Indian Institute of Technology
Course Details Report

Course No: MA2101
Course Name: Linear Algebra via Matrices

Course Type:
Theory

Description:
To introduce to the students the Linear Algebra which forms a basis for almost all mathematics that is required for engineering through matrices and their factorizations.

Course Content:
Matrix operations: Basic operations, Transpose and adjoint, Elementary row operations, RREF, Determinant, Computing matrix inverse. Systems of linear equations: Linear independence, Rank, Solvability, Gauss-Jordan elimination and Gauss elimination. Matrix as a linear map: subspace and span, Basis & dimension, Linear transformation, Coordinate vectors, Coordinate matrices, Change of basis matrix, Equivalence and similarity. Orthogonality: Inner products, Gram-Schmidt process, QR-factorization, Orthogonal projection, Best approximation, Least squares solutions. Eigenvalues and Eigenvectors: The characteristic polynomial, spectrum, Special types of matrices. Canonical forms: Schur triangularization, Annihilating polynomials, Diagonalizability, Jordan form, Singular value decomposition.

Text Books:
A. Singh, Introduction to Matrix Theory, Springer, 2021.

Reference Books:
G. Strang, Introduction to Linear Algebra, 6th Ed., Wellesley-Cambridge Press, 2023.