I Year II Semester	L	T	P	C
Code: 20MA2002	3	0	0	3

LINEAR ALGEBRA AND VECTOR CALCULUS

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 able to

1. Solve the linear system of equations using the concepts of rank, Gauss elimination, Gauss Jordan, and Gauss Seidel methods.
2. Solve eigen values and eigen vectors of square matrices.
3. Appraise the Laplace transform technique and use it to solve various engineering problems.
4. Find the gradient and directional derivative of a scalar function and divergence, curl of a vector function.
5. Apply line, surface, and volume integrals to find work done by a force, flux and interpret vector integral theorems

UNIT I: Solving systems of linear equations:
Rank of a matrix by echelon form and normal form – Solving system of homogeneous and non homogeneous equations– Gauss elimination for solving system of equations- Gauss Jordon-Gauss Jacobi and Gauss Seidal methods

UNIT II: Eigen values - Eigen vectors and Quadratic forms:
Eigen values - Eigen vectors– Properties – Cayley-Hamilton theorem (with out proof) - Inverse and powers of a matrix by using Cayley-Hamilton theorem- Diagonalization- Quadratic forms-Nature of the Quadratic forms - Reduction of quadratic form to canonical form and Orthogonal Transformations.

UNIT III: Laplace transforms:
Laplace transforms of standard functions-Shifting theorems - Transforms of derivatives and integrals Unit step function –Dirac's delta function- Inverse Laplace transforms–Convolution theorem (without proof).
Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.

UNIT IV: Vector Differentiation:
Gradient- Directional Derivative -Divergence- Curl – Scalar Potential -Vector identities.

UNIT V: 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.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. B. V Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc.Graw Hill Education

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.
7. T.K.V. Iyengar, B. Krishna Gandhi, S. Ranganathan, M.V.S.S.N. Prasad, Engineering Mathematics (Volume-III), S Chand Publications.