CBCS Syllabus as per NEP 2020 for M.Sc. II (2023 Pattern)

Name of the Programme : M.Sc. (Mathematics)

Program Code : PSMAT

Class : M.Sc.

Semester : III

Course Type : Skill development Course

Course Name : Scilab Programming

Course Code : MAT-631-SDC

No. of Lectures : 30

No. of Credits : 2

Course Objectives:

1. To develop proficiency in using fundamental Scilab commands for matrix operations, basic arithmetic, and array manipulations.
2. To develop a comprehensive understanding of basic and advanced matrix operations, including addition, multiplication, and inversion, and apply these operations to solve practical problems in Scilab.
3. Utilize Scilab to find solutions for systems of linear equations using various numerical methods and techniques, and interpret the results effectively.
4. Learn to calculate and interpret eigenvalues and eigenvectors of matrices using Scilab, and understand their significance in various applications, such as stability analysis and matrix diagonalization.
5. Acquire skills in matrix diagonalization, including the process and its implementation in Scilab, and understand its applications in simplifying complex matrix operations.
6. To Create and analyze 2-D and 3-D graphs in Scilab to visualize data, understand graphical representations, and interpret results to draw meaningful conclusions.

7. To develop and refine programming skills in Scilab for implementing numerical methods, including polynomial operations and custom functions, to solve a variety of mathematical and engineering problems.

Course Outcomes:

By the end of the course, students will be able to:

CO1: To perform a variety of matrix operations, including addition, multiplication, inversion, and transposition, and apply these techniques to solve problems involving matrices.

CO2: To demonstrate the ability to solve systems of linear equations using Scilab, including understanding and implementing methods for solving such systems..

CO3: To apply the Newton-Raphson methods to find approximates solutions to nonlinear equations and assess the accuracy and efficiency of the method in Scilab.

CO4: To compute eigenvalues and eigenvectors for given matrices, interpret their significance, and apply these concepts in various mathematical and engineering contexts.

CO5: Students will understand and apply matrix diagonalization techniques to simplify matrix operations and solve related problems using Scilab.

CO6: Students will be able to create and analyze 2-D and 3-D graphs to visualize data and interpret graphical results effectively, enhancing their ability to present and analyze data graphically.

CO7: Students will develop programming skills in Scilab for implementing numerical methods and polynomial operations, including solving practical problems through custom scripts and functions.

Topics and Learning Points

Teaching Hours

Unit 1: Introduction to Scilab **[10 Lectures]**

1.1 Installation

1.2 Introduction and overview

1.3 Some basic Commands

1.4 Matrix operations

1.5 System of Linear Equation

1.6 Elementary row and Column operation

1.7 Calculation of Eigen value and Eigen vector

1.8 Diagonalization

Unit 2: Revision of Scilab with some basic commands **[8 Lectures]**

2.1 Size, Length, eye, ones, rand, zeros, etc

2.2 Operations on functions

2.3 'Deff' command for one and two variable functions

Unit 3: Graph Presentations **[8 Lectures]**

3.1 Graphs of some standard function

3.2 The 2-D and 3-D Graphs

3.3 Color Graphs

Unit 4: Scilab Programming for Numerical Methods **[4 Lectures]**

4.1 Newton Raphson Method

4.2 Operations on Polynomial

Mapping of Program Outcomes with Course Outcomes

Class: M.Sc.-II (Sem III) **Subject:** Mathematics

Course: Scilab Programming **Course Code:** MAT-631-SDC

Weightage: 1= weak or low relation, 2= moderate or partial relation, 3= strong or direct relation

	Programme Outcomes (POs)									
Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10
CO 1	2	2	-	2	-	-	1	-	-	2
CO 2	2	2	-	2	-	-	1	-	-	1
CO 3	2	3	-	1	2	-	1	-	-	1
CO 4	2	2	-	1	2	-	1	-	-	-
CO 5	2	2	-	1	-	-	1	-	-	-
CO 6	2	1	-	1	-	2	1	-	-	-
CO 7	2	1	-	1	-	-	1	-	-	1

Justification for the mapping

PO1: Comprehensive Knowledge and Understanding:

CO1: Understanding of various matrix operations, their theoretical aspects.

CO2: Knowledge of methods for solving linear equations.

CO3: Theoretical understanding of the Newton-Raphson method.

CO4: Knowledge of eigenvalues and eigenvectors.

CO5: Understanding of matrix diagonalization.

CO6: Understanding of graphical representation of data.

