

Unit 2: Linear Data Structures.

An abstract linear data type allows us to define sequences of elements (for example, sequences of prime numbers, list of student names, etc.).

In this lesson, we will study the main linear data structures such as stacks, queues and linked lists. Moreover, we will show some problems where these data structures can be used to solve them. For the case of the linked lists, we will study two different implementations: the singly linked lists (sequence of singly nodes) and the double linked lists (sequence of doubly nodes).

At the end of this unit, students should be able to:

1. Understand the LIFO (last-in, first-out) principle.
2. Explain the operations of a stack.
3. Implement a stack using the Python's list class.
4. Use the stack data structure to solve problems such as reversing a word or checking for balanced parentheses in an expression.
5. Understand the FIFO (first-in, first-out) principle.
6. Explain the operations of a queue.
7. Implement a queue using the Python's list class.
8. Use the queue data structure to solve problems.
9. Implement a list ADT using a singly linked list.
10. Explain what advantages and disadvantages singly linked lists have compared to the Python list class (array-based sequence).
11. Implement a list ADT using a doubly linked list.
12. Explain what advantages and disadvantages doubly linked lists offer compared to singly linked lists.