

MODULE DESCRIPTION FORM

Module Information				
Module Title	Discrete Mathematics		Module Delivery	
Module Type	Basic		☒ Theory ☒ Lecture ☐ Lab ☒ Tutorial ☒ Practical ☐ Seminar	
Module Code	AI102			
ECTS Credits	5			
SWL (hr/sem)	125			
Module Level	1	Semester of Delivery		2
Administering Department	AI	College	CIT	
Module Leader	Diaa Ahmed Ibrahim		e-mail	diaa.a.ibrahim@uofallujah.edu.iq
Module Leader's Acad. Title	Asst. Prof. Dr		Module Leader's Qualification	P.h.D
Module Tutor	Mohammed A.S Al-Hitawi		e-mail	al_hitawe@uofallujah.edu.iq
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			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	- Introduce students to the fundamental concepts of discrete mathematics and their applications in computer science and artificial intelligence. - Develop logical reasoning and mathematical problem-solving skills. - Enable students to analyze and construct mathematical proofs using various proof techniques. - Provide a foundation in sets, relations, functions, combinatorics, and graph theory. - Strengthen students' ability to model computational problems mathematically.

	Prepare students for advanced courses in algorithms, artificial intelligence, machine learning, and data science.
Module Learning Outcomes	Upon successful completion of this module, students will be able to: LO1: Explain the fundamental concepts of discrete mathematics and their role in computing and artificial intelligence. LO2: Apply propositional and predicate logic to analyze logical statements and arguments. LO3: Use set theory, relations, and functions to represent and solve mathematical problems. LO4: Construct valid mathematical proofs using direct proof, contradiction, contraposition, and mathematical induction. LO5: Solve counting and probability problems using combinatorial techniques. LO6: Analyze graphs, trees, and networks using graph-theoretic concepts. LO7: Model and solve computational problems using discrete mathematical methods.
Indicative Contents	Introduction to discrete mathematics and its applications in computing and artificial intelligence. Propositional logic, logical equivalence, truth tables, and predicate logic. Set theory, set operations, Cartesian products, power sets, relations, and functions. Proof techniques including direct proof, proof by contradiction, proof by contraposition, and mathematical induction. Counting principles, permutations, combinations, and basic probability. Graph theory including graphs, paths, trees, connectivity, and graph applications. Mathematical modeling and problem-solving exercises relevant to computer science and artificial intelligence.

Learning and Teaching Strategies	
Teaching and Learning Strategies	- Interactive lectures supported by examples and problem-solving sessions. - Guided derivation of mathematical concepts and proofs. - Individual and group exercises. - Classroom discussions and collaborative learning. - Weekly quizzes and formative assessments. - Problem-based learning activities. - Use of visual representations for sets, relations, and graphs. - Mathematical modeling activities related to AI applications. - Self-learning activities supported by digital resources and educational websites.

Student Workload (SWL)			
The student's academic workload is calculated for 16 weeks			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	32	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	2

Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125
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Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	3 and 15	LO #1, #2 and #3
	Home Assignments	2	5% (5)	2 and 12	LO #2, #3, #4, #5
	Oral Participation / Seminar	1	5% (5)	Continuous	LO #1–#7
	Problem Set	5	10% (10)	Every 2 weeks	All (LO #1–#7)
	Daily Activities / Classwork	10	10% (10)	Continuous	LO #2 – #6
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #5
	Final Exam	3hr	50% (50)	16	All (LO #1–#7)
Total assessment			100% (100 Marks)		
Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري					
	جامعة الفلوجة				
Week 1	Introduction to Discrete Mathematics, Sets and Set Operations				
Week 2	Power Sets, Cartesian Products, Applications of Sets				
Week 3	Propositional Logic, Truth Tables				
Week 4	Logical Equivalences and Predicate Logic				
Week 5	Rules of Inference and Logical Reasoning				
Week 6	Mathematical Proof Techniques				
Week 7	Mid-Term Exam				
Week 8	Mathematical Induction and Recursive Definitions				
Week 9	Relations and Their Properties				
Week 10	Functions and Function Properties				
Week 11	Counting Principles				
Week 12	Permutations and Combinations				
Week 13	Introduction to Graph Theory				
Week 14	Trees and Graph Applications				

Week 15	Course Review and Final Examination Preparation& Complex numbers (Polar Form)
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Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Set Operations Exercises
Week 2	Power Sets and Cartesian Products
Week 3	Truth Tables Construction
Week 4	Predicate Logic Problems
Week 5	Logical Reasoning Exercises
Week 6	Proof Writing Practice
Week 7	Mid-Term Exam
Week 8	Mathematical Induction Problems
Week 9	Relations Exercises
Week 10	Functions Problems
Week 11	Counting Principles Exercises
Week 12	Permutations and Combinations
Week 13	Graph Representation Problems
Week 14	Trees and Graph Applications
Week 15	Comprehensive Review

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	- Discrete Mathematics and Its Applications, 8th Edition, McGraw-Hill Education, 2019.	Yes
Reference Book	- Mathematics for Computer Science, Revised Edition, May 18, 2015. Massachusetts Institute of Technology (MIT), Department of Mathematics and Computer Science and Artificial Intelligence Laboratory (CSAIL). - Discrete Mathematics with Applications, 5th Edition, Cengage Learning, 2019. - Discrete and Combinatorial Mathematics, 5th Edition, Pearson Education.	Yes
Websites	i. MIT Open Courseware – Mathematics for Computer Science ii. Khan Academy Mathematics. iii. Brilliant – Discrete Mathematics	Available Online

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
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.				