

CNIT 31500 – Lab 4

Purdue University

Fall 2023

October 11, 2023 version 2. Subsequent changes will be marked in blue.

1 Goals

The primary goal of this lab is to develop linked lists, and then use the linked lists to build data structures. This lab concentrates on construction of the single linked list with all of its structure and functions. Follow-up labs (5 and 6) will use linked lists to build stacks, queues, and trees.

2 Specifications

Develop a single linked list data structure to support building of higher-level data structures. To build the linked list, you will need, at minimum, the following functions:

- `CreateListNoNodes` - create list with no nodes, just a start pointer.
- `CreateListNode` - create list with a single node. Data to fill the node is the precondition and must be passed as a parameter.
- `InsertFront` - insert a node at the front of the list.
- `InsertMiddle` - insert a node in the middle of the list. (Hint: use the data to know where to insert the node)
- `InsertEnd` - insert a node at the end of the list.
- `DeleteFront` - delete the first node in the list.
- `DeleteMiddle` - delete a node in the middle of the list. (Hint: use the data to know where to delete the node)
- `DeleteEnd` - delete a node at the end of the list.
- `Traverse` - traverse the list based on some key value in the data portion of the node.

- LookUpByIndex - find a particular node by an index number. Return -1 if that index does not exist.
- PrintNode – print information in the current node: first name, last name, major, and GPA

There must be a Node Struct containing data and a pointer. In this case, the data will be a Struct with the following elements:

- first name
- last name
- major
- GPA

You will need a start pointer to maintain the head of the list and a current pointer when traversing the list. Hint - think about the order to write the functions, as some are dependent on others!

Your list should be sorted based on GPA, in decreasing order. If GPA of multiple people is the same, sort by last name.

You should also create a menu that will ask a user whether they wish to:

- print all students
- insert a student
- delete a student
- find a particular student

3 Submission Guidelines

Submit your code on Gradescope, NOT Brightspace. Do not indicate your name or username in the comments to allow for anonymous grading.

Your code must compile to get a non-0 credit.

3.1 Checkoff requirements

Structure code and insertion of front and end elements must be checked off week of October 18th. Lab is due on the week of the 25th.

4 Bonus

In additions to the menu items above, add an option of providing input to the menu from a file. Assume that:

- lower case p stands for "print all students";

- lower case i followed by lastname, firstname, major, GPA means that a user wants to insert a student
- lower case d followed by last name means that a user wants to delete a student (specify in the comments all assumptions that yo make for this choice)
- lower case f followed by last name means that a user wants to find a student.

If you have this option, ask a user for the filename and proceed accordingly.