Activity No. 3	
LINKED LISTS	
Course Code: CPE010	**Program:** BS Computer Engineering
Course Title: Data Structures and Algorithms	**Date Performed:** 09 / 27 / 2024
Section: CPE21S4	**Date Submitted:** 09 / 27 / 2024
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6. Output

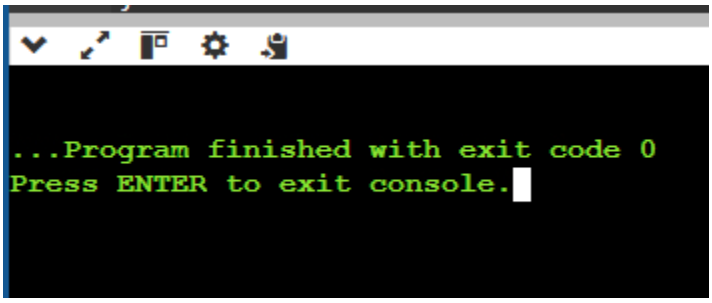
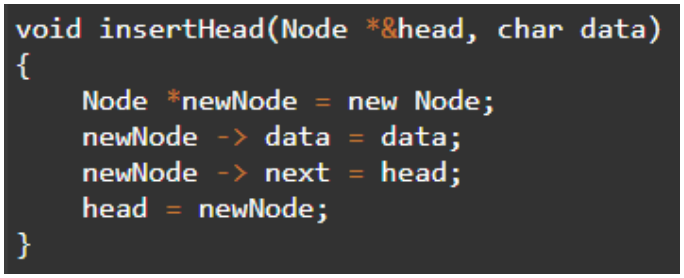
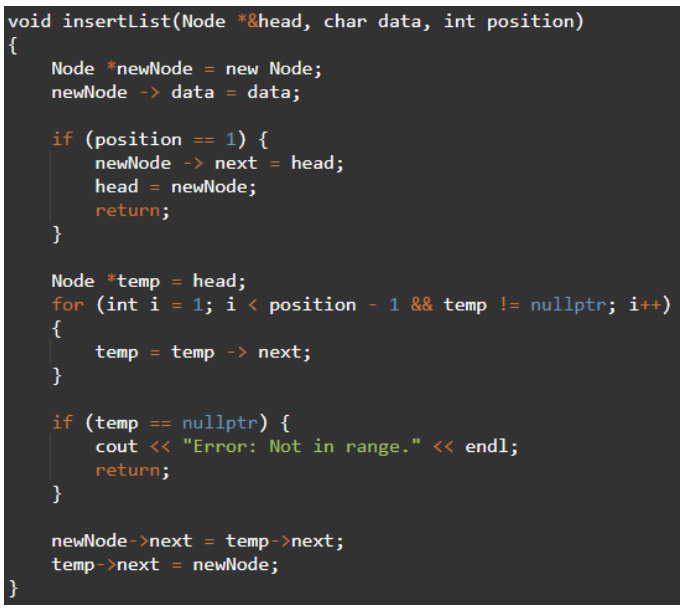
