MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

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| **Module Information**  **معلومات المادة الدراسية** | | | | | | | |
| **Module Title** | Data Structures and Algorithms | | | | **Module Delivery** | | |
| **Module Type** |  | | | | * **☐ Theory** * **☒ Lecture** * **☒ Lab** * **☒ Tutorial** * **☒ Practical** * **☐ Seminar** | | |
| **Module Code** | DASA225 | | | |
| **ECTS Credits** |  | | | |
| **SWL (hr/sem)** | 150 | | | |
| **Module Level** | | UGx11 2 | **Semester of Delivery** | | | | 2 |
| **Administering Department** | | Type Dept. Code | **College** | Type College Code | | | |
| **Module Leader** | Name | | **e-mail** | E-mail | | | |
| **Module Leader’s Acad. Title** | | Professor | **Module Leader’s Qualification** | | | | Ph.D. |
| **Module Tutor** | Name (if available) | | **e-mail** | E-mail | | | |
| **Peer Reviewer Name** | | Name | **e-mail** | E-mail | | | |
| **Scientific Committee Approval Date** | |  | **Version Number** | | | 1.0 | |

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| **Relation with other Modules**  **العلاقة مع المواد الدراسية الأخرى** | | | |
| **Prerequisite module** | None | **Semester** |  |
| **Co-requisites module** | None | **Semester** |  |

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| **Module Aims, Learning Outcomes and Indicative Contents**  **أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية** | |
| **Module Objectives**  **أهداف المادة الدراسية** | - To understand and Implement fundamental data structures and algorithms.  -To analyze the complexity and performance of algorithms.  - To develop problem-solving skills using data structure and algorithms in C++. |
| **Module Learning Outcomes**  **مخرجات التعلم للمادة الدراسية** | - Understanding and apply various data structures and their operations.  -Implement algorithms using appropriate data structures.  - Analyze and compare the efficiency of algorithms.  - Solve complex problems using data structures and algorithms in C++. |
| **Indicative Contents**  **المحتويات الإرشادية** | Indicative content includes the following :  - Introduction to Data Structures and Algorithms  - Complexity Analysis  - Array and String  - Linked Lists  - Stacks and Queues  - Recursion  - Trees  - Balanced Trees  - Priorty Queues and Heaps  -Hashing  -Graph  - Advanced Graph Algorithms  -Sorting Algorithms  - Searching Algorithms  - Review and Advanced Topics      Total hrs = 105 = SSWL - (Exam hrs) = 109 - 4 = 105 hr (Time table hrs x 15 weeks) |

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| **Learning and Teaching Strategies**  **استراتيجيات التعلم والتعليم** | |
| **Strategies** | - Lectures : To explain and discuss key concepts , theories ,and algorithms .  - Lab Sessions : Hands-on programming exercises to reinforce learning .  - Assignments : Regular assignments to apply learned concepts .  - Quizzes and Exams : Periodic assessments to evaluate understanding .  - Projects : Comprehensive projects to integrate various concepts. |

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| **Student Workload (SWL)**  **الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا** | | | |
| **Structured SWL (h/sem)**  **الحمل الدراسي المنتظم للطالب خلال الفصل** | 93 | **Structured SWL (h/w)**  **الحمل الدراسي المنتظم للطالب أسبوعيا** | 6 |
| **Unstructured SWL (h/sem)**  **الحمل الدراسي غير المنتظم للطالب خلال الفصل** | 57 | **Unstructured SWL (h/w)**  **الحمل الدراسي غير المنتظم للطالب أسبوعيا** | 3 |
| **Total SWL (h/sem)**  **الحمل الدراسي الكلي للطالب خلال الفصل** | **150** | | |

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| **Module Evaluation**  **تقييم المادة الدراسية** | | | | | |
| **As** | | **Time/Number** | **Weight (Marks)** | **Week Due** | **Relevant Learning Outcome** |
| **Formative assessment** | **Quizzes** | 2 | 10% (10) | 5 and 10 | LO #1, #2 and #10, #11 |
| **Assignments** | 2 | 10% (10) | 2 and 12 | LO #3, #4 and #6, #7 |
| **Projects / Lab.** | 1 | 10% (10) | Continuous | All |
| **Report** | 1 | 10% (10) | 13 | LO #5, #8 and #10 |
| **Summative assessment** | **Midterm Exam** | 2hr | 10% (10) | 7 | LO #1 - #7 |
| **Final Exam** | 3hr | 50% (50) | 16 | All |
| **Total assessment** | | | 100% (100 Marks) |  |  |

