

NEPCBCS 2023-24

Mathematics



**M. C. E. Society's**

**Abeda Inamdar Senior College**

Of Arts, Science and Commerce, Camp, Pune-1

(Autonomous) Affiliated to SavitribaiPhule Pune University

NAAC accredited 'A' Grade

**Faculty of Science & Technology**

**Choice Based Credit System Syllabus**

**To be implemented from the academic year 2024-2025**

**Semester III (CBCS – Autonomy 2023 Pattern)**

**S.YB.Sc.(Computer Science) Mathematics**

<b>Course Objectives</b>	
<b>1.</b>	To give the students sufficient knowledge of fundamental principles, methods, and a clear perception of in numerous power of mathematical ideas and tools and know-how to use them by modeling, solving, and interpreting
<b>2.</b>	To reflect the broad nature of the subject and developing mathematical tools for continuing further study in various fields of science and technology.
<b>3.</b>	To Enhance students' overall development and to equip them with mathematical modeling abilities, problem-solving skills, creative talent, and power of communication necessary for various kinds of employment.
<b>4.</b>	To enable students to develop a positive attitude towards mathematics as an the interesting and valuable subject of study.

<b>Course Outcome</b>	
<b>1.</b>	A student should be able to recall basic facts about mathematics and should be able to display knowledge of conventions such as notations, terminology and recognize basic geometrical figures and graphical displays, and state important facts resulting from their studies.
<b>2.</b>	A student should get a relational understanding of mathematical concepts and concerned structures and should be able to follow the patterns involved, mathematical reasoning
<b>3.</b>	A student should get adequate exposure to global and local concerns that explore many aspects of Mathematical Sciences.
<b>4.</b>	A student must be able to apply their skills and knowledge, that is, translate information presented verbally into mathematical form, select and use appropriate mathematical formulae or techniques to process the information, and draw the relevant conclusion.
<b>5.</b>	A student should be made aware of the history of mathematics and hence of its past, present, and future role as part of our culture.

<b>Course Title</b>	Mathematics for Artificial Intelligence -II	
<b>Course Code:23SBCS31MNA</b>		<b>No. of Credits:2</b>
<b>Course Type: Minor</b>		<b>Total Teaching Hours:30</b>

### Syllabus

Syllabus		
<b>Unit I</b>	<b>Introduction</b>	<b>06</b>
	1. Matrix Operations	02
	2. The Inverse of a Matrix	02
	3. Row reduction and Echelon forms	02
<b>Unit II</b>	<b>Linear Equations-I</b>	<b>06</b>
	1. System of Linear equations	02
	2. Solution of system of Linear Equations	04
<b>Unit III</b>	<b>Linear Equations-II</b>	<b>12</b>
	1. Vectors in $\mathbb{R}^n$	01
	2. Linear combination of vectors in $\mathbb{R}^n$	02
	3. Null Space and Column Space of a matrix	02
	4. Dimension and Rank	02
	5. Linear Dependence or Independence	02
	6. Linear transformation	03
<b>Unit IV</b>	<b>Determinants</b>	<b>06</b>
	1. Introduction to determinants	02
	2. Properties of determinants	02
	3. Cramer's rule, Area and Volume	02

Suggested Readings	
<b>1.</b>	Linear Algebra and its Applications, David C Lay, Steven R. Lay, Judi J. MacDonald Pearson Publication, 2016, Fifth Edition.
<b>2.</b>	Elementary Linear Algebra with supplemental Applications, Howard Anton and others, Wiley Student Edition.

### Web Reference:

- <http://math.mit.edu/~gs/linearalgebra/>
- <http://www.freebookcentre.net/maths-books-download/Linear-Algebra-A-free-Linear-Algebra-Textbook-and-Online-Resource.html>

<b>Course Title</b>	Mathematics Practical-II	
<b>Course Code:23SBCS32MNA</b>		<b>No.of Credits:2</b>
<b>Course Type: Minor</b>		<b>Total Teaching Sessions: 10</b>

<b>Sr. No</b>	<b>Syllabus</b>	<b>No. of Practical</b>
<b>1</b>	<b>Introduction to Scilab</b>	<b>2</b>
	1. Basic syntax 2. Mathematical Operators 3. Complex numbers 4. Polynomials 5. Built-in functions	
<b>2</b>	<b>Operations on Matrices</b>	<b>2</b>
	1. Matrix construction 2. Algebraic operations on Matrices 3. Accessing rows and columns 4. Determinant and inverse of a matrix 5. Reduced row echelon form, Rank of a matrix 6. Solving systems of linear equations	
<b>3</b>	<b>User-defined functions</b>	<b>1</b>
	1. 'deff' command	
<b>4</b>	<b>Plotting graphs using Scilab</b>	<b>1</b>
	1. 2-D graph 2. 3-D graph	
<b>5</b>	<b>Written Practical Based on Unit I:23SBCS31MNA</b>	<b>1</b>
<b>6</b>	<b>Written Practical Based on Unit II:23SBCS31MNA</b>	<b>1</b>
<b>7</b>	<b>Written Practical Based on Unit III:23SBCS31MNA</b>	<b>1</b>
<b>8</b>	<b>Written Practical Based on Unit IV:23SBCS31MNA</b>	<b>1</b>

<b>Course Title</b>	Mathematics for Artificial Intelligence-III	
<b>Course Code:23SBCS41MNA</b>		<b>No. of Credits:2</b>
<b>Course Type: Minor</b>		<b>Total Teaching Hours:30</b>