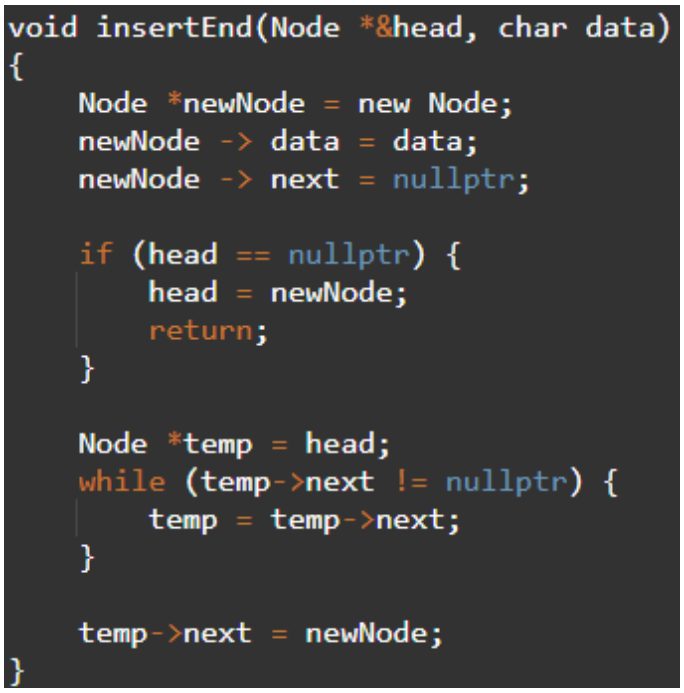
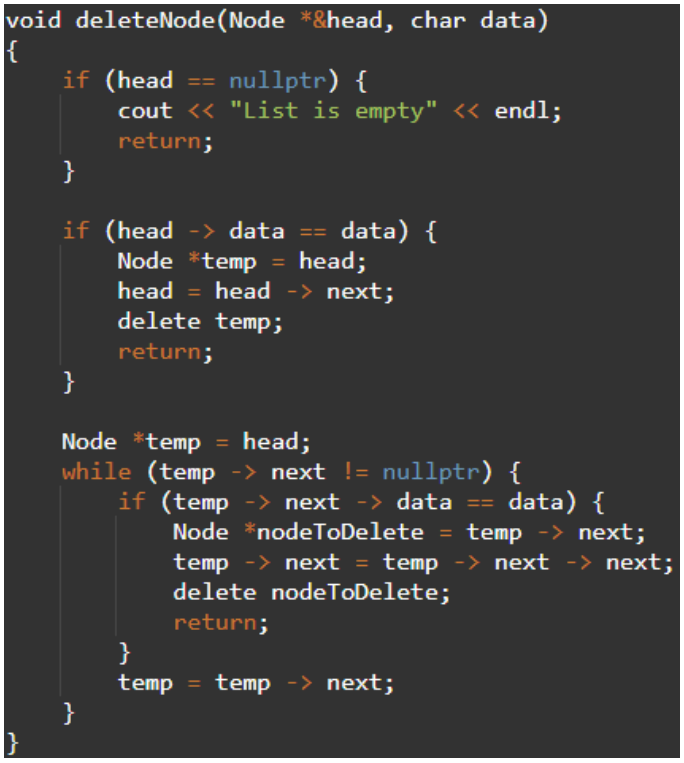
Screenshot	
Discussion	We can implement the code snippet: `void listTraversal (Node* head)` `{` `  while (head != NULL)` `  {` `  cout << head -> data;` `  head = head -> next;` `  }` `}` To output the contents of the nodes and display 'CPE010' This process is used for the linked list traversal.

