P. E. S. COLLEGE OF ENGINEERING, MANDYA

(An Autonomous Institution affiliated to VTU, Belagavi)

DEPARTMENT OF MATHEMATICS

Code: P18MAO651 **Total hours: 52**
Credits: 4-0-0 **Hours per week: 04**

VI SEMESTER B. E. – ACADEMIC YEAR: 2020-21

(Open Elective Common to all branches)

LINEAR ALGEBRA AND ANALYSIS

UNIT-I

Linear Algebra: Matrices – symmetric, skew-symmetric, Hermitian and skew-Hermitian matrices – properties and examples, involutory and Nilpotent matrices – problems, orthogonal matrices.

Self-study component: Elementary Matrices and Determinants, Singular and Non-singular matrices. Matrix operations. Adjoint and inverse of a matrix. **10 Hrs**

UNIT-II

Canonical forms: Normal canonical forms. Computation of inverse of a matrix by Cayley-Hamilton theorem, Minimal polynomial, Charactestic and minimal polynomials of block matrices. Applications to Engineering field.

Self-study component: Elementary transformations of a matrix, Echelon form of a matrix. Rank of a matrix. Partitions of matrices and block matrix. **11 Hrs**

UNIT-III

Numerical method: Introduction, Classification of PDE's of second order, Finite difference approximation to ordinary and partial derivatives. Numerical solution of a PDE, Numerical solution of one dimensional wave equation. Numerical solution of one dimensional heat equation. Crank-Nicolson's method for solving one dimensional heat equation. Numerical solution of Laplace's equation in two dimensions.

Self-study component: Derive Numerical solution of Laplace's equation in two dimensions. **10 Hrs**

UNIT-IV

Sequence and series: Introduction to series and sequences and numbers. Convergence of sequence and series, Tests for convergence – Comparison test, Ratio test and Cauchy's root test Raabe's test-Problems. Power series, radius and circle of Convergence of a power series– problems.

Self-study component: Concept of a sequence and series. Infinite summation of sequence. Limit of a sequence. Subsequence. Convergence and divergence of a sequence. **10 Hrs**

UNIT-V

Vector spaces: Introduction, examples of vector space linear combination, spanning sets, subspace, linear spans, row space of a matrix, linear dependence and independence. Basis and dimensions, applications to matrices, coordinates. Linear transformations: linear mapping, Kernel and image of linear mapping, rank-nullity theorem, singular and nonsingular linear mapping, Matrix representation of a linear transformation.

Self-study component: Basic concepts of groups. Commutative groups. Subgroups and direct sum of two subgroups. Linear functions. **11 Hrs**

Reference Books:

1. Higher Engineering Mathematics by B. S. Grewal, Khanna publishers, 42nd Edition.
2. Theory and Problems of Linear Algebra, schaum's outline series, Tata Mcgraw hill, New Delhi.
3. Engineering Mathematics, IES Master Publication, and second edition.