



Form: Course Syllabus	Form Number	EXC-01-02-02A
	Issue Number and Date	2/3/24/2022/2963 05/12/2022
	Number and Date of Revision or Modification	
	Deans Council Approval Decision Number	2/3/24/2023
	The Date of the Deans Council Approval Decision	23/01/2023
	Number of Pages	07

1.	Course Title	Graph Theory
2.	Course Number	0301445
3.	Credit Hours (Theory, Practical)	3
	Contact Hours (Theory, Practical)	3
4.	Prerequisites/ Corequisites	0301241
5.	Program Title	BSc. Mathematics
6.	Program Code	
7.	School/ Center	Science
8.	Department	Mathematics
9.	Course Level	Elective Specialization requirement
10.	Year of Study and Semester (s)	4 th year, 1 st or 2 nd semesters
11.	Other Department(s) Involved in Teaching the Course	None
12.	Main Learning Language	English
13.	Learning Types	<input checked="" type="checkbox"/> Face to face learning <input type="checkbox"/> Blended <input type="checkbox"/> Fully online
14.	Online Platforms(s)	<input checked="" type="checkbox"/> Moodle <input checked="" type="checkbox"/> Microsoft Teams
15.	Issuing Date	10-10- 2024
16.	Revision Date	

17. Course Coordinator:

Name: Omar AbuGhneim	Contact hours: 10:30-11:30 (Su, Tue, Thu)
Office number: Math. Building Office 329	Phone number: 06-5355000 Ex. 22103
Email: o.abughneim@ju.edu.jo	



18. Other Instructors:

Name:
Office number:
Phone number:
Email:
Contact hours:
Name:
Office number:
Phone number:
Email:
Contact hours:

19. Course Description:

<p>As stated in the approved study plan.</p> <p>Definition of graphs multigraphs and digraphs. Examples on graphs multigraphs and digraphs. Important type of graphs such as: Complete Graphs, Null Graphs, Paths, Cycles, Wheels, Bipartite Graphs, Complete Bipartite Graphs, Hypercubes and Trees. Operations on graphs such as: Complement of a graph, Union of two graphs, Join of two graphs, Cartesian product of two graphs. Subgraphs and Induced Subgraphs. Isomorphisms, Adjacency and Incidence Matrices. Connected Graphs, Eulerian Graphs, and Hamiltonian Graphs. Planar Graph and Crossing number. Domination number, Clique number, Chromatic number, and Independence number. Matchings and Hall's marriage theorem.</p> <p>Applications such as: Network Flow Problem, Four Color Problem, Traveling Salesman Problem, and Minimum Connector Problem. (If time permit)</p>



20. Program Student Outcomes (SO's):

(To be used in designing the matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program)

1. Identify, formulate, and solve broadly-defined technical or scientific problems by applying knowledge of Mathematics and Science and/or technical topics to areas relevant to the discipline.

7. Utilize research methods, critical and creative thinking skills to assess and analyze information) to solve problems properly, then draw valid reasoning and logical conclusions leading to true consequences.

21. Course Intended Learning Outcomes (CLO's):

(Upon completion of the course, the student will be able to achieve the following intended learning outcomes)

1. Define, interpret and analyze fundamental principles and theory concerning graphs. Analyze given graphs and find important information about them such as Crossing number, Domination number, Clique number, Chromatic number, Independence number and the Matching number.
2. Analyse practical problems and model them in graphs and then determine some of the properties of these graphs. Also, using the known results on the graph theory to find solutions to practical problems that give rise graphs.
3. Identify planar graphs and find the crossing number of nonplanar graphs. Determine whether certain graphs are Eulerian or Hamiltonian. Compute Crossing number, Domination number, Clique number, Chromatic number, Independence number and Matching number of some types of important graphs.
4. Investigate some of the applications on graph theory such as Hall's Marriage Problem, Network Flow Problem, Four Color Problem, Traveling Salesman Problem, and Minimum Connector Problem.

Course CLOs	The learning levels to be achieved					
	Remembering	Understanding	Applying	Analysing	evaluating	Creating
1	•	•		•		
2			•	•		•
3	•	•			•	
4		•	•	•		



22. The matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program:

Course CLO's	Program SO's							
	SO (1)	SO (2)	SO (3)	SO (4)	SO (5)	SO (6)	SO (7)	SO (8)
CLO (1)	•						•	
CLO (2)	•						•	
CLO (3)	•						•	
CLO (4)	•						•	

23. Topic Outline and Schedule:

Week	Lecture	Topic	CLO/s Linked to the Topic	Learning Types (Face to Face (FF)/ Blended/ Fully Online)	Platform Used	Synchronous (S)/ Asynchronous Lecturing	Evaluation Methods	Learning Resources
1	1.1	Definition of graphs with examples	1	FF	Teams	S	Exams	Text Book
	1.2	Definition of graphs with examples	1	FF	Teams	S	Exams	Text Book
	1.3	Definition of graphs with examples	1	FF	Teams	S	Exams	Text Book
2	2.1	Subgraphs and types of graphs	1	FF	Teams	S	Exams	Text Book
	2.2	Subgraphs and types of graphs	1	FF	Teams	S	Exams	Text Book
	2.3	Subgraphs and types of graphs	1	FF	Teams	S	Exams	Text Book
3	3.1	Isomorphic graphs	1,2	FF	Teams	S	Exams	Text Book
	3.2	Isomorphic graphs	1,2	FF	Teams	S	Exams	Text Book
	3.3	Graph operations	1,2	FF	Teams	S	Exams	Text Book
4	4.1	Graph operations	1,2	FF	Teams	S	Exams	Text Book
	4.2	Graph operations	1,2	FF	Teams	S	Exams	Text Book
	4.3	Graph operations	1,2	FF	Teams	S	Exams	Text Book
5	5.1	Properties of trees	1,2	FF	Teams	S	Exams	Text Book
	5.2	Properties of trees	1,2	FF	Teams	S	Exams	Text Book
	5.3	Properties of trees	1,2	FF	Teams	S	Exams	Text Book
6	6.1	Spanning trees	1,2	FF	Teams	S	Exams	Text Book
	6.2	Bipartite graphs	1,2	FF	Teams	S	Exams	Text Book
	6.3	Bipartite graphs	1,2	FF	Teams	S	Exams	Text Book