Table 3-1. Output of Initial/Simple Implementation

Operation	Screenshot
Traversal	`void listTraversal (Node* head)` `{` `  while (head != NULL)` `  {` `  cout << head -> data;` `  head = head -> next;` `  }` `}`

Insertion at head	
Insertion at any part of the list	
Insertion at the end	

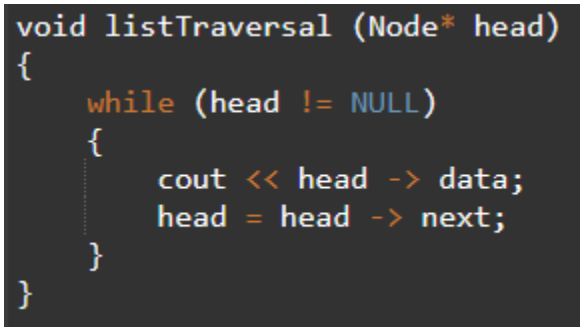
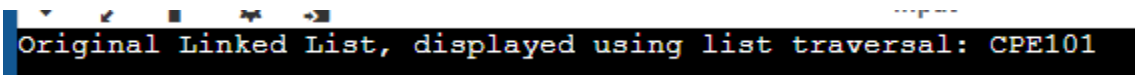
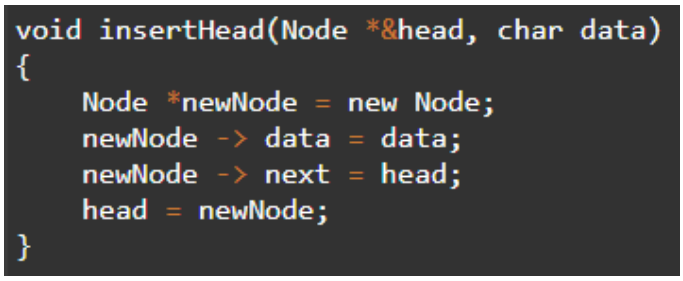
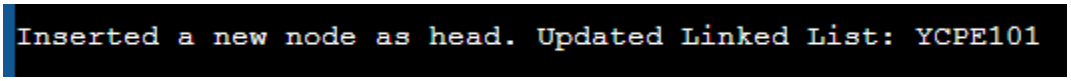
Deletion of a node	

```
void deleteNode(Node *&head, char data)
{
    if (head == nullptr) {
        cout << "List is empty" << endl;
        return;
    }

    if (head -> data == data) {
        Node *temp = head;
        head = head -> next;
        delete temp;
        return;
    }

    Node *temp = head;
    while (temp -> next != nullptr) {
        if (temp -> next -> data == data) {
            Node *nodeToDelete = temp -> next;
