BAKI ALİ NEFT MƏKTƏBİ
BAKU HIGHER OIL SCHOOL

The Ministry of Education of the Azerbaijan Republic
The State Oil Company of the Azerbaijan Republic
Baku Higher Oil School

Department of Information Technology

Data Structures and Algorithms

Syllabus, Spring 2025

Instructor: Azar Aliyev
Course Code: CExxx
Instruction Language: English
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Course Description

This course introduces fundamental concepts of data structures and algorithms, providing a solid foundation for designing efficient and scalable software solutions. Students will learn various data structures, algorithms, and their applications in solving real-world problems. Emphasis will be placed on understanding the principles behind these structures and algorithms, as well as analyzing their time and space complexity.

Objectives

- To develop a deep understanding of fundamental data structures such as arrays, linked lists, stacks, queues, trees, and graphs.
- To explore various algorithms for searching, sorting, and manipulating data.
- To analyze the time and space complexity of algorithms and make informed decisions about algorithmic choices.
- To apply data structures and algorithms to solve complex computational problems.
- To enhance problem-solving skills and algorithmic thinking through hands-on coding exercises and projects.

Course Outcomes

By the end of the course, students should be able to:

- Design and implement basic and advanced data structures.
- Choose appropriate data structures and algorithms for solving specific problems.
- Analyze the time and space complexity of algorithms.
- Apply algorithmic thinking to devise efficient solutions to computational problems.
- Implement and test algorithms using a programming language of choice.
- Demonstrate proficiency in problem-solving through practical projects.

Prerequisites

Students are expected to have a strong foundation in programming, preferably in a language such as Python, Java, or C++. Prior exposure to basic computer science concepts, including loops, conditionals, functions, and recursion, is essential. A solid understanding of mathematical concepts such as set theory and basic discrete mathematics will be beneficial. Familiarity with basic data types and their manipulations is also recommended.

Grading

Type	**Grade**
Activity Point	10%
Homework	20%
*Quiz 1	15%
*Quiz 2	15%
Final exam	40%

**The dates for the quizzes will be announced one week prior.*

Syllabus

Week	Topic
1	Time and Memory Complexity, Recursion, GCD, LCM, Fibonacci
2	Stack, Queue
3	Linked List
4	Sorting and Searching
5	Greedy Methods **(Quiz #1)**
6	Dynamic Programming
7	Binary Trees
8	Introduction to Graphs
9	Heaps and Union Find
10	Graphs Traversal Techniques – DFS **(Quiz #2)**
11	Graphs Traversal Techniques - BFS
12	Graph Connectivity, Graph Algorithms