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| **Delivery Plan (Weekly Syllabus)**  **المنهاج الاسبوعي النظري** | |
| **Week** | **Material Covered** |
| **Week 1** | Introduction to Data structures and Algorithms : basics review. |
| **Week 2** | Complexity Analysis : Time and space complexity . |
| **Week 3** | Arrays and Strings : Array operations , String manipulation and multidimensional arrays . |
| **Week 4** | Linked Lists :Singly Linked lists , doubly linked lists , circular linked lists . |
| **Week 5** | Stacks and Queues :Stack operations and queue operations ,application . |
| **Week 6** | Recursion : Recursive algorithms ,comparison with iteration . |
| **Week 7** | Trees : Binary Trees , binary search trees , tree traversal techniques . |
| **Week 8** | Balanced Trees : AVL trees , rotations , balance factor . |
| **Week 9** | Priority Queues and Heaps :Binary heaps , heap operations ,applications . |
| **Week 10** | Hashing : Hash functions, Hash table operations ,collisions handling . |
| **Week 11** | Graphs : Graph representations ,BFS ,DFS . |
| **Week 12** | Advance Graph Algorithms : shortest path and minimum spanning tree algorithms ,Dijkstra’s algorithm , Kruskal ‘s algorithm, Prim’s algorithm . |
| **Week 13** | Sorting Algorithms : Quick Sort , Merge Sort , Heap Sort ,non-comparison sorts . |
| **Week 14** | Searching Algorithms : Linear Search , binary Search , search in data structures. |
| **Week 15** | Review and Advance Topics : understanding and introduce dynamic programming and backtracking. |
| **Week 16** | Final Review and Exam Preparation |

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| **Delivery Plan (Weekly Lab. Syllabus)**  **المنهاج الاسبوعي للمختبر** | |
| **Week** | **Material Covered** |
| **Week 1** | Lab1 : review of C++ programs |
| **Week 2** | Lab 2: Complexity Analysis : solve problems on Complexity analysis. |
| **Week 3** | Lab 3: Array and String : Implement array and string operations . |
| **Week 4** | Lab 4 : Linked lists : implement Singly ,doubly ,and circular linked lists . |
| **Week 5** | Lab 5: Stack and Queues : implement Stack and Queue using array and linked lists . |
| **Week 6** | Lab 6: Recursion : Implement recursive algorithms ( Factorial ,Fibonacci,etc.) |
| **Week 7** | Lab 7: Trees : Implement binary tree structure and traversals method . |
| **Week 8** | Lab 8 : Balanced Trees : Implement AVL trees and balancing operations . |
| **Week 9** | Lab 9: Priority Queues and Heaps : Implement heaps and priority queues . |
| **Week 10** | Lab 10 : Hashing : Implement hash tables and collision resolution . |
| **Week 11** | Lab 11 : Graph : Implement BFS and DFS . |
| **Week 12** | Lab 12 : Advanced Graph Algorithms : Implement Dijktra’s and Kruskal’s algorithms . |
| **Week 13** | Lab 13 : Sorting Algorithms : implement Sort Algorithms . |
| **Week 14** | Lab 14 : Searching Algorithms : Implement Linear and Binary Search Algorithms . |
| **Week 15** | Lab 15 : Final Project and Review . |

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| **Learning and Teaching Resources**  **مصادر التعلم والتدريس** | | |
|  | **Text** | **Available in Nthe Library?** |
| **Required Texts** | - “Data Structures and Algorithm Analysis in C++” by  MarkAllen Weiss .  - “Algorithms in C++ “ by Robert Sedgewick. | No  No |
| **Recommended Texts** | -“Introduction to Algorithms” by Thomas H.Cormen ,Charless  E.,Ronald L .Rivest ,and Clifford Stein . |  |
| **Websites** | -Cplusplus.com  -Greeks for Greeks Data Structures  - Stack Overflow | |

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| **Grading Scheme**  **مخطط الدرجات** | | | | |
| **Group** | **Grade** | **التقدير** | **Marks %** | **Definition** |
| **Success Group**  **(50 - 100)** | **A -** Excellent | **امتياز** | 90 - 100 | Outstanding Performance |
| **B -** Very Good | **جيد جدا** | 80 - 89 | Above average with some errors |
| **C –** Good | **جيد** | 70 - 79 | Sound work with notable errors |
| **D -** Satisfactory | **متوسط** | 60 - 69 | Fair but with major shortcomings |
| **E -** Sufficient | **مقبول** | 50 - 59 | Work meets minimum criteria |
| **Fail Group**  **(0 – 49)** | **FX –** Fail | **راسب (قيد المعالجة)** | (45-49) | More work required but credit awarded |
| **F –** Fail | **راسب** | (0-44) | Considerable amount of work required |
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| **Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. | | | | |