



Mathematics Practical Python Programming Language-I

Semester: III	Credits: 2	Subject Code: BSP32109	Lectures: 48
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Course Outcomes:

At the end of this course, the learner will be able to:

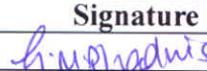
- Relate and demonstrate the use of built-in data structures "list" and "tuples".
- Compare and apply various control structures in Programming.
- Explain the basic concepts of Linear algebra in Python.
- Practice Linear Algebra problems using Python.
- Apply and analyze concepts of Python programming to solve problems based on Numerical Methods and Numerical Integration.
- Compare and contrast the rate of convergence of numerical methods using Python Programming.

Practical 1: Introduction to Python

- Installation of Python
- Values and types: int, float and str,
- Variables: assignment statements, printing variable values, types of variables.
- Operators, operands and precedence:+, -, /, *, **, % PEMDAS(Rules of precedence)
- String operations: + : Concatenation, * : Repetition
- Boolean operator:
- Comparison operators: ==, !=, >, =, <=
- Logical operators: and, or, not
- Mathematical functions from math, cmath modules.
- Keyboard input: input () statement

Practical 2: Python Data Types

- Strings:
 - Length (Len function)
 - String traversal: Using while statement, Using for statement
 - String slice
 - Comparison operators (>, <, ==)
- Lists:
 - List operations
 - Use of range function
 - Accessing list elements
 - List membership and for loop
 - List operations
 - Updating list: addition, removal or updating of elements of a list

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- Tuples:
 - Defining a tuple,
 - Index operator,
 - Slice operator,
 - Tuple assignment,
 - Tuple as a return value

Practical 3: Control statements in Python-I

- Conditional and alternative statements, Chained and Nested Conditionals: if, if-else, if-elif-else, nested if, nested if-else
- Looping statements such as while, for etc, Tables using while.

Practical 4: Control statements in Python-II

- Functions:
 - Calling functions: type, id
 - Type conversion: int, float, str
 - Composition of functions
 - User defined functions, Parameters and arguments

Practical 5: Applications: Matrices, Determinants

- Matrix construction, eye(n), zeros(n, m) matrices
- Addition, Subtraction, Multiplication of matrices, powers, and inverse of a matrix.
- Accessing Rows and Columns, Deleting and Inserting Rows and Columns
- Determinant, reduced row echelon form, nullspace, columnspace, Rank

Practical 6: System of Equations

- Solving systems of linear equations (Gauss Elimination Method, Gauss Jordan Method, LU- decomposition Method)
- Eigenvalues , Eigenvectors, and Diagonalization

Practical 7: RSA Encryption

- Ceaser Cipher
- Problem based on RSA algorithm

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Practical 8: Roots of equations

- Roots of Equations
- Newton-Raphson Method
- False Position (Regula Falsi) Method

Practical 9: Numerical integration

- Numerical Integration:
 - Trapezoidal Rule,
 - Simpson's 1/3rd Rule,
 - Simpson's 3/8th Rule

Recommended Text Books:

- Downey, A. et al., *How to think like a Computer Scientist: Learning with Python*, John Wiley, 2015.
 - Sections: 1, 2, 3 2
- Robert Johansson, *Introduction to Scientific Computing in Python*
 - Section: 4

Reference Books:

- Guzdiel, M. J., *Introduction to Computing and Programming in Python*, Pearson India.
- Lambert K. A., *Fundamentals of Python - First Programs*, Cengage Learning India, 2015.
- Perkovic, L., *Introduction to Computing Using Python*, 2/e, John Wiley, 2015.
- Sandro Tosi, *Matplotlib for Python Developers*, Packt Publishing Ltd.(2009)
- Zelle, J., *Python Programming: An Introduction to Computer Science*, Franklin, Beedle & Associates Inc

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