Course Code MAT3002	Applied Linear Algebra	Course Type	LT
		Credits	3
Prerequisites	Elementary knowledge of Matrices		

Course Objectives:

- Linear algebra is one of the most important subjects of pure mathematics and has many applications in electrical, communications and computer science. This course aims at introducing students to the fundamental concepts of linear algebra by starting with linear equations and culminating in abstract vector spaces and linear
- **KL1 – Remember, KL2-Understand, KL3-Apply, KL4-Analyse, KL5-Evaluate, KL6-Create**

Course Outcomes:

By the end of the course, the students will be able to

CO1- Solve systems of linear equations with the concept of linear matrix.

CO2 - Understand the concepts of vector spaces and subspaces, basis and dimensions & finite& infinite dimensional vector Space,

CO3- Linear Transformations, find the change of basis matrix with respect to two bases of a vector space and its matrix representation for solving the application based problem in computer graphics.

CO4 - Inner product spaces and their matrix representations use Gram-Schmidt process to obtain orthonormal basis,

CO5 – Application of Inner product space in the different area of computer science. .

Student Outcomes (SO) : a,e,j,k

Module No.	Module Description	Hrs.	Course outcomes
1	**Linear Equations and Matrices** Introduction of system of linear equations, Elementary Operations, System in triangular and Echelon form, Existence of solution, Methods of solution- Gaussian elimination and Gauss Jordan methods – inverse matrix - LDU factorization – Applications to electrical networks and cryptography.	8	CO1
2	**Vector Spaces and Subspaces** Vector spaces and subspaces – Linear Independence, Basis and Dimension – Row, Column and Null spaces – Rank and Nullity – Bases for subspaces – Inevitability – Applications in Interpolation and Wronskian	9	CO2
3	**Linear Transformations** Definition and Examples – properties - The Range and Kernel – Invertible linear transformations –Matrices of linear transformations - Vector space of linear transformations – change of bases – similarity, Application in computer graphics,	9	CO3
4	**Inner Product Spaces**	8	CO4

	Inner products – The lengths and angles of vectors – Matrix representations of inner products – Orthogonal projections - Gram-Schmidt orthogonalization.		
5	**Applications of Inner Product Spaces** QR factorization – Singular Value Decomposition - Projection - orthogonal projections – relations of fundamental subspaces – Least square solutions – Orthogonal projection matrices	**9**	**CO5**
6	**Guest Lectures by experts on contemporary topics**	**2**	
	Total	**45**	

Mode of Teaching and Learning:

Class room teaching
Use of mathematical software's (such as MATLAB, MATHEMATICA, SAGE, ETC.) as teaching aid
Minimum of 2 hours lectures by experts on contemporary topics

Mode of Evaluation and assessment: Digital Assignments, Continuous Assessment Tests, Final Assessment Test and unannounced open book examinations, quizzes, student's portfolio generation and assessment, innovative assessment practices

Text Book(s):

1. Linear Algebra by Jin Ho Kwak and Sungpyo Hong, Second edition, Springer, 2004.
2. Linear Algebra with applications by Steven J. Leon, 8th Edition, Pearson, 2010.
3. Linear Algebra Third edition, SCHAUM's Out Lines, McGraw Hill Education.

Reference Book(s):

1. Elementary Linear Algebra by Stephen Andrilli and David Hecker, 4th edition, Academic Press, 2010.
2. Introduction to Linear Algebra by Gilbert Strang, 4th edition, Wellesley-Cambridge Press, 2011.
3. Introductory Linear Algebra - An applied first course by Bernard Kolman and David R. Hill, 9th Edition, Pearson education, 2011.
4. Linear Algebra A Modern Introduction by David Poole, 2nd edition, Thomson Learning, 2006