

## NIELIT Virtual Academy O Level Module-03 (M3-R5.1)

### O level- Module-03 (M3-R5.1-Programming and Problem Solving through Python Language)

#### Objective

The objectives of this module are to make the learners understand the programming language concepts like Data Types, Loops, Functions; Python Lists, Strings, Tuples, Dictionaries, Elementary Data Handling using Pandas, NumPy etc. After completion of this course, the learner is expected to analyze the real life problem and write a program in Python to solve the problem. The main emphasis of the module will be on writing algorithm to solve problems and implement in Python. After completion of the module, the learner will be able to

- ✓ Draw flow charts for solving different problems.
- ✓ Develop efficient algorithms for solving a problem.
- ✓ Use the various constructs of Python viz. conditional, iteration.
- ✓ Write programs making judicious use of Lists, Strings, Tuples, and Dictionaries wherever required.
- ✓ Manage data using NumPy.
- ✓ Handle files and create Modules in Python.

#### Methodology:

- ✓ **Video Lecture with text contents.**
- ✓ **24x7 Availability.**
- ✓ **Content Access through e-learning portal.**
- ✓ **Covers both Theory & Practical.**
- ✓ **Doubt clearing session for all units.**
- ✓ **Sample paper practice.**

**Registration Link:** <http://nva.nielit.gov.in>

**\*\*\*For NIELIT O Level Registration and Examination, please contact Course coordinator:**

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## Programming and Problem Solving Through Python Language (M3-R5.1)

### Introduction to Programming

#### Unit-01

- The basic Model of computation, algorithms, flowcharts.
- Programming Languages, compilation, testing & debugging and documentation.

### Algorithms and Flowcharts to Solve Problems

#### Unit-02

- Flow Chart Symbols, Basic algorithms/flowcharts for sequential processing.
- Decision based processing and iterative processing, some examples like: Exchanging values of two variables, summation of a set of number.
- Decimal Base to Binary Base conversion, reversing digits of an integer, GCD (Greatest Common Divisor) of two numbers.
- Test whether a number is prime, factorial computation, Fibonacci sequence, Evaluate 'sin x' as sum of a series.
- Reverse order of elements of an array, Find largest number in an array, Print elements of upper triangular matrix, etc.

### Introduction to Python

#### Unit-03

- 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),
- Strings (Slicing, Indexing, Concatenation, other operations on Strings), Accepting input from Console, printing statements, Simple 'Python' programs.

### Operators, Expressions and Python Statements

#### Unit-04

- Assignment statement, expressions, Arithmetic.
- Relational, Logical, Bitwise operators and their precedence.
- Conditional statements: if, if-else, if-elif-else, simple programs Example
- Notion of iterative computation and control flow –range function, While Statement, For loop
- Break statement, Continue Statement, Pass statement, else, assert.

### Sequence Data Types

#### Unit-05

- Lists, Tuples.
- Dictionary, (Slicing, Indexing, Concatenation, other operations on Sequence datatype).
- Concept of mutability, Examples to include finding the maximum, minimum, means.
- Linear search on list/tuple of numbers, and counting the frequency of elements in a list using a dictionary.

<b>Functions</b>	
<b>Unit-06</b>	<ul style="list-style-type: none"> <li>• Top-down approach of problem solving, Modular programming and functions, Function parameters,</li> </ul>
	<ul style="list-style-type: none"> <li>• Local variables, the Return statement, DocStrings, global statement, Default argument values, keyword arguments, VarArgs parameters.</li> </ul>
	<ul style="list-style-type: none"> <li>• Library function-input(), eval(),print(), String Functions: count(), find(), rfind(), capitalize(), title(), lower(), upper(), swapcase(), islower(), isupper(), istitle(), replace(), strip(), lstrip(),rstrip(), aplit(), partition(), join(), isspace(), isalpha(), isdigit(), isalnum(), startswith(), endswith(), encode(), decode(), String:</li> </ul>
	<ul style="list-style-type: none"> <li>• String: Slicing, Membership, Pattern Matching, Numeric Functions: eval(), max(), min(), pow(), round(), int(), random(), ceil(), floor(), sqrt(), Date &amp; Time Functions, Recursion.</li> </ul>
<b>File Processing</b>	
<b>Unit-07</b>	<ul style="list-style-type: none"> <li>• Concept of Files, File opening in various modes and closing of a file, Reading from a file, Writing onto a file,</li> </ul>
	<ul style="list-style-type: none"> <li>• File functions-open(), close(), read(), readline(), readlines(),write(), writelines()</li> </ul>
	<ul style="list-style-type: none"> <li>• tell(),seek(), Command Line arguments.</li> </ul>
<b>Scope and Modules</b>	
<b>Unit-08</b>	<ul style="list-style-type: none"> <li>• Scope of objects and Names, LEGB Rule Module Basics, Module Files as Namespaces</li> </ul>
	<ul style="list-style-type: none"> <li>• Import Module, Reloading Modules.</li> </ul>
<b>NumPy Basics</b>	
<b>Unit-09</b>	<ul style="list-style-type: none"> <li>• Introduction to NumPy, ndarray, datatypes, array attributes, array creation routines</li> </ul>
	<ul style="list-style-type: none"> <li>• Array From Existing Data, Array From Numerical Ranges, Indexing &amp; Slicing.</li> </ul>