I Year - II Semester

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MATHEMATICS-III
(Common to ALL branches of First Year B.Tech.)

Course Objectives:

1. The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2. The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.
3. Understand the most basic numerical methods to solve simultaneous linear equations.

Course Outcomes: At the end of the Course, Student will be able to:

1. Determine rank, Eigenvalues and Eigen vectors of a given matrix and solve simultaneous linear equations.
2. Solve simultaneous linear equations numerically using various matrix methods.
3. Determine double integral over a region and triple integral over a volume.
4. Calculate gradient of a scalar function, divergence and curl of a vector function. Determine line, surface and volume integrals. Apply Green, Stokes and Gauss divergence theorems to calculate line, surface and volume integrals.

UNIT I: Linear systems of equations:

Rank-Echelon form-Normal form – Solution of linear systems – Gauss elimination - Gauss Jordon- Gauss Jacobi and Gauss Seidal methods.Applications: Finding the current in electrical circuits.

UNIT II: Eigen values - Eigen vectors and Quadratic forms:

Eigen values - Eigen vectors– Properties – Cayley-Hamilton theorem - Inverse and powers of a matrix by using Cayley-Hamilton theorem- Diagonalization- Quadratic forms- Reduction of quadratic form to canonical form – Rank - Positive, negative and semi definite - Index – Signature.
Applications: Free vibration of a two-mass system.

UNIT III: Multiple integrals:

Curve tracing: Cartesian, Polar and Parametric forms.
Multiple integrals: Double and triple integrals – Change of variables – Change of order of integration.
Applications: Finding Areas and Volumes.

UNIT IV: Special functions:

Beta and Gamma functions- Properties - Relation between Beta and Gamma functions- Evaluation of improper integrals.
Applications: Evaluation of integrals.

UNIT V: Vector Differentiation:

Gradient- Divergence- Curl - Laplacian and second order operators -Vector identities.
Applications: Equation of continuity, potential surfaces

UNIT VI: Vector Integration:

Line integral – Work done – Potential function – Area- Surface and volume integrals Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof) and related problems.
Applications: Work done, Force.

Text Books:

1. **B.S.Grewal,** Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **N.P.Bali**, Engineering Mathematics, Lakshmi Publications.

Reference Books:

1. **Greenberg,** Advanced Engineering Mathematics, 2nd edition, Pearson edn
2. **Erwin Kreyszig,** Advanced Engineering Mathematics, 10th Edition, Wiley-India
3. **Peter O'Neil,** Advanced Engineering Mathematics,7th edition, Cengage Learning.
4. **D.W. Jordan and T.Smith,** Mathematical Techniques, Oxford University Press.
5. **Srimanta Pal, Subodh C.Bhunia**, Engineering Mathematics, Oxford University Press.
6. **Dass H.K., Rajnish Verma. Er.,** Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.