            temp -> next = temp -> next -> next;
            delete nodeToDelete;
            return;
        }
        temp = temp -> next;
    }
}
```

Table 3-2. Code for the List Operations

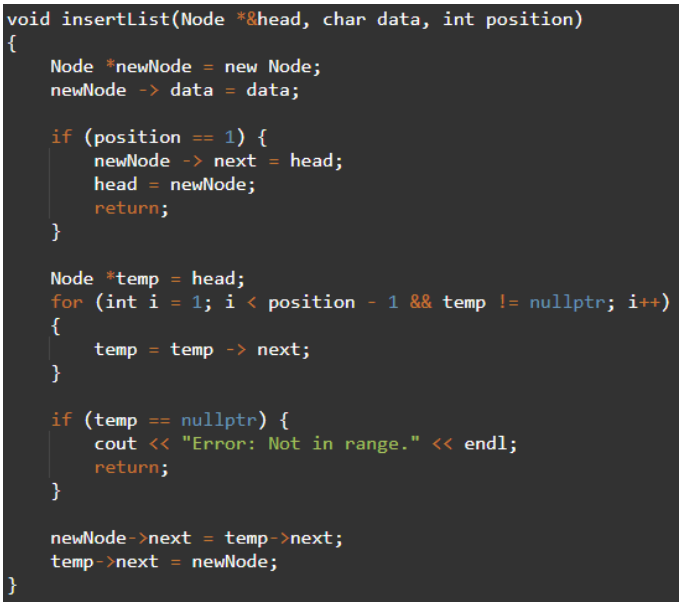
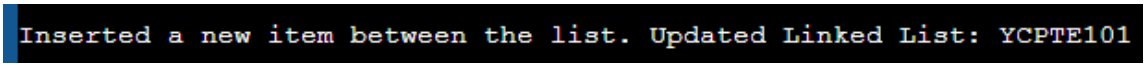
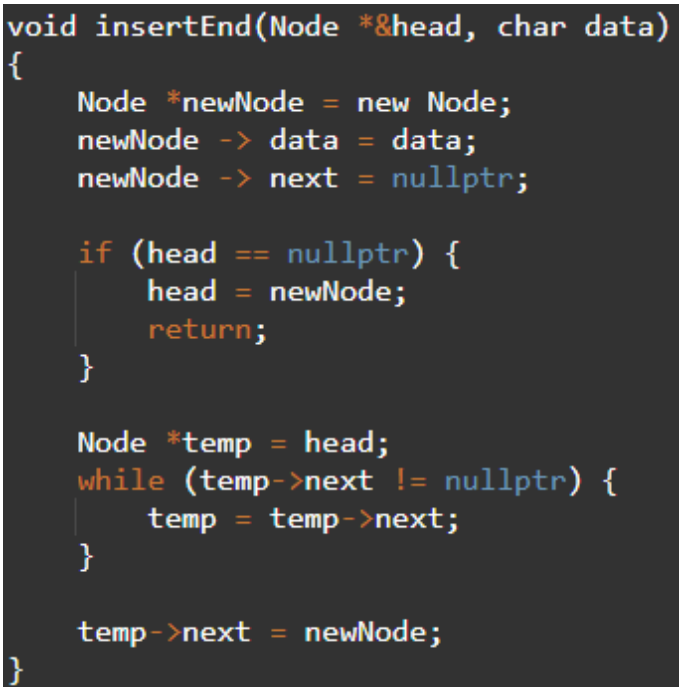
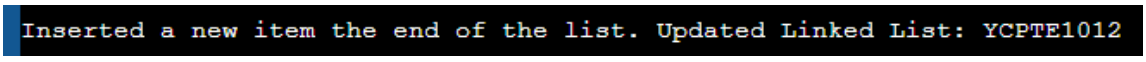
a.	**Source Code**	
	Console	
b.	**Source Code**	
	Console	

```
void listTraversal (Node* head)
{
    while (head != NULL)
    {
        cout << head -> data;
        head = head -> next;
    }
}
```

```
Original Linked List, displayed using list traversal: CPE101
```

```
void insertHead(Node *&head, char data)
{
    Node *newNode = new Node;
    newNode -> data = data;
    newNode -> next = head;
    head = newNode;
}
```

```
Inserted a new node as head. Updated Linked List: YCPE101
```

c.	**Source Code**	
	Console	
d.	**Source Code**	
	Console	

```
void insertList(Node *&head, char data, int position)
{
    Node *newNode = new Node;
    newNode -> data = data;

    if (position == 1) {
        newNode -> next = head;
        head = newNode;
        return;
    }

    Node *temp = head;
    for (int i = 1; i < position - 1 && temp != nullptr; i++)
    {
        temp = temp -> next;
    }

    if (temp == nullptr) {
        cout << "Error: Not in range." << endl;
        return;
    }

    newNode->next = temp->next;
    temp->next = newNode;
}
```

```
Inserted a new item between the list. Updated Linked List: YCPTE101
```

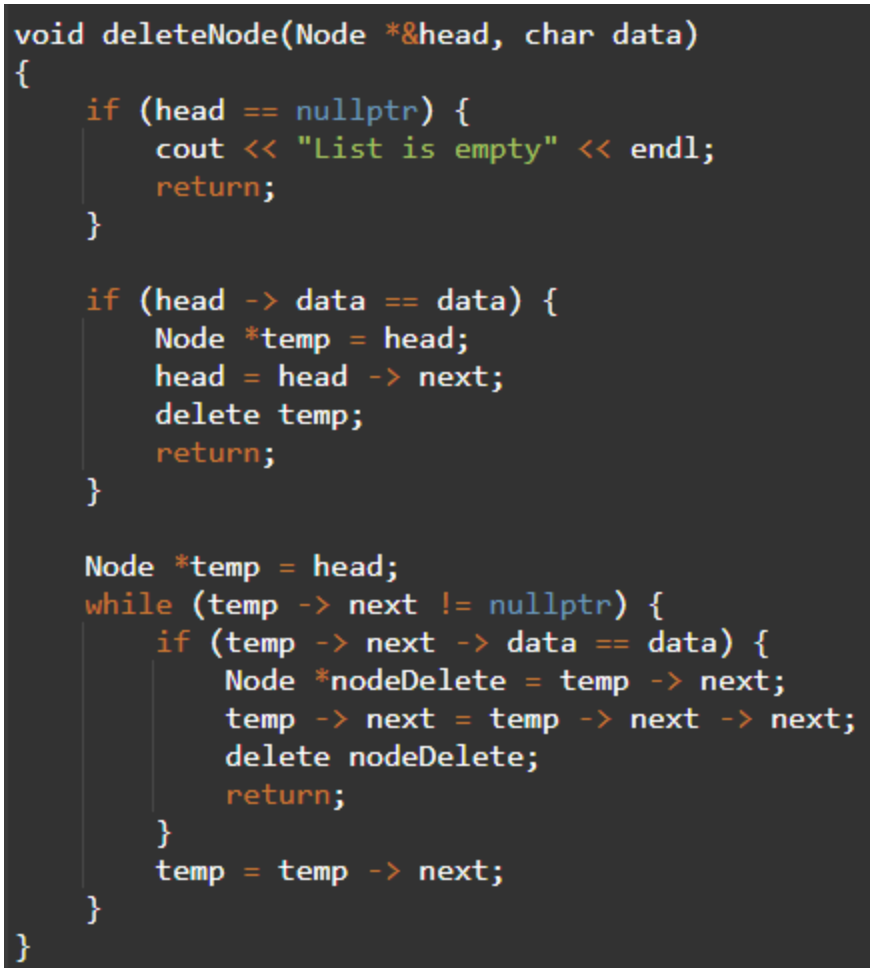
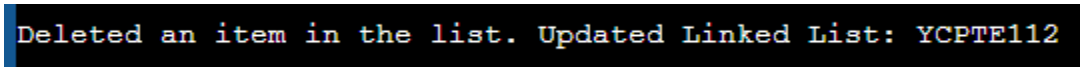
```
void insertEnd(Node *&head, char data)
{
    Node *newNode = new Node;
    newNode -> data = data;
    newNode -> next = nullptr;

    if (head == nullptr) {
        head = newNode;
        return;
    }

    Node *temp = head;
    while (temp->next != nullptr) {
        temp = temp->next;
    }

    temp->next = newNode;
}
```

```
Inserted a new item the end of the list. Updated Linked List: YCPTE1012
```

