

# Introduction to Linear Algebra (Math 280) Syllabus

Term 151, Year 2015/16

## INSTRUCTOR INFORMATION

### Instructor

Dr. Mohammed Alshahrani

### Email & Website

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### Office Location & Hours

Building 5, Room 201-1, Tel: 013-860-7748

### Office hours:

Sundays, Tuesdays & Thursdays

09:00-09:50 AM

## GENERAL INFORMATION

### DESCRIPTION

MATRICES AND SYSTEMS OF LINEAR EQUATIONS. VECTOR SPACES AND SUBSPACES. LINEAR INDEPENDENCE. BASIS AND DIMENSION. INNER PRODUCT SPACES. THE GRAM-SCHMIDT PROCESS. LINEAR TRANSFORMATIONS. DETERMINANTS. DIAGONALIZATION. REAL QUADRATIC FORMS.

### LEARNING OUTCOMES

Upon successful completion of this course, a student should be able to:

- Use elementary row operation to solve systems of linear equations and decide whether a square matrix is singular or nonsingular.
- Express a nonsingular matrix as a product of elementary operations.
- Evaluate the determinant of a matrix using cofactor expansion or elementary row (column) operations.
- Find the inverse of a nonsingular matrix using its adjoint and solve some systems by Cramer's method.
- Construct a basis for a given vector space and evaluate its dimension.
- Represent a linear transformation by a matrix.
- Construct an orthonormal set using the Gram-Schmidt orthogonalization process
- Determine the eigenvalues and eigenspaces of a square matrix.
- Decide whether a given square matrix is diagonalizable or not.
- Diagonalize orthogonally a real symmetric matrix.

## GRADING POLICY

### EVALUATION

Activity	Points
Homework	100
Computer Assignment	100
Exam 1	100
Exam 2	100
Final	200
<b>Total</b>	<b>600</b>

## COURSE MATERIALS

### Required Text

Linear Algebra with Applications, 8<sup>th</sup> Edition (Pearson New International Edition), by Steve Leon, 2014.

### RESOURCES:

This course will be supplemented by the following websites

- My personal website:  
<http://faculty.kfupm.edu.sa/MATH/mshahrani/>
- BlackBoard: (Version 9.1 on  
<https://blackboard.kfupm.edu.sa/>)  
Syllabus, Lecture Notes, Homework Problem Sets, Grades, Attendance, etc.

## COURSE SCHEDULE

Week	Topic	Section
1	Systems of linear equations	1.1
	Row echelon form	1.2
2	Matrix arithmetic	1.3
	Matrix algebra	1.4
3	Elementary matrices	1.5
4	The determinant of a matrix	2.1
	Properties of determinants	2.2
	Additional topics and applications	2.3
5	Vector space: Definition and examples	3.1
	Subspaces	3.2
6	Linear independence	3.3
	Basis and dimension	3.4
7	Change of basis	3.5
	Row space and column space	3.6
8	Linear transformations	4.1
	Matrix representations of linear transformations	4.2
9	Similarity	4.3
	The scalar product in $\mathbb{R}^n$	5.1
10	Orthogonal subspaces	5.2
	Inner product spaces	5.4
11	Orthonormal sets	5.5
12	The Gram-Schmidt orthogonalization process	5.6
	Orthogonal polynomials	5.7
13	Eigenvalues and eigenvectors	6.1
14	Diagonalization	6.3
15	Quadratic forms	6.6

## EVENTS

Event	Date & Time	Notes
Id Adha Holiday	Sunday September 20, 2015 - Monday September 28, 2015.	
Exam 1	Thursday, October 8, 2015 (07:00-09:00PM)	Material: Sections 1.1 - 3.2
Exam 2	Thursday, November 5, 2015 (07:00-09:00PM)	Material: Sections 3.2 - 5.1
Final	Monday, December 28, 2015 (08:00-11:00AM)	Material: Comprehensive