

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time

BA (Prog.) with Computer Science as Major

Category III

DISCIPLINE SPECIFIC CORE COURSE (DSC-2): Data Structures

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
DSC02: Data Structures	4	3	0	1	Class pass XII with Mathematics	Nil

Learning Objectives

The course aims at developing the ability to define, differentiate, implement the basic data structures like arrays, stacks, queues, lists, trees and use them to solve problems. C++ is chosen as the language to understand implementation of these data structures.

Learning outcomes

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

- Understand abstract specification of data-structures.
- Implement data structures as ADT..
- Identify the appropriate data structure(s) for a given application.
- Apply recursive techniques to solve problems.

SYLLABUS OF DSC-2

UNIT – I (15 Hours)

Arrays, Linked Lists, Stacks, Queues, Deques: Arrays: array operations, applications, sorting, two-dimensional arrays, dynamic allocation of arrays; Linked Lists: singly linked lists, doubly

linked lists, circularly linked lists, Stacks: stack as an ADT, implementing stacks using arrays, implementing stacks using linked lists, applications of stacks; Queues: queue as an ADT, implementing queues using arrays, implementing queues using linked lists, double-ended queue as an ADT.

UNIT – II (06 Hours)

Searching and Sorting: Linear Search, Binary Search, Insertion Sort, Count Sort.

UNIT – III (09 Hours)

Recursion: Recursive functions, linear recursion, binary recursion.

UNIT – IV (06 Hours)

Trees, Binary Trees: Trees: definition and properties, binary trees: definition and properties, traversal of binary trees.

UNIT – V(09 Hours)

Binary Search Trees: insert, delete (by copying), search operations.

Practical component (if any) – 30 Hours

1. Perform matrix addition and multiplication.
2. Implement following recursive functions:
 - Factorial of a number
 - N^{th} fibonacci number
 - Power function: x^y
3. Implement singly linked lists.
4. Implement doubly linked lists.
5. Implement circular linked lists.
6. Implement stack data structure and its operations using arrays.
7. Implement stack data structure and its operations using linked lists.
8. Convert Prefix expression to Infix and Postfix expressions, and evaluate.
9. Implement queue data structure and its operations using arrays.
10. Implement queue data structure and its operations using linked lists.
11. Implement Binary Trees and its traversals.

Essential/recommended readings

1. Goodrich, M.T., Tamassia, R., & Mount, D. *Data Structures and Algorithms Analysis in C++*, 2nd edition, Wiley, 2011.
2. Cormen, T.H., Leiserson, C.E., Rivest, R. L. Stein C. *Introduction to Algorithms*, 4th edition, Prentice Hall of India, 2022.
3. Drozdek, A. *Data Structures and Algorithms in C++*, 4th edition, Cengage Learning, 2012.

Suggestive readings

- (i) Sahni, S., *Data Structures, Algorithms and applications in C++*, 2nd edition, Universities Press, 2011.
- (ii) Langsam Y., Augenstein, M. J., & Tanenbaum, A. M. *Data Structures Using C and C++*, Pearson, 2009.

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DISCIPLINE SPECIFIC CORE COURSE – A2 : DATA INTERPRETATION AND VISUALIZATION USING PYTHON

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
A2: Data Interpretation and Visualization using Python	4	3	0	1	Class XII pass with Mathematics	knowledge of Python

Learning Objectives

This course is designed to introduce the students to the application of Python to get a deterministic view of data and interpret results..

Learning outcomes

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

- Interpret Data
- Obtain a deterministic view of data
- Perform data handling using Numpy arrays
- Load, clean, transform, merge and reshape data using Pandas
- Visualize data using Pandas and matplotlib libraries

SYLLABUS OF A2