### Syllabus

<b>Syllabus</b>		
<b>Unit I</b>	<b>Eigenvalues and Eigen vectors</b>	<b>06</b>
	1. The characteristic equation	01
	2. Eigenvalues and Eigenvectors	02
	3. Diagonalization	03
<b>Unit II</b>	<b>Orthogonality</b>	<b>08</b>
	1. Inner product	01
	2. Length and orthogonality	02
	3. Orthogonal sets and Orthonormal sets	02
	4. Orthogonal projections	01
	5. Gram Schmidt's Process	02
<b>Unit III</b>	<b>Two-Dimensional Transformation</b>	<b>08</b>
	1. Representation of points	01
	2. Transformations and matrices(Scaling, Shearing, Reflection, Rotation)	02
	3. Combined transformations/ Concatenation	02
	4. Transformation of straight lines	02
	i. Midpoint Transformation	
	ii. Transformation of parallel lines	
	iii. Transformation of intersecting line	
	5. Homogeneous coordinates and Translation	01
<b>Unit IV</b>	<b>Concepts of Statistics and Probability</b>	<b>08</b>
	1. Measures of central tendency	02
	2. Measures of dispersion: Range, Variance, Standard Deviation	
	3. Events and Sample Spaces	03
	4. Concept of Probability	
	5. Conditional Probability, Bayes' theorem (without proof).	03

## Suggested Readings

<b>1.</b>	Linear Algebra and its Applications, David C Lay, Steven R. Lay, Judi J. MacDonald Pearson Publication, 2016, Fifth Edition.
<b>2.</b>	D. F. Rogers, J. A. Adams, Mathematical elements for Computer graphics, McGraw Hill Intl Edition.
<b>3.</b>	Statistical Methods, S.P. Gupta, Sultan Chand and Sons Educational Publisher
<b>4.</b>	Fundamentals of Statistics. Vol I, A.M. Goon, M.K. Gupta, B. Das Gupta, World press

### Web Reference:

1. <http://math.mit.edu/~gs/linearalgebra/>

2.

<http://www.freebookcentre.net/maths-books-download/Linear-Algebra-A-free-Linear-Algebra-Textbook-and-Online-Resource.html>

3. <https://www.youtube.com/watch?v=DPcVMEBDpAY>

4. [https://www.youtube.com/watch?v=55JDox30\\_Fk](https://www.youtube.com/watch?v=55JDox30_Fk)

5. <https://open.umn.edu/opentextbooks/textbooks/459>

<b>Course Title</b>	Mathematics Practical-III	
<b>CourseCode:23SBCS42MNA</b>		<b>No. of Credits:2</b>
<b>Course Type: Minor</b>		<b>Total Teaching Sessions: 10</b>

<b>Sr. No</b>	<b>Syllabus</b>	<b>No. of Practical</b>
<b>1</b>	<b>Introduction to Python</b>	<b>1</b>
	<ol style="list-style-type: none"> <li>1. Values and types: int, float and str,</li> <li>2. Variables: assignment statements, printing variable values, types of variables.</li> <li>3. Operators, operands and precedence:+, -, /, *, **, % PEMDAS(Rules of precedence)</li> <li>4. String operations: + : Concatenation, * :Repetition</li> <li>5. Boolean operator: <ol style="list-style-type: none"> <li>i. Comparison operators: ==,! =, &gt;, =,&lt;=</li> <li>ii. Logical operators: and, or, not</li> </ol> </li> <li>6. Mathematical functions from math, cmath modules.</li> </ol>	
<b>2</b>	<b>Two &amp; Three Dimensional Plots</b>	<b>1</b>
	<ol style="list-style-type: none"> <li>1. Installation of numpy, matplotlib packages</li> <li>2. Two dimensional plots <ol style="list-style-type: none"> <li>i. Legends , labels and titles</li> <li>ii. Setting colors, line width , line style</li> <li>iii. Subplots</li> <li>iv. Text annotation</li> </ol> </li> <li>3. Three-dimensional Plots</li> </ol>	
<b>3</b>	<b>Linear Algebra Using Python</b>	<b>2</b>
	<ol style="list-style-type: none"> <li>1. Matrix construct, eye(n), zeros(n,m),diagonal matrices</li> <li>2. Addition, Subtraction, Multiplication, scalar multiplication of matrices, powers and inverse of a matrix.</li> <li>3. Accessing Rows and Columns, Deleting and Inserting Rows and Columns</li> <li>4. Determinant, reduced row echelon form, null space, column space, Rank of a matrix</li> <li>5. Solving systems of linear equations</li> <li>6. Eigenvalues, Eigenvectors</li> </ol>	
<b>4</b>	<b>Two Dimensional transformation Using Python</b>	<b>2</b>
	<ol style="list-style-type: none"> <li>1. Points</li> <li>2. Lines, rays, and line segments:</li> <li>3. Polygon</li> <li>4. Triangles</li> <li>5. Two dimensional Transformation</li> </ol>	

<b>5</b>	<b>Problems Based on Unit I:23SBCS41MNA</b>	<b>1</b>
<b>6</b>	<b>Problems Based on Unit II:23SBCS41MNA</b>	<b>1</b>
<b>7</b>	<b>Problems Based on Unit III:23SBCS41MNA</b>	<b>1</b>
<b>8</b>	<b>Problems Based on Unit IV:23SBCS41MNA</b>	<b>1</b>

<b>Suggested Readings</b>	
<b>1.</b>	How to think like a Computer Scientist: Learning with Python, Downey, A. et al., John Wiley, 2015. Sections: 1, 2, 3
<b>2.</b>	Introduction to Scientific Computing in Python, Robert Johansson, Section: 4
<b>3.</b>	Python Programming: An Introduction to Computer Science, Zelle, J., Franklin, Beedle & Associates Inc.