جامعة الزيتونة الأردنية

Al-Zaytoonah University of Jordan

Course Syllabus

According to JORDAN National Qualification Framework (JNQF)

Course Name: Graph Theory

Course Number: 0101370

General Course Information:

Course Title	Graph Theory
Course Number	0101370
Credit Hours	3 credit hours
Education Type	Blended learning
Prerequisites/Co-requisites	Foundations of Mathematics
Academic Program	Bachelor Program
Program Code	114
Faculty	Faculty of Science and IT
Department	Mathematics
Level of Course	3
Academic Year /Semester	2023/2024 1st Semester
Awarded Qualification	Bachelor
Other Department(s) Involved in Teaching the Course	-
Language of Instruction	English
Date of Production	2021-2022
Date of Revision	16-10-2023

Course Coordinator:

Coordinator's Name	NA
Office No.	
Office Phone Extension Number	
Office Hours	
E-mail	

Other Instructors:

Course Description *(English/Arabic)*:

English	This course covers the following topics some counting techniques such as the principle of inclusion and exclusion, Graphs, Paths, Trees and networks and useful algorithms on networks such as shortest path algorithm, Minimal spanning tree algorithm and flow algorithms in networks.
Arabic	يغطي المساق النظرية الأساسية وتطبيقات نظرية الرسم البياني. تشمل الموضوعات التي ستتم دراستها تقنيات العد المختلفة، ومبدأ التضمين والاستبعاد، والرسوم البيانية، والمسارات، والأشجار والشبكات، والخوارزميات المفيدة على الشبكات مثل خوارزمية أقصر مسار، وخوارزمية الشجرة الممتدة، وخوارزميات التدفق في الشبكات.

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

Introduction to Graph Theory, by Robin J. Wilson, 4th Ed.

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

1. Discrete Mathematics with Combinatorics, by J. A. Anderson, 2nd Ed.
2. Discrete Mathematics and Its Applications, by K. H. Rosen, 6th Ed.
3. Discrete Mathematics and Combinatorics, by Sengadir, 2009.
4. Discrete Mathematics and Graph Theory, by Satyanarayana & Pras, 2009.

Course Educational Objectives (CEOs):

CEO1	**Understanding Basic Graph Concepts: Students should develop a deep understanding of fundamental graph theory concepts, including vertices, edges, degree, and adjacency.**
CEO2	Students should be able to represent graphs using various methods, such as adjacency matrices, incidence matrices, and graph drawings, and understand the relationships between these representations.
CEO3	Students should learn about graph isomorphism and understand how to determine if two graphs are isomorphic.
CEO4	Students should understand the concepts of connected graphs, components, and cut vertices/edges, and be able to analyse the connectivity of a graph.
CEO5	Students should become proficient in finding paths, cycles, and Eulerian and Hamiltonian cycles in graphs, as well as understanding their applications.

Intended Learning Outcomes (ILO's):

Intended learning outcomes (ILOs)		**Relationship to CEOs**	**Contribution to PLOs**	**Bloom Taxonomy Levels***	**JNQF Descriptors****
K	Knowledge and Understanding				
1. ILO1-k	Students will understand basic principles of counting.	CEO1	PLO1 -K	Understanding	K
2. ILO2-k	To understand the fundamental concepts in graph theory.	CEO1+ CEO2+ CEO3	PLO1-K	Understanding	K
3. ILO3-k	Students will know the addition and multiplication rules.	CEO1	PLO2-K	Understanding	K
S					
4. ILO4-s	Recognition of the numerous applications of graph theory.	CEO1	PLO6-s	Applying	S
5. ILO5-s	To improve the proof writing skills.	CEO2	PLO7-s	Applying	S
C	Subject specific skills				
6. IL06-c	Cooperate to work effectively in the group assignments.	CEO5	PLO11-c	Applying	C

***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
1.	Knowledge of the main concepts in pure mathematics.	√		
2.	Knowledge of the main concepts in applied mathematics.	√		
3.	Explain concepts, principles and theories in the fields of probability and statistics.	√		
4.	Possession of technological culture related to the fields of mathematics and its applications.	√		
5.	Making use of mathematical logic in practical life.		√	
6.	Engaging scientific methodology as a way of thinking and as a tool in facing problems.		√	
7.	Applying mathematical software packages in problem solving.		√	
8.	Being capable of data analysis.		√	
9.	Capability of teaching according to modern educational techniques.		√	
10.	Develop creative and innovative methods of teaching mathematics.		√	
11.	Showing the ability to work under ethical and professional standards within teams.			√
12.	Gaining critical thinking and scientific research skills.			√

**** 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)	Activity	IL Os	PLOs	JNQF Descriptors*
1	Introduction. What is a graph?	Introduction. What is a graph?	ILO1-k	PLO2-k	K
2	Definition	Definition	ILO1-k	PLO2-k	K
3	Examples	Examples	ILO1-k	PLO2-k	K
4	Three puzzles	Three puzzles	ILO2-k	PLO2-k	K
5	Paths and cycles. Connectivity	Paths and cycles. Connectivity	ILO2-k	PLO2-k	K
6	Eulerian graphs	Eulerian graphs	ILO2-k	PLO2-k	K
7	Exercises	Exercises	ILO2-k	PLO2-k	K
Midterm Exam (30%)					
9	Hamiltonian	Hamiltonian graphs	ILO4-s	PLO6-s	S

	graphs				
10	Some algorithms	Some algorithms	ILO4-s	PLO6-s	S
11	Trees. Properties of trees	Trees. Properties of trees	ILO4-s	PLO6-s	S
12	Digraphs. Definitions	Digraphs. Definitions	ILO4-s	PLO7-s	S
13	Eulerian digraphs and tournaments	Eulerian digraphs and tournaments	ILO4-s	PLO7-s	S
14	Markov chains	Markov chains	ILO4-s	PLO6-s	S
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.
- learning through projects.
- learning through problem solving.

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, 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

Assessment Tools Implemented in the Course:

- Final Exam
- Midterm Exam
- Quizzes

- Homework
- Practice Labs
- Discussion Forums
- Improvement plans for online or face-to-face teaching.

Responsible Persons and their Signatures:

Course Coordinator		**Completed Date**	**0ctober 2023**
		Signature	

Received by (Department Head)		**Received Date**	/ /
		Signature	