

ADVANCED PROGRAMMING WITH PYTHON

Subject Code: CS34111CS	Subject Type: Core
Evaluation Scheme: MSE(30), TA(20), ESE(50)	L-T-P: 2-0-2

Pre-Requisites: Programming Fundamentals, Data Structures, Object-Oriented Programming

Course Description: This course aims to enable students to develop advanced programming skills in Python for scientific computing, software development, data analysis, and AI/ML applications through modern programming paradigms and libraries.

Course Outcomes: At the end of the course, the student will be able to

CO-1	Apply advanced Python programming constructs for efficient software development.
CO-2	Develop modular and object-oriented applications using Python.
CO-3	Implement data analysis, visualization, and scientific computing workflows.
CO-4	Design Python-based solutions for machine learning, automation, and real-world applications.

Course Articulation Matrix:

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	2	1	-	-	1
CO-2	3	3	2	1	-	1
CO-3	3	2	3	2	1	1
CO-4	3	3	2	1	2	2

1 - Slightly; 2 - Moderately; 3 – Substantially

Syllabus:

Unit-1: Advanced Python Fundamentals

Advanced data types, list comprehensions, generators, iterators, decorators, lambda functions, exception handling, file handling, regular expressions, functional programming concepts, modules and packages.

Unit-2: Object-Oriented and Modular Programming

Classes and objects, inheritance, polymorphism, abstraction, operator overloading, magic methods, modular programming, package creation, virtual environments, code optimization, testing and debugging.

Unit-3: Scientific Computing and Data Handling

NumPy, Pandas, matrix computation, data manipulation, statistical operations, data cleaning, data visualization using Matplotlib and Plotly, performance optimization, multiprocessing and multithreading.

Unit-4: Python for AI, Automation, and Applications

Python for machine learning using Scikit-learn, API development using Flask / FastAPI, web scraping, automation scripts, database connectivity, JSON/XML handling, mini project on real-world application.

Learning Resources:**Text Books:**

1. Mark Lutz, *Learning Python*, 5th Edition, O'Reilly, 2013.
2. Luciano Ramalho, *Fluent Python*, 2nd Edition, O'Reilly, 2022.
3. Wes McKinney, *Python for Data Analysis*, 3rd Edition, O'Reilly, 2022.

Reference Books:

1. Allen B. Downey, *Think Python*, 2nd Edition, O'Reilly.
2. Aurélien Géron, *Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow*, O'Reilly.