

<b>COURSE TITLE</b>	<b>MATHEMATICS FOR DATA SCIENCE</b>
<b>COURSE CODE</b>	<b>01AS0102</b>
<b>COURSE CREDITS</b>	<b>5</b>

**Objective:**

- 1 This subject aims to provide fundamentals of Linear Algebra using matrix operations and applications of Linear Algebra through Python. The topics delivered in this course are essential for the learners of Computer Engineering, Information Technology and Artificial Intelligence.

**Course Outcomes:** After completion of this course, student will be able to:

- 1 Understand concepts of Matrix and Determinant and its applications
- 2 Identify the conversion of real life problems into system of linear equations and solve them through several matrix methods
- 3 Apply the concepts of Eigen value and Eigen Vectors to Diagonalization and Quadratic form
- 4 Apply Linear Algebra in Image Processing and Cryptography through Python

**Pre-requisite of course:** Basic Matrix Operations and Determinant

**Teaching and Examination Scheme**

<b>Theory Hours</b>	<b>Tutorial Hours</b>	<b>Practical Hours</b>	<b>ESE</b>	<b>IA</b>	<b>CSE</b>	<b>Viva</b>	<b>Term Work</b>
4	0	2	50	30	20	25	25

<b>Contents : Unit</b>	<b>Topics</b>	<b>Contact Hours</b>
1	<b>Matrix and Determinant</b> Types of Matrices and its properties, Row echelon form, Reduced row echelon form, Rank by row operation, Inverse of Matrix by row operation, Determinant, Rank by determinant, Inverse of matrix by Adjoint method	12
2	<b>System of Linear Equations</b> Homogeneous and Non-homogeneous system of Linear equations, Methodology of Gauss-elimination and Gauss-Jordan-elimination, Cramer's Rule, Solution of a system through L-U Decomposition, Consistency of a system of Linear equations	12
3	<b>Eigen Values and Eigen Vectors</b> Eigen values and Eigen vectors of a matrix, Algebraic Multiplicity and Geometric Multiplicity, Similarity of two matrices and Diagonalization, Cayley - Hamilton theorem, Quadratic form, Index, Signature and nature	13

<b>Contents : Unit</b>	<b>Topics</b>	<b>Contact Hours</b>
4	<b>Applications of Linear Algebra through Python</b> Basic Syntax of Python, Representation and operations on different types of Matrices through Python, asics of Computer graphics and Image processing using matrix algebra, Basics of Cryptography (Coding- Decoding) through direct Python code	8
<b>Total Hours</b>		<b>45</b>

### Suggested List of Experiments:

<b>Contents : Unit</b>	<b>Topics</b>	<b>Contact Hours</b>
1	<b>Experiment -1</b> Experiment 1 from Matrix and Determinant	2
2	<b>Experiment -2</b> Experiment 2 from Matrix and Determinant	2
3	<b>Experiment -3</b> Experiment 3 from Matrix and Determinant	2
4	<b>Experiment -4</b> Experiment 4 from Matrix and Determinant	2
5	<b>Experiment -5</b> Experiment 5 from System of Linear Equations	2
6	<b>Experiment -6</b> Experiment 6 from System of Linear Equations	2
7	<b>Experiment -7</b> Experiment 7 from System of Linear Equations	2
8	<b>Experiment -8</b> Experiment 8 from System of Linear Equations	2
9	<b>Experiment -9</b> Experiment 9 from Eigen Values and Eigen Vectors	2
10	<b>Experiment -10</b> Experiment 10 from Eigen Values and Eigen Vectors	2
11	<b>Experiment -11</b> Experiment 11 from Eigen Values and Eigen Vectors	2
12	<b>Experiment -12</b> Experiment 12 from Applications of Linear Algebra through Python	2
13	<b>Experiment - 13</b> Experiment 13 from Applications of Linear Algebra through Python	2
14	<b>Experiment - 14</b> Experiment 14 from Applications of Linear Algebra through Python	2
<b>Total Hours</b>		<b>28</b>

### Textbook :

- 1 Introduction to Linear Algebra with Application , Jim Defranza & Daniel Gagliardi , Tata McGrew Hill , 2015

**Textbook :**

- 2 Elementary Linear Algebra, Applications version , Anton and Rorres , Wiley India Edition , 2018
- 3 Linear Algebra, Ron Larson , Cengage Learning , 2016
- 4 Linear Algebra and its Applications , David C. Lay , Pearson Education , 2023
- 5 Numerical Python , Robert Johnsson , Apress Publication, 2018

**Suggested Theory Distribution:**

The suggested theory distribution as per Bloom’s taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
<b>Remember / Knowledge</b>	<b>Understand</b>	<b>Apply</b>	<b>Analyze</b>	<b>Evaluate</b>	<b>Higher order Thinking / Creative</b>
10.00	20.00	40.00	10.00	10.00	10.00

**Instructional Method:**

- 1 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc
- 2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room
- 3 Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory
- 4 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory