

Python Programming (Integrated Lab)

Course Code	18CSL46/18ISL46	Credits	03
Course type	PC	CIE Marks	25 marks
Hours/week: L-T-P	2 – 0 – 2	SEE Marks	25 marks
Total Hours:	Lecture = 20 Hrs; Lab= 20 Hrs Total = 40 Hrs	SEE Duration	3 Hours for 50 marks

Course learning objectives

1. Gain knowledge about basic Python language syntax and semantics to write Python programs and use concepts such as variables, conditional and iterative execution methods etc.
2. Understand the fundamentals of object-oriented programming in Python, including defining classes, objects, invoking methods, exception handling mechanisms.
3. Understand the principles of inheritance, packages and interfaces.
4. Demonstrate the NumPy and Pandas package for scientific computing and data manipulation.

Pre-requisites : Basics of Object Oriented Programming using C++/Java

Unit – I

8 Hours

Introduction to Python, use IDLE to develop programs, Basic coding skills, working with data types and variables, working with numeric data, working with string data, Python functions, Boolean expressions, selection structure, iteration structure, Illustrative Programs

Unit – II

8 Hours

Define and use functions and modules, Basic skills for working with lists, work with a list of lists, work with tuples, get started with dictionaries, An introduction to file I/O, use text files, use CSV files, Handle a single exception, handle multiple exceptions Illustrative programs

Unit – III

8 Hours

Object Oriented Programming, An introduction to classes and objects, define a class, work with object composition, work with encapsulation, work with inheritance, override object methods, Using SQLite Manager to work with a database, Using Python to work with a database, Creating a GUI that handles an event Illustrative programs

Unit – IV

8 Hours

NumPy Basics: Arrays and Vectorized Computation: Creating ndarrays, Data Types for ndarrays, Operations between Arrays and Scalars, Basic Indexing and Slicing, Indexing with slices, Boolean Indexing, Transposing Arrays and Swapping Axes.

Unit – V

8 Hours

Introduction to Pandas, Pandas Objects, Operations in Pandas: Object creation, viewing data, selection, Different ways of creating DataFrame, Handling missing data, merge and concat operations. Pivot and Pivot table.

SciPy: Introduction to Optimization and Minimization, Interpolation, Integration, Statistics

Books

Text Books:

1. Michael Urban and Joel Murach, Python Programming, Shroff/Murach, 2016
2. Wes McKinney, Python for Data Analysis, O'Reilly, 1st Edition, 2012
3. Mark Lutz, Programming Python, O`Reilly, 4th Edition, 2010

Reference Books:

1. SciPy and NumPy, O`Reilly, 1st Edition, 2012

E-resourses

1. NumPy Reference Manual

Course Outcome (COs)

At the end of the course, the student will be able to	Bloom's Level
1. Explain basic principles of Python programming language	L2
2. Implement object oriented concepts, database and GUI applications.	L3
3. Implement basic programs using Numpy and Panda packages	L3

Program Outcome of this course (POs)

	PO No.
1. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
2. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	PO5
3. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12

Course delivery methods

1. Chalk and board
2. PPT
3. Video lectures

Assessment methods

1. Project
2. Experiments

List of Experiments (Part A)

1. Develop and execute an Object Oriented program in Python using basic data structures like arrays and dictionaries.
2. Develop and execute an Object Oriented program in Python to demonstrate inheritance and polymorphism.
3. Develop and execute an Object Oriented program in Python to demonstrate database connectivity.
4. Develop and execute an Object Oriented program in Python using file I/O and exception handling.
5. Develop a program in Python to demonstrate the use of NumPy package.
6. Develop a program in Python to demonstrate the use of Pandas package.

PART B

Each project team consisting of 3-4 students needs to formulate a problem definition in consultation with the guide for the Project component and work towards completion after approval. Project report has to be submitted by each student individually at the end of the Journal.

Scheme of Continuous Internal Evaluation (CIE):

Components	IA test*	Journal and lab test OR Project report and intermediate evaluation	Total Marks
Maximum marks :50	30	20	50
*IA test could be two tests each of one hour duration or only one test of 2 hours duration. Submitting Journal/ Project report is compulsory. Minimum marks required to qualify for SEE : 20 out of 50 marks			

Semester End Examination (SEE):

1.	It will be conducted for 50 marks having 3 hours/2 hours duration. It will be reduced to 25 marks for the calculation of SGPA and CGPA.		
2.	Initial write up stating the objectives, methodology and the outcome	10 marks	50 marks
	Presentation (PPT) of the project	15 marks	
	Hardware project: Exhibiting and demonstration of working of project. Software project: Demonstration of the programming capabilities by writing flowchart, algorithm and codes related to a section of the project.	25 marks (This will be based on the list of term works)	
3.	Minimum passing marks to be scored in SEE: 20 out of 50 marks		