

Sardar Vallabhbhai Patel Institute of Technology, Vasad

B. E. Second Sem (Vector Calculus & Linear Algebra - 2110015)

Year 2016-2017

Proposed Syllabus for Mid Sem

❖ Systems of Linear Equations and Matrices:

- Introduction to System of linear equation and Matrix
- Elementary matrices, Special matrices (Symmetric, Skew-symmetric, Conjugate, etc...)
- Row echelon form, reduced row echelon form, Gauss elimination method, Gauss Jordan elimination method for non-homogeneous system
- Trivial and Non-trivial solution for homogeneous system of linear equations, inverse of the matrix by Gauss Jordan method.
- Solving the system by inverting the coefficient matrix, Cramer's rule
- Hermitian, Skew-hermitian, Unitary, Orthogonal
- Determination of rank of a matrix by definition, Necessary and sufficient condition for system to be consistent

❖ Vectors in \mathbb{R}^n and Vector Spaces:

- Vectors in \mathbb{R}^n (Norm, Distance, Pythagorean theorem, Parallelogram law, Cauchy Schwartz Inequality)
- Linear Combinations, Span, Linear Independence
- Definition of vector space and examples
- Subspaces and their examples

❖ Basis and Dimension:

- Basis, Dimension
- Basis for row space, column space and null space
- Rank-Nullity theorem, Examples
- Orthogonal complement

❖ Eigen Values and Eigen Vector:

- Eigen values and Eigen vectors
- Algebraic and Geometric Multiplicity, Cayley Hamilton Theorem
- Diagonalization
- Quadratic forms

❖ Inner Product Spaces:

- Dot Product on \mathbb{R}^n
- Definition of Inner Product Spaces and their examples
- Orthonormal basis (Gram-Schmidt Orthogonalization Process)
- Least Square Solution