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

المملكة العربية السعودية
جامعة الإمام محمد بن سعود الإسلامية
كلية العلوم
قسم الرياضيات و الإحصاء

Linear Algebra for Engineering

Course Code	Course Num.	Course Name	Credit Hours	Lec	Lab	Tut	Prerequisites
MAT	MAT 226	Linear Algebra for Engineering	4	3	0	2	MAT105

Objectives

- **To provide students with a good understanding about matrices concept and methods of linear algebra**
- **To let students be familiar with basics of vector spaces and linear transformations.**
- **To connect linear algebra to other fields.**
- **To know some applications of Linear Algebra.**

Topics to be Covered:

List of Topics	No. of Weeks	Contact Hours
Matrices and Gauss Elimination: Linear equation and systems, Matrix notations and operations, Method of elimination, Row and row reduced echelon form of a matrix, Definition of the inverse of a square matrix, Inverse of square matrix by Gauss elimination, Factorization A = LU.	4	16
Determinants: Determinants and their properties, Cofactor expansions, Cramer's rule.	1	4
Eigenvalues and Eigenvectors: Eigenvalues and eigenvectors of a square matrix, Characteristic polynomial of a square matrix, Matrix diagonalization, Applications to differential equations.	1	4
Vector spaces: Introduction to vectors and matrices, Vectors in R2 and R3, Dot product, Norm, Distance, Orthogonal vectors, Angle between two vectors, Vector spaces, Rank, Nullspace, Linear independence of vectors, Spanning subspace, Basis and dimension, Orthogonality, Projection, Gram-Schmidt normalization.	5	20
Linear transformations: Basic definitions, the matrix of a transform, Coordinates and change of basis, Homomorphism and isomorphism, Diagonalization.	2	8
Applications: matrices in Engineering, Graphs and Networks, Markov matrices, Population, Gaussian elimination in practice.	1	4
Review.	1	4

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Schedule of Assessment

	Assessment task	Week Due	Proportion of Total Assessment
1	Midterm 1	6^{th}/ 7^{th} week	20 %
2	Midterm 2	11^{th}/ 12^{th} week	20 %
3	Quizzes, Homeworks, class participation, and mini-projects	During the semester	20%
4	Final Exam	16^{th}week	40 %

Learning Resources

Textbook
Linear Algebra, Gareth Williams, 6^{th} edition, 2008, Jones and Bartlett

Other Essential References Materials
Linear Algebra, Schaum's Outline, S. Lipschutz, M. Lipson, McGraw-Hill 3^{rd} edition. (2000).

Other Recommended Textbooks and Reference Material
- *Linear Algebra, S. Leduc, Cliffs Notes (1996).*
- *Linear Algebra, A Modern Introduction, D. Poole, Brooks Cole; 1^{st} edition. (2002).*