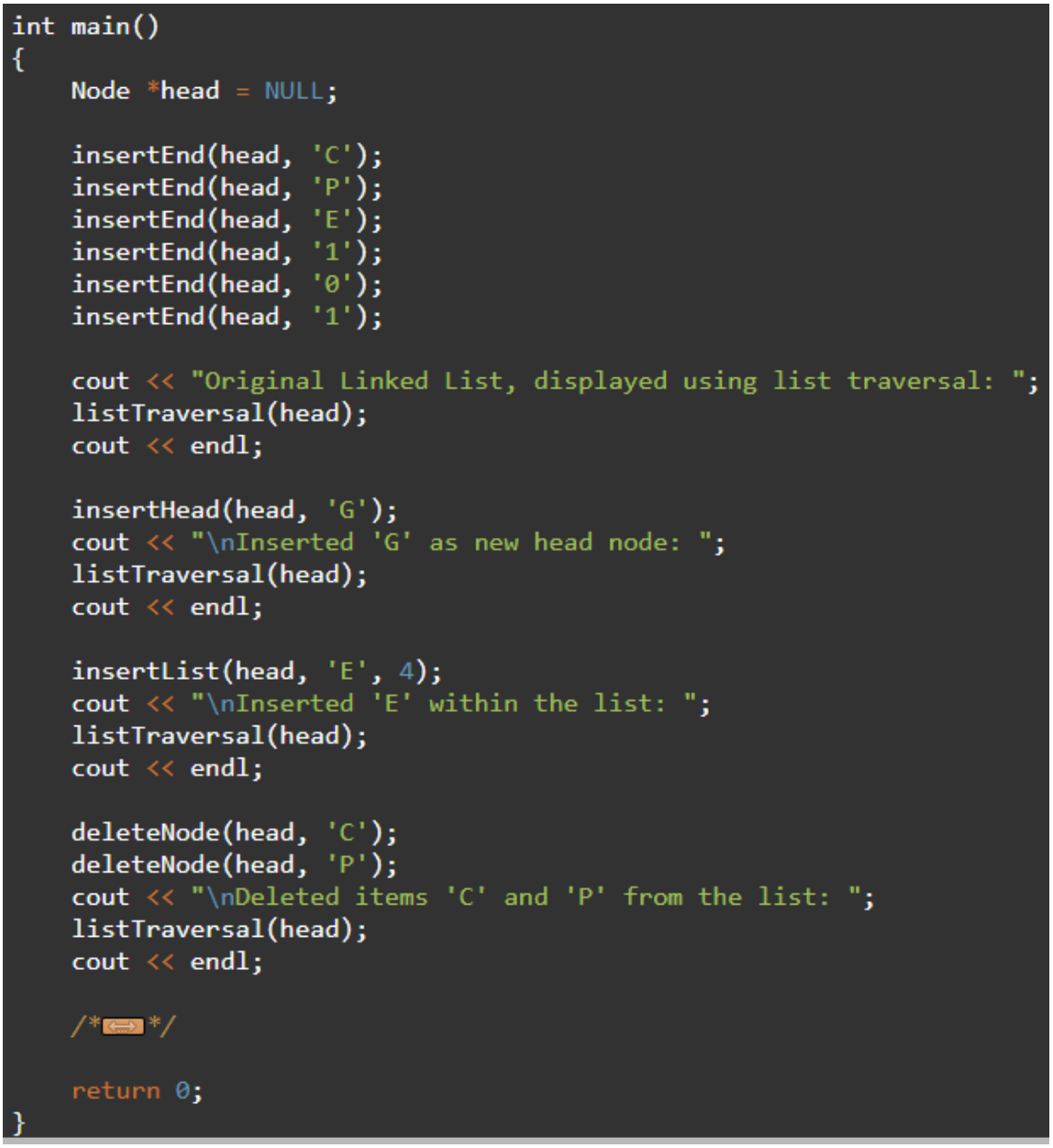
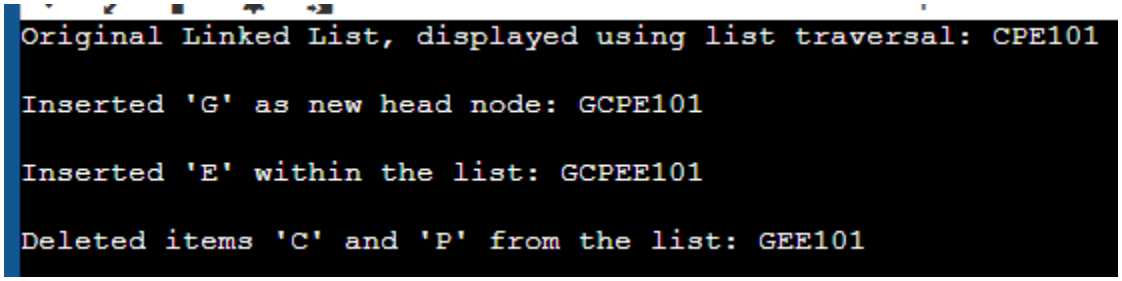
e.	**Source Code**	
	Console	

```
void deleteNode(Node *&head, char data)
{
    if (head == nullptr) {
        cout << "List is empty" << endl;
        return;
    }

    if (head -> data == data) {
        Node *temp = head;
        head = head -> next;
        delete temp;
        return;
    }

    Node *temp = head;
    while (temp -> next != nullptr) {
        if (temp -> next -> data == data) {
            Node *nodeDelete = temp -> next;
            temp -> next = temp -> next -> next;
            delete nodeDelete;
            return;
        }
        temp = temp -> next;
    }
}
```

```
Deleted an item in the list. Updated Linked List: YCPTE112
```

f.	**Source Code**	
	Console	

```
int main()
{
    Node *head = NULL;

    insertEnd(head, 'C');
    insertEnd(head, 'P');
    insertEnd(head, 'E');
    insertEnd(head, '1');
    insertEnd(head, '0');
    insertEnd(head, '1');

    cout << "Original Linked List, displayed using list traversal: ";
    listTraversal(head);
    cout << endl;

    insertHead(head, 'G');
    cout << "\nInserted 'G' as new head node: ";
    listTraversal(head);
    cout << endl;

    insertList(head, 'E', 4);
    cout << "\nInserted 'E' within the list: ";
    listTraversal(head);
    cout << endl;

    deleteNode(head, 'C');
    deleteNode(head, 'P');
    cout << "\nDeleted items 'C' and 'P' from the list: ";
    listTraversal(head);
    cout << endl;

    /*⟺*/

    return 0;
}
```

