VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)
MATRICES AND CALCULUS

B.Tech. I Year I Sem.   L   T   P   C
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Pre-requisites: Mathematical Knowledge at pre-university level

Course Objectives: To learn
  - Types of matrices and their properties.
  - Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
  - Concept of eigen values and eigenvectors and to reduce the quadratic form to canonical form
  - Geometrical approach to the mean value theorems and their application to the mathematical problems
  - Evaluation of surface areas and volumes of revolutions of curves.
  - Evaluation of improper integrals using Beta and Gamma functions.
  - Partial differentiation, concept of total derivative
  - Finding maxima and minima of function of two and three variables.
  - Evaluation of multiple integrals and their applications

UNIT - I: Matrices   10 L
Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Gauss Seidel Iteration Method.

UNIT - II: Eigen values and Eigen vectors   10 L
Linear Transformation and Orthogonal Transformation: Eigen values, Eigenvectors and their properties, Eigen values and Vectors with reference to Symmetric, Skew-symmetric, Hermitian, Skew- Hermitian, orthogonal and Unitary Matrices. Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem,
Quadratic Forms: Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms.

UNIT - III: Calculus   10 L
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. Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (Only in Cartesian coordinates),
Beta and Gamma Functions: Introduction to Improper Integrals, Definition of Beta and Gamma functions, properties and other forms. Relation between Beta and Gamma functions. Evaluation of Improper integrals using Beta and Gamma functions

UNIT - IV: Multivariable Calculus (Partial Differentiation and applications) 10 L
Definitions of Limit and continuity. Partial Differentiation: Euler's Theorem, Total derivative, Jacobian, Functional dependence & independence. Applications: Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

UNIT-V: Multivariable Calculus (Integration)   8 L
Evaluation of Double Integrals (Cartesian and polar coordinates), change of order of integration (only Cartesian form), Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double

and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals.

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 analyse the solution of the system of equations

CO-2:   Find the Eigen values and Eigen vectors. Reduce the quadratic form to canonical form using orthogonal transformations.

CO-3:   Solve the applications on the mean value theorems.

CO-4:   Evaluate the improper integrals using Beta and Gamma functions

CO-5:   Find the extreme values of functions of two variables with/ without constraints. Evaluate the multiple integrals and apply the concept to find areas, volumes.

TEXT BOOKS:
1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Editon, 2016.

REFERENCE BOOKS:
1. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition,Pearson, Reprint, 2002.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
4. H. K. Dass and Er. RajnishVerma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.