Python Programming

L T P C – 3 0 2 4

Unit 1. Python Basics

Introduction to programming languages, Python as a programming language, History of python, Python versions, Python installation, Environmental variables, Environmental variables in Windows operating system, Add python to Windows path, Executing python from the command line, Invoking python IDLE, Python documentation, Getting help, Dynamic types, Python reserved words, Naming conventions, Character set, Comments, Identifiers, Data types, Operators, Assigning values to variables, Type conversions, String methods, Simple output, Output formatting with "format", Simple input: Input function, Mutable vs immutable objects in python, Lists: Create and access, Lists: Modify and slice, Lists: Operations, Lists: Methods, Sets: Create and operations, Sets: Operators and methods, Sets: Frozenset, Sets: Methods, Tuples: Create and access, Tuples: Slice and alteration, Dictionaries: Create and access, Dictionaries: Modify and delete, Dictionaries: Methods, Copying collections: Shallow, Copying collections: Deep.

Unit 2. Language Concepts

Indenting requirements, Control statements, Decision making statement: If statement, If statement, If-else statement, Implementation, If-elif-else statement, Implementation, Decision making statement: Nested if-else statement, Nested if-else statement, Implementation, Iteration statements: While loop, While loop, Implementation, Iteration statements: While loop with else, While loop with else, Implementation, Iteration statements: For loop, For loop, Implementation, For loop range function with else, Implementation, For loop with object sequences, Nested for loops, Implementation, Break statement, Implementation, Continue statement, Implementation, Functions, Functions: Built in functions, Functions: User-defined functions, Calling a function, Returning a value from the function, Implementation, Scope or lifetime of variables, Creation and usage of global variables, Creation and usage of nonlocal variables, Passing collections to a function, Variable number of arguments, Implementation, Keyword arguments, Optional parameters, Default parameters, Nested functions, Recursive functions, Advantage and disadvantage, Passing functions to a function, map() function, filter() function, Lambda functions.

Unit 3. OOP, Exceptions and I/O

Object-oriented programming concepts, Class and object, Abstraction and encapsulation, Inheritance, Polymorphism, Classes in Python, Creating objects: Instance methods, Implementation, Memory management, Constructors, Constructors with parameters, Optional parameters in constructor, Deleting attributes and objects, Special methods, Class variables, Inheritance, Accessing base class element in derived class, Single inheritance, Multi-level inheritance, Multiple inheritance, Method Resolution Order (MRO), Access modifiers, Polymorphism, Operator overloading, Method overloading, Method overriding, Python errors: Syntax errors, Built-in exceptions, Exception handling, Simple exceptions, Multiple exceptions, Using else and finally, Raise an exception, Assert statement, Data streaming and buffering: Serial data, I/O streams and buffers, Access modes, File open, File close, Exceptions in file, Writing to files, Reading from files, seek() and tell() methods, readline() and readlines() methods, Renaming and deleting files.

Unit 4. Modules and Regular Expressions

Modules, Modularization, Abstraction versus modularization, Modules in Python, Using modules in Python code, Import statement variances, Module search path, Loading and reloading of modules, dir() function, Python built-in modules: sys, Python built-in modules: math, Methods in module math, Python built-in modules: datetime, Python built-in modules: random, Regular expressions, Special sequences, Character classes in RegEx, Regular expression methods, Implementation, re.split(), Implementation, re.sub(), Implementation, re.subn(), re.search(), re.compile(), Implementation, Match object, Implementation, Raw string with "r" or "R" prefix, RegEx quantifiers, RegEx greedy match, RegEx non-greedy match, Greedy vs non-greedy match, RegEx flags.

Unit 5. Data Structures, GUI and CGI

Abstract data structures, Primitive data structure, Non-primitive data structures, List comprehensions, Accessing elements, Performing operations, Comprehension using If, Comprehension If-else, Nested list comprehensions, Dictionary comprehensions, Accessing elements, Performing operations, Comprehension using zip(), Comprehension for lambda functions, Nested dictionary comprehensions or dictionaries with compound values, Processing lists in parallel, Time functionality: Big O notation, Case scenarios, Time complexity in python collections, GUI in Python, Components and events, GUI example, Widgets, Attributes for widgets, Label widget, Button widget, Image button, Entry widget, Combo box widget, Check button widget, Radio button widget, Canvas widget, Frame widget, Message box widget, Message widget, Menu widget, Methods, Menu button, Implementation, CGI basics, Configuring CGI, HTML form elements, Form structure, Python and CGI program, CGI scripts, HTTP headers and environment variables, GET method, POST method, Complete CGI code, Advantages and disadvantages.

Unit 6. Python Applications

OS methods, Environment methods, Directory methods, File methods, Implementation, Implementation, Serialization and deserialization, The pickle module, Pickling and unpickling: Dictionary, Protocol formats, Picklable vs unpicklable types, Serializing attribute connections, Pickle exceptions, Networking fundamentals, Basic communication model, Network topologies, RING topology, STAR topology, MESH topology, TREE topology, Transmission mediums and modes, The client/server model, Client interaction with server, The socket module, The server-side, The client-side, Threaded server, Numpy: Overview, Numpy: Setup, Datatypes, Numpy: Basic operations, Binary operations, NumPy operations, Slicing and indexing, Broadcasting, Matrix operators, Iteration order in multi-dimensional array, Array values modification, External loop in multi-dimensional array, Broadcast iteration, Matplotlib, Plot methods in Matplotlib, Image design functions, Axis functions, Figure functions, Simple plots, Basic plots, Matplotlib options, Matplotlib: Multi plots, 3D plots, Data processing with pandas, Invalid value, Processing strings, Indexing and selecting data, iloc(): Integer based, Column name access, Group-by operations, Iterating through groups, Aggregation, Transformations, Filtration.

Lab Exercises –

Exercise 1: Pythagorean Triplets
Exercise 2: Reverse a Given Number
Exercise 3: Check if a Number is an Armstrong Number
Exercise 4: Print "n" Natural Numbers
Exercise 5: Remove Vowels and Punctuation
Exercise 6: Count the number of strings