



Title of the Course: MATRIX THEORY

Semester : III

Course Code	22OE3MA1	Course Delivery Method	Blended Mode
Credits	3	CIA Marks	30
No. of Lecture Hours / Week	3	Semester End Exam Marks	70
Total Number of Lecture Hours	45	Total Marks	100
Year of Introduction : 2023-24	Year of offering : 2023-24	Year of Revision:-----	Percentage of Revision :--

Course Objectives: The objective of this course is to teach the basic concepts of linear algebra and its applications to non-mathematics post graduate students.

Course Outcomes: After successful completion of this course, students will be able to

CO1: understand the basics of matrix theory. (PO1)

CO2: find the Echelon form of matrices. (PO1)

CO3: solve system of linear equations using various methods. (PO5)

CO4: find Eigen values and Eigen vectors of matrices. (PO5)

CO5: study applications of Cayley Hamilton theorem. (PO3)

UNIT-I

Linear system of Equations : Introduction, Fundamentals of Matrices, Rank of Matrix.

(Sections 1.0, 1.1, 1.2 of units 1 of Text book 1)

UNIT-II

Linear system of Equations : Echelon Form, Normal Form of a Matrix, Finding inverse by row operations.

(Sections 1.3, 1.4, of unit 1 of Text book 1 and concepts from Text book 2)

UNIT-III

Linear system of Equations : Solution of a System of Linear Equations, Gauss-Elimination Method, Inverse Method, Cramer's Rule.

(Sections 1.5,1.6, of unit 1 of Text book 1 and concepts from Text book 2)

UNIT -IV

Eigen Values-Eigen Vectors: Introduction, Basic concepts, Eigen Values and Eigen Vectors.(Sections 2.0,2.1,2.2 of unit 2 of Text book 1)

UNIT -V

Eigen Values-Eigen Vectors: Cayley Hamilton Theorem with proof, and its applications.(Sections 2.4 of unit 2 of Text book 1).

PRESCTIBED TEXT BOOK:

[1] "A text book of Engineering Mathematics-III" , N.P Bali & Dr.K.L. Sai Prasad. First edition 2018, University science press, New Delhi.

[2] " Higher Engineering Mathematics", B. S. Grewal, 40th Edition, 2007, Khanna Publishers, New Delhi.

REFERENCE BOOKS:

Course has Focus on :Foundation (Elective Paper)

Websites of Interest : 1. www.nptel.ac.in

2. www.epgp.inflibnet.ac.in

3. www.ocw.mit.edu

P B SIDDHARTHA COLLEGE OF ARTS AND SCIENCE::VIJAYAWADA

(An Autonomous College in the Jurisdiction of Krishna University)

M.Sc. Mathematics

Fourth Semester

**Open elective
MATRIX THEORY – 22OE3MA1**

Time:3 hours

Max. Marks: 70

SECTION A

Answer all questions.

(5x4=20)

1 a) Prove that $A^3 - 4A^2 - 3A + 11I = 0$, where $A = \begin{bmatrix} 1 & 3 & 2 \\ 2 & 0 & -1 \\ 1 & 2 & 3 \end{bmatrix}$ (CO1, L2)

(OR)

b) Determine the rank of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{bmatrix}$ (CO1,L2)

2 a)Find the inverse of the matrix $A = \begin{bmatrix} 2 & -1 \\ 1 & 3 \end{bmatrix}$ (CO2,L3)

(OR)

b) For the matrix $A = \begin{bmatrix} 1 & 1 & 2 \\ 1 & 2 & 3 \\ 0 & -1 & -1 \end{bmatrix}$, find non-singular matrices P and Q such that PAQ

is in the normal form. (CO2,L3)

3 a) Solve the equations $x+2y+3z=0$, $3x+4y+4z=0$, $7x+10y+12z=0$. (CO3,L3)

(OR)

b) Find the values of μ and λ so that the equations $2x+3y+5z=9$, $7x+3y-2z=8$, $2x+3y+\lambda z=\mu$ have no solution. (CO3, L3)

4 a) Find the eigen values and eigen vectors of the matrix $A = \begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$ (CO4,L4)

(OR)

b) Find the characteristic equation of the matrix $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$ (CO4,L4)

5 a) Verify Cayley Hamilton theorem for the matrix $A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$. (CO5, L2)

(OR)

b) Using Cayley Hamilton theorem find the inverse of $A = \begin{bmatrix} 5 & 3 \\ 3 & 2 \end{bmatrix}$ (CO5, L2)

SECTION B

Answer the following questions. (5X10=50)

6 a) Find the solutions of the system of equations

$$x_1 - x_2 + 2x_3 = 1,$$

$$2x_1 + 2x_3 = 1,$$

$x_1 - 3x_2 + 4x_3 = 2$ and describe explicitly all solutions. (CO1, L2)

(OR)

b) Find the rank of the matrix $A = \begin{bmatrix} 1 & 2 & -3 \\ 2 & 1 & 0 \\ -2 & -1 & 3 \\ -1 & 4 & -2 \end{bmatrix}$ (CO1, L2)

7 a) Reduce the matrix $A = \begin{bmatrix} 6 & 3 & -4 \\ -4 & 1 & -6 \\ 1 & 2 & -5 \end{bmatrix}$ into row reduced echelon form. (CO2, L3)

(OR)

b) Reduce the matrix $A = \begin{bmatrix} 1 & 1 & 0 & 1 \\ 0 & -2 & 4 & 0 \\ 0 & 3 & -1 & 0 \\ 0 & 1 & -2 & 1 \end{bmatrix}$ into normal form. (CO2, L2)

8 a) Solve the system of equations $x+y-2z=0$, $2x-3y+z=0$, $x-4y+2z=0$. (CO3, L3)

(OR)

b) Solve the system of equations $x+y+2z=9$, $2x+4y-3z=1$, $3x+6y-5z=0$ using Gauss elimination method. (CO3, L3)

9 a) Find the eigen values and eigen vectors of the matrix $A = \begin{bmatrix} 1 & 2 & -1 \\ 1 & 0 & 1 \\ 4 & -4 & 5 \end{bmatrix}$ (CO4, L3)

(OR)

b) Find the eigen values and eigen vectors of the matrix $A = \begin{bmatrix} 0 & 1/2 \\ 1/2 & 0 \end{bmatrix}$ (CO4, L3)

10 a) State and prove the Cayley-Hamilton theorem. (CO5, L3)
(OR)

b) Using Cayley Hamilton theorem find the inverse of $A = \begin{bmatrix} 7 & -1 & 3 \\ 6 & 1 & 4 \\ 2 & 4 & 8 \end{bmatrix}$. (CO5, L3)
