**ECE 3822: Engineering Computation II**

**Homework No. 9: C++ Variables and Scope**

**Goal:** The goal of this homework is to demonstrate how data structures are used to manage data, and to understand something about how they are organized in memory.

**Description:** The tasks are:

1. Write a simple C program that creates a char\*\* array that holds the following three strings: “Mary”, “Joe”, and “Susan”. The arrays must be allocated to hold only the space required to store these strings. The program must allocate and deallocate memory. Draw a picture explaining how the char\*\* ‘data structure’ is organized in memory. Be very specific and use the actual memory locations used in your program. Show that when the program is ready to exit, memory is properly cleaned up (there are no memory leaks). Show exactly where the three strings reside in memory.
2. Create a text file containing the same three strings. Call this file names.txt. Design a single linked list class that can hold character strings of arbitrary length (which means you must allocate and deallocate memory to hold the strings in the linked list). As we demonstrated in class, write a main program that reads these strings from a file and appends them to a linked list. Demonstrate that your program works. Your class should have a class for a node and a class for the list, which will be a set of linked nodes. Follow the implementation we demonstrated in class, but clean it up and turn it into good code.
3. Once the linked list in task no. 2 is loaded into memory, explain how this data structure is stored in memory. Draw a graph that starts at the head node of the list and accounts for all memory. Discuss how much memory is used by each node in the list, and account for any overhead that the list might be using. Be careful: pointers might be allocated to account for the C++ objects (which are implemented as structures).

Submit a pdf demonstrating that your code works properly across a wide range of test conditions. Include code listings in the appendix.