LINEAR ALGEBRA AND CALCULUS

Common to ECE, CSE, IT, CSE(AI&ML) & CSE(DS) Branches

21MA101BS

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Course Objectives: To learn

1. The types of matrices and their properties.
2. Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
3. Concept of Eigen values and eigenvectors and to reduce the quadratic form to canonical form
4. Concept of Sequence.
5. Concept of nature of the series.
6. Geometrical approach to the mean value theorems and their application to the mathematical problems
7. Evaluation of surface areas and volumes of revolutions of curves.
8. Evaluation of improper integrals using Beta and Gamma functions.
9. Partial differentiation, concept of total derivative.
10. Finding maxima and minima of function of two and three variables.

Course Outcomes: After learning the contents of this paper the student must be able to

CO 1: Write the matrix representation of a set of linear equations and to analyze the solution of the system of equations.
CO 2: Find the Eigen values and Eigen vectors.
CO 3: Reduce the quadratic form to canonical form using orthogonal transformations.
CO 4: Analyze the nature of sequence and series.
CO 5: Solve the applications on the mean value theorems.
CO 6: Evaluate the improper integrals using Beta and Gamma functions.
CO 7: Find the extreme values of functions of two variables with / without constraints.

UNIT-I: Matrices

Types of Matrices: Symmetric, Hermitian, Skew-Symmetric, Skew-Hermitian, Orthogonal and Unitary Matrices; Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss- Jordan method; System of Linear Equations: Homogeneous and Non-Homogeneous equations. Gauss Elimination method, Gauss Seidel Iteration method.

UNIT-II: Eigen values and Eigen vectors

Introduction to Vector space, linear independence of vectors, and orthogonality of vectors. Linear and Orthogonal Transformation. Eigen values & Eigen vectors and their properties, Diagonalization of a matrix. Cayley-Hamilton Theorem (without proof); finding inverse and power of a matrix by Cayley-Hamilton Theorem; Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

UNIT-III: Sequences & Series

Sequence: Definition of Sequence, limit, Convergent, Divergent and Oscillatory sequences.
Series: Convergent, Divergent and Oscillatory Series; Series of positive terms; Comparison test, p-test, D- Alembert's ratio test; Raabe's test; Cauchy's Integral test; Cauchy's root test; logarithmic test. Alternating series: Leibnitz test; Alternating Convergent Series: Absolute and Conditionally Convergence.

UNIT-IV: Calculus

Mean Value Theorems**:** Rolle's Theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem, Taylor's Series (without proof); Improper Integrals**:** Beta and Gamma functions and their applications.

UNIT-V: Multivariable calculus(Partial Differentiation and applications)

Definitions of Limit and continuity. Euler's Theorem; Total derivative; Jacobian; Functional dependence & independence, Maxima and minimaof functions of two variables and three variables using method of Lagranges multipliers.

TEXTBOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3 G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition, Pearson, Reprint, 2002.

REFERENCES:

1. N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, Reprint,2008.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
3. Engineering Mathematics-I, by Dr. T.K.V Iyengar and others, S Chand and Co.