SHRI GNANAMBICA DEGREE COLLEGE: MADANAPALLE

(AUTONOMOUS)

COURSE 3: PYTHON PROGRAMMING AND DATA STRUCTURES

SEMESTER II

(W.E.F.2025-26)

Program: BSC (AI / Data Science)

Hours per week: 4 **Credits: 3**

Course Objectives:

1. To introduce the fundamentals of Python programming, including environment setup, syntax, and core concepts.
2. To develop problem-solving skills using control flow, functions, and modules.
3. To provide knowledge of Python data structures, file handling, and exception handling for effective programming.
4. To impart object-oriented programming concepts and GUI development skills for building applications.

Course Outcomes:

After successful completion of the course, students will be able to:

1. Explain the basic features, syntax, data types, and operators of Python programming.
2. Apply control flow constructs, functions, and modules to develop structured Python programs.
3. Demonstrate the use of sequences, sets, and dictionaries for effective data handling and manipulation.
4. Implement file handling techniques and apply exception handling mechanisms for robust applications.
5. Develop object-oriented and GUI-based applications using Python.

Unit I

Basics of Python Programming:

Introduction to Python, Features of Python, Programming Modes - Interactive Mode & Script Mode, Identifiers, Naming Conventions, Keywords (Reserved Words), Built-in Data Types, Literals - Integer, Float, Complex, Boolean, String, Variables, Operators, Expressions, Assignment Statements, Input/Output Statements, Python Syntax (Lines, Comments, Indentation)

Operators & Operands, Classification of Operators - Arithmetic Operators, Relational Operators, Logical Operators, Bitwise Operators, Assignment, Augmented Assignment, Identity Operators, Expressions & Precedence Rules

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Unit II

Control Flow, Functions & Modules:

Control Flow - if Statement, if-else, if-elif-else. Iterative Statements – while, for, Nested Loops, Loop Control Statements – break, continue, pass; else with loops , Need for Functions, Defining & Invoking User-defined Functions, Return Statement, Function Input/Output Cases, Scope of Variables - Local, Global, Nested Functions, Function Arguments - Required, Positional, Default, Variable-length, main() Function, Documentation Strings, Recursive Functions, Anonymous Functions (Lambda), Library Functions Modules - Import, from.import, Creating & Using Modules, Namespaces

Unit III

Sequence, Set, Mapping Types:

Strings- Representation, Indexing, Slicing, Immutability, String Operators, Traversal, Accumulation, Formatting & Methods, Lists - Overview, Indexing, Slicing, Methods, Mutability, List Operations - Add, Update, Delete, Search, Copy, Traverse, Comprehension

Tuples - Operations, Immutability, Tuple Assignment, Sets - Overview, Methods, Mathematical Operations, Frozenset, Comprehension, Dictionaries - Overview, Methods, Operations, Traversal, Comparison

Unit IV

File Handling, Exception Handling &Object-Oriented Programming:

File Handling - Types, Paths, Basic Operations on Files - Open/Close, Read/Write, CSV Files, OS/Pathlib Error & Exception Handling - Syntax Errors, Built-in Exceptions, Catching and Handling Exceptions: try-except, raise, User-defined Exceptions, Assertions, OOP Concepts: Clsses, Objects, Attributes, Methods, Constructor and Destructors, Encapsulation: Private and Public Members. Inheritance: Single, Multilevel, Multiple, Method Overriding

Unit V

Abstract Data Structures and GUI Programming:

Abstract Data Structures (ADTs): Concepts and Importance, Linked List: Definition, Types- Singly, Doubly, Circular; Node Structure, Insertion, Deletion, Traversal (Single Linked list implementation only), Stacks: LIFO Principle, Implementation using List, Applications, Queues: FIFO Principle, Implementation using List, Priority Queues, GUI Programming with Tkinter: Widgets (Label, Button, Entry, Menu, Listbox, Canvas etc.), Event Handling, Building Simple GUI Apps

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References:

1. Python Programming-An Object-Oriented approach, Anita Goel, Universities Press
2. Python Programming using Problem Solving Approach Reema Thareja Oxford University Press 2020
3. Exploring Python, Budd T A, McGraw-Hill Education, 1st Edition, 2011.
4. Python: The Complete Reference, Martin C. Brown, Mc Graw-Hill, 2018
5. Fundamentals of Python, Kenneth A. Lambert. (2019), First Programs,2nd Edition, CENGAGE Publication.

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COURSE 3: PYTHON PROGRAMMING AND DATA STRUCTURES -PRACTICALS

SEMESTER II

(W.E.F.2025-26)

Program: BSC (AI / Data Science)

Hours per week: 2 **Credits: 1**

List of Experiments

1. Basic Python Programs:
   a. Write a program to display basic details (name, roll number, department) using print() and demonstrate different literal types (int, float, string, boolean, complex).
   b. Write a program to perform arithmetic, relational, logical, bitwise, and assignment operations on given inputs.
2. Control Flow Practice
   a. Write a program to find the largest of three numbers using if-elif-else.
   b. Write a program to check whether a number is prime or not using loops.
   c. Write a program to illustrate the use of loop control statements (break, continue, pass).
3. Functions and Recursion
   a. Write a program to define a function to calculate factorial of a number (using recursion).
   b. Write a program to demonstrate different types of function arguments (default, positional, keyword, variable-length).
4. Write a program to illustrate string slicing, concatenation, repetition, and built-in methods.
5. Write a program to create a list of numbers, perform insertion, deletion, searching, sorting, and list comprehension.
6. Write a program to demonstrate tuple packing, unpacking, and immutability.
7. Write a program to implement set operations (union, intersection, difference, subset, superset).
8. Write a program to create a dictionary of student roll numbers and marks, and perform add, update, delete, and traversal operations.
9. Write a program to read and display count of vowels, consonants, digits, and spaces of a text file.
10. Write a program to copy the contents of one file into another file.
11. Write a program to read and process student marks from a CSV file (calculate average, highest, lowest).
12. Write a program to demonstrate exception handling using try-except-finally.
13. Write a program to create a class Student with attributes and methods to display details.

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14. Write a program to demonstrate single and multilevel inheritance.
15. Implement stack (LIFO) and queue (FIFO) using lists and linked lists.
16. Implement singly linked lists: node creation, insertion, deletion, traversal.
17. Write a Tkinter program with Label, Entry, and Button widgets to take user input and display it.
18. Write a Tkinter program to create a simple calculator application.

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QUESTION PAPER BLUE PRINT

Time: 3 Hrs **Max. Marks: 70**

PART - A

Answer any 4 of the 8. Each Question Carries 5 marks. **(4 x 5 =20)**

1. Question
2. Question
3. Question
4. Question
5. Question
6. Question
7. Question
8. Question

PART-B

Answer one from each unit. Each Question Carries 10 marks. **(5X10=50)**

UNIT 1

9. Question

OR

10. Question

UNIT 2

11. Question

OR

12. Question

UNIT 3

13. Question

OR

14. Question

UNIT 4

15. Question

OR

16. Question

UNIT 5

17. Question

OR

18. Question

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