- giving incorrect information about the source of a quotation
- changing words but copying the sentence structure of a source without giving credit
- copying so many words or ideas from a source that it makes up the majority of your work, whether you give credit or not” ([www.plagiarism.org](http://www.plagiarism.org))

Plagiarism is a very serious offense and will be penalized accordingly by the university disciplinary committee. The best way to avoid accidentally plagiarizing is to work on your own before you ask for the help of other resources.

### **Cheating**

Cheating has a very broad description which can be summarized as “acting dishonestly”. Some of the things that can be considered as cheating are the following:

- Copying answers on examinations, homework and laboratory works
- Using prohibited material on examinations
- Lying to gain any type of advantage in class
- Providing false, modified or forged data in a report
- Plagiarizing
- Modifying graded material to be regraded
- Causing harm to colleagues by distributing false information about an examination, homework or laboratory

## COURSE ASSIGNMENTS

### A. Two Midterm Exams [20 + 25%]

Two closed-book written exams. The exams will be held in the weekend when possible. The exam hours and classrooms will be announced over Moodle.

### B. Programming Assignments [20%]

5 programming assignments. The weight of each assignment will be announced in the handouts. The assignments will require implementation of a project in Java and writing a report on your work.

Zoom meetings will be held to provide detailed information about the project requirements. Attendance to these online meetings is not mandatory, but valuable information will be provided to help you in your assignments.

### C. Final Exam [35%]

Closed book exam

#### Important Notes:

**Note 1: A weighted midterm and final exam average of 30 points (out of 100) is required to pass this course. Students, who cannot satisfy this condition, will get an automatic F grade.**

For example, a student who gets:

28 points (out of 100) from midterm 1;

32 points (out of 100) from midterm 2;

30 points (out of 100) from final exam

will satisfy this condition and will not get an automatic F :  $(28 \times 20 + 32 \times 25 + 30 \times 35) / (20 + 25 + 35) = 30,125 > 30$ . However, the student may still get an F grade depending on the overall course performance.

**Note 2: To pass the course, a minimum 40/100 weighted grade is required for programming assignments. Students, who cannot satisfy this condition, will get an automatic F grade.**

The weighted average of programming assignments is calculated in a similar way to the exam grades, as explained above.

TENTATIVE COURSE OUTLINE				
W	Day	Topics	Readings	Assignments
1	10.02 - 16.02	Introduction Review of Basic Algorithms	Chapter 1	
2	17.02 - 23.02	Elementary Data Structures Linked Lists, Arrays	Chapter 1	
3	24.02 - 02.03	Stacks and Queues	Chapter 1	Programming Assignment 1 out (Lists/Stacks/Queues)
4	03.03 - 09.03	Stacks and Queues Analysis of Algorithms	Chapter 1	
5	10.03 - 16.03	Analysis of Algorithms	Chapter 1	
6	17.03 - 23.03	Elementary Sorts Mergesort and Quicksort	Chapter 2	Programming Assignment 2 out (Alg. Analysis / Sorting)
7	24.03 - 30.03	Mergesort and Quicksort	Chapter 2	
8	31.03 - 06.04	Mergesort and Quicksort <u>Monday-Tuesday: Holidays, No classes</u>	Chapter 2	<b>Midterm Exam 1</b>
9	07.04 - 13.04	Trees	Chapter 2	Programming Assignment 3 out (Trees)
10	14.04 - 20.04	Binary Search Trees	Chapter 3	
11	21.04 - 27.04	Balanced Search Trees <u>Wednesday: National Holiday, no classes</u>	Chapter 3	Programming Assignment 4 out (Balanced Trees / Heaps)
12	28.04 - 04.05	2-3 Trees, Red-Black Trees <u>Thursday: National Holiday, no classes</u>	Chapter 3	
13	05.05 - 11.05	Priority Queues Heaps, Heapsort	Chapter 3	<b>Midterm Exam 2</b>
14	12.05 - 18.05	Hashing	Chapter 3	Programming Assignment 5 out (Hashing)
15	19.05 - 25.05	Applications <u>Monday: National Holiday, no classes</u>	Chapter 3	
16	26.05 - 01.06	Applications	Chapter 3	
<b>Final Exams Week</b>				

COURSE ASSESSMENTS & LEARNING OUTCOMES MATRIX	
Assessment Methods	Course Learning Outcomes
Midterm 1, Midterm 2, Final	L01
HW1-5, Midterm 1, Midterm 2, Final	L02
HW1-5, Midterm 2, Final	L03
HW1-5, Midterm 1, Midterm 2, Final	L04
HW1-5, Midterm 1, Final	L05

<b>Prepared By &amp; Date</b>	Prof. Tolga apın 02.02.2025	<b>Revision Date</b>	02.02.2024
-------------------------------	---------------------------------	----------------------	------------