QUAID-E-AWAM UNIVERSITY OF ENGINEERING, SCIENCE AND TECHNOLOGY, NAWABSHAH



DEPARTMENT OF MATHEMATICS AND STATISTICS

Title of Subject	: Linear Algebra
Course Code	: MATH 203
Discipline	: First Semester Second Year
Effective	: 2017 Batch and onwards
Credit Hours	: 03+00
Minimum Contact Hours: 42	
Total Marks	100 + 00

Specific Objectives of course: Linear algebra is the study of vector spaces and linear transformations. The main objective of this course is to help the students to learn in rigorous manner, the tools and methods essential for studying the solution spaces of problems in mathematics, engineering, the natural sciences, and social sciences and develop mathematical skills needed to apply these to the problems arising within their field of study; and to various real world problems.

Course Outline:

System of Linear Equations: Representation in matrix form. Matrices. Operations on matrices. Echelon and reduced echelon form. Inverse of a matrix (by elementary row operations). Solution of linear system. Gauss-Jordan method. Gaussian elimination.

Determinants: Permutations of order two and three and definitions of determinants of the same order. Computing of determinants. Definition of higher order determinants. Properties. Expansion of determinants.

Vector Spaces:

Definition and examples, subspaces. Linear combination and spanning set. Linearly Independent sets. Finitely generated vector spaces. Bases and dimension of a vector space. Operations on subspaces, Intersections, sums and direct sums of subspaces. Quotient Spaces.

Linear mappings: Definition and examples. Kernel and image of a linear mapping. Rank and nullity. Reflections, projections, and homotheties. Change of basis. Eigenvalues and eigenvectors. Theorem of Hamilton-Cayley. **Inner product Spaces:** Definition and examples. Properties, Projection. Cauchy inequality. Orthogonal and orthonormal basis. Gram Schmidt Process. Diagonalization.

Recommended Books (Latest Editions):

- 1. Ch. W. Curtis, *Linear Algebra*, Springer.
- 2. T. Apostol, Multi Variable Calculus and Linear Algebra, 2nd ed., John Wiley and sons.
- 3. H. Anton, C. Rorres , *Elementary Linear Algebra: Applications Version*, 10th Edition, John Wiley and sons.
- 4. S. Friedberg, A. Insel, Linear Algebra, 4th Edition, Pearson Education Canada.
- 5. S. I. Grossman, *Elementary Linear Algebra*, 5th Edition, Cengage Learning.