

## **BA (Prog.) with Computer Science as Non-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		
<b>DSC02: Data Structures</b>	<b>4</b>	<b>3</b>	<b>0</b>	<b>1</b>	Pass in Class XII	Pass in Class XII and knowledge of C++

#### **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 (5 Weeks)**

**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 (2 Weeks)**

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

#### **UNIT – III ( 3 Weeks)**

**Recursion:** Recursive functions, linear recursion, binary recursion.

#### **UNIT – IV (2 Week)**

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

#### **UNIT – V(3 Weeks)**

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

#### **Practical component (if any) -**

1. Perform matrix addition and multiplication.
2. Implement following recursive functions:
  - i. Factorial of a number
  - ii.  $N^{\text{th}}$  fibonacci number
  - iii. 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++*, 2<sup>nd</sup> edition, Wiley, 2011.
2. Cormen, T.H., Leiserson, C.E., Rivest, R. L. Stein C. *Introduction to Algorithms*, 4<sup>th</sup> edition, Prentice Hall of India, 2022.
3. Drozdek, A. *Data Structures and Algorithms in C++*, 4<sup>th</sup> edition, Cengage Learning, 2012.

#### **Suggestive readings**

- (i) Sahni, S., *Data Structures, Algorithms and applications in C++*, 2<sup>nd</sup> edition,

3. Load Titanic data from sklearn library , plot the following with proper legend and axis labels:
  - a. Plot bar chart to show the frequency of survivors and non-survivors for male and female passengers separately
  - b. Draw a scatter plot for any two selected features
  - c. Compare density distribution for features age and passenger fare
  - d. Use a pair plot to show pairwise bivariate distribution
4. Using Titanic dataset, do the following
  - a. Find total number of passengers with age less than 30
  - b. Find total fare paid by passengers of first class
  - c. Compare number of survivors of each passenger class
5. Download any dataset and do the following
  - a. Count number of categorical and numeric features
  - b. Remove one correlated attribute (if any)
  - c. Display five-number summary of each attribute and show it visually

### Essential/recommended readings

1. McKinney W. *Python for Data Analysis: Data Wrangling with Pandas, NumPy and IPython*, 2<sup>nd</sup> edition, O'Reilly Media, 2018.
2. Molin S. *Hands-On Data Analysis with Pandas*, Packt Publishing, 2019.
3. Gupta S.C., Kapoor V.K. *Fundamentals of Mathematical Statistics*, 12<sup>th</sup> edition, Sultan Chand & Sons, 2020.

### Suggestive readings

- (i) Chen D. Y. *Pandas for Everyone: Python Data Analysis*, 1<sup>st</sup> edition, Pearson Education, 2018.
- (ii) Miller J.D. *Statistics for Data Science*, Packt Publishing Limited, 2017.

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