

ADVANCED PROGRAMMING WITH PYTHON

Subject Code: CS35111CS	Subject Type: DC	Evaluation Scheme: MSE (30), TA (20), ESE (50)	L-T-P: 2-0-2 (3)
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Pre-Requisites: Programming Fundamentals, Data Structures, Object-Oriented Programming

Course Objective: 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	Course Outcomes
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.

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.