

## Programming and Problem Solving Through Python Language

### Objective of the Course

The objectives of this course are to make the student understand programming language, programming, concepts of Loops, reading a set of Data, stepwise refinement, Functions, Control structure, Arrays. After completion of this course the student is expected to analyze the real life problem and write a program in 'Python' language to solve the problem. The main emphasis of the course will be on problem solving aspect i.e. developing proper algorithms

After completion of the course the student will be able to

- Develop efficient algorithms for solving a problem.
- Use the various constructs of a programming language viz. conditional, iteration and recursion.
- Implement the algorithms in "Python" language.
- Use simple data structures like arrays, Handling File in "C".

### Outline of Module

S. No.	Topic	Minimum number of hours
1.	Introduction to Programming	05 hrs
2.	Algorithms and Flowcharts	05 hrs
3.	Programming with Python	10 hrs
4.	Python constructs	10 hrs
5.	Array	05 hrs
6.	String Handling and Sequence Data types	05 hrs
7.	Functions	05 hrs
8.	File Processing	10 hrs
9.	Introduction to NumPy	05 hrs
10.	Practical Lab	60 hrs
	<b>Total</b>	<b>120 Hrs</b>

### Detailed Syllabus

- 1. Introduction to Programming** : The basic Model of computation, algorithms, flowcharts, Programming Languages, compilation, testing & debugging and documentation.

2. **Algorithms and Flowcharts** : Flow Chart Symbols, Basic algorithms/flowcharts for sequential processing, decision-based processing and iterative processing. Examples like Exchanging values of two variables, summation of a set of numbers, Decimal Base to Binary Base conversion, Reverse digits of an integer, GCD (Greatest Common Divisor) of two numbers, Test whether a number is prime, factorial computation, Fibonacci sequence, Reverse order of elements of an array, Find largest number in an array, etc
3. **Programming with Python:** Python Introduction: Technical Strength of Python, Introduction to Python Interpreter and program execution, Using Comments, Literals, Constants, Python's Built-in Data types, Numbers (Integers, Floats, Complex Numbers, Real, Sets)
4. **Python constructs** : Assignment statement, expressions, Arithmetic, Relational, Logical, Bitwise operators and their precedence, Conditional statements: if, if-else, if-elif-else; simple programs, Notion of iterative computation and control flow –range function, while Statement, for loop, break statement, Continue Statement, Pass statement, else, assert.
5. **String Handling and Sequence Data types** : String Handling: Strings (Slicing, Indexing, Concatenation, other operations on Strings), Accepting input from Console, printing statements, Simple 'Python' programs. Sequence Data Types: Lists, tuples and dictionary, (Slicing, Indexing, Concatenation, other operations on Sequence data type), concept of mutability, Examples to include finding the maximum, minimum, mean; linear search on list/tuple of numbers, and counting the frequency of elements in a list using a dictionary.
6. **Functions:** Top-down approach of problem solving, Modular programming and functions, Function parameters, Local variables, the Return statement, Default argument values, keyword arguments, VarArgs parameters. Library function : e.g. input(), eval(),print() String Functions: e.g. count(), find(), rfind(), capitalize(), title(), lower(), upper(), swapcase(), islower(), isupper(), istitle(), replace(), strip() Numeric Functions: e.g. eval(), max(), min(), pow(),Date & Time Functions, Recursion. Packages and Modules: Scope of objects and Names, LEGB Rule Module Basics, Module Files as namespaces, Import Model, Reloading Modules.
7. **Introduction to NumPy** : Array Processing Package, Array types, Array slicing, Computation on NumPy Arrays – Universal functions, Aggregations: Min, Max, etc., N-Dimensional arrays, Broadcasting, Fancy indexing, sorting arrays

### Reference Books/Study Material

1. Python Programming- A modular Approach (with Graphics, database, Mobile and Web Applications by Sheetal Taneja and Naveen Kumar, Pearson.
2. Python Network Programming Cookbook by Pradeeban Kathiravelu, Dr. M. O. Faruque Sarkar, PACKT.
3. Head First Python by Paul Berry, O'Reilly
4. Dive into Python by Mark Pilgrim, APress
5. Beginning Programming with Python Dummies by John Paul Meuller.

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