

Kuvempu University
Bachelor of Science (B.Sc.) Semester Scheme
Curriculum Structure for Under Graduate Programme for 2025-26
Syllabus for Mathematics (Skill)
SEMESTER-IV

Sl No	Course /Paper Code	Title of the Paper	Subject Category	Teaching Hours per week	Semester End Exam	Internal Assessment	Total Marks	Credits	Examination Duration
SEMESTER-IV									
1	Mathematics Skill-1	24MATH CPS-1		04	40	10	50	02	3 Hrs

MATHEMATICS PRACTICAL KNOWLEDGE/SKILL-1
SEMESTER – IV

24MATHCPS-1: Mathematics Skill-1
Solution of Mathematical Problems Using Python

Practical Hours: 4 Hours/Week

Credits: 2

Total Practical Hours: 56 Hours

Max. Marks: 50

Course Learning Objectives:

- Understand Mathematical Concepts Computationally.
- Learn to apply Python Programming to Solve Mathematical Problems.
- Analyse and Visualise Mathematical Results
- Understand the basic steps of solving a given problem

Course Outcomes: This course will enable the students to

- Verify and Validate Mathematical solutions
- Acquire the knowledge of Matrices through FOSS tools

Part I:

Introduction to Python:

Introduction to Features and Applications of Python, Python Versions, Installation of Python, Python IDEs, Simple Python Program. Comments, Indentation. Identifiers, Variables, Operators, Precedence and Association.

Python Libraries: Importing Libraries, installing new packages.

Libraries overview - NumPy, Pandas, Matplotlib.

Built-in Data Type - int, float, complex. Type Conversions

Built-in Functions- Console Input and Console Output.

Strings, Statements-if, else, elif, nested if, while loop, break, continue statements, for loop Statement

Part II:

A. Basic Python Programs

1. Add two numbers
2. Maximum of two numbers
3. Factorial of a number
4. Find simple interest
5. Find the area of a Rectangle
6. Find area of a circle
7. Print all Prime numbers in an Interval

B. Matrix Programs

8. Adding and Subtracting Matrices
9. Multiplication of matrices
10. Transpose of a Matrix
11. Matrix creation of $n \times n$
12. Get k^{th} column of matrix

References:

1. Think Python How to Think Like a Computer Scientist, Allen Downey et al., 2nd Edition,
2. Introduction to Python Programming, Gowrishankar S et al., CRC Press, 2019.
3. Python Data Analytics: Data Analysis and Science Using Pandas, matplotlib, and the Python
4. Advanced Core Python Programming, MeenuKohli, BPB Publications, 2021.
5. Core PYTHON Applications Programming, Wesley J. Chun, 3rd Edition, Prentice Hall, 2012.
6. Automate the Boring Stuff, Al Sweigart, No Starch Press, Inc, 2015.
7. <http://www.ibiblio.org/g2swap/byteofpython/read/>
8. <https://docs.python.org/3/tutorial/index.html>

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SEMESTER-V

Sl No	Course /Paper Code	Title of the Paper	Subject Category	Teaching Hours per week	Semester End Exam	Internal Assessment	Total Marks	Credits	Examination Duration
SEMESTER-V									
1	Mathematics Skill-2		24MATH CPS-2	04	40	10	50	02	3 Hrs

MATHEMATICS PRACTICAL KNOWLEDGE/SKILL-2

SEMESTER – V

24MATHCPS-2: Mathematics Skill-2

Python For Scientific Graphing

Practical Hours: 4 Hours/Week

Credits: 02

Total Practical Hours: 56 Hours

Max. Marks: 50

Course Learning Objectives:

- Use Python to visualize scientific data.
- Plot mathematical functions and experimental data
- Create good-quality graphs
- Interpret graphs scientifically

Course Outcomes:

This course will enable the students to

- Plot any mathematical function
- Visualize experimental data
- Create professional scientific graphs

Part I

Python Basics: Variables, data types, operators, Lists, tuples, dictionaries, Basic loops and functions.

Numerical Computing with NumPy: NumPy for science, Arrays vs lists, Creating arrays (linspace, arange), Mathematical operations on arrays, Vectorization.

Introduction to Matplotlib (Core Plotting): Matplotlib, Basic plotting workflow, Line plots, Labels and titles, Grid, legends Saving graphs as images.

Scientific Graph Types: Scatter Plot, Bar Graphs, Histogram and Pie Charts.

Advanced Graph Customization: Figure size & styles, Subplots (multiple graphs in one figure), Colours, markers, line styles, Error bars.

