Kingdom of Saudi Arabia
Ministry of Education
Jazan University, Faculty of Science
Mathematics Department

المملكة العربية السعودية
وزارة التعليم
كلية العلوم ,جامعـــة جـــازان
قسم الرياضيات

**Title:** Math 102 "Matrices Algebra".
**Credit:** 03 hours.

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**Textbook:** Howard Anton and Chris Rorres, *Elementary Linear Algebra*, 9th Edition, 2005.

## Scientific References:


- Precalculus, Custom Edition Barnett, Ziegler and Bylenn, McGraw Hill, (2009).
- Algebra and Trigonometry, R. E. Larson, R. P. Hostetler, 6th Edition, Houghton Mifflin Company, (2004).
- College Algebra and Trigonometry, R. Aufmann, V. Baker and R. Nation, 4thEdition, Houghton Mifflin Company, (2003).


## Course Description:

- **Concept of matrix,** rank of matrix, types of matrices, basic algebraic operations on matrices, inverse of square matrix $A_{2\times2}$ and $A_{3\times3}$.
- **Determinants** and their properties and methods of calculation.
- **Linear equation system** homogenies and non-homogenies.
- **Solving methods Linear equation systems**: Gauss method, simple row method, Cramer's Rule.
- **Eigenvalues and Eigenvectors of matrices.**
- **Linear Space and subspace.**

## Learning Outcome:

After finishing the course, the student is expected to be familiar with the followings:

- Matrices and algebraic operations.
- Linear equation systems and its solutions.
- Linear space and subspace and its examples.

## Course Assessments:

- First Exam 20%,
- Second Exam 20%,
- Quizzes and homework 10%
- Final Exam 50%.

## Methods of teaching the course:

- Academic lectures
- JUMP
- Homework
- Scientific discussions

## Mid –Term Exams:

- **First mid-term exam: To be decided.**
- **Second mid-term exam: To be decided.**

## Course Description in details:

| ***Chapter title*** | ***Topic/ Activity*** | ***Ex.*** | ***Exerc.*** | ***HW.*** | ***Weeks.*** |
|---|---|---|---|---|---|
| **Chapter 1: Systems of Linear Equations and Matrices** | **1.3 Matrices and Matrix Operations:** Definitions and its Properties, Types of Matrices, Operations on Matrices (Addition- Subtraction-Multiplication), Linear Combinations, Transpose and Trace. | 1-12 | 1, 2, 3, 7. | 4, 5, 6. | **First and Second.** |
| | **1.4 Inverses. Rules of Matrix Arithmetic:** Properties of Matrix Operations, Inverse of 2 by 2 Matrix and its properties, Powers of a Matrix, Matrix polynomial. | 1-10 | 1, 3, 4, 6, 8, 9, 11, 14, 15. | 5, 7, 10, 12, 13, 16, 17, 20. | **Third and Fourth.** |
| | **1.5 Elementary Matrices and a Method for Finding $A^{-1}$:** Elementary Matrices and Row Operations, Using Row Operations to Find $A^{-1}$ | 1-6 | 1, 3, 6, 9, 12, 15. | 2,4,5,7,8, 10, 13. | **Fifth.** |

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| | **1.7 Diagonal, Triangular and Symmetric Matrices.** | 1-6 | 1, 3, 4, 6, 10. | 2, 5, 7, 8. | **Sixth.** |
| | 1.1 **Introduction to Systems of Linear Equations:** Consistent and inconsistent linear systems. | 1-3 | 1, 3, 5. | 2, 4, 6. | **Seventh.** |
| | 1.2 **Gaussian Elimination:** Gaussian Elimination and Gauss–Jordan elimination. | 1-7 | 1-15. (odd) | 1-14. (even) | **Eighth.** |
| **Chapter 2: Determinants** | **2.1 Determinants by cofactors and Cramer's Rule** Minors and Cofactors, Cofactor Expansion, Adjoint of a Matrix, Inverse of a Matrix Using Its Adjoint, Determinant of a Triangular Matrix, Cramer's Rule. | 1-9 | 1,3, 4, 5, 7, 9, 11, 13, 15, 17. | 2,5,6, 8, 10, 12, 14, 16, 18, 20. | **Ninth.** |
| | **2.2 Evaluating Determinants by Row Reduction** A Basic Theorem**,** Elementary Row Operations | 1-6 | 1, 3 ,4, 6, 8. | 2, 5, 7, 9. | **Tenth.** |
| | **2.3 Properties of The Determinant Function** Basic Properties of Determinants. | 1-4 | 1, 5, 6. | 2, 3, 4,7. | |
| | **Eigenvalues and Eigenvectors.** Characteristic Equation. Eigenvalues and Eigenvectors (2×2 matrices only). | 5, 6 | 14, 15 (odd parts) | 14, 15 (even parts) | **Eleventh.** |
| **Chapter 5: General Vector Spaces** | **5.1 Real Vector Spaces** Vector Space Axioms, examples and exercises. | 1-7 | 1-10 (odd) | 1-10 (even) | **Twelfth and Thirteen.** |
| | **5.2 Subspaces** | 1-7 | 1-5 (odd parts) | 1-5 (even parts) | |
| | **Final Exam** | | | | |