Python programming

Course Code: BECCS1C01
Course Title: Problem Solving Using Python
Semester: I
Credits: 02+01 (T+P)

Rationale

Python programming course is designed to provide students with a strong foundation in programming, emphasizing practical skills and real-world applications. Python is very easy to use, powerful, and versatile. It has become the language of choice for many developers. Python is easy for beginners to learn and widely utilized in various domain.

Course Outlines

Contents
Unit - I **Introduction to Python Programming:** Introduction to Programming, Python Installation, Introduction to IDEs like Spyder (Anaconda)/PyCharm and Python shell, Python Execution Model, Interpreter, Virtual Machine, Scripts vs Interactive Mode, Python keyword and Identifiers, Indentation, Comments, Data Types, Variables, flow of execution, Type conversions. **Operators in Python:** Operands and Operators, Arithmetic, Logical, Boolean, Bitwise, Assignment, Comparison Operators, Statements, Precedence Of Operators.
Unit – II **Control structures:** Conditionals: Boolean values and operators, Conditional blocks: Conditional (if), Alternative (if-else), Chained conditional (if-elif-else). **Loops** and decision: Flow Control, Iteration: while, for, for each, break, continue. **Functions and Modules:** Functions Defining and Invoking functions, Scope(Local/Global), Parameter types Recursive functions, Built in Functions such as enumeration, zip, sorted, map, etc. Modules in Python, Importing Built-in Modules (math, random, os, etc.), Creating Custom Modules.
Unit -III **Data Structures in Python:** **Strings:** String manipulation, operation, on Strings, indexing, slicing a string. **Lists:** Introduction, Basic list operations, replacing, inserting, removing an element; Searching and sorting a list, Methods of list objects, Nested list, List Comprehension. **Tuple:** Introduction, Creation and Accessing Tuples, Basic operations, List vs Tuple. **Dictionary:** Introduction, Operations and Functions, Accessing values, Traversing dictionaries. **Sets:** Introduction, Creating Sets, Functions, and operations on Sets, Frozensets.
Unit - IV **Arrays:** Introduction to Numpy Arrays, Need for NumPy, Array vs Lists, Creating Arrays, Indexing, Slicing, Reshaping Arrays, Concatenation and Splitting of Arrays, Mathematical Operations, Statistics and Probability using Numpy.

File Handling: Reading keyboard input, opening and closing file, read, write and append mode, create and read a text file, looping over a file object, writing on a file, splitting lines in a text file, Renaming and deleting files.

Exception Handling: Errors and exceptions, handling exceptions, try….except…else…finally, Raising Exceptions

Unit – V

Exploratory Data Analysis: Working with Pandas: Series and Dataframes, Working with csv files, Data Import, Functions and Operations in Pandas, Data Cleaning, Handling Missing Data, Data Selection and Manipulation, Exploratory Data Analysis with Pandas

Data Visualization: Matplotlib and Seaborn libraries for visualization

Course Outcomes

Upon successful completion of this course, candidates will be able to:

- To implement Python code to solve simple to moderately complex problems.
- To develop strong problem-solving skills by identifying issues, devising algorithms, and implementing solutions in Python.
- To decompose a Python program into functions for modular approach understanding.
- To work with various data structures in Python, including lists, tuples, dictionaries, and sets.
- To understand the working of data exploration with Python using Pandas and Dataframes.

Text Books/ Reference books

1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.
2. Allen B. Downey, "Think Python : How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.
3. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017.