



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

1.	<b>Course Title</b>	<b>Combinatorial Analysis</b>
2.	<b>Course Number</b>	0301443
3.	<b>Credit Hours (Theory, Practical)</b>	3
	<b>Contact Hours (Theory, Practical)</b>	3
4.	<b>Prerequisites/ Corequisites</b>	0301241
5.	<b>Program Title</b>	BSc. Mathematics
6.	<b>Program Code</b>	
7.	<b>School/ Center</b>	Science
8.	<b>Department</b>	Mathematics
9.	<b>Course Level</b>	Elective Specialization requirement
10.	<b>Year of Study and Semester (s)</b>	4 <sup>th</sup> year, 1 <sup>st</sup> or 2 <sup>nd</sup> semesters
11.	<b>Other Department(s) Involved in Teaching the Course</b>	None
12.	<b>Main Learning Language</b>	English
13.	<b>Learning Types</b>	<input checked="" type="checkbox"/> Face to face learning <input type="checkbox"/> Blended <input type="checkbox"/> Fully online
14.	<b>Online Platforms(s)</b>	<input checked="" type="checkbox"/> Moodle <input checked="" type="checkbox"/> Microsoft Teams
15.	<b>Issuing Date</b>	10-10- 2024
16.	<b>Revision Date</b>	

**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
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**18. Other Instructors:**

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

**19. Course Description:**

As stated in the approved study plan. Principles of enumeration; Pigeonhole Principle, Permutations and Combinations, Binomial coefficients, Generalized permutations and combinations, Recurrence Relations, Solutions for recurrence relations; generating function; principles of inclusion and exclusion; introduction to the theory of graphs; Types of graphs, Isomorphisms between graphs ; trees, Eulerian and Hamiltonian Graphs.
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**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. To know and use combinations and permutations in problems of counting. To use the sum and product rules of counting to solve practical problems. The use of the Pigeonhole Principle counting.
2. To know the properties of the binomial expansion and to know the properties of binomial coefficients. To know and solve recurrence linear relations with constant coefficients. Then to use these in solving some counting practical problems.
3. To use power series as generating function and to know their properties and use them to solve practical counting problems. Use Inclusion-Exclusion Principle to solve counting problems.
4. To know some basic notions of graph Theory, and to distinguish different types of graphs. Use graphs in solving some practical problems. Finally, to learn and distinguish Eulerian and Hamiltonian graphs.

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	The Basics of Counting	1	FF	Teams	S	Exams	Text Book
	1.2	The Basics of Counting	1	FF	Teams	S	Exams	Text Book
	1.3	The Basics of Counting	1	FF	Teams	S	Exams	Text Book
2	2.1	The Pigeonhole Principle	1	FF	Teams	S	Exams	Text Book
	2.2	The Pigeonhole Principle	1	FF	Teams	S	Exams	Text Book
	2.3	The Pigeonhole Principle	1	FF	Teams	S	Exams	Text Book
3	3.1	The Pigeonhole Principle	1	FF	Teams	S	Exams	Text Book
	3.2	Permutations and Combinations	1	FF	Teams	S	Exams	Text Book
	3.3	Permutations and Combinations	1	FF	Teams	S	Exams	Text Book
4	4.1	Binomial Coefficients	2	FF	Teams	S	Exams	Text Book
	4.2	Binomial Coefficients	2	FF	Teams	S	Exams	Text Book
	4.3	Generalized Permutations and Combinations	1	FF	Teams	S	Exams	Text Book
5	5.1	Generalized Permutations and Combinations	1	FF	Teams	S	Exams	Text Book
	5.2	Generalized Permutations and Combinations	1	FF	Teams	S	Exams	Text Book
	5.3	Generalized Permutations and Combinations	1	FF	Teams	S	Exams	Text Book
6	6.1	Recurrence Relations	2	FF	Teams	S	Exams	Text Book



	6.2	Recurrence Relations	2	FF	Teams	S	Exams	Text Book
	6.3	Solving Linear Recurrence Relations	2	FF	Teams	S	Exams	Text Book
<b>7</b>	7.1	Solving Linear Recurrence Relations	2	FF	Teams	S	Exams	Text Book
	7.2	Solving Linear Recurrence Relations	2	FF	Teams	S	Exams	Text Book
	7.3	Generating Functions	3	FF	Teams	S	Exams	Text Book
<b>8</b>	8.1	Generating Functions	3	FF	Teams	S	Exams	Text Book
	8.2	Generating Functions	3	FF	Teams	S	Exams	Text Book
	8.3	Inclusion-Exclusion Principle	3	FF	Teams	S	Exams	Text Book
<b>9</b>	9.1	Inclusion-Exclusion Principle	3	FF	Teams	S	Exams	Text Book
	9.2	Applications of Inclusion-Exclusion Principle	3	FF	Teams	S	Exams	Text Book
	9.3	Applications of Inclusion-Exclusion Principle	3	FF	Teams	S	Exams	Text Book
<b>10</b>	10.1	Applications of Inclusion-Exclusion Principle	3	FF	Teams	S	Exams	Text Book
	10.2	Applications of Inclusion-Exclusion Principle	3	FF	Teams	S	Exams	Text Book
	10.3	Applications of Inclusion-Exclusion Principle	3	FF	Teams	S	Exams	Text Book
<b>11</b>	11.1	Graphs and Graph models	4	FF	Teams	S	Exams	Text Book
	11.2	Graphs and Graph models	4	FF	Teams	S	Exams	Text Book
	11.3	Graph terminology and special types of graphs	4	FF	Teams	S	Exams	Text Book
<b>12</b>	12.1	Graph terminology and special types of graphs	4	FF	Teams	S	Exams	Text Book
	12.2	Graph terminology and special types of graphs	4	FF	Teams	S	Exams	Text Book
	12.3	Graph terminology and special types of graphs	4	FF	Teams	S	Exams	Text Book
<b>13</b>	13.1	Representing graphs and graph isomorphisms	4	FF	Teams	S	Exams	Text Book
	13.2	Representing graphs and graph isomorphisms	4	FF	Teams	S	Exams	Text Book
	13.3	Representing graphs and graph isomorphisms	4	FF	Teams	S	Exams	Text Book
<b>14</b>	14.1	Representing graphs and graph isomorphisms	4	FF	Teams	S	Exams	Text Book
	14.2	Connectivity	4	FF	Teams	S	Exams	Text Book
	14.3	Connectivity	4	FF	Teams	S	Exams	Text Book
<b>15</b>	15.1	Eulerian and Hamiltonian paths	4	FF	Teams	S	Exams	Text Book
	15.2	Eulerian and Hamiltonian paths	4	FF	Teams	S	Exams	Text Book
	15.3	Eulerian and Hamiltonian paths	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. 6	1+2	5	On Campus
Midterm	30	Ch. 8	2+3	11	On Campus
Final Exam	50	Ch. 6 + Ch. 8 + Ch. 10	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: Discrete Mathematics and its Applications by Kenneth H. Rosen (Seventh Edition)

**B- Recommended books, materials, and media:**

Introductory Combinatorics by Richard A. Brualdi (4th edition)

**28. Additional information:**

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