

## Lab Assignment #2 [Weight: ~5% of the Course Grade]

### Topic: Linked List Data Structure

- For this assignment, you must work in pairs or — exceptionally — in teams of three.
- Include the name and ID for each group member in your files.
- For C/C++ implementation, you must separate class header and class implementation. You may not use other languages for this assignment.
- Please submit your completed assignment before the dropbox closes on LEARN.

### Drone Fleet Management as an ADT

Our company is in a possession of a small fleet of drones that we would like to make available to customers. We are tasked with programming a data structure for storage of drone records.

Submit three files: `lab2_drones_manager.cpp`, `lab2_drones_manager.hpp`, and `lab2_drones_manager_test.hpp`. Do not modify the signatures for any of the functions listed below.

#### Step0. [see `lab2_drones_manager.hpp`]

We are providing you with the implementation of the private **DroneRecord** class. Each drone is to be recorded as an instance of this class. Each record has a unique drone ID, which is stored as an unsigned integer. In addition, each **DroneRecord** also stores drone type, manufacturer, description, range, battery type, and year bought; range and year bought are to be stored as unsigned integers while others are to be stored as strings.

We are also providing you with the declaration for the **DronesManager** class. This class will be used as a container to handle **DroneRecord** objects, and will be based on a doubly linked list implementation of List ADT. **DronesManager** includes relevant member attributes, and corresponding accessor and mutator functions.

#### Step1. [see `lab2_drones_manager.hpp`]

Implement all of the methods for the class **DronesManager** that are listed below.

**class DronesManager {...}** [header already defined in `lab2_drones_manager.hpp`;  
provide your definitions in `lab2_drones_manager.cpp`]

✓ **// EXPLICIT CONSTRUCTOR AND DESTRUCTOR**  
✓ **// PURPOSE:** Creates a new empty DronesManager  
`DronesManager();`

✓ **// PURPOSE:** Destroys this instance and frees up all dynamically allocated memory  
`~DronesManager();`

✓ // PURPOSE: Comparison operator to compare two DroneRecord instances  
friend bool operator==(const DronesManager::DroneRecord& lhs,  
const DronesManager::DroneRecord& rhs);

✓ // PURPOSE: Setup DronesManagerTest as friend so tests have access to private variables  
friend class DronesManagerTest;

### ✓ // ACCESSORS

// PURPOSE: Returns the number of elements in the list  
unsigned int get\_size() const;

✓ // PURPOSE: Checks if the list is empty; returns true if the list is empty, false otherwise  
bool empty() const;

✓ // PURPOSE: Returns the value at the given index in the list  
// if index is invalid, returns last element; if the list is empty, returns DroneRecord(0)  
DroneRecord select(unsigned int index) const;

✓ // PURPOSE: Searches for the given value, and returns the index of this value if found  
// if not found, returns the size of the list; if the list is empty, returns 0  
unsigned int search(DroneRecord val) const;

✓ // PURPOSE: Prints all the elements in the list to the console  
void print() const;

### ⑤ // MUTATORS

✓ // PURPOSE: Inserts a value into the list at a given index; the list is not sorted  
// if the index is invalid, insertion is rejected  
bool insert(DroneRecord val, unsigned int index);

✓ // PURPOSE: Inserts a value at the beginning of the list; the list is not sorted  
bool insert\_front(DroneRecord val);

✓ // PURPOSE: Inserts a value at the end of the list; the list is not sorted  
bool insert\_back(DroneRecord val);

✓ // PURPOSE: Deletes a value from the list at the given index  
bool remove(unsigned int index);

✓ // PURPOSE: Deletes a value from the beginning of the list  
bool remove\_front();

✓ // PURPOSE: Deletes a value at the end of the list  
bool remove\_back();

// PURPOSE: Replaces value at the given index with the given value; the list is not sorted  
// if the index is invalid, replacement is rejected  
bool replace(unsigned int index, DroneRecord val);

// PURPOSE: Reverses the linked list  
bool reverse\_list();

## Step2. [see lab2\_drones\_manager\_test.hpp]

Implement all of the test case methods in the **DronesManagerTest** class that are listed below. If the code is already provided, implement a different version of the test case on your own. The test cases will be graded.

```
class DronesManagerTest {...}
```

[declared and implemented in lab2\_drones\_manager\_test.hpp;  
test runner in lab2\_main.cpp]

### // TEST CASES

// PURPOSE: New empty list is valid

bool test1();

// PURPOSE: insert\_front() and insert\_back() on zero-element list

bool test2();

// PURPOSE: select() and search() work properly

bool test3() ;

// PURPOSE: remove\_front() and remove\_back() on one-element list

bool test4();

// PURPOSE: replace() and reverse\_list() work properly

bool test5();

// PURPOSE: insert\_front() keeps moving elements forward

bool test6();

// PURPOSE: inserting at different positions in the list

bool test7();

// PURPOSE: try to remove too many elements, then add a few elements

bool test8();

// PURPOSE: lots of inserts and deletes, some of them invalid

bool test9();

// PURPOSE: lots of inserts, reverse the list, and then lots of removes until empty

bool test10();