

COURSE CODE: MATH-222
COURSE NAME: LINEAR ALGEBRA
CREDIT HOURS: Theory = 03
 Practical = 00
 Total = 03
CONTACT HOURS: Theory = 48
 Practical = 00
 Total = 48
PREREQUISITES: MATH-101

MODE OF TEACHING:

Instruction: Three hours of lecture per week 100%

COURSE DESCRIPTION:

The course reviews the basic concepts, including Matrices, Determinants, and linear system of equations. Stress is laid on solution of linear and simultaneous equations, Numerical techniques for the first order initial value problems, vector spaces, Eigen vectors and Eigen value problems with applications, least square curves, Binary arithmetic and errors in arithmetic operations and computational methods.

COURSE OBJECTIVES:

The course should develop the ability to select an appropriate and efficient method for solving linear system of equations, initial value problems and handling the Eigen value problems.

RELEVANT PROGRAM LEARNING OUTCOMES (PLOs):

The course is designed so that students achieve following PLOs:

- | | | | |
|------------------------------------|-------------------------------------|---|--------------------------|
| 1 Engineering Knowledge: | <input checked="" type="checkbox"/> | 7 Ethics: | <input type="checkbox"/> |
| 2 Problem Analysis: | <input checked="" type="checkbox"/> | 8 Individual and Collaborative Team Work: | <input type="checkbox"/> |
| 3 Design/Development of Solutions: | <input type="checkbox"/> | 9 Communication: | <input type="checkbox"/> |
| 4 Investigation: | <input type="checkbox"/> | 10 Project Management: | <input type="checkbox"/> |
| 5 Tool Usage: | <input type="checkbox"/> | 11 Lifelong Learning: | <input type="checkbox"/> |
| 6 The Engineer and Society: | <input type="checkbox"/> | | |

COURSE LEARNING OUTCOMES (CLOs):

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

No.	CLO	Domain	Taxonomy Level	PLO
1	Solve system of linear equation, vector spaces and linear transformation.	Cognitive	3	1
2	Apply the concept of Eigen values, Eigen vector to model related problems	Cognitive	3	2

PRACTICAL APPLICATIONS:

- Networking
- Traffic flow
- Current and voltage in LCR circuits
- Small signals in nonlinear circuits = amplifiers
- Compatibility in structures
- Finite element analysis (has Mechanical, Electrical, and Thermodynamic applications)

TOPICS COVERED:

Theory:

Week	Topics
1	Algebra of matrices and determinants. Use of matrices and determinants in solving simultaneous equation.
2	Rank of a matrix, vector space, solutions of Linear Systems: Existence, Uniqueness. Homogenous and non-homogenous equations.
3	Gauss-elimination method, Row echelon form with applications, Linear dependence, and independence.
4	Gauss-Jordon method, LU-decomposition methods
5-6	Jacobi's method. Gauss Seidel method.
7	Solution of ordinary differential equations and initial value problems
8	Euler and modified Euler methods. Runge-Kutta method.
9	Application of Eigen values and Eigen vectors. Symmetric, Skew symmetric and Orthogonal Matrices.
10	Eigen basis, Diagonalization, Quadratic Form.
11-12	Complex matrices and form, Linear transformation, and matrices. Eigen values of tri diagonal matrix. Least Square Curves.
13	Binary arithmetic.
14	Representation of numbers in computer.
15	Error in arithmetic operations.
16	Error in computational methods.
17-18	ESE

TEXT AND MATERIAL:**Textbook (s):**

- a. Schaum's Outline of Linear Algebra, (3rd Edition) by Seymour Lipschutz, Marc Lipson

Reference Material:

- a. Introduction to Linear Algebra, (4th Edition) by Gilbert Strang, 2009. ISBN: 0980232716.
- b. Linear Algebra: Theory and Applications (2nd Edition) by Ward Cheney, David R. Kincaid, 2010. ISBN: 1449613527

ASSESSMENT SYSTEM:**1. CLOs Assessment**

Cognitive	Psychomotor	Affective
Spreadsheet	-	-

2. Relative Grading

Theoretical / Instruction		100%
	<i>Assignments 10%</i>	
	<i>Quizzes 10%</i>	
	<i>Mid Semester Exam 30%</i>	
	<i>End Semester Exam 50%</i>	
Total		100%