



مركز الاعتماد
وإضمان الجودة
ACCREDITATION & QUALITY ASSURANCE CENTER



The University of Jordan

Accreditation & Quality Assurance Center

Course Syllabus

Course Name: Matrix Analysis

1	Course title	Matrix Analysis
2	Course number	0301721
3	Credit hours (theory, practical)	3
	Contact hours (theory, practical)	3
4	Prerequisites/corequisites	None
5	Program title	M.Sc.
6	Program code	
7	Awarding institution	The University of Jordan
8	Faculty	Science
9	Department	Mathematics
10	Level of course	Obligatory
11	Year of study and semester (s)	First year
12	Final Qualification	M.Sc. degree
13	Other department (s) involved in teaching the course	None
14	Language of Instruction	English
15	Date of production/revision	March 28, 2017

16. Course Coordinator:

Dr. Fuad Kittaneh

17. Other instructors:**18. Course Description:**

Similarity and canonical forms, special classes of matrices, the singular value decomposition, determinant and trace inequalities, the min-max principle, norms of vectors and matrices, the Lowner order of Hermitian matrices, Kronecker product of matrices.

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

This course aims at familiarizing the students with the fundamental concepts, principles, and methods of matrix analysis and its applications to functional analysis, operator theory, numerical analysis, mathematical physics, and statistics.

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

1. Investigate the similarity and the Jordan canonical forms of matrices.
2. Know a lot about various classes of matrices, including Hermitian matrices, unitary matrices, normal matrices, and positive semidefinite matrices.
3. Employ Schur's theorem and the spectral theorem for normal matrices in many aspects of matrix analysis.
4. Prove determinant inequalities for positive definite matrices.
5. Compute the singular value decomposition and the generalized inverses of matrices.
6. Establish matrix inequalities involving eigenvalues, singular values, traces, and the Löwner order of Hermitian matrices.
7. Be familiar with the basic facts and applications of the Kronecker products of matrices.

20. Topic Outline and Schedule:

Topic	Week	Instructor	Achieved ILOs	Evaluation Methods	Reference
Similarity and canonical forms	1+2		1	Home work 1	
Special classes of matrices	3+4		2+3	First Exam	
Determinant inequalities for positive definite matrices	5+6		3+4	Home Work 2	
The singular value decomposition and the generalized inverses	7+8		2+5	Second Exam	
The min-max principle for eigenvalues and singular values	9+10		3+5	Home Work 3	
The Löwner order of Hermitian matrices	11+12		2+6	Home Work 4	
Norms of vectors and matrices	13+14		3+6	Home Work 5	
Kronecker product of matrices	15		7		

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
	Lectures	Exam	
		Presentation	
		Homework	

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, Introduction to Matrix Analysis, McGraw-Hill, New York, 1970.
2. R. Horn and C. Johnson, Matrix Analysis, Second Edition., Cambridge University Press, Cambridge, 2013.
3. M. Marcus and H. Minc, A Survey of Matrix Theory and Matrix Inequalities, Dover, New York, 1992.
4. D. Serre, Matrices: Theory and Applications, Springer-Verlag, New York, 2002.
5. G. Stewart and J. Sun, Matrix Perturbation Theory, Academic Press, New York, 1990.
6. F. Zhang, Matrix Theory, Second Edition, Springer-Verlag, New York, 2011
6. F. Zhang, Matrix Theory, Springer-Verlag, New York, 2011.

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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Assistant Dean for Quality Assurance
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