7	7.1	Matchings and job assignment	2,4	FF	Teams	S	Exams	Text Book
	7.2	Matchings and job assignment	2,4	FF	Teams	S	Exams	Text Book
	7.3	Matchings and job assignment	2,4	FF	Teams	S	Exams	Text Book
8	8.1	Distance in graphs	1,2	FF	Teams	S	Exams	Text Book
	8.2	Eccentricity and diameters of graphs	1,2	FF	Teams	S	Exams	Text Book
	8.3	Eccentricity and diameters of graphs	1,2	FF	Teams	S	Exams	Text Book
9	9.1	Characterization of Eulerian graphs	3,4	FF	Teams	S	Exams	Text Book
	9.2	Characterization of Eulerian graphs	3,4	FF	Teams	S	Exams	Text Book
	9.3	Hamiltonian graphs	3,4	FF	Teams	S	Exams	Text Book
10	10.1	Hamiltonian graphs	3,4	FF	Teams	S	Exams	Text Book
	10.2	Hamiltonian graphs	3,4	FF	Teams	S	Exams	Text Book
	10.3	Vertex coloring	1,4	FF	Teams	S	Exams	Text Book
11	11.1	Vertex coloring	1,4	FF	Teams	S	Exams	Text Book
	11.2	Vertex coloring	1,4	FF	Teams	S	Exams	Text Book
	11.3	Independent sets	1,4	FF	Teams	S	Exams	Text Book
12	12.1	Edge coloring	1,4	FF	Teams	S	Exams	Text Book
	12.2	Edge coloring	1,4	FF	Teams	S	Exams	Text Book
	12.3	Adjacency matrix	1,2	FF	Teams	S	Exams	Text Book
13	13.1	Incidence matrix	1,2	FF	Teams	S	Exams	Text Book
	13.2	Distance matrix	1,2	FF	Teams	S	Exams	Text Book
	13.3	Distance matrix	1,2	FF	Teams	S	Exams	Text Book
14	14.1	Planarity	1,3	FF	Teams	S	Exams	Text Book
	14.2	Planarity	1,3	FF	Teams	S	Exams	Text Book
	14.3	Planarity	1,3	FF	Teams	S	Exams	Text Book
15	15.1	Characterization of planar graphs	1,4	FF	Teams	S	Exams	Text Book
	15.2	Characterization of planar graphs	1,4	FF	Teams	S	Exams	Text Book
	15.3	Characterization of planar graphs	1,4	FF	Teams	S	Exams	Text Book

**24. Evaluation Methods:**

Opportunities to demonstrate achievement of the CLOs are provided through the following assessment methods and requirements:

Evaluation Activity	Mark	Topic(s)	CLO/s Linked to the Evaluation activity	Period (Week)	Platform
First Exam	20	Ch. 2	1+2	5	On Campus
Midterm	30	Ch.3 – Ch. 5	1+2+3+4	11	On Campus
Final Exam	50		1+2+3+4		On Campus

25. Course Requirements:

Each student must have:

- Account on Microsoft Teams

26. Course Policies:

1. Attendance is absolutely essential to succeed in this course. You are expected to attend every class; please notify your instructor if you know you are going to be absent. All exams must be taken at the scheduled time. Exceptions will be made only in extreme circumstances, by prior arrangement with the instructor.
2. If a student is absent for more than 10% of lectures without an excuse of sickness or due to other insurmountable difficulty, then he/she shall be barred from the final examination also he/she will get a failing grade in this course.
3. Medical certificates shall be given to the University Physician to be authorized by him. They should be presented to the Dean of the Faculty within two weeks of the student's ceasing to attend classes.
4. Test papers shall be returned to students after correction. His/her mark is considered final after a lapse of one week following their return.
5. Cheating is prohibited. The University of Jordan regulations on cheating will be applied to any student who cheats in exams or on home works.

**27. References:****A-** Required book(s), assigned reading and audio-visuals:

Textbook: A Friendly Introduction to Graph Theory by Fred Buckley and Marty Lewinter (1st Edition)

B- Recommended books, materials, and media:

1) Introduction to Graph Theory by Douglas Brent West (2nd edition)

2) Introduction to Graph Theory (Dover Books on Mathematics) by Richard J. Trudeau

28. Additional information:

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Name of the Instructor or the Course Coordinator: Prof. Omar AbuGhneim	Signature:	Date: 11-10-2024
Name of the Head of Quality Assurance Committee/ Department: Prof. Manal Ghanem	Signature:	Date:
Name of the Head of Department: Prof. Baha Alzalg	Signature:	Date:
Name of the Head of Quality Assurance Committee/ School of Science: Prof. Emad A. Abuosba	Signature:	Date:
Name of the Dean or the Director: Prof. Mahmoud I. Jaghoub	Signature:	Date: