



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
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	Number of Pages	07

1.	Course Title	Theory of Inequalities
2.	Course Number	0301714
3.	Credit Hours (Theory, Practical)	3
	Contact Hours (Theory, Practical)	3
4.	Prerequisites/ Corequisites	None
5.	Program Title	M.Sc.
6.	Program Code	
7.	School/ Center	Science
8.	Department	Mathematics
9.	Course Level	Elective
10.	Year of Study and Semester (s)	Second year
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 type="checkbox"/> Microsoft Teams
15.	Issuing Date	November 22, 2024
16.	Revision Date	

17. Course Coordinator:

Name: Prof. Fuad Kittaneh	Contact hours:
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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.

Classical inequalities for positive real numbers, means of positive real numbers, bounds for the zeros of polynomials, noncommutative inequalities for positive semidefinite matrices, miscellaneous inequalities..

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. Read, analyze and write logical arguments to prove mathematical and statistical concepts and theorems.
3. Communicate with mathematical and statistical ideas clearly and consistently, in writing and verbally.
7. Work effectively within work teams and communicate scientific knowledge and results with peers and experts in the field.
8. Apply methodologies and ethics of scientific research in preparation of scientific research in mathematics field.



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. Prove inequalities based on the classical inequalities involving convexity and concavity of functions.
2. Know the fundamental facts about the weighted means of positive real numbers.
3. Apply various matrix inequalities to the companion matrices to locate the zeros of polynomials.
4. Derive bounds for the zeros of polynomials related to the classical bounds.
5. Investigate various noncommutative inequalities for positive semidefinite matrices extending the classical inequalities for positive real numbers.
6. Establish improvements and generalizations of certain classical and noncommutative inequalities.

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

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)	x		x					
CLO (2)	x		x				x	
CLO (3)	x		x					
CLO (4)	x		x					x
CLO (5)	x		x				x	
CLO (6)	x		x				x	x



23. Topic Outline and Schedule:

Week	Lecture	Topic	CLO/s Linked to the Topic	Learning Types Face to Face (FF) Blended (BL) Fully Online (FO)	Platform Used	Synchronous (S)	Evaluation Methods	Learning Resources
1	1.1	Classical inequalities for positive real numbers	1, 2	FF		S	Home work 1	
	1.2	Classical inequalities for positive real numbers	1, 2	FF		S	Home work 1	
2	2.1	Classical inequalities for positive real numbers	1, 2	FF		S	Home work 1	
	2.2	Classical inequalities for positive real numbers	1, 2	FF		S	Home work 1	
3	3.1	Classical inequalities for positive real numbers	1, 2	FF		S	Home work 1	
	3.2	Classical inequalities for positive real numbers	1, 2	FF		S	Home work 1	
4	4.1	Means of positive real numbers	1, 2	FF		S	First Exam	
	4.2	Means of positive real numbers	1, 2	FF		S	First Exam	
5	5.1	Means of positive real numbers	1, 2	FF		S	First Exam	
	5.2	Means of positive real numbers	1, 2	FF		S	First Exam	
6	6.1	Location of the zeros of polynomials from matrix inequalities	3, 4	FF		S	Home work 2	
	6.2	Location of the zeros of polynomials from matrix inequalities	3, 4	FF		S	Home work 2	
7	7.1	Location of the zeros of polynomials from matrix inequalities	3, 4	FF		S	Home work 2	



	7.2	Location of the zeros of polynomials from matrix inequalities	3, 4	FF		S	Home work 2	
8	8.1	Location of the zeros of polynomials from matrix inequalities	3, 4	FF		S	Home work 2	
	8.2	Location of the zeros of polynomials from matrix inequalities	3, 4	FF		S	Home work 2	
9	9.1	Bounds for the zeros of polynomials	3, 4	FF		S	Second Exam	
	9.2	Bounds for the zeros of polynomials	3, 4	FF		S	Second Exam	
10	10.1	Bounds for the zeros of polynomials	3, 4	FF		S	Second Exam	
	10.2	Bounds for the zeros of polynomials	3, 4	FF		S	Second Exam	
11	11.1	Bounds for the zeros of polynomials	3, 4	FF		S	Second Exam	
	11.2	Bounds for the zeros of polynomials	3, 4	FF		S	Second Exam	
12	12.1	Noncommutative inequalities for positive semidefinite matrices	5, 6	FF		S	Home work3	
	12.2	Noncommutative inequalities for positive semidefinite matrices	5, 6	FF		S	Home work3	
13	13.1	Noncommutative inequalities for positive semidefinite matrices	5, 6	FF		S	Home work 3	
	13.2	Noncommutative inequalities for positive semidefinite matrices	5, 6	FF		S	Home work 3	
14	14.1	Miscellaneous inequalities	5, 6	FF		S	Home work 4	
	14.2	Miscellaneous inequalities	5, 6	FF		S	Home work 4	
15	15.1	Miscellaneous inequalities	5, 6	FF		S	Home work 4	
	15.2	Miscellaneous inequalities	5, 6	FF		S	Home work 4	
16							Final Exam	

**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 the Evaluation activity	Period (Week)	Platform
Course Work: Exam, Homework, Presentation	30		1-6	1-15	On Campus
Midterm Exam	30		3-4	11-12	On Campus
Final Exam	40		1-6		On Campus

25. Course Requirements:

(e.g.: students should have a computer, internet connection, webcam, account on a specific software/platform...etc.):

26. Course Policies:

1. The student is not allowed to take the course and its pre-requisite in the same time.
2. 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.
3. 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.
4. 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.
5. Test papers shall be returned to students after correction. His/her mark is considered final after a lapse of one week following their return.
6. Solutions for the exams questions and marks will be announced to the students.
7. Cheating is prohibited. The University of Jordan regulations on cheating will be applied to any student who cheats in exams or on homeworks.

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

1. R. Bellman, Inequalities.
2. P. Bullen, D. Mitrinovic, and P. Vasic, Means and Their Applications
3. G. Hardy, J. Littlewood, and G. Polya, Inequalities.
4. M. Marden, Geometry of Polynomials.
5. D. Mitrinovic, Analytic Inequalities.
6. A. Marshall and I. Olkin, Inequalities: Theory of Majorization and Its Applications.
7. G. Polya and G. Szego, Problems and Theorems in Analysis, Vol. I and II.

4. Selected Research Papers.

B- Recommended books, materials, and media:**28. Additional information:**

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Name of the Instructor or the Course Coordinator: Prof. Fuad Kittaneh	Signature:	Date: 25/11/2024
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: