Course Title: Linear Algebra	***Course Code: 20MA412***
Credits: 3	***Contact Hours (L: T: P): 39: 0: 0***
Type of Course: Theory	***Category: Professional Core Course***
CIE Marks: 50	***SEE Marks: 100***

Prerequisites: Engineering Mathematics-I, II, III.

Course Objectives: The course should enable the students to:

Sl. No.	Course Objectives
1	Understand several important concepts in linear algebra, including systems of linear equations and their solutions; matrices and their properties; vector spaces; linear independence of vectors; subspaces, bases, and dimension of vector spaces; inner product spaces; linear transformations; and Eigen values and eigenvectors.
2	Apply these concepts to such real-world phenomena as electrical networks, traffic flow, archeological dating, economic interdependencies, population movement, communication networks, and weather prediction.
3	Learn to use the computer package MATLAB to perform matrix computations and to explore and analyze linear algebra concepts.
4	Improve your ability to think logically, analytically, and abstractly.
5	Improve your ability to communicate mathematics, both orally and in writing.

Unit No.	Course Content	No. of Hours
1	**Linear equations**: Systems of linear equations, row reduction and Echelon form, vector equations, Matrix equation, solution sets of linear systems, Linear independence.	7
2	**Matrix Algebra:** Introduction to linear transformations, Matrix of a linear transformation. Matrix operations, Inverse of a matrix, characterization of invertible matrices, partitioned matrices, matrix factorizations.	8
3	**Vector spaces**: Vector spaces and subspaces, Null spaces, column spaces, linear transformations, linearly independent sets, bases, dimension of a vector space, rank, change of basis.	8
4	**Eigen values, Eigen vectors and Orthogonality:** Introduction, characteristic equation, diagonalization, Eigen vectors and linear transformations, Complex Eigen values. Orthogonality- Inner product, length, and orthogonality, orthogonal sets, orthogonal projections.	8
5	**Orthogonality and least squares:** Gram-Schmidt process, least squares problems, Inner product spaces, diagonalization of symmetric matrices, quadratic forms.	8

Text Book:

Sl. No.	Author/s	Title	Publisher Details
1	David C.	Linear algebra and its applications Lay, 3e	Pearson Education, 2003.

Reference Book:

Sl. No.	Author/s	Title	Publisher Details
1	Gilbert Strang,	Linear algebra and its applications 3e	Thomson Asia Pvt. ltd., 2003.
2	Kenneth Hoffman, Ray Kunze	Linear algebra, 2e	Prentice-Hall of India Pvt. Ltd., 2002.

Course Outcomes: Upon completion of this course the student will be able to:

CO1	Apply the numerical methods to solve Systems of linear equations, row reduction and Echelon form, vector equations, Matrix equation, solution sets of linear systems.
CO2	Linear independence, Solve the linear transformations, Matrix of a linear transformation. Matrix operations, Inverse of a matrix, characterization of invertible matrices, partitioned matrices, matrix factorizations.
CO3	Determine the Vector spaces and subspaces, Null spaces, column spaces, linear transformations, linearly independent sets, bases, dimension of a vector space, rank, and change of basis.
CO4	Determine and describe the characteristic equation, diagonalization, Eigen vectors and linear transformations, Complex Eigen values. Orthogonality-Inner product, length, and orthogonality, orthogonal sets, orthogonal projections.
CO5	Determine and describe the Gram-Schmidt process, least squares problems, Inner product spaces, diagonalization of symmetric matrices, quadratic forms.

Mapping Course Outcomes with Program outcomes & Program Specific outcomes:

Course Outcomes	Program Outcomes												PSO's			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	-	-	-	-	-	-	-	-	-	-	2	-	-	-
CO2	2	2	-	-	-	-	-	-	-	-	-	-	2	-	2	-
CO3	2	2	-	-	-	-	-	-	-	-	-	-	2	-	2	-
CO4	2	2	-	-	-	-	-	-	-	-	-	-	2	-	2	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-	2	-	2	-

1-Low association, 2- Moderate association, 3-High association