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 التعـليـم
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	**227**	**Linear Algebra and Differential Equations**	**4**	**3**	**0**	**2**	**5**		**2[1]**	**English**

A. Course Description

This course describes the most important ideas, theoretical results, and examples of matrices, determinants, linear transformations, systems of linear equations, eigenvalues, eigenvectors, and first and second order differential equations. The course includes the essential fundamentals of these topics. The emphasis is on calculations but some applications are detailed.

B. Course Outcomes

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

- Use matrices concept and methods of linear algebra.
- Be familiar with basics of vector spaces and linear transformations.
- Connect linear algebra to differential equations.
- Apply techniques for solving first and second order differential equations.

C. References:

Required Textbook

- *Linear Algebra,* Gareth Williams, 6th Edition, 2008, Jones and Bartlett.

- *A first course in differential equations with applications,* Dennis G. Zill**,** 5th edition, PWS – Kent Publishing Company (2000).

Other references

- *Linear Algebra, Schaum's Outline,* S. Lipschutz, M. Lipson, McGraw-Hill 3rd edition. (2000).

- *Linear Algebra, A Modern Introduction,* D. Poole, Brooks Cole; 1st edition. (2002).

- *Linear Algebra, S. Leduc,* Cliffs Notes (1996).

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[1] *B.Sc. in Computer Science.*

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D. Topics Outline

1. **Matrices:** Systems of Linear Equation, Elementary Row Operations and Gauss Eliminations, Algebra of Matrices, Transpose of a Matrix, Inverse of a Square Matrix, Determinants and their Properties, Adjoint Matrix, Cramer's Rule.

2. **Vector Spaces**: Basic Definitions, Subspaces, Linear Dependence and Independence, Spanning Sets, Bases and Dimensions.

3. **Diagonalization:** Characteristic Polynomial, Computation of Eigenvalues and Eigenvectors, Diagonalization of a Matrix.

4. **First Order Differential Equations**: Separable Equations, Homogeneous Equations, Exact Equations, and First Order Linear Equations.

5. **Second Order Linear Differential Equations:** General Solution of The Homogeneous Equation Second Order Linear Differential Equations with Constants Coefficients, Particular Solution of the None-Homogeneous Equation, The Undetermined Coefficients and Variation of Constants Methods.

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)

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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)
goo.gl/ykm7t3