

INSTITUTE	FACULTY OF PHARMACY
PROGRAM	BACHELOR OF PHARMACY
SEMESTER	1
COURSE TITLE	BASICS OF PYTHON PROGRAMMING FOR PHARMACEUTICAL SCIENCES
COURSE CODE	13PH0101T
COURSE CREDITS	2

Objective:

- 1 Introduce the fundamentals of Python programming for pharmaceutical sciences.
- 2 Develop basic programming skills using control structures, functions, and data structures.
- 3 Provide knowledge of data handling techniques for structured dataset management.
- 4 Familiarize students with data analysis tools such as NumPy and Pandas for healthcare datasets.
- 5 Enable students to visualize and interpret pharmaceutical data.

Course Outcomes: After completion of this course, student will be able to:

- 1 Explain the fundamentals of Python programming, including variables, data types, operators, and libraries.
- 2 Analyze program logic using control structures and functions.
- 3 Organize, manipulate, and retrieve data using data structures and file handling techniques.
- 4 Analyze pharmaceutical datasets using Python libraries.
- 5 Visualize and interpret pharmaceutical data using graphical tools.

Pre-requisite of course: 1. Basic computer operation skills and file management 2. Familiarity with using internet browsers and installing software 3. Elementary mathematics (arithmetic, percentages, ratios) 4. Basic logical reasoning and problem-solving skills 5. Introductory understanding of pharmaceutical sciences terminology 6. Basic knowledge of spreadsheets such as Microsoft Excel or Google Sheets 7. No prior programming knowledge required

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
2	0	0	30	10	10	0	0

Contents : Unit	Topics	Contact Hours
1	Introduction to Python programming Installing Python and an Integrated Development Environment (IDE) [Jupyter Notebook, PyCharm, VS Code, etc.], Advantages of IDEs over text editors. , Python variables and data types (integers, floats, strings, booleans), Type casting and basic operators (arithmetic, comparison, logical), Input and output operations., Basic string operations and manipulation techniques. Introduction to standard libraries and third-party libraries, installing and uninstalling libraries.	6
2	Control Structures & Functions Conditional statements (if, if-else, if-elif-else), nested conditions Loops (for loop, while loop). , Break and continue statements. , Defining and calling functions, passing arguments, and returning values. , Writing modular programs for simple pharmaceutical applications- dosage calculation and BMI calculation.	6
3	Data Structures & File Handling Lists, tuples, and dictionaries. , Indexing and slicing lists, basic operations on lists and dictionaries, and string manipulation techniques. , Introduction to NumPy arrays, basic operations using NumPy (array creation, arithmetic operations). , Reading and writing CSV files. , Understanding structured healthcare datasets. , Importing small pharmaceutical datasets and performing basic data access and manipulation tasks.	6
4	Data Handling with Pandas Introduction to the Pandas library. , Pandas Series and DataFrame structures. , Reading CSV and Excel files-PK study datasets and ADR reports., Inspecting datasets using functions such as head(), tail(), info(), and describe(). , Data cleaning techniques and handling missing values. , Filtering and selecting data based on conditions. , Grouping data and performing aggregation functions.	6
5	Data Visualization with Matplotlib Introduction to Matplotlib. , Creating line plots, histograms, scatter plots, and box plots. , Labeling axes, titles, and legends. , Create plots and visualize pharmaceutical datasets - concentration-time curves for oral and IV administration, ADR reporting rates across drugs, dissolution profiles. , Scientific interpretation of plots.	6
Total Hours		30

Textbook :

- 1 Python Crash Course, Eric Matthes, No Starch Press, 2023
- 2 Automate the Boring Stuff with Python (3rd Ed.), Al Sweigart, No Starch Press, 2025
- 3 Introduction to Computing Using Python, Ljubomir Perkovic, Wiley, 2015
- 4 Practical Statistics for Data Scientists with Python, Peter Bruce et al., O'Reilly, 2020
- 5 Python for Data Analysis (3rd Ed.), Wes McKinney, O'Reilly, 2022

Textbook :

- 6 Scientific Computing for Chemists with Python, Charles J. Weiss, Open Educational Resource, 2017

References:

- 1 Learning Python, Learning Python, Mark Lutz, O'Reilly, 2013
- 2 Hands-On Data Analysis with Pandas, Hands-On Data Analysis with Pandas, Stefanie Molin, Packt, 2023
- 3 Matplotlib for Python Developers, Matplotlib for Python Developers, Sandro Tosi, Packt, 2021
- 4 Guide to NumPy, Guide to NumPy, Travis Oliphant, USA Press, 2015

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
15.00	20.00	30.00	20.00	10.00	5.00

Instructional Method:

- 1 Interactive lectures
- 2 Live coding demonstrations
- 3 Hands-on computer laboratory sessions
- 4 Tutorials and guided exercises
- 5 Problem-based learning using pharmaceutical cases
- 6 Dataset analysis workshops
- 7 Mini-project assignments
- 8 Group discussions on data interpretation
- 9 Practical plotting and visualization exercises

Supplementary Resources:

- 1 Python Software Foundation – <https://www.python.org/> – Official Python downloads and documentation
- 2 Jupyter Notebook – <https://jupyter.org/> – Notebook environment for coding
- 3 W3Schools – <https://www.w3schools.com/python/> – Beginner-friendly Python tutorial
- 4 Pandas – <https://pandas.pydata.org/> – Official documentation
- 5 NumPy – <https://numpy.org/> – Numerical computing documentation
- 6 Matplotlib – <https://matplotlib.org/> – Data visualization documentation
- 7 World Health Organization – <https://www.who.int/data> – Public health datasets

Supplementary Resources:

8 Clinical Trials Registry - India – <https://ctri.nic.in/> – Clinical trial datasets