Interdisciplinary Course
Python for Mathematics

Semester: II **Hours of Instructions / Week :4**
25MAII02 **No. of Credits :4**

Course Objectives:

1. To understand the fundamentals of Python, including its benefits and applications.
2. To Implement various data types, data structures and constants in Python.
3. To Apply interpolation techniques, including Lagrangian polynomials and Newton's forward and backward differences.

Unit I: Introduction to Python : Data Types and Structures **-10Hrs**

Introduction – Python Integrated Development Environment - Python Benefits and Applications - Software Installation - Anaconda and Jupyter Notebook - Introduction to Data Types - Introduction to Data Structures - Introduction to Constants.

Unit II: Python Fundamentals: Operators, Arrays, and Matrice **-12Hrs**

Introduction – Arithmetic Operators – Assignment Operator – Comparison Operator - Logical Operator – Identity Operator – Membership Operator - Bitwise Operator - Python Precedence – Introduction to Arrays – Array Creation – Accessing Array Elements – Array Slicing - Array Shape and Reshaping - Array Join - Array Split - Array Search - Array Sort - Introduction Matrix - Creating a Matrix - Accessing Matrices - Matrix Multiplication - Matrix Deletion.

Unit III: Python for Numerical Analysis: Vectors, Functions, and Equations **-14Hrs**

Introduction - Vector Creation - Vector Operations - Functions: Mathematical Functions - Numeric and Numbers Representation - Power and Logarithmic Functions –Triangular Functions - Angular Conversion Functions - Hyperbolic Functions –Introduction to Special Functions. Solution of Equations and Eigen value Problems -Linear Interpolation Method - Newton's Method - Gaussian Elimination Method - Gauss Jordan Method - Gauss Jacobi Method - Gauss Seidel Method - Inverse of Matrix by Gauss Elimination Method – Eigen Value of a Matrix by Power Method.

Unit IV: Numerical Analysis and Mathematical Modeling with Python **-12Hrs**

Numerical Introduction - Lagrangian Polynomials – Divided Difference – Newton Forward Difference – Newton Backward Difference - Newton-cote's formula –Trapezoidal Rule-Simpson's One-Third Rule - Simpson's Three-Eighths Rule - Romberg's Method - Initial Value Problems for Ordinary Differential Equations - Set Theory.

Unit V: Computational Mathematics and Data Visualization with Python -12Hrs

Introduction to Probability Distribution –Normal Distribution Function-Binomial Distribution-Poisson Distribution – Exponential Distribution – Geometrical Distribution-Introduction to Python Packages for Mathematics – Introduction to Data Visualization – Matplotlib – Line Chart - Bar Chart - Histogram - Scatter Plot - Pie Chart - Multiple Plots - Customizing the Plots.

Total Hours:60

Reference Books:

1. Explore Python for Mathematics, Prof.P.Subashini, Dr.N.Balamani, Dr.R.Janani (2024)
2. Python Programming for Mathematics, Julien Guillod, First edition (2025).
3. Python for Mathematics, Vincent Knight, First edition (2025).
4. Exploring University Mathematics with Python, SiriChongchitnan, (2023).

E-Learning Resources:

1. https://oxmmscpython.github.io/?utm_source=chatgpt.com
2. https://www.udemy.com/course/math-with-python/?utm_source=chatgpt.com&couponCode=NVDIN35
3. https://www.classcentral.com/course/udemy-math-with-python-42777?utm_source=chatgpt.com

Course Outcomes:

CO1: Understand the basics of Python programming.
CO2: Use Python for mathematical computations.
CO3: Enhance knowledge on Visualize mathematical data.
CO4: Explore mathematical concepts using Python
CO5: Apply Python to real-world mathematical problems