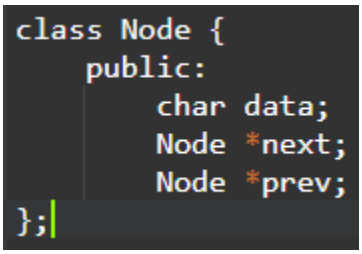
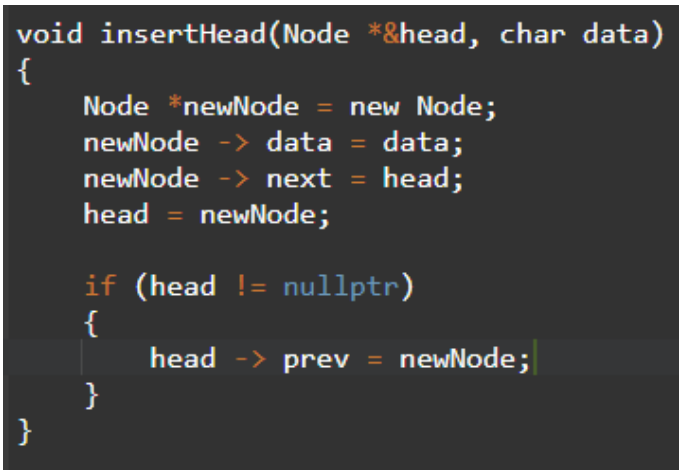
```
Original Linked List, displayed using list traversal: CPE101

Inserted 'G' as new head node: GCPE101

Inserted 'E' within the list: GCPEE101

Deleted items 'C' and 'P' from the list: GEE101
```

Table 3-3. Code and Analysis for Singly Linked Lists

Screenshot(s)	Analysis
	This modification handles the type of link each item has within the list. *Node *prev* gives permission to access previous items in the list.
	All functions have a node initialization process. This helps in creating new nodes to manipulate such as adding and deleting elements.
	With the help of the for loop finding the position to where the new node should be, the last two lines of the function reassign values within the list.

`` void insertEnd(Node *&head, char data) { Node *newNode = new Node; newNode -> data = data; newNode -> next = nullptr; if (head == nullptr) { head = newNode; return; } Node *temp = head; while (temp -> next != nullptr) { temp = temp -> next; } temp->next = newNode; newNode -> prev = temp; } ```	The last two lines of code in this function gives the characteristic of having a doubly-linked list.

Table 3-4. Modified Operations for Doubly Linked Lists

7. Supplementary Activity

C/C++

```
#include <iostream>
#include <string>
using namespace std;

class Node
{
    public:
        string song;
        Node *next;
}

void AddSong(string new_song)
{
    Node* new_node = new Node(new_song);
    if (head == nullptr)
    {
        head = new_node;
        new_node->next = head; // Pointing to itself
    }
    else
    {
        Node* temp = head;
        while (temp->next != head)
        {
            temp = temp->next; // Traverse to the last node
        }
            temp->next = new_node;
            new_node->next = head; // Make it circular
     }
     cout << "Added: " << new_song << endl;
}
```

```
void makePlaylist(string songs[], int n)
{
    for (int i = 0; i < n; i++)
    {
        addSong(songs[i]);
    }
}
```

8. Conclusion

I have learned more about pointers and nodes and all possible operations. I have also learned about the possible perks of using linked lists in specific use cases. I had a hard time understanding nodes and pointers so I had trouble doing the laboratory activity. Modifying the operations to accommodate for doubly linked lists was hard as the output differed from the expected output. Even though I had grasped a deeper understanding of the main laboratory work, I had little time left for the supplementary activity, thus not completing a working code.

9. Assessment Rubric