



مركز الاعتماد  
وإضمان الجودة  
ACCREDITATION & QUALITY ASSURANCE CENTER



**The University of Jordan**

**Accreditation & Quality Assurance Center**

## **Course Syllabus**

**Course Name: Theory of  
Inequalities**

<b>1</b>	Course title	Theory of Inequalities
<b>2</b>	Course number	0301714
<b>3</b>	Credit hours (theory, practical)	3
	Contact hours (theory, practical)	3
<b>4</b>	Prerequisites/corequisites	None
<b>5</b>	Program title	M.Sc.
<b>6</b>	Program code	
<b>7</b>	Awarding institution	The University of Jordan
<b>8</b>	Faculty	Science
<b>9</b>	Department	Mathematics
<b>10</b>	Level of course	Elective
<b>11</b>	Year of study and semester (s)	Second year
<b>12</b>	Final Qualification	M.Sc. degree
<b>13</b>	Other department (s) involved in teaching the course	None
<b>14</b>	Language of Instruction	English
<b>15</b>	Date of production/revision	March 28, 2017

**16. Course Coordinator:**

Dr. Fuad Kittaneh

**17. Other instructors:**

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**18. Course Description:**

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.

**19. Course aims and outcomes:****A- Aims:**

This course aims at familiarizing the students with the advanced concepts, principles, and methods of mathematical inequalities and matrix inequalities, together with their applications to functional analysis, operator theory, numerical analysis, mathematical physics, probability and statistics.

**B- Intended Learning Outcomes (ILOs):** Upon successful completion of this course, the students will be able to ...

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.

**20. Topic Outline and Schedule:**

Topic	Week	Instructor	Achieved ILOs	Evaluation Methods	Reference
Classical inequalities for positive real numbers	1+2+3		1+2	Home work 1	
Means of positive real numbers	4+5		1+2	First Exam	
Location of the zeros of polynomials from matrix inequalities	6+7+8		3+4	Home Work 2	
Bounds for the zeros of polynomials	9+10+11		3+4	Second Exam	
Noncommutative inequalities for positive semidefinite matrices	12+13		5+6	Home work 3	
Miscellaneous inequalities	14+15		5+6	Home Work 4	

**21. Teaching Methods and Assignments:**

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

In order to succeed in this course, each student needs to be an active participant in learning – both in class and out of class.

- Class time will be spent on lecture as well as discussion of homework problems and some group work.
- To actively participate in class, you need to prepare by reading the textbook and doing all assigned homework before class (homework will be assigned each class period, to be discussed the following period).
- You should be prepared to discuss your homework (including presenting your solutions to the class) at each class meeting - your class participation grade will be determined by your participation in this.
- You are encouraged to work together with other students and to ask questions and seek help from the professor, both in and out of class.

**22. Evaluation Methods and Course Requirements:**

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

ILO/s	Learning Methods	Evaluation Methods	Related ILO/s to the program
	<b>Lectures</b>	<b>Exam</b>	
		<b>Presentation</b>	
		<b>Homework</b>	

**23. 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 home works.

**24. Required equipment:****25. References:**

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.

**26. Additional information:**

Name of Course Coordinator: Dr. Fuad Kittaneh Signature: ----- Date: 28/03/2017

Head of curriculum committee/Department: ----- Signature: -----

Head of Department: ----- Signature: -----

Head of curriculum committee/Faculty: ----- Signature: -----

Dean: ----- -Signature: -----

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