Plotting Mathematical Models: Simple Harmonic Motion, Simple Harmonic Motion, Exponential decay

Part II

Suggested Programs

1. Area of Circle
2. Print squares of numbers from 1-20
3. Write function to compute cube of a number
4. Create array from 0 to 30
5. Multiply array by 6
6. Generate array for $y = x^2$
7. Plot $y = x^3$
8. Plot $y = \sin x$
9. Plot in same graph $\sin x$ and $\cos x$
10. Plot in same graph e^x and $\log x$
11. Scatter Plot-Experimental data
12. Plot experimental data with error bars
13. Projectile Motion graph
14. SHM graph
15. Plotting Standard curves like Lemniscate, Cardioid, Astroid etc

REFERENCES

1. Python crash course: A hands-on, project-based introduction to programming - Matthes, E. (2019). (2nd ed.). No Starch Press.
2. Python for data analysis: Data wrangling with Pandas, NumPy, and IPython - McKinney, W. (2017). (2nd ed.). O'Reilly Media.
3. Introduction to computation and programming using Python - Guttag, J. V. (2021). (3rd ed.). MIT Press.

4. Automate the Boring Stuff, Al Sweigart, No Starch Press, Inc, 2015.
5. Python documentation. <https://docs.python.org>
6. NumPy documentation. <https://numpy.org/doc/>
7. Matplotlib documentation. <https://matplotlib.org/stable/>
8. SciPy lecture notes. <https://scipy-lectures.org>

Kuvempu University

Bachelor of Science (B.Sc.) Semester Scheme

Curriculum Structure for Under Graduate Programme for 2025-26

Syllabus for Mathematics Skill

SEMESTER-VI

Sl No	Course /Paper Code	Title of the Paper	Subject Category	Teaching Hours per week	Semester End Exam	Internal Assessment	Total Marks	Credits	Examination Duration
1	2	3	4	5	6	7	8	9	10
SEMESTER-VI									
2	Mathematics Skill-3		24MATH CPS-3	04	40	10	50	02	3 Hrs

MATHEMATICS PRACTICAL KNOWLEDGE/SKILL-3

SEMESTER – VI

24MATHCPS-3: Mathematics Skill-3

Numerical Methods Using Python

Practical Hours: 4 Hours/Week

Credits: 02

Total Practical Hours: 56 Hours

Max. Marks: 50

Course Learning Objectives:

- Introduce fundamental numerical techniques.
- Develop computational skills for solving mathematical problems.
- Implement numerical algorithms using Python.
- Analyse accuracy, convergence, and errors.
- Apply numerical methods to scientific and engineering problems.

Course Outcomes:

This course will enable the students to

- Solve linear systems numerically
- Perform interpolation and integration
- Solve ODEs using numerical techniques
- Evaluate stability and convergence

Part I

Brief Introduction to:

Numerical Analysis Basics: Errors, Significant digits, Stability and convergence and Order of accuracy.

Solutions of Nonlinear Equations: Bisection Method, Regula Falsi Method, Newton–Raphson Method and Convergence analysis

Numerical Differentiation and Integration: Finite difference methods, Trapezoidal Rule, Simpson’s 1/3 Rule and Error analysis

Numerical Solution of Differential Equations: Modified Euler Method, Runge–Kutta Method and Applications in population models and physics

Part II

Suggested Programs

- Implementation of Bisection Method.
- Implementation of Newton–Raphson Method.
- Secant or Regula Falsi Method.
- Curve fitting using Least Squares Method.
- Numerical differentiation using finite difference method.
- Numerical integration using Trapezoidal Rule.
- Numerical integration using Simpson’s 1/3 Rule.
- Solution of first-order ODE using Euler Method.
- Solution of first-order ODE using Runge–Kutta (RK4) Method.

REFERENCES

1. Numerical analysis- Burden, R. L., & Faires, J. D. (2015). (10th ed.). Cengage Learning.
2. An introduction to numerical analysis (2nd ed.). Atkinson, K. E. (1989). Wiley.
3. Numerical methods for engineers (7th ed.). Chapra, S. C., & Canale, R. P. (2015). McGraw-Hill Education.
4. Numerical Python: Scientific computing and data science applications with NumPy, SciPy and Matplotlib (2nd ed.). Johansson, R. (2019). Apress.
5. Automate the Boring Stuff, Al Sweigart, No Starch Press, Inc, 2015.
6. Python documentation. <https://docs.python.org>
7. NumPy documentation. <https://numpy.org/doc/>
8. Matplotlib documentation. <https://matplotlib.org/stable/>

QUESTION PAPER PATTERN FOR PRACTICAL
KNOWLEDGE/SKILL PAPER EXAMINATION

SEMESTER-IV-VI

Duration: 03 Hours

• Experimentation (Major and Minor /Spotters)	30 Marks
• Viva Voce	10 Marks

Total	40 Marks