CO7: Knowledge of programming concepts in Scilab.

PO2: Practical, Professional, and Procedural Knowledge:

CO1: Practical application of matrix operations.

CO2: Practical skills in solving systems of linear equations.

CO3: Practical application of the Newton-Raphson method.

CO4: Practical skills in computing eigenvalues and eigenvectors.

CO5: Practical application of matrix diagonalization techniques.

CO6: Practical skills in creating and analyzing graphs.

CO7: Practical programming skills and application of numerical methods.

PO3: Entrepreneurial Mindset, Innovation, and Business Understanding

No specific COs directly map to this PO in the provided content.

PO4: Specialized Skills, Critical Thinking, and Problem-Solving

CO1: Application of specialized matrix operations for problem-solving.

CO2: Specialized problem-solving in linear systems.

CO3: Critical thinking in evaluating numerical method efficiency.

CO4: Problem-solving using eigenvalues and eigenvectors.

CO5: Critical problem-solving through diagonalization.

CO6: Specialized problem-solving through graphical data analysis.

CO7: Specialized problem-solving through programming.

PO5 Research, Analytical Reasoning, and Ethical Conduct:

CO3: Research and analysis of the efficiency of the Newton-Raphson method.

CO4: Analytical reasoning in interpreting eigenvalues.

PO6 Communication, Collaboration, and Leadership:

CO6: Effective communication of graphical results.

PO7: Digital Proficiency and Technological Skills:

CO1: Use of Scilab for performing matrix operations.

CO2: Use of Scilab for solving linear equations.

CO3: Use of Scilab for implementing the Newton-Raphson method.

CO4: Use of Scilab for calculating eigenvalues and eigenvectors.

CO5: Use of Scilab for matrix diagonalization.

CO6: Use of Scilab for creating and analyzing graphs.

CO7: Use of Scilab for programming and solving numerical problems.

PO8: Multicultural Competence, Inclusive Spirit, and Empathy

No specific COs directly map to this PO in the provided content.

PO9: Value Inculcation, Environmental Awareness, and Ethical Practices

No specific COs directly map to this PO in the provided content.

PO10: Autonomy, Responsibility, and Accountability:

CO1: Responsibility in performing accurate matrix operations.

CO2: Responsibility in solving and interpreting linear systems.

CO3: Responsibility in applying and assessing the Newton-Raphson method.

CO7: Responsibility in developing and using programming solutions.

CBCS Syllabus as per NEP 2020 for M.Sc. II (2023 Pattern)

Name of the Programme : M.Sc. (Mathematics)

Program Code : PSMAT

Class : M.Sc.

Semester : IV

Course Type : Skill development Course

Course Name : LaTex for Scientific Writing

Course Code : MAT-691-SDC

No. of Lectures : 30

No. of Credits : 2

Course Objectives:

8. Students will be able to define LaTeX and explain its purpose, history, and basic installation process.
9. Students will learn to structure a LaTeX document; including creating simple LaTeX input file and compiling it.
10. Students will gain proficiency in LaTeX syntax and commands essential for creating formatted documents.
11. Students will be able to format text, including applying different font styles and colors, both in text mode and math mode.
12. Students will learn to organize and structure complex documents using sectioning, labeling, and referring to numbered items.
13. Students will be equipped to manage advanced features such as text alignment, quoting, and listing/tabbing texts.
14. Students will learn to create and format tables using the tabular environment, including the use of lines, the array package, and vertical positioning.

Course Outcomes:

By the end of the course, students will be able to:

CO1: To demonstrate the ability to use LaTeX to create well-structured and formatted documents, showcasing an understanding of its syntax and structure.

CO2: To format text and mathematical content appropriately, including the application of different fonts and colors.

CO3: Students will effectively organize documents with sections, labels, and references, ensuring clarity and consistency in their work.

CO4: To manage text alignment and quoted text accurately, enhancing the readability and presentation of their documents.

CO5: Students will use LaTeX to create and format lists and tabs, improving document organization and readability.

CO6: Students will be proficient in creating and formatting tables, including drawing lines and using advanced features from packages like array.

CO7: Students will effectively handle the vertical positioning of tables in documents, ensuring proper layout and alignment.

