KINGDOOM OF SAUDI ARABIA
Ministry of Education
Al-Imam Mohammad Ibn Saud Islamic University
College of Sciences
Department of Mathematics & Statistics

المملكة العربية السعودية
وزارة التعليم
جامعة الإمام محمد بن سعود الإسلامية
كلية العلوم
قسم الرياضيات والإحصاء

SYLLABUS

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab.*	*Tut.*	*Private study*	*Pre-requisites*	*Course Level*	*Teaching Language*
MAT	**223**	**Linear Algebra**	**4**	**3**	**0**	**2**	**6**	**MAT 251**	**4**[1]	**English**

A. Course Description

This course describes the most important ideas, theoretical results, and examples of matrices, vector spaces, linear transformations, eigenvalues and eigenvectors. The course includes the essential fundamentals of these topics. The emphasis is on calculations.

B. Course Outcomes

At the end of this course the student will be able to:

- Be familiar with basics of matrix theory.
- Be familiar with basics of vector spaces and linear transformations.
- Connect linear algebra to other fields.

C. References:

Required Textbook

Elementary Linear Algebra, H. Anton, C. Rorres, 11th Edition, Wiley, 2014.

Other references:

- *Linear Algebra with Application,* W. K. Nicholson, 5th Edition, McGraw- Hill, 2006.
- *Linear Algebra with Application,* O. Bretscher, 4th Edition, Pearson Ed. Int., 2009.
- *Linear Algebra, Schaum's Outline,* S. Lipschutz, M. Lipson, 3rd Edition, McGraw-Hill, 2000.

Course Website: Google Classroom Webpage: http://www.imamm.org/

[1] *B.Sc. in Applied Mathematics.*

D. Topics Outline

1. **Matrices and Gauss Elimination:** Linear Systems and Matrices (Gauss Eliminations, Echelon & Reduced Echelon Forms, Matrix Operations, Matrix Inverses), Determinants (Minor & Cofactors, Evaluating Determinants, Cramer's Rule, Adjoints & Matrix Inverses).
2. **Vectors in R^2 and R^3:** Dot Product, Projections, Cross Production, Mixed Product.
3. **Vector Spaces:** Vector Spaces and Subspaces, Euclidean Vector Spaces R^n, Linear Dependence & Independence, Basis and Dimensions of a Vector Space, Change of a Basis, Inner Products (Norms, Angle and Orthogonality), Gram-Schmidt Process, Orthogonal Matrices.
4. **Linear Transformations:** Definition and Basics, the Kernel and the Image, Linear Transformation Matrix, Nonsingular Transformations and their Inverses, the Direct Sum, the Dimension Theorem.
5. **Eigenvalues and Eigenvectors:** Characteristic Polynomial, Eigenvalues, Eigenvectors, Diagonalization, Triangularization, Matrix Powers.

E. Office Hours

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

F. Exams & Grading System

The semi-official dates of the exams for this course are:

- **Midterm 1:** 6th or 7th week.
- **Midterm 2:** 11th or 12th week.
- **Quizzes & Homework:** During the semester.
- **Final Exam:** 16th week.

Your course grade will be based on your semester work as follows:

Midterm 1: 20 %	**Midterm 2:** 20 %	**Final Exam:** 40 %
Quizzes, Homework, Attendance & Participation: 20 %		

The grading distribution:

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

G. Student Attendance/Absence

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Exams
goo.gl/ykm7t3