



**University/Academy:** Arab Academy for Science and Technology & Maritime Transport

**Faculty/Institute:** College of Computing and Information Technology

**Program:** Computer Science / Information Systems / Software Engineering

**Form No. (12)  
Course Specification**

**1- Course Data**

<b>Course Code:</b> CS212	<b>Course Title:</b> Data Structure and Algorithms	<b>Academic Year/Level:</b> Year 2 / Semester 4
<b>Specialization:</b> Computer Science	<b>No. of Instructional Units:</b> 2 hrs lecture 4 hrs lab	<b>Lecture:</b>

**2- Course Aim**

This course covers the organization of data and the algorithms that act upon them. The topics of linked lists, stacks, queues, trees and graphs as well as hashing are introduced. Applications to data structure searching and sorting, memory allocation and file management are included.

**3- Intended Learning Outcome:**

**a- Knowledge and Understanding**

**Students will be able to demonstrate knowledge of:**

- K2.** Modeling and design of computer-based systems bearing in mind the trade-offs.
- K4.** Criteria and specifications appropriate to specific problems, and plan strategies for their solution.
- K7.** Principals of generating tests which investigate the functionality of computer programs and computer systems and evaluating their results.
  - Understand how to analyze the complexity of algorithms, and to express it using asymptotic notation (K7)
  - Learn the definitions, uses, and typical implementations of array abstract data types.(k2)
  - Learn the definitions, uses, and typical implementations of Linked List abstract data types. (K2, K4)
  - Learn the definitions, uses, and typical implementations of Stack abstract data types. (K2, K4)
  - Learn the definitions, uses, and typical implementations of Queue abstract data types. (K2, K4)
  - Learn the definitions, uses, and typical implementations of Tree abstract data types.
  - Learn the definitions, uses, and typical implementations of graphs. (K2, K4)
  - Learn the uses, performance characteristics, and typical implementations of the classical graph algorithms(K2, K4)
  - Learn the definitions, uses, and typical implementations of hashing. (K2, K4)

<b>b- Intellectual Skills</b>	<p><u>By the end of the course, the student acquires high skills and an ability to understand:</u></p> <p>I3. Identify criteria to measure and interpret the appropriateness of a computer system for its current deployment and future evolution.</p> <p>I7. Achieve judgments considering balanced costs, benefits, safety, quality, reliability, and environmental impact.</p> <p>I10. Define traditional and nontraditional problems, set goals towards solving them, and. observe results.</p> <p>I11. Perform comparisons between (algorithms, methods, techniques...etc).</p> <p>I13. Identify attributes, components, relationships, patterns, main ideas, and errors.</p> <ul style="list-style-type: none"> <li>• Compare the relative advantages of using arrays, vectors, and linked lists in solving problem efficiently. (I3,I7,I11)</li> <li>• Use stacks, queues, trees, and graphs to solve real-life problems (I10,I13)</li> <li>• Analyze the complexity of algorithms, and express it using asymptotic notation (I3,I7)</li> </ul>
<b>c- Professional Skills</b>	<p><u>By the end of the course the student will have the ability to:</u></p> <p><b>P2.</b> Implement comprehensive computing knowledge and skills in projects and in deployment of computers to solve position practical problems.</p> <p><b>P3.</b> Deploy the equipment and tools used for the construction, maintenance and documentation of computer applications.</p> <p><b>P9.</b> Use appropriate programming languages, web-based systems and tools, design methodologies, and knowledge and database systems.</p> <ul style="list-style-type: none"> <li>• Write programs using abstract data types.</li> <li>• Use programming tools for compilation control, editing, version control, and debugging to do so.</li> </ul>
<b>d- General Skills</b>	<p><b>Students will be able to:</b></p> <p><b>G1.</b> Demonstrate the ability to make use of a range of learning resources and to manage one's own learning.</p> <p><b>G3.</b> Show the use of information-retrieval.</p> <p><b>G7.</b> Show the use of general computing facilities.</p> <ul style="list-style-type: none"> <li>• Acquire problem solving Skills</li> <li>• Acquire designing Skills</li> </ul>
<b>4- Course Content</b>	<p>Introduction to Data Structures</p> <p>Arrays</p> <p>Pointers and dynamic memory allocation</p> <p>Linked Lists</p> <p>Doubly and circular Linked Lists</p> <p>Stack</p> <p>7<sup>th</sup> Week Exam +Stack Applications</p> <p>Stack applications</p> <p>Queues</p> <p>Trees Representation</p> <p>Binary Search Trees</p> <p>Binary Search Trees.</p> <p>Graph Representation</p> <p>Graph Algorithms</p> <p>Hash Representation</p>

<b>5- Teaching and Learning Methods</b>	Lectures, Labs, Projects.
<b>6- Teaching and Learning Methods for Students with Special Needs</b>	<ul style="list-style-type: none"> <li>• Students with special needs are requested to contact the college representative for special needs ( currently Dr Hoda Mamdouh in room C504)</li> <li>• Consulting with lecturer during office hours.</li> <li>• Consulting with teaching assistant during office hours.</li> <li>• Private Sessions for redelivering the lecture contents.</li> <li>• For handicapped accessibility, please refer to program specification.</li> </ul>
<b>7- Student Assessment:</b>	
<b>a- Procedures used:</b>	Exams and Individual Projects
<b>b- Schedule:</b>	Week 7 exam 4 Projects through the semester Week 16 Final exam
<b>c- Weighing of Assessment:</b>	7 <sup>th</sup> week exam 30% Project 1 5% Project 2 5% Project 3 5% Project 4 5% Lab work 10% Final exam 40%
<b>8- List of References:</b>	
<b>a- Course Notes</b>	From the Moodle on <a href="http://www.aast.edu">www.aast.edu</a>
<b>b- Required Books (Textbooks)</b>	"Data Structures and Algorithm Analysis in C++", 3 <sup>rd</sup> edition , by Mark Allen Weiss
<b>c- Recommended Books</b>	Adam Drozdek, <i>Data Structures and Algorithms in C++</i> , Course Technology, 3rd edition 2004
<b>d- Periodicals, Web Sites, ..., etc.</b>	

Course Instructor: Dr Samah Senbel

Head of Department: Dr Samah Senbel

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