Devi Ahilya University, Indore, India Institute of Engineering & Technology				MSc – I Year (Applied Mathematics) with Specialization in Computing & Informatics Semester- II			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
	L	**T**	**P**	**L**	**T**	**P**	**Total**
AM2EC3: Python	**3**	**-**	**-**	**3**	**-**	**-**	**3**
Duration of Theory Paper: 3 Hours							

Learning Objective: To equip learners with a comprehensive understanding of Python fundamentals, OOP, file handling, data manipulation, and analysis using essential libraries for real-world applications.

Prerequisite: Basic programming knowledge, familiarity with mathematical concepts, computer literacy, comfort with using a text editor or IDE, and no mandatory prior experience in Python. The course is designed to accommodate beginners while gradually progressing to more advanced Python concepts.

COURSE CONTENTS

Unit:I

Introduction to Python and Environment Setup, Python Variables and Data Types, Python Data Structures, Lists, Tuples, Set and Dictionaries, String Manipulation and Comprehensions,Broadcasting, Python Operators, Control Structures (if, elif, else), Control Structures (Loops), Functions and Their Use in Python

Unit:II

Overview of OOP, Creating Classes and Objects, Accessing Attributes and More about Classes, Methods in Classes and Special Methods, Private Attributes and Property Methods, Self Reference and Instance as Return Type, Python Inheritance (Introduction to OOP), Need for Inheritance and Different Forms of Inheritance, Derived and Base Classes (Subclassing) and Creating Objects

Unit:III

Reading and Writing Text Files, Appending to Files and Challenge, Writing Binary Files Manually, Using Pickle to Write Binary Files, Introduction to NumPy, NumPy Array Operations and Slicing, Python Regular Expressions, Error Handling (try, except,catch,final)

Unit:IV

Introduction to Pandas, Pandas DataFrames and Data Import/Export, Data Cleaning, Preprocessing, and Selection, Data Merging and Joining, Introduction to Matplotlib and Basic Visualizations, Customizing Matplotlib Visualizations

Unit:V

Introduction to Seaborn and Advanced Visualizations, Namespace, Introduction to modules:math,random,os, Introduction libraries : Plotly, Scikit learn,Scipy, Exploratory Data Analysis (EDA), Data Analysis Project

Learning Outcomes:

After learning the course, the students should be able to:

- Master Python basics, including variables, data types, operators, and control structures for effective coding and problem-solving.
- Utilize NumPy for numerical operations and Pandas for data manipulation, enabling efficient dataset handling.
- Excel in data visualization with Matplotlib and Seaborn, applying exploratory data analysis (EDA) techniques for insightful data interpretation.
- Apply Object-Oriented Programming (OOP) principles, including classes, objects, and inheritance, for modular and scalable code development.
- Develop skills in reading/writing text files, handling file manipulation challenges, and working with binary files using Pickle for efficient data storage.

BOOKS RECOMMENDED:

1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist ‘‘, 2nd edition, Updated for Python 3, Shroff/O‘Reilly Publishers, 2016.

2. R. Nageswara Rao, “Core Python Programming”, dreamtech.

3. Python Programming: A Modern Approach, Vamsi Kurama, Pearson.

4. McKinney Wes, "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython", O'Reilly Media, 2012.

REFERENCE BOOKS:

1. Core Python Programming, W.Chun, Pearson.

2. Introduction to Python, Kenneth A. Lambert, Cengage.

3. Learning Python, Mark Lutz, Orielly.

4. Telles Matt "Python Power!: The Comprehensive Guide", Cengage Learning, 2008.