Topics and Learning Points

Teaching Hours

Unit 1: Introduction **[8 Lectures]**

1.1 What is LaTex

1.2 History

1.3 Getting started with LaTex: Installation

1.4 Document structure

1.5 Compile a LaTex Input file

1.6 LaTex Syntax

Unit 2: Formatting Words, Lines and Paragraphs **[8 Lectures]**

2.1 Text and Math mode fonts

2.2 Emphasized Fonts

2.3 Colored Fonts

Unit 3: To Deal with Complicating Features in a Documents [10 Lectures]

3.1 Sectioning

3.2 Labeling and Referring Numbered Items

3.3 Text Alignment

3.4 Quoted Texts

3.5 Listing and Tabbing Texts

Unit 4: Table Preparation [4 Lectures]

4.1 Table through the tabular Environment

4.2 Drawing lines in tables

4.3 Use of Array Package

4.4 Vertical Positioning of Tables

Mapping of Program Outcomes with Course Outcomes

Class: M.Sc.-II (Sem IV) **Subject:** Mathematics

Course: LaTex for Scientific Writing **Course Code:** MAT-691-SDC

Weightage: 1= weak or low relation, 2= moderate or partial relation, 3= strong or direct relation

	Programme Outcomes (POs)									
Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10
CO 1	2	2	1	-	-	-	1	-	-	-
CO 2	2	2	-	-	-	-	1	-	-	-
CO 3	-	3	-	2	-	2	-	-	-	-
CO 4	-	2	-	2	-	-	1	-	-	-
CO 5	-	2	2	1	-	-	1	-	-	-
CO 6	2	1	2	-	-	2	1	-	-	-
CO 7	2	1	2	-	-	-	1	-	-	-

Justification for the mapping

PO1: Comprehensive Knowledge and Understanding:

CO1, CO2, CO6, CO7: These COs require a deep understanding of LaTeX's syntax, structure, and advanced features, demonstrating comprehensive knowledge.

PO2: Practical, Professional, and Procedural Knowledge:

CO1: Practical skills in LaTeX are crucial for creating well-structured documents. Understanding LaTeX syntax and structure involves practical application, making it a core aspect of procedural knowledge.

CO2: Formatting text and mathematical content with LaTeX involves hands-on skills and understanding of LaTeX's formatting options, which directly relates to professional and procedural knowledge.

CO3: Organizing documents with sections, labels, and references requires practical skills in using LaTeX to ensure clarity and consistency, demonstrating procedural knowledge in document management.

CO4: Managing text alignment and quoted text accurately involves practical application of LaTeX commands to enhance readability, showcasing professional and procedural skills.

CO5: Creating and formatting lists and tabs in LaTeX involves practical application of LaTeX tools to improve document organization, reflecting procedural and professional knowledge.

CO6: Proficiency in creating and formatting tables, including advanced features like drawing lines and using packages, demonstrates both practical and professional skills in LaTeX.

CO7: Effective handling of vertical positioning of tables involves practical skills in layout management, showcasing procedural knowledge in document formatting.

PO3: Entrepreneurial Mindset, Innovation, and Business Understanding

CO1: Mastery of LaTeX demonstrates an innovative approach to document preparation. By using advanced tools, students showcase their readiness to adopt and leverage technology in a business context, reflecting an entrepreneurial mindset.

CO5: The ability to create and format lists and tabs in LaTeX demonstrates practical skills in document organization. In business, well-organized documents are essential for clarity and efficiency, reflecting an innovative approach to information presentation.

CO6: Proficiency in advanced table formatting, including the use of LaTeX packages, shows the ability to handle complex data presentations innovatively. This skill is valuable in business contexts where detailed and well-organized data is required for analysis and decision-making.

CO7: Handling the vertical positioning of tables demonstrates a detailed understanding of document layout and alignment. This skill is crucial for producing professional-quality documents in business, where precise formatting is essential for clarity and effectiveness.

PO4: Specialized Skills, Critical Thinking, and Problem-Solving

CO3, CO4, CO5: These COs involve critical thinking and problem-solving in organizing and formatting documents effectively.

PO6: Communication, Collaboration, and Leadership:

CO3: Effective document organization improves communication and can be critical in collaborative and leadership scenarios.

PO7: Digital Proficiency and Technological Skills:

CO1, CO2, CO4, CO5, CO6, CO7: These COs require advanced LaTeX skills, showcasing proficiency in digital tools and technological capabilities.

PO8: Multicultural Competence, Inclusive Spirit, and Empathy

No specific COs directly map to this PO in the provided content.

PO9: Value Inculcation, Environmental Awareness, and Ethical Practices

No specific COs directly map to this PO in the provided content.