

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Algorithms and Data Structures		Module Delivery	
Module Type	C		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	AI204			
ECTS Credits	6			
SWL (hr/sem)	150			
Module Level	GII	Semester of Delivery		4
Administering Department	AI	College	CIT	
Module Leader	Mohammed A.S. Al-Hitawi		e-mail	al_hitawe@uofallujah.edu.iq
Module Leader's Acad. Title	Assist. Lec.		Module Leader's Qualification	Mater
Module Tutor	Name (if available)		e-mail	E-mail
Peer Reviewer Name	Prof. Dr. Waleed khalid abduljabbar		e-mail	waleed75@uofallujah.edu.iq
Scientific Committee Approval Date	1/06/2026	Version Number	2.0	

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1- How to build your Algorithm (Programs) efficiently. 2- How to measure your algorithm complexity. 3- What data structure is appropriate for your algorithm. 4- Learning different data structures. 5- Understand why this data structure is better than the other one. 6- Learning how to choose the best data structure for your algorithm. 7- learn how to deal with your problem, building its algorithm and fitting the best data structures to it.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• How to measure the performance of your algorithm. • What are data structures and how to use them • Explain and utilize linked lists, stacks, queues and trees. • Apply design guidelines to evaluate alternative software designs. • Basic ability to analyze algorithms and to determine algorithm correctness and time efficiency class. • Master a variety of advanced abstract data type (ADT) and data structures and their implementations. • Ability to apply and implement learned algorithm design techniques and data structures to solve problems.
Indicative Contents المحتويات الإرشادية	• Analysis in Algorithms: Basic concepts of complexity measures Recursion • Basic Data Structures: Vector, linked list, stack, queue, dequeue, tree, trie, set, and hashing • Search Algorithms: Linear search for unordered/ordered lists, binary search, and interpolation search • Sorting Algorithms: Insertion sorts, exchange sort, selection sort, merge sort, quicksort, bucket sort, radix sort, and topological sort • Object-oriented Programming: Abstract classes and abstract methods, encapsulation, superclass and subclass, inheritance, and polymorphism

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	There are a number of teaching and learning activities including lectures, laboratories and group projects. The concepts and principles of complexity analysis in algorithms, data structures, search algorithms, sort algorithms, and object-oriented programming will be covered in lectures. The implantations of data structures and algorithms in an object-oriented language will be taught during the laboratories. Students are required to perform a group project to apply the concepts and principles covered in this course to critically analyses the given problem(s) and creatively formulate the solution(s). Students implement the solution(s) in an object-oriented language.

Student Workload (SWL)			
الحمل الدراسي للطلاب محسوب ل ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل	78	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل	72	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	150		

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

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Algorithms and Data Structures
Week 2	Algorithm Complexity and Asymptotic Analysis
Week 3	Sorting Algorithms
Week 4	Sorting Algorithms
Week 5	Searching Algorithms
Week 6	Searching Algorithms
Week 7	First exam

Week 8	Arrays and Pointers
Week 9	Linked List
Week 10	Stack and Queue
Week 11	Tree lecture 1
Week 12	Tree lecture 2
Week 13	Graph
Week 14	Hashing
Week 15	Second try exam
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المناهج الاسبوعي للمختبر	
	Material Covered
Week 1	Implement Sorting algorithms.
Week 2	Implement Search Algorithms.
Week 3	Student information system using linked list or Color cubes games using Stack
Week 4	A snake game using queue
Week 5	Social Media connections using Graph data structure
Week 6	Simple search engine application using hash table data structure

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Introduction to Algorithm, third Edition, Thomas H. Cormen Algorithms, fourth edition, Robert Sedgewick and Kevin Wayne	Yes
Recommended Texts	Introduction to Algorithm, third Edition, Thomas H. Cormen Algorithms, fourth edition, Robert Sedgewick and Kevin Wayne	Yes
Websites	https://www.coursera.org/learn/data-structures	

Grading Scheme مخطط الدرجات				
Group	Grade	التقدير	Marks %	Definition
Success Group	A - Excellent	امتياز	90 - 100	Outstanding Performance

(50 - 100)	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
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.				