"Dissemination of Education for Knowledge, Science and Culture"
- **Shikshanmaharshi Dr. Bapuji Salunkhe**

**Shri Swami Vivekanand Shikshan Sanstha Kolhapur's**

# RAJE RAMRAO MAHAVIDYALAYA, JATH
## Dist- Sangli

UGC Recognition under 2F & 12 (B) UGC Act 1956

(Affiliated to Shivaji University, Kolhapur)

NAAC Reaccrediated: "B" (Third Cycle)

## DEPARTMENT OF MATHEMATICS

SYLLABUS FOR CERTIFICATE COURSE
in

# "MATHEMATICAL COMPUTATION USING PYTHON"

**Syllabus to be implemented from Aug 2022 to onwards.**

**Aims and Objectives:-**

Students should

1. learn the fundamentals of writing Python scripts.
2. write Python functions to facilitate code reuse.
3. use Python to read and write files.
4. work with Python standard library

**Course Outcomes:-**

1. Student acquire knowledge about writing Python scripts
2. Write Python functions to facilitate code reuse.
3. Works with Python standard library.

**Period:-**

The duration of the course is 30 days

**Evaluation System:-**

| **Course Title** | **Marks** | | | |
|---|---|---|---|---|
| Mathematical Computation Using Python | Attendance | Practical | Exam | Total |
| | 20 marks | 50 marks | 30 | 100 marks |

(Introduced from Aug 2022)
Title of Course: Mathematical Computation Using Python

Theory: 24 Hrs. (30 Lectures of 48 minutes) Marks – 100

**1 Introduction to Python: 01 lecture**

Python, Anaconda, Spyder IDE, Python Identifiers and Keywords , data types, simple mathematical operation, Indentation and Comments., Input and Output, First Python program.

**2 Expression and operators: 02 lecture**

Expression, Boolean expression, logical operations: comparison operator, membership operator, identity operator, bitwise operator. Order of evaluation. File Handling : open, read, write, append modes of file.

**3 Conditional Statements: 02 lecture**

if-else, nested if-else, if-elif-else, try-except block.

**4 Looping Statements, Control statements: 02 lecture**

Looping Statements: for loop, while loop , Nested loops
Control Statements: break, continue and pass.

**5 Functions: 02 lecture**

Built-in functions, User-defined functions, Arguments, recursive function, Python Anonymous/Lambda Function, Global, Local and Nonlocal variables and return statement.

**6 Modules and packages in Python : 02 lecture**

Modules, import, import with renaming, from-import statement, math module ,cmath module , random module, packages.

**7 Python Data structure: 02 lecture**

Strings, list, tulpes, dictionary, set and array.

**8 Operations on set and array: 02 lecture**

Set operations, Intersection, union, difference, symmetric difference, searching and sorting.

**9 Systems of linear algebraic equations: 02 lecture**

Gauss Elimination Method, LU Decomposition Methods

**10 Roots of Equations: 02 lecture**

Bisection, Newton-Raphson Method

**11 Initial Value Problems: 02 lecture**

Euler's Method, Runge-Kutta Methods.

**12 Magic square and Area calculation without measurement. 01 lecture**

**13 Graph Theory : Networkx 02 lecture**

Grpah, nodes, edges, directed graph, multigraph, drawing graph, Google page rank by random walk method

**14 Collatz conjecture and Monte Hall problem 02 lecture**

**15 Data compression using Numpy 02 lecture**

**16 Data visualization in Python: 02 lecture**

2D and 3D plot in python : line plot, bar plot, histogram plot, scatter plot, pie plot, area plot, Mandelbrot fractal set visualization.

**Recommended Book:**

1.Jaan Kiusalaas, Numerical Methods in Engineering with Python3, Cambridge University Press.

2. Amit Saha, Doing Math with Python, No Starch Press, 2015.

3. YashwantKanetkar and Aditya Kanetkar,Let Us Python, BPB Publication, 2019.