SECOND SEMESTER

COURSE NAME: Advanced Linear Algebra COURSE CODE: MAT-505 Credit : 04

Vector Spaces and Linear Transformation

Vector Spaces: Subspaces, Direct Sums, Spanning Sets and Linear Independence, The Dimension of a Vector Space, Ordered Bases and Coordinate Matrices, The Row and Column Spaces of a Matrix.

Linear Transformations: Isomorphisms, The Kernel and Image of a Linear Transformation, Rank-Nullity Theorem, The Matrix of a Linear Transformation, Change of Bases for Linear Transformations, Equivalence of Matrices, Similarity of Matrices, Similarity of Operators, Invariant Subspaces.

Isomorphism Theorems

The Isomorphism Theorems: Quotient Spaces, The Universal Property of Quotients and the First Isomorphism Theorem, Quotient Spaces, Complements and Codimension, Additional Isomorphism Theorems, Linear Functionals, Dual Bases, Reflexivity, Annihilators.

Linear Operator, Eigenvalues and Eigenvectors

Linear Operator, Characteristic Polynomial and Minimal Polynomial of an Operator, Eigenvalues and Eigenvectors, Geometric and Algebraic Multiplicities, The Jordan Canonical Form, Triangularizability Diagonalizable Operators, Projections, Algebra of Projections, Projections and Invariance.

Inner Product Spaces and Bilinear Form

Real and Complex Inner Product Spaces, Norm and Distance, Isometries, Orthogonality, Orthogonal and Orthonormal Sets, The Projection Theorem and Best Approximations, Orthogonal Direct Sums, The Riesz Representation Theorem.

The Adjoint of a Linear Operator, Normal Operators, The Matrix of a Bilinear Form, Quadratic Forms, Orthogonality.

REFRENCE BOOKS

1. Gel′fand I.M. Lectures on linear algebra (1989), Courier Corporation.
2. Kenneth Hoffman & Ray Kunze, Linear Algebra (2^{nd} edition)(2015), Prentice-Hall.
3. David C. Lay, Linear Algebra and its Application (3^{rd} Edition) (2007) Pearson Education Asia, India Reprint.
4. Seymour Lipshutz and Marc Lipson, Schaum's outlines "Linear Algebra" (3^{rd} Edition)(2012), Mc Graw Hill Education.