DEPARTMENT OF MATHEMATICS,

UNIVERSITY OF KARACHI,

Course Outline

MATH 503: LINEAR ALGEBRA

Course contents:

Vector spaces: Definition and basic properties, Subspaces, Linear independence, linear combination and span. Basis and dimension change of basis. Orthogonal bases and projection in R^n. Inner product spaces. Linear transformations: Definition and examples. Properties of linear transformations. Range and Kernel. The rank and nullity of a matrix. The matrix representation of a linear transformation. Isomorphism, isometrics and their applications. Eigenvalues, eigenvectors and canonical forms: Eigenvalues, and eigenvectors, a model of population growth, similar matrices and diagonalisation, symmetric matrices and orthogonal diagonalisation. Quadratic forms. Matrix differential equations. The theorems of Cayley Hamilton and Gershgorin. Numerical methods: The error in numerical computations. Solving linear systems I: Gaussian elimination with pivoting. Solving linear systems II: Iterative methods. Computing eigenvalues and eigenvectors.

Books Recommended:

1. Stanley, I., Grossman, Applied Linear Algebra, Second Edition, Wadsworth Publishing Co., California, 1984.
2. Stroud, K. A., Linear Algebra: Theory and Application, Stanley Thornes Publishers Ltd., 1978.
3. Graham, A., Matrix Theory and Applications for Engineers and Mathematicians, Halsted University, Ellis Horwood Ltd.,1980
4. Graham, A., Nonnegative Matrices and Applications for Engineers and Mathematicians, Halsted University, Ellis Horwood Ltd., 1987.
5. Lipschutz, S., Essential Computer Mathematics, Mc Graw Hill Inc., 1982.

6. Lennox, S. C., Chadwick, M., Computer Mathematics for Applied Scientists, Second Edition,

Heinemann Educational Books Ltd., London, 1985.

7. Garding and Tambour, Algebra and Switching Circuits, Mc Graw Hill 1988.

8. Mendelson, E., Boolean Algebra and Switching Circuits, Mc Graw Hill 1978.

9. Halmon, P. R., Lectures on Boolean Algebra, Van Nostrand, 1963.

10. Sharma, A. K., Linear Transformations, First Edition, Discovery Publishing House, New Delhi, 2007.

11. Jain, R. K. and Iyengar, S. R. K., Advanced Engineering Mathematics, Third Edition, Narosa Publishing House, New Delhi, 2007.