Course code	Course Name	L-T-P - Credits	Year of Introduction
MA482	APPLIED LINEAR ALGEBRA	3-0-0-3	2016

Prerequisite: NIL

Course Objectives

1. To visualize of vectors in n-space which is useful in representing data.
2. To learn handling of linear system of equations using matrix as a tool.
3. To introduce eigen values and eigen vectors which are significant in dynamic problems.
4. To introduce matrix decompositions methods that reduce a matrix into constituent parts which make it easier to calculate more complex matrix operations

Syllabus:

Vector spaces, linear equations and matrices, linear transformation, Inner product, eigen values and eigen vectors, matrix decomposition.

Expected outcome:

The students will be able to apply

1. Theory of vector space in representing data.
2. Matrix operations in solving system of linear equations.
3. Matrix decomposition in solving system of equations.

Text Books:

1. Gilbert Strang Linear Algebra and It's Applications, 4th edition, Cengage Learning, 2006.
2. Stephen Boyd, Lieven Vandenberghe, Introduction to Applied Linear Algebra: Vectors, Matrices, and Least Squares, Cambridge University Press, 2018
3. W. Keith Nicholson, Linear Algebra with applications, 4th edition, McGraw-Hill, 2002

References:

1. I.N Herstein, Topics in Linear Algebra, Wiley Eastern, 1975.
2. S.Kumaresan, Linear Algebra : A Geometric Approach, Prentice-Hall of India, 2000.
3. Seymour Lipschutz, Marc Lipson, Schaum's outline of linear algebra, 3rd Ed., Mc Graw Hill Edn., 2017

Module	Content	Hours	End Sem. Exam Marks %
I	**Vector Spaces:** Vector Spaces, Subspaces- Definition and Examples, Linear independence of vectors, Bases and dimension, Linear Span, Field-Definition	6	15%
II	**Vector space in R^n:** System of linear equations, row space, Column space and null space. Four fundamental spaces, relation between rank and nullity, consistency theorem, basis from a spanning set and independent set:	7	15%
FIRST INTERNAL EXAMINATION			
III	**Linear transformations**: General linear transformation, Matrix of transformation, Kernel and range, properties, Isomorphism, change of basis, invariant subspace, Linear functional.	7	15%
IV	**Inner Product:** Real and complex inner product spaces, properties of inner product, length and distance, Cauchy-Schwarz inequality, Orthogonality, Orthogonal complement, Orthonormal bases, Gram Schmidt orthogonalization	8	15%
SECOND INTERNAL EXAMINATION			

V	**Eigens pace:** Properties of Eigen values and Eigen vectors , Eigen values, Eigen vectors, minimal polynomial, Diagonalization, Orthogonal diagonalization, Jordan canonical form	8	20%
VI	**Matrix Factorization:** LU decomposition, QR Decomposition and singular value decomposition	6	20%
END SEMESTER EXAMINATION			

QUESTION PAPER PATTERN
(End semester examination)

Time: 3 hours **Maximum marks: 100**

The question paper shall consist of Part A, Part B and Part C.

Part A shall consist of three questions of 15 marks each uniformly covering Modules I and II. The student has to answer any two questions (15×2=30 marks).

Part B shall consist of three questions of 15 marks each uniformly covering Modules III and IV. The student has to answer any two questions (15×2=30 marks).

Part C shall consist of three questions of 20 marks each uniformly covering Modules V and VI. The student has to answer any two questions (20×2=40 marks)