جامعة بيرزيت

BIRZEIT UNIVERSITY

Faculty of Engineering and Technology
Department of Computer Science

Course information:

A. **Course Code:** COMP2421
B. **Course Name:** Data Structures and Algorithms
C. **Prerequisite:** COMP142 or COMP133 or COMP230
D. **Co-requisite:** None

Instructors Information:
Sections 1 & 2:

A. **Name: Dr. Ahmed Abusnaina**
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Sections 3 & 4:

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* Please do contact your lecturer in case of any questions due to online teaching.

Course Description:

This course introduces some basic data structures and algorithms (recursion, linked lists, stacks, queues, trees, heaps, various sorting, searching, hashing, dynamic programming, graph theory, and Huffman coding). Algorithm Analysis will also be covered in this course. The use of data structures in programming languages and relevant aspects of data and file management will be illustrated using C programming language.

Course Goals:

The primary goal of this course is to enhance the knowledge of students and their understanding of algorithms and data structures along with their associated design and analysis techniques. This course aims to develop the ability of students to design and implement data structures and algorithms, analyze their correctness and efficiency, and choose the right data structure/algorithm for a particular task.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

A. Knowledge and understanding

1. Understand the fundamental types of data structures (lists, stacks, queues, trees, graphs…) and their respective representations
2. Explain different operations for maintaining common data structures

B. Intellectual/Cognitive skills

1. Analyse the complexity of simple algorithms to work out the order of magnitude of running time and space complexity
2. Design and apply appropriate data structures and algorithms for solving computing problems

C. Subject specific and practical skills

1. Apply advanced problem solving techniques (e.g., recursion and data abstraction) to solve computing problems
2. Implement different types of data structures and sorting algorithms
3. Analyze various programming problems and use appropriate data structures/sorting algorithms

D. General and transferable skills

1. Communication and oral skills by discussing the implementation of projects
2. Apply time-management skills
3. State conclusions that the evaluations and comparisons of different algorithms

Course Content:

No. of Lectures (1:40 hours)	Course Content	Assignments and Due Date
	Topic	
1.5	Recursion	
2.5	Algorithm Analysis	
1.5	Lists, Linked Lists, Double Linked Lists, Examples	
1.5	Cursor Implementation of Linked Lists	
2	Stacks, Queues, Implementation and Examples	
1	Trees, Tree Traversal, Binary Trees	
1.5	Expression Trees, Binary Search Trees	
1	AVL Trees, Single and Double Rotation	
1.5	Splaying, B_Trees	

2	Hashing	
2	Priority Queues (Heaps)	
1	Sorting, Linear Sorting Algorithms, Merge Sort, Analysis of Merge Sort	
1	Analysis of Quick Sort, Shell Sort, External Sort	
5	Graphs	
3	Dynamic Programming	
1	Huffman Coding	

Teaching and learning method:

A. Lectures – introduce new concepts and theory
B. Class discussion for more understanding and give examples

Assessment methods based on outcomes:

1. Exams to asses A1, A2, B1, B2, C1
2. Projects to assess B1, B2, C1, C2, C3, D1, D2, D3

Weighting of assessments:

Projects/Assignments	60%
Oral exam/Take home exam	15%
Final Project	25%
Total	100%

* If teaching reverts to face-to-face during the semester, the distribution of grades will be final exam (40%) and Projects/Assignments (60%).

References:

A. Essential books /text books
    1. Data Structures and Algorithm Analysis in C 2nd edition. Mark Allen Weiss, Pearson, 1996.
    2. Introduction to Algorithms 3rd edition. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, MIT Press, 2009.