جامعة الزيتونة الأردنية

Al-Zaytoonah University of Jordan

Course Syllabus

According to JORDAN National Qualification Framework (JNQF)

Course Name: Discrete Mathematics

Course Number: 0130110

General Course Information:

Course Title	Discrete Mathematics
Course Number	0130110
Credit Hours	3 credit hours
Education Type	Traditional learning
Prerequisites/Co-requisites	N/A
Academic Program	Computer Science
Program Code	112
Faculty	Faculty of Science and IT
Department	Computer Science
Level of Course	1
Academic Year /Semester	2024/2025 (2nd Semester)
Awarded Qualification	Bachelor's degree
Other Department(s) Involved in Teaching the Course	N/A
Language of Instruction	English
Date of Production/Revision	2024-2025
	28/04/2025

Course Coordinator:

Coordinator's Name	Dr. Khalid Farhan
Office No.	9211
Office Phone Extension Number	N/A
Office Hours	12:30 to 14:00 (Sunday, Monday and Tuesday) 08:00 to 9:30 (Wednesday)
E-mail	Khalid.F@zuj.edu.jo

Other Instructors:

Instructors' Names	Dr. Mohammad Al-Madi, Dr. Katrina Sundus, Mrs. Fatimah Quiam, Dr. Hamzah Alzareer
Office No.	9114, 9221, 9231, 9130
Office Phone Extension Number	430, N/A, N/A, 423, N/A
Office Hours	[Dr. Mohammad Al-Madi] 11:00 to 14:00 and 15:30 to 17:00 [Monday] 13:00 to 14:00 [Wednesday] 15:30 to 16:00 [Wednesday ---------- [Dr. Katrina Sundus] 8:00 to 9:30 (Sunday and Tuesday) 12:30 to 2:00 (Monday and Wednesday) ----------

	[Mrs. Fatimah Quiam] 12:30 to 15:00 (Sunday and Tuesday) 14:00 to 15:00 (Monday and Wednesday) ---------- Dr. Hamzah Alzareer 11:00 to 12:30 (Sunday) 12:30 to 13:00 and 15:30 to 16:00 (Monday) 11:00 to 14:00 (Tuesday) 12:30 to 16:00 (Wednesday) ----------
Email	m.almadi@zuj.edu.jo, k.sundus@zuj.edu.jo, f.quiam@zuj.edu.jo, h.alzaareer @zuj.edu.jo

Course Description *(English/Arabic)*:

English	*Discrete mathematics is concerned with data structures, logic design, artificial intelligence, and many other materials. This course introduces the following topics: Numbers and Exponents; Errors (absolute and relative); Propositions; Predicates and Quantifiers; Quantifiers and Logical operators; Logical inference; Methods of proof; Sets.*
Arabic	يُعرض في هذا المساق هياكل البيانات والتصميم المنطقي والذكاء الاصطناعي والعديد من المواد الأخرى. يقدم هذا المقرر المواضيع التالية: الأعداد والأسس، الأخطاء (المطلقة والنسبية)، المقترحات، المسندات ومحددات الكمية. محددات الكمية والعوامل المنطقية، الاستدلال المنطقي طرق الإثبات، مجموعات وتقنيات العد.

Textbook: *Author(s), Title, Publisher, Edition, Year, Book website.*

Kenneth H. Rosen, "Discrete Mathematics and its Applications", 8th Edition, McGraw-Hill, 2019.

References: *Author(s), Title, Publisher, Edition, Year, Book website.*

1. James, L. Hein, “Discrete Structures, Logic, and Computability”, 4th Ed., Jones and Bartlett learning, 2017.
2. Oscar Levine, “Discrete Mathematics: an open introduction”, 2nd Ed., 2016.
3. Liben-Nowell, D. “Discrete Mathematics for Computer Science, Preliminary Edition ", John Wiley, 2015.

Course Educational Objectives (CEOs):

1.	To introduce the concepts of mathematical logic.
2.	To introduce the concepts of sets, relations, and functions.
3.	To perform the operations associated with sets, functions, and relations.
4.	To introduce generating functions and recurrence relations and to relate practical examples to the appropriate set, function, or relation model, and interpret the associated operations and terminology in context and to use graph theory for solving problems.

Intended Learning Outcomes (ILO's):

Intended learning outcomes (ILOs)		Relationship to CEOs	Contribution to PLOs	Bloom Taxonomy Levels*	JNQF Descriptors**
	K- Knowledge and Understanding				
ILO1-K	Understanding propositional logic and predicate logic.	CEO1	PLO3-S	Understanding	K
ILO2-K	Recognizing rules of logical inference and methods of proof.	CEO4	PLO3-S	Understanding and analyzing	K
	S- Intellectual skills				
ILO3-S	Distinguish between number representation in pure mathematics and in computer science. Find the absolute and relative errors when representing real numbers on computers.	CEO1	PLO2-K, PLO3-S	Analyzing and applying	S
ILO4-S	Simplify propositions, convert predicates into propositions using quantification methods, and understand the distribution of quantifiers over logical operators.	CEO4	PLO3-S	Applying	S
	C- Competencies				
ILO5-C	The ability to differentiate between numbers in computers and in mathematics and to convert English assertions using propositional logic and predicate logic and simplify them.	CEO1, CEO3, CEO4	PLO2-K, PLO3-S	Understanding, analyzing and applying	C
	D- Transferable Skills				
ILO6-D	The ability to understand the set theory in computer by inferring new facts from previous ones.	CEO2, CEO3, CEO4	PLO3-S	Understanding, analyzing and applying	D

*Bloom Taxonomy Levels:

Level #	1	2	3	4	5	6

Level Name	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating
** Descriptor (National Qualification Framework Descriptors): K: Knowledge, S: Skill, C: Competency.						

Program Learning Outcome (PLOs):

(PLOs)		JNQF Descriptors**		
		K	S	C
PLO1-K	Knowledge of professional ethics, social responsibility, and the regulations governing.	√		
PLO2-K	Understanding various programming techniques, the stages of software development, and the fundamental principles of security.	√		
PLO3-S	Skill in applying mathematical concepts to analyze and design algorithms and verify their correctness.		√	
PLO4-S	Skill in using different programming languages and applying them to develop software and computer applications.		√	
PLO5-C	The ability to analyze, design, and develop effective and reliable computer programs that meet users' requirements and adhere to professional ethics.			√
PLO6-C	The ability to keep up with continuous advancements in computer science, innovate, and work independently or as part of a team.			√
PLO7-D	The ability to work collaboratively, communicate effectively, and demonstrate teamwork spirit.			√

**** Descriptors according to the national qualifications framework (K: knowledge, S: skill, C: Competency)**

Weekly Schedule *(please choose the type of teaching)*

- ☒ **Face to Face (F2F)**
- ☐ **Hybrid** *(One – To - One)*
- ☐ **Online**

Schedule of Simultaneous and their Topics:

Week	First Lecture (F2F)	Second Lecture (F2F)	ILOs	PLOs	JNQF Descriptors *
1	**Numbers and Exponents** Integer and real numbers in mathematics and in computer. Exponents, properties of exponents, and metric system.	**Numbers and Exponents** Integer and real numbers in mathematics and in computer. Exponents, properties of exponents, and metric system.	ILO3-S	PLO2-K, PLO3-S	S
2	**Errors** Normalized exponential notation of numbers (mantissa and exponent parts). Precision, magnitude,	**Errors** Normalized exponential notation of numbers (mantissa and exponent parts). Precision, magnitude, absolute and relative errors.	ILO3-S	PLO2-K, PLO3-S	S

	absolute and relative errors.				
3	**Propositions** Truth tables for logical operators. Types of propositions (tautology, contingency and contradiction).	**Propositions** Truth tables for logical operators. Types of propositions (tautology, contingency and contradiction).	ILO1-K	PLO3-S	K
4	**Logical identities** Simplifying propositions using logical identities. Translation from English statements to logical expression, and vice versa.	**Logical identities** Simplifying propositions using logical identities. Translation from English statements to logical expression, and vice versa.	ILO4-S	PLO3-S	S
5	**Predicates and Quantifiers** Universe of discourse. The quantifiers (universal, existential, and unique).	**Predicates and Quantifiers** Universe of discourse. The quantifiers (universal, existential, and unique).	ILO4-S	PLO3-S	S
6	**Nested Quantifiers** Review of previous chapters.	**Nested Quantifiers** Review of previous chapters.	ILO4-S	PLO3-S	S
7	**Quantifiers and Logical Operators** Translation from English statements to Logical notation, and vice versa. The negation of quantifiers.	**Quantifiers and Logical Operators** Translation from English statements to Logical notation, and vice versa. The negation of quantifiers.	ILO4-S	PLO3-S	S
8	**Distribution of quantifiers over logical operators** Proofs of distribution.	**Distribution of quantifiers over logical operators** Proofs of distribution.	ILO4-S	PLO3-S	S

Midterm Exam (30%)					
9	**Logical Inference.** Rules of inference. Fallacious arguments. Addition al rules of inferenc e.	**Logical Inference.** Rules of inference. Fallacious arguments. Additional rules of inference.	ILO2-K	PLO3-S	K
10	**Methods of Proof.** Techniques of proof for implication (vacuous, trivial, direct, and indirect proofs). Proof by contradiction, proof by cases.	**Methods of Proof.** Techniques of proof for implication (vacuous, trivial, direct, and indirect proofs). Proof by contradiction, proof by cases.	ILO5-C	PLO2-K, PLO3-S	C
11	**Proof by induction.** Using counterexamples.	**Proof by induction.** Using counterexamples.	ILO5-C	PLO2-K, PLO3-S	C
12	**Sets.** Subsets, proper subsets, power set. Set operations, set identities, generalization. Cartesian products.	**Sets.** Subsets, proper subsets, power set. Set operations, set identities, generalization. Cartesian products.	ILO6-D	PLO3-S	C
13	**Computer representation of sets.** Review of previous chapters.	**Computer representation of sets.** Review of previous chapters.	ILO6-D	PLO3-S	D
15	**Projects Discussion**				
16	**Final Exam**				

* **K: Knowledge, S: Skills, C: Competency**

Teaching Methods and Assignments:

Development of ILOs is promoted through the following teaching and learning methods:

- Lecture.
- Flipped learning (through solving new problems in brainstorming groups).
- Learning through problem solving.
- Participatory learning.

Course Policies:

A- Attendance policies:
The maximum allowed absences is 15% of the lectures.
B- Absences from exams and handing in assignments on time:
Midterm exam can be retaken based on approval of excuse by the instructor's discretion.
Not handing assignment on time will incur penalties.
C- Academic Health and safety procedures
D- Honesty policy regarding cheating, plagiarism, and misbehaviour:
Cheating, plagiarism, misbehaviour will result in zero grade and further disciplinary actions may be taken.
E- Grading policy:

- All homework is to be posted online through the e-learning system.
- Exams will be marked within 72 hours and the marked exam papers will be handed to the students.
- Online Activities (Course Videos, Practice labs, Discussion Forums, Quizzes) **20%**
- Midterm 30**%**
- Final Exam 50**%**

F- Available university services that support achievement in the course: **E-Learning Platform, Labs, Library.**

Required Equipment:

- PC / Laptop with webcam and mic
- Internet Connection
- Access to the ZUJ E-Learning Platform at https://exams.zuj.edu.jo/
- E-learning plan
- Satisfaction questionnaires for online and face-to-face learning
- Software for e-learning
- Training

Assessment Tools Implemented in the Course:

- Final Exam
- Midterm Exam
- Quizzes
- Homework
- Practice Labs
- Discussion Forums
- Periodic reports for learning assessment
- Improvement plans for online or face-to-face teaching.
- Others…

Responsible Persons and their Signatures:

Course Coordinator	**Dr. Khalid Farhan**	**Completed Date**	**28 / 04 / 2025**
		Signature	**Dr. Khalid Farhan**
Received by (Department Head)		**Received Date**	/ /
		Signature	