Ministry of Higher Education
Al-Zahrawi University
Faculty of Science
Department of
Cybersecurity Sciences

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Mathematics for Computing**			**Module Delivery**	
Module Type	**S**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	ZU-SC-CS-1A-MC				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level		UGI	**Semester of Delivery**		1
Department		امن سيبراني	**College**	Science	
Module Leader	م.م. عبد الله شعلان نفنف		**e-mail**	Abdullah.shaalan@alzahu.edu.iq	
Module Leader's Acad. Title		مدرس مساعد	**Module Leader's Qualification**		
Module Tutor			**e-mail**	E-mail	
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date			**Version Number**	1.0	

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. Provide a solid grounding in mathematics sufficient to understand a range of Cyber Security topics. 2. Improve students' confidence in using mathematical concepts in computer science. 3. Present mathematical techniques that underlie Cyber Security. 4. Illustrate the power of Mathematics in solving problems in Cyber Security. 5. Provide an introduction to mathematical proof, logic, linear algebra and number theory, etc.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Upon completion of the course, students will be able to: 1. Apply direct and contradiction proofs to demonstrate the validity of mathematical statements, developing logical reasoning skills. 2. Utilize contraposition, counterexamples, and mathematical induction to prove mathematical statements, demonstrating proficiency in various proof techniques. 3. Understand and apply concepts related to functions, relations, and set theory, including mapping, equivalence relations, and set operations. 4. Manipulate Boolean algebra expressions, applying Boolean operations and understanding de Morgan's laws. 5. Analyze propositional logic statements, construct truth tables, and express logical statements in conjunctive and disjunctive normal forms. 6. Apply quantifiers and predicate logic to reason about mathematical statements involving variables and predicates. 7. Apply counting principles and techniques, such as the pigeonhole principle, to solve problems related to combinatorics and counting arguments. 8. Demonstrate proficiency in permutations, combinations, and binomial coefficients, enabling the computation of probabilities and counting arrangements. 9. Understand and apply concepts related to divisibility, greatest common divisor, and prime numbers, including prime factorization. 10. Utilize modular arithmetic to solve problems involving congruences and modular equations.

	11. Understand the properties of vectors, including scalar product and vector product, and apply vector operations to solve problems in geometry and physics. 12. Understand the properties of matrices, including inverse and determinant, and solve systems of linear equations using matrix operations. 13. Analyze eigenvalues and eigenvectors of matrices, applying these concepts in various mathematical and scientific contexts. 14. Use the revision week to consolidate their understanding of the covered topics, review and reinforce their knowledge, and prepare for assessments or further studies in the field.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **Mathematical proof** Direct, contradiction, contraposition, counterexample and mathematical induction. **Fundamental structures** Functions, relations and set theory **Logic** Boolean values, standard operations on Boolean values, de Morgan's laws, Logical connectives, truth tables, normal forms (conjunctive and disjunctive), Quantifiers and predicate logic. **Basics of counting** Counting arguments, pigeonhole principle, permutations and combinations; binomial coefficients **Elementary number theory** Divisibility, Greatest Common divisor, Prime numbers, Factorization and Modular Arithmetic **Linear Algebra** Vector: scalar product, vector product; Matrices: inverse, determinant, Eigenvalues and Eigenvectors.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	

	The main strategy that will be adopted in delivering this module is to encourage students' participation in the class, while at the same time refining and expanding their critical thinking skills. Also, provide explanations and examples illustrating the main concepts and encourage the students to practice these concepts. This will be achieved through lectures and interactive tutorials using visual aids, diagrams, and interactive activities to explain the concepts and provide real-life examples to help students understand the practical implications.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	5	15% (15)	3, 5, 7, 9, 11	LO #2 - 10
	Assignments	5	15% (15)	4, 6, 10, 12 and 13	LO #3 - 12
	In-class Exercises	---	10% (10)	Continuous	All
	Report	---	---	---	---
Summative assessment	**Midterm Exam**	2hr	10% (10)	8	LO #2 - 7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Course Overview
Week 2	Mathematical proof: direct and contradiction
Week 3	Mathematical proof: contraposition, counterexample and mathematical induction
Week 4	Functions, relations and set theory
Week 5	Boolean algebra: Boolean values; standard operations on Boolean values; de Morgan's laws
Week 6	Propositional logic: Logical connectives; truth tables; normal forms (conjunctive and disjunctive)
Week 7	Quantifiers and predicate logic.
Week 8	**Midterm Exam** + Basics of counting: Counting arguments; pigeonhole principle
Week 9	Permutations and combinations; binomial coefficients
Week 10	Divisibility, Greatest Common divisor, Prime numbers
Week 11	Factorization, Modular Arithmetic
Week 12	Vector: basic properties, scalar product, vector product
Week 13	Matrices: basic properties, inverse, determinant
Week 14	Eigenvalues and Eigenvectors
Week 15	Revision week
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Mathematics for Computer Science, Eric Lehman, F. Thomson Leighton, et al., 2017.	Yes
Recommended Texts	Discrete Mathematics and Its Applications (Eighth Edition), Kenneth Rosen, 2018, McGraw-Hill.	Yes
Websites	https://ocw.mit.edu/courses/6-042j-mathematics-for-computer-science-fall-2010/pages/readings/	

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.