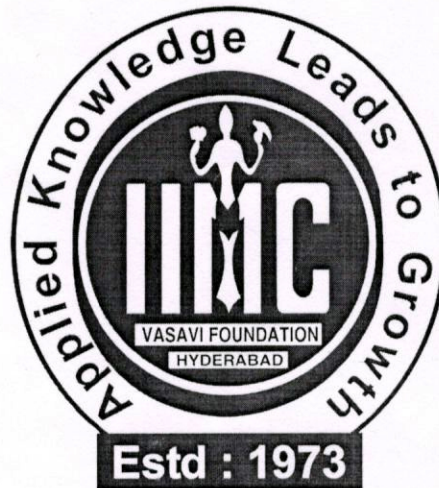


(Applicable to the batch of students admitted in the academic year 2025-2026)

B.Sc.(Data Science) (CBCS)

FACULTY OF SCIENCE, IIMC

**B.Sc. (DATA SCIENCE)**  
**Syllabus (CBCS)**  
(w.e.f. 2026-27)  
Semester I & II



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**Department of Computer Science**  
**INDIAN INSTITUTE OF**  
**MANAGEMENT & COMMERCE**  
**Autonomous College (UG & PG)**  
*# 6-1-91, Khairatabad, Hyd- 500 004, T.S*

*P.V. Sridhar*

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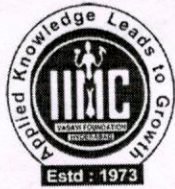
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An ISO 21001 : 2018 Certified College

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## DATA SCIENCE SYLLABUS

### B.SC. I YEAR I SEMESTER (CBCS) PAPER – I (Theory) : 50 Marks PROBLEM SOLVING AND PYTHON PROGRAMMING

**UNIT – I: Introduction to Computing and Problem Solving:** Fundamentals of Computing – Computing Devices – Identification of Computational Problems – Pseudo Code and Flowcharts – Instructions – Algorithms – Building Blocks of Algorithms.

**Introduction to Python Programming:** Python Interpreter and Interactive Mode- Variables and Identifiers – Arithmetic Operators – Values and Types – Statements, Reading Input, Print Output, Type Conversions, type() Function and Is Operator, Dynamic and Strongly Typed Language.

**Control Flow Statements:** if, if...else, if...elif...else Decision Control Statements, Nested if Statement, while Loop, for Loop, continue and break Statements.

**UNIT – II: Functions:** Built-In Functions, Commonly Used Modules, Function Definition and Calling the Function, The return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, \*args and \*\*kwargs, Command Line Arguments. **Strings:** Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings.

**UNIT – III: Lists:** list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: List, Tuples and Dictionaries.

**Files and exception:** text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.

**UNIT – IV: Object-Oriented Programming:** Classes and Objects, Creating Classes in Python, Creating Objects in Python, The Constructor Method, Classes with Multiple Objects, Class Attributes versus Data Attributes, Encapsulation, Inheritance, Polymorphism.

**Functional Programming:** Lambda. Iterators, Generators, List Comprehensions

#### References :

1. Introduction to Python Programming. Gowrishankar S., Veena A. CRC Press, Taylor & Francis Group, 2019
2. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (<http://greenteapress.com/wp/think-python/>)
3. Learning To Program With Python. Richard L. Halterman. Copyright © 2011
4. Python for Everybody, Exploring Data Using Python 3. Dr Charles R. Severance. 2016

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**B.Sc. I-Year I-Semester (CBCS) Data Science Syllabus Paper-I(Practical):  
Problem Solving and Python Programming (Lab) [2 HPW :: 1 Credit :: 20 Marks]**

1. Write a program that takes two integers as command line arguments and prints the sum of two integers.
2. Write a program to display the information: Your name, Full Address, Mobile Number, College Name, Course Subjects
3. Write a program to find the largest number among 'n' given numbers
4. Write a program that reads the URL of a website as input and displays contents of a webpage.
5. Write a program to find the sum of all prime numbers between 1 and 1000.
6. Write a program that reads set of integers and displays first and second largest numbers.
7. Write a program to print the sum of first 'n' natural numbers.
8. Write a program to find the product of two matrices
9. Write a program to find the roots of a quadratic equation.
10. Write recursive and non-recursive functions to find (a) GCD of two integers (b) factorial of positive integer (c) Fibonacci Sequence up to given number (d) decimal number to Binary equivalent
11. Write a program with a function that accepts two arguments: a list and a number 'n'. It should display all the numbers in the list that are greater than the given number 'n'
12. Write a Program with a function to find how many numbers are divisible by 2, 3,4,5,6 and 7 between 1 to 1000.
13. Write a program that accept a string as an argument and return the number of vowels and consonants the string contains.
14. Write a program that accepts two strings S1, S2 and finds whether they are equal are not.
15. Write a program to count the number of occurrences of characters in a given string.
16. Write program to find whether a given string is palindrome or not.
17. Write a program with a function that takes two lists L<sub>1</sub> and L<sub>2</sub> containing integer numbers as parameters. The return value is a single list containing the pair wise sums of the numbers in L<sub>1</sub> and L<sub>2</sub>.
18. Write a program to read the lists of numbers as L<sub>1</sub>, print the lists in reverse order without using reverse function
19. Write a program that combine lists L<sub>1</sub> and L<sub>2</sub> into a dictionary.
20. Write a program to find mean, median, mode for the given set of numbers in a list.
21. Write a program to find all duplicates in the list
22. Write a program to find all the unique elements of a list.
23. Write a program to find max and min of a given tuple of integers.
24. Write a program to find union, intersection, difference, symmetric difference of given two sets.
25. Write a program to display a list of all unique words in a text file
26. Write a program to read the content of a text file and display it on the screen line wise with a line number followed by a colon
27. Write a program to analyse the two text files using set operations
28. Write a program to print each line of a file in reverse order.
29. Write a program to implement the inheritance
30. Write a program to implement the polymorphism.

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## DATA SCIENCE SYLLABUS

**B.SC. I YEAR II SEMESTER (CBCS) PAPER – II (Theory) : 50 Marks**

### DATA STRUCTURES AND ALGORITHMS

**UNIT – I** Fundamental Concepts: Introduction to Data Structures, Types of Data Structures, Basics of Design and Analysis of Algorithms, Linear Data Structure Using Arrays: 1-D Arrays, 2-D Arrays, N-D Arrays, Memory Representation and Address Calculation of 1-D, 2-D, N-D Arrays, Concept of Ordered List, String Manipulation, Pros and Cons of Arrays. Stacks: Concept, Primitive Operations, Abstract Data Type, Representation Stacks Using Arrays, Prefix, Infix, Postfix Notations for Arithmetic Expression, Applications of Stacks– Converting Infix Expression to Postfix Expression, Evaluating the Postfix Expression, Checking Well-formed (Nested) Parenthesis, Processing of Function Calls, Reversing a String.

**UNIT – II** Recursion: Introduction, Recurrence, Use of Stack in Recursion, Variants of Recursion, Execution of Recursive Calls, Recursive Functions, Iteration versus Recursion. Queues: Concept, Primitive Operations, Abstract Data Type, Representation Queues Using Arrays, Circular Queue, Double-Ended Queue, Applications of Queues. Linked Lists: Introduction, Concept, Terminology, Primitive Operations-creating, inserting, deleting, traversing, Representation of Linked Lists, Linked List Abstract Data Type, Linked List Variants - Singly Linked List, Doubly Linked List, Linear and Circular Linked List, Representation Stacks and Queues Using Linked Singly Lists, Application of Linked List–Garbage Collection.

**UNIT – III** Trees: Introduction, Representation of a General Tree, Binary Tree Introduction, Binary Tree Abstract Data Type, Implementation of Binary Trees, Binary Tree Traversals – Preorder, Inorder, Postorder Traversals, Applications of Binary Trees Briefly. Graphs: Introduction, Graph Abstract Data Type, Representation of Graphs, Graph Traversal – Depth-First Search, Breadth First Search, Spanning Tree – Prim's Algorithm, Kruskal's Algorithm. Hashing: Introduction, Hash Functions, Collision Resolution Strategies.

**UNIT – IV** Searching and Sorting Algorithms: Sequential (Linear) Search, Binary Search, Bubble Sort, Insertion Sort, Selection Sort, Quick Sort, Merge Sort, and Comparison of Sorting Techniques. Heaps: Concept, Implementation, Abstract Data Type, Heap Sort.

#### References :

1. "Computer Algorithms" - Ellis Horowitz, Sartaj Sahni and S. Rajasekaran
2. "Data Structure and Algorithmic Thinking with Python" - Narasimha Karumanchi
3. "Data Structures and Algorithms in Python"- Roberto Tamassia, M. H. Goldwasser, M.T. Goodrich.
4. "Problem Solving in Data Structures & Algorithms Using Python"- Hemant Jain

*P.V. Subbarao*

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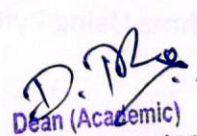
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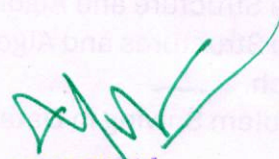
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**B.Sc. I-Year II-Semester (CBCS) Data Science Syllabus Paper-II(Practical):  
Data Structures and Algorithms using Python (Lab) [2 HPW :: 1 Credit :: 20 Marks]**

1. Write programs to implement the following using an array: a) Stack ADT b) Queue ADT.
2. Write a program to convert the given infix expression to postfix expression using stack.
3. Write a program to evaluate a postfix expression using stack.
4. Write a program to ensure the parentheses are nested correctly in an arithmetic expression.
5. Write a program to find following using Recursion (a) Factorial of positive Integer (b) nth term of the Fibonacci Sequence (c) GCD of two positive integers
6. Write a program to create a single linked list and write functions to implement the following operations. a) Insert an element at a specified position b) Delete a specified element in the list c) Search for an element and find its position in the list d) Sort the elements in the list ascending order
7. Write a program to create a double linked list and write functions to implement the following operations. a) Insert an element at a specified position b) Delete a specified element in the list c) Search for an element and find its position in the list d) Sort the elements in the list ascending order
8. Write a program to create singular circular linked lists and function to implement the following operations. a) Insert an element at a specified position b) Delete a specified element in the list c) Search for an element and find its position in the list
9. Write programs to implement the following using a single linked list: a) Stack ADT b) Queue ADT.
10. Write a program to implement Binary search technique using Iterative method and Recursive methods
11. Write a program for sorting the given list numbers in ascending order using the following technique: Bubble sort and Selection sort
12. Write a program for sorting the given list numbers in ascending order using the following technique: Insertion sort and Quicksort
13. Write a program for sorting the given list numbers in ascending order using the following technique: Merge sort and Heapsort
14. Write a program to tree traverse of a binary tree in following way.
15. Write a program to the implementation graph traversals – BFS and DFS.
16. Write a program to find the minimum spanning tree for a weighted graph.

  
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