**Python for Bioinformatics**

**Module 1: Introduction to Python and Basic Programming**

Introduction, Variables, Data types, *Text data type, Numeric data type, Sequence data type*

*Mapping type,*  Expressions, Type conversion, Keywords, Operators, Input statement, Conditional statements, *if statement, if…else statement, If-elif-else statement, Nested if-elif-else statement* Loops, *Definite loop, Indefinite loop in Python, Nested loops*

**Module 2: String Handling, Modular Programming, and Data Structures**

Introduction, Structure, Objectives, String basics in Python, accessing characters, *String length*

*String concatenation, String slicing,* String methods, Data structures, Lists, *Creating a list*

*Accessing elements, List length, List methods, Tuples, Creating a tuple, Sets, Dictionaries*

*Strings ,* Dictionaries, Modular programming, Functions, Modules

**Module 3: File Handling and Object Oriented Concept**

Introduction, *Handling different types of files in Python, Binary files, Opening binary files, Comma-separated values files, FASTA File,*  Accessing characters, String methods, working with directories, Object-oriented programming, Classes in Python.

**Module 4: Basic Concept of Biopython Module**

Install Biopython, Sequence object in Biopython, Sequence object operations, Mutable sequence, Sequence Record object, Sequence input-output module, Accessing sequences from FASTA and GenBank, Finding a protein in multiple databases, Introducing Bio.PDB, Extracting more information from a PDB file, Computing molecular distances on a PDB file, Animating with PyMOL, Parsing mmCIF files using Biopython

**Module 5: Data Handling and Visualization in Bioinformatics**

Data handling, Data visualization, Working with NumPy, Working with Pandas, Working with Matplotlib, Bar plot, Histogram plot, Scatter plot.

**Module 6: Mini project on Bioinformatics**

Machine Learning for Bioinformatics, Introducing scikit-learn with a PCA example, Using clustering over PCA to classify samples, Exploring breast cancer traits using Decision Trees, , Predicting breast cancer outcomes using Random Forests, Cluster analysis, Drug discovery, Mini project description.

**Reference Book:**

Shahnaz Verma, Parul Fatima. (2024). PYTHON FOR BIOINFORMATICS: using machine learning for drug discovery, cluster analysis, and phylogenetics (english edition). BPB PUBLICATIONS.

Antao, T. (2018). *Bioinformatics with Python Cookbook: Learn how to use modern Python bioinformatics libraries and applications to do cutting-edge research in computational biology*. Packt Publishing Ltd.

Idris, I. (2014). Python data analysis: learn how to apply powerful data analysis techniques with popular open-source Python modules. Packt Pub. http://site.ebrary.com/id/10962285