

Disha College



DATA STRUCTURE BCA III

**SUBJECT TEACHER
SEEMA PATHAK**

Unit 1



Objective

- Classification of data structure
- Data structure operations
- Some data structure

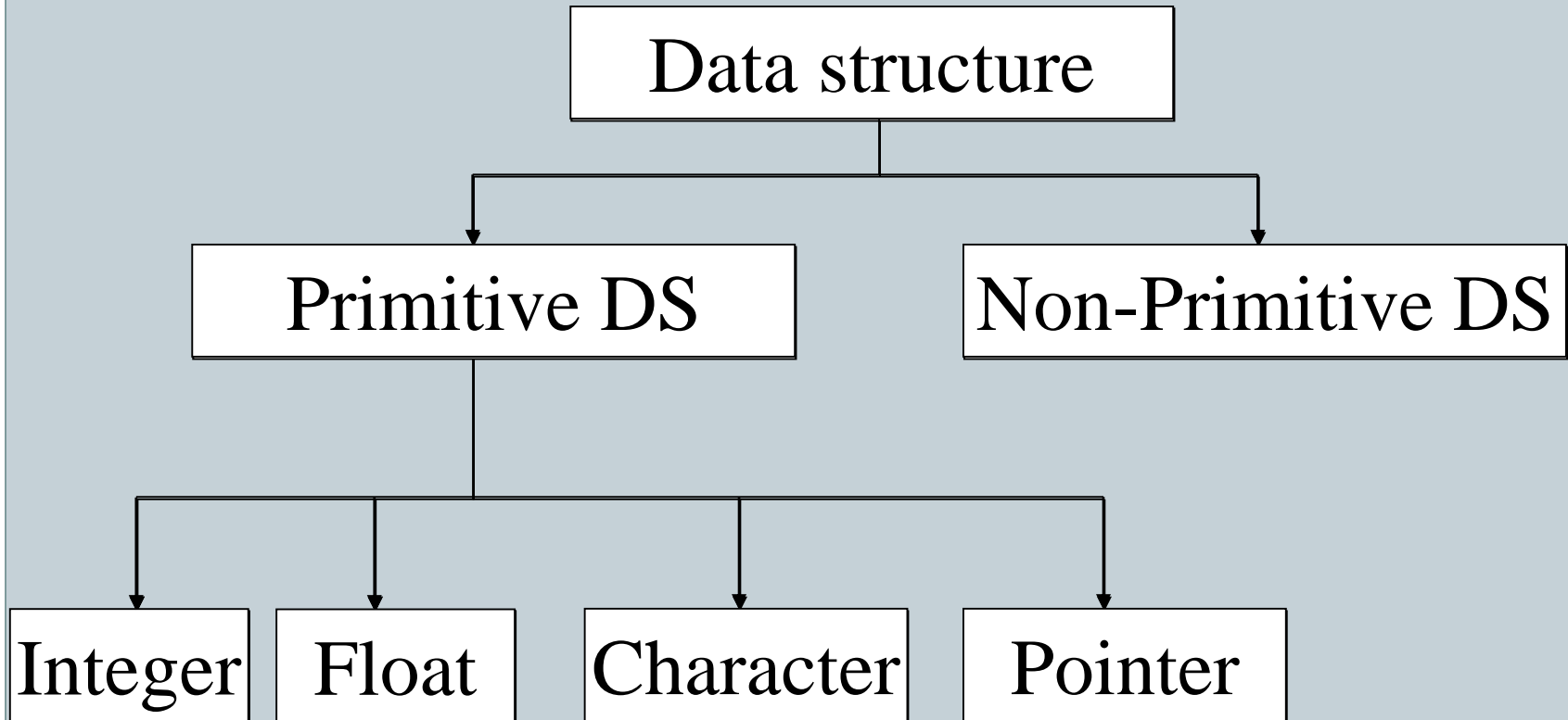
Classification of data structure



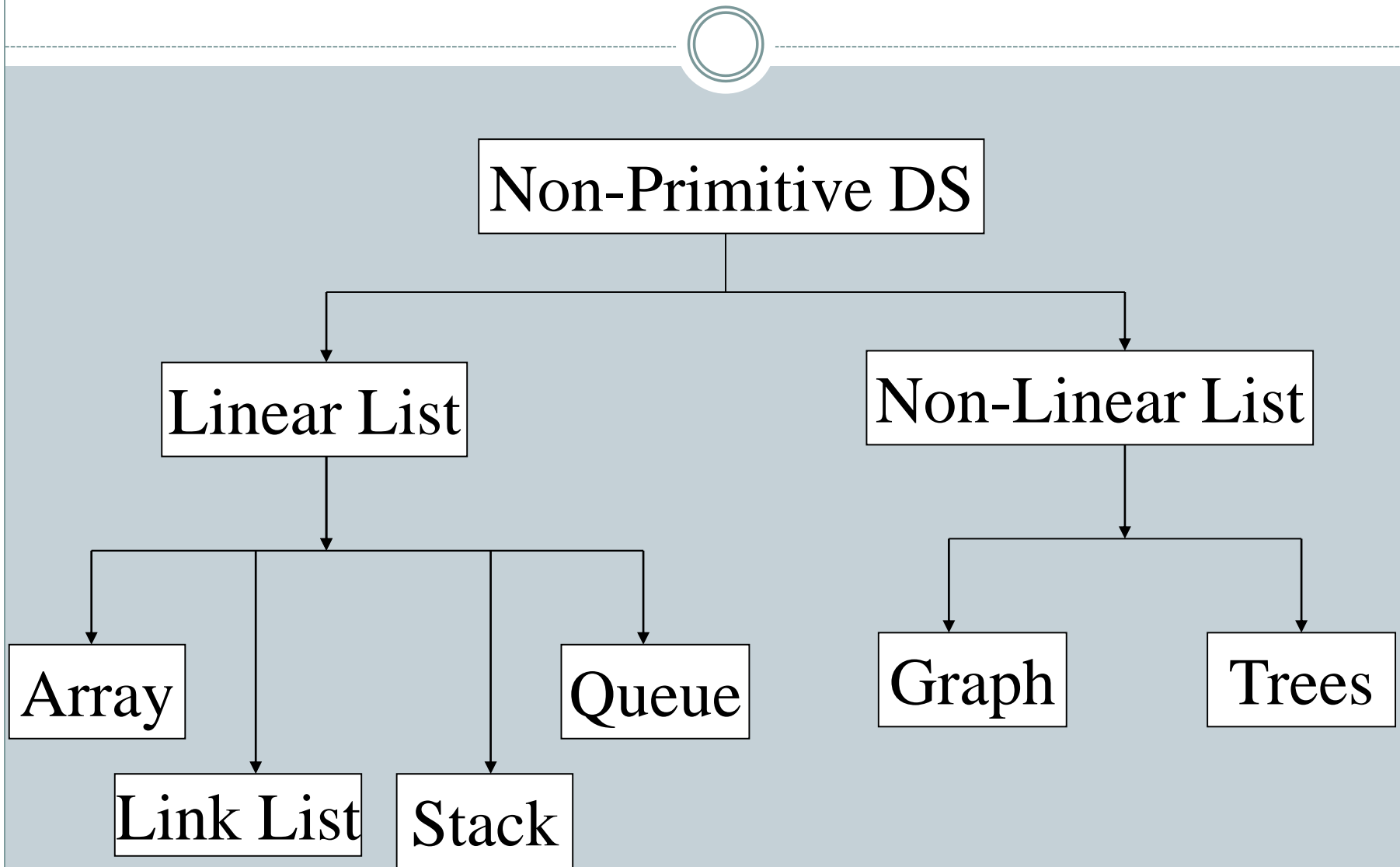
Data structure are normally divided into two broad categories:

- Primitive Data Structure
- Non-Primitive Data Structure

Classification of Data Structure



Classification of Data Structure



Primitive data structure



- These are basic structures that can not be divided into parts.
- They contain single value.
- These are directly operated upon by the machine instructions.
- In general, there are different representation on different computers.
- Integer, Floating-point number, Character constants, string constants, pointers etc, fall in this category.

Non-Primitive Data Structure



- These are more sophisticated data structures.
- These are derived from the primitive data structures.
- The non-primitive data structures emphasize on structuring of a group of homogeneous (same type) or heterogeneous (different type) data items.
- Lists, Stack, Queue, Tree, Graph are example of non-primitive data structures.

Other Classifications



On the basis of linearity

- Linear data structure
- Non linear data structure

On the basis of size

- Static data structure
- Dynamic data structure

On the basis of type of elements

- Homogeneous data structure
- Non homogeneous data structure

Linear and Non-linear Data Structures



- **Linear Data Structure:** Linear data structures can be constructed as a continuous arrangement of data elements in the memory. It can be constructed by using array data type. In the linear Data Structures the relationship of adjacency is maintained between the data elements.
- **Non-linear Data Structure :** Non-linear data structure can be constructed as a collection of randomly distributed set of data items joined together by using a special pointer (tag). In non-linear Data structure the relationship of adjacency is not maintained between the data items.

Static and Dynamic Data Structure



- **Static Data Structure:** Static data structure are those data structures whose size is declared when they are created and can not be changed.
Ex. Integer, float, string, array
- **Dynamic Data Structure:** Dynamic data structures are those data structures whose size can be changed during execution.
Ex: Linked list

Homogeneous and Heterogeneous data structure



- **Homogeneous data structure:** All the data elements of homogeneous data structure are of same data type.
Ex. Array
- **Heterogeneous data structure:** All the data elements of heterogeneous data structure are of different data type.
Ex. Record, tree, graph

Data structure operations



The most commonly used operation on data structure are broadly categorized into following types:

- Creation
- Insertion
- Traversal
- Deletion
- Search
- Sort

Array



- An array is a linear, static, homogeneous data structure.
- An array is defined as a set of finite number of homogeneous elements referenced by common name.
- It means an array can contain one type of data only, either all integer, all float-point number or all character.
- The elements of array will always be stored in the consecutive (continues) memory location.
- Array is the simplest data structure among all structures.

	A[0]	A[1]	A[2]	A[3]	A[4]
A[4]	10	20	12	66	31

Stack



- Stack is a linear data structure.
- A stack is an ordered collection of elements with special feature that deletion and insertion of elements can be done only from one end called the top of the stack (TOP)
- Due to this property it is also called as Last In First Out type of data structure (LIFO).
- When an element is inserted into a stack or removed from the stack, its base remains fixed where the top of stack changes.

Queue



- Queue are first in first out type of data structure (i.e. FIFO)
- In a queue new elements are added to the queue from one end called REAR end and the element are always removed from other end called the FRONT end.
- The bellow show figure how the operations take place on a stack:

Linked List

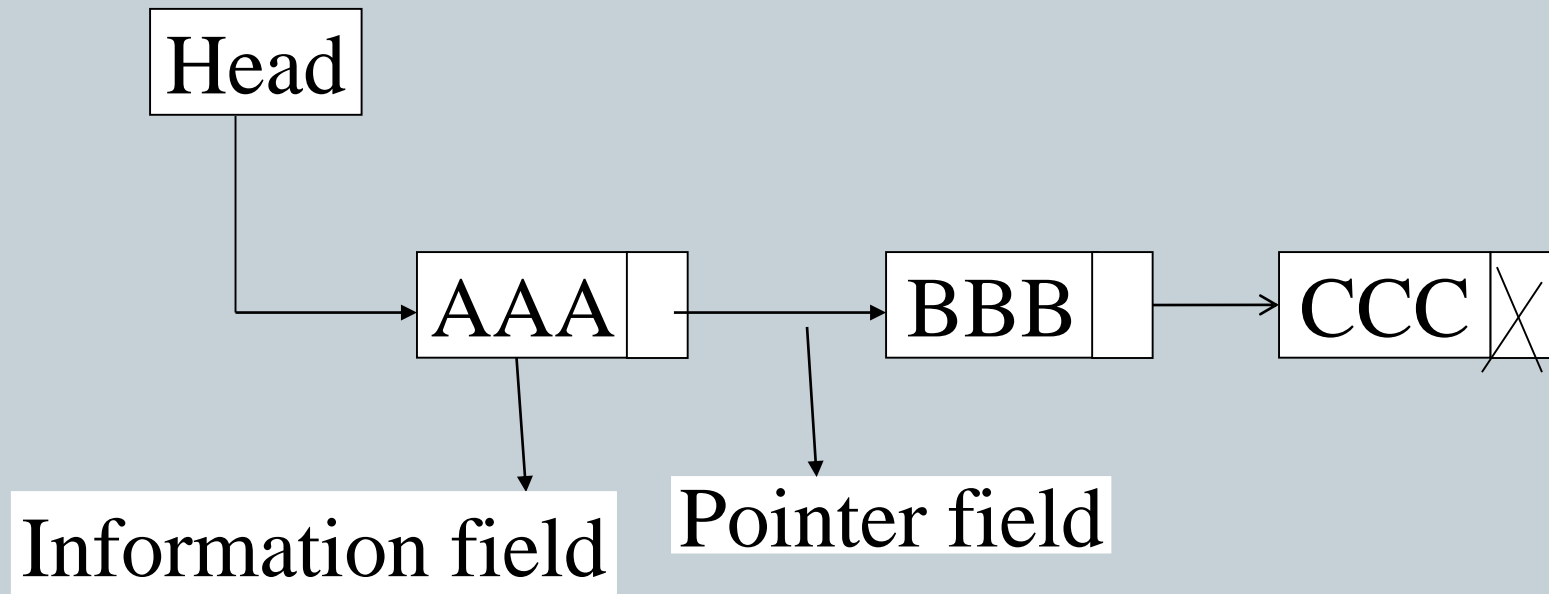


- A lists (Linear linked list) can be defined as a collection of variable number of data items.
- Lists are the most commonly used non-primitive data structures.
- An element of list must contain at least two fields, one for storing data or information and other for storing address of next element.
- As you know for storing address we have a special data structure of list the address must be pointer type.

Linked List



Technically each such element is referred to as a node, therefore a list can be defined as a collection of nodes as show bellow:



Tree

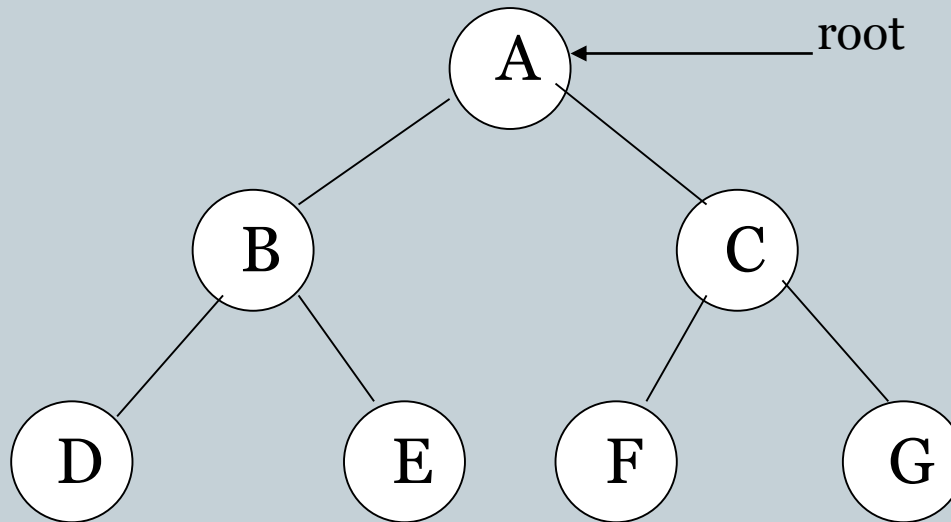


- A tree can be defined as finite set of data items (nodes).
- Tree is non-linear type of data structure in which data items are arranged or stored in a sorted sequence.
- Tree represent the hierarchical relationship between various elements.

Tree



- The tree structure organizes the data into branches, which related the information.



Graph



- Graph is a mathematical non-linear data structure capable of representing many kind of physical structures.
- It has found application in Geography, Chemistry and Engineering sciences.
- Definition: A graph $G(V,E)$ is a set of vertices V and a set of edges E .