	Ministry of Higher Education and Scientific Research - Iraq University of Technology Department of Computer Science	

MODULE DESCRIPTOR
وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	HEURISTIC SEARCH METHODS	**Module Delivery**	
Module Type	CORE	**Theory** **Lecture** **Lab** **Tutorial** **Practical** **Seminar**	
Module Code	HESM225		
ECTS Credits	5		
SWL (hr/sem)	125		

Module Level	2	**Semester of Delivery**	4
Administering Department	Artificial Intelligence	**College**	Computer Science Department
Module Leader	Dr. Nada Hussain ALi	**e-mail**	
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	Ph.D.
Module Tutor	None	**e-mail**	None
Peer Reviewer Name		**e-mail**	
Review Committee Approval		**Version Number**	

Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى

Prerequisite module	Searching Strategies	**Semester**	3

Co-requisites module	Planning & Robotics	Semester	8

Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	• Understanding the problem state space and problem solving. • Implementing and employing intelligent search methods to • solve problems that are not solved with traditional methods. • Using Heuristics in games. • Understanding knowledge discovery, acquisition and • Engineering approach.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1-Understand the concept of heuristic search and its applications in problem-solving. 2-Learn about different heuristic search algorithms, such as greedy best-first search, A* search, and their variants. 3-Analyze the time and space complexities of these algorithms. 4-Understand the role of heuristic functions and their properties (admissibility, consistency, etc.). 5-Apply heuristic search techniques to solve various problems, such as path-finding, game-playing, and optimization problems. 6-Implement heuristic search algorithms in programming languages. 7-Evaluate the performance trade-offs of different heuristic search algorithms based on problem characteristics.
Indicative Contents المحتويات الإرشادية	Problem state space, search space and problem solving approach • Heuristic search • Fundamentals, characteristics and aims • Heuristic function and Heuristic value • Heuristic search methods • Hill climbing search algorithm • Best first search algorithm • A-search algorithm • A*- search algorithm • Minmax search algorithm • Alpha-Beta - search algorithm • Using Heuristic in games • The 8-puzzle problem • The sliding-tile puzzle problem • The tic tac toe problem • Searching with heuristic embedded in rules •The student advisor system

	• Systems based on heuristic search and pattern recognition • The chemical synthesis system • Principles of Meta-Heuristic Search
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Lectures (Theoretical and Practical) Examples, Homework and Programs Exams and using modern data show devices to display lectures subjects. References as books, internet subjects.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Problem state space, search space and problem solving approach
Week 2	Heuristic search-Fundamentals, characteristics and aims
Week 3	Heuristic function and Heuristic value
Week 4	Hill climbing search algorithm
Week 5	Best first search algorithm
Week 6	A-search algorithm
Week 7	A*- search algorithm
Week 8	Minmax search algorithm
Week 9	Alpha-Beta - search algorithm
Week 10	Using Heuristic in games-The 8-puzzle problem
Week 11	The sliding-tile puzzle problem
Week 12	The tic tac toe problem
Week 13	Searching with heuristic embedded in rules
Week 14	Systems based on heuristic search and pattern recognition
Week 15	**Principles of Meta-Heuristic Search**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Hill climbing search algorithm
Week 2	Best first search algorithm
Week 3	A-search algorithm
Week 4	A-search algorithm
Week 5	A*- search algorithm

Week 6	A*- search algorithm
Week 7	Minmax search algorithm
Week 8	Alpha-Beta - search algorithm
Week 9	The sliding-tile puzzle problem
Week 10	The sliding-tile puzzle problem
Week 11	The tic tac toe problem
Week 12	The tic tac toe problem

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	George F. Luger, "Artificial Intelligence Structures and Strategies for Complex Problem Solving", Pearson Education Asia (Singapore), Sixth edition 2009	Yes
Recommended Texts	Stuart J. Russell and Peter Norvig, "Artificial Intelligence, A Modern Approach", Fourth Edition, ,Pearson, 2022	No
Websites	https://cs.uotechnology.edu.iq/index.php/ar/branches/ai#31	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

NB 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.