CC102: VECTOR CALCULUS AND LINEAR ALGEBRA

CREDITS = 5 (L=3, T=2, P=0)

Course Objectives:

The basic necessity for the Foundation of Engineering & Technology being Mathematics, the main aim is, to teach Mathematical methodology, develop Mathematical skills & enhance thinking power of students.

Teaching and Assessment Scheme:

Teaching Scheme			Credits	Marks Distribution				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	CE	ESE	CE	
3	2	0	5	70	30	30	20	150

Course Contents:

Unit No.	Topics	Teaching Hours
1	**Matrices and its applications:** Types of Matrices, Elementary Row and Column Operations, REF, RREF, Rank of Matrix by Different Techniques, Solution of Homogeneous and Non-homogeneous System of Linear Equation.	08
2	**Linear algebra:** Euclidean N-Space, General Vector Spaces, Subspaces, Linear Independence, Basis and Dimension, Row and Column Spaces, Rank, Inner Product Spaces, Length and Angle in Inner Product Spaces, Orthonormal Bases; Gram Schmidt Process.	12
3	**Linear transformations:** Introduction, Properties-Kernel and Range, Linear Transformation from Rn to Rm, Matrices of Linear Transformations.	07
4	**Eigen values and Eigen vectors:** Eigen Values and Eigen Vectors, Cayley-Hamilton Theorem,	07

	Diagonalization, Orthogonal Diagonalization, Symmetric Matrices. Quadratic Forms and its Applications.	
5	**Vector calculus:** Differentiation of Vectors –Gradient, Divergence, Curl, Directional Derivatives. Line, Surface Integrals-Statements of Green's, Gauss' Divergence and Stoke's Theorems- Applications to Engineering Problems.	10
	Total Hours	**44**

List of References:

1. Howard A. and Chris R.,"*Elementary Linear Algebra*", John Wiley & Sons, 2005.
2. Grewal B. S., "*Higher Engineering Mathematics*", Khanna Publisher, New Delhi, (Latest Edition).
3. Bali N. P. and Goyal M.,"*Engineering Mathematics*", Laxmi Publication (Latest Edition).

Course Outcomes (COs):

On successful completion of the course, students will be able to:

1. Solve system of linear equations using different tools of linear algebra for the problems arising in the field of engineering.
2. Apply vectors in higher dimensional space in experimental data, storage and warehousing, electrical circuits, graphical images, economics, mechanical systems and in physical sciences.
3. Use Eigen values and Eigen vector in different subjects of engineering like control theory, vibration analysis, electric circuits, advanced dynamics and quantum mechanics.
4. Apply linear transformation in subject like computer graphics, cryptography, thermodynamics etc.
5. Apply differential and integral vector calculus to the problems in R^3.
6. Use the techniques and theory of linear algebra to model various real world problems.