Systems Software
Assignment 4: Object