University of Fallujah
College of Information Technology
Department of Cybersecurity

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Computation Theory**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**CYS213**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	2		**Semester of Delivery**	2	
Administering Department	Dept. of Cybersecurity		**College**	College of Information Technology	
Module Leader	Dr. Ahmad A. AlSabhany		**e-mail**	Ahmad.alsabhany@uofallujah.edu.iq	
Module Leader's Acad. Title	Assistant lecturer		**Module Leader's Qualification**	MSc	
Module Tutor	Mufeed Hameed Saleh		**e-mail**	Mufeed.h@uofallujah.edu.iq	
Peer Reviewer Name	Dr. Omar Salah F. Shareef		**e-mail**	omar.alshareef@uofallujah.edu.iq	
Scientific Committee Approval Date	25-5-2026		**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. To introduce students to the fundamental laws and principles of probability and statistics. 2. To enable students to organize, describe, and analyze data effectively. 3. To provide understanding of data distribution, variation, and correlation. 4. To develop the ability to compute and interpret measures of central tendency and dispersion. 5. To introduce the concepts of permutations, combinations, and counting principles. 6. To equip students with knowledge of probability rules, theorems, and common probability distributions. 7. To provide the foundation for further study in data analysis, engineering, and computer science applications.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Explain the fundamental concepts of computation, formal languages, and automata theory. 2. Construct and analyze finite automata and formal grammars. 3. Apply pushdown automata and context-free grammars to language recognition problems. 4. Explain the operation and significance of Turing machines as models of computation. 5. Analyze computational problems using formal models and computability concepts. 6. Compare the capabilities and limitations of different computational models. 7. Apply theoretical computing concepts to problems in software development and cybersecurity.
Indicative Contents المحتويات الإرشادية	• Introduction to Computation Theory • Alphabets, Strings, Languages, and Formal Language Concepts • Finite State Machines and Finite Automata • Deterministic Finite Automata (DFA) • Non-Deterministic Finite Automata (NFA) • Regular Expressions and Regular Languages • Conversions Between Regular Expressions and Finite Automata • Applications of Finite Automata • Context-Free Grammars (CFG) • Parse Trees and Language Derivations • Context-Free Languages • Pushdown Automata (PDA) • Turing Machines • Variants of Turing Machines • Decidability and Computability • Computational Problems and Undecidability • Introduction to Complexity Classes

	• Applications of Computation Theory in Computing and Cybersecurity

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**10**		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quiz**	1	10% (10)	5	LO #1, #2, #3
	Assignments	2	10% (10)	2 and 12	All
	Quiz	1	10% (10)	12	LO #4, #5, #6
	Report	1	10% (10)	13	LO #7
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	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 Computation Theory**
Week 2	**Formal Languages and Pattern Matching**
Week 3	**Deterministic Finite Automata (DFA)**
Week 4	**Nondeterministic Finite Automata (NFA)**
Week 5	**Regular Expressions and Intrusion Detection Patterns**
Week 6	**Regular Languages and Protocol Validation**
Week 7	**Automata Applications in Security Tools**

Week 8	**Midterm Examination**
Week 9	**Context-Free Grammars (CFG)**
Week 10	**Parsing and Syntax Analysis**
Week 11	**Pushdown Automata (PDA)**
Week 12	**Language Processing and Security Analysis**
Week 13	**Turing Machines and Models of Computation**
Week 14	**Computability and Undecidable Problems**
Week 15	**Complexity Theory and Cryptographic Problems**
Week 16	**Final Exam Preparation.**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	**1. Introduction to the Theory of Computation, Michael Sipser, 3ed ed. 2013.**	**Yes**
Recommended Texts		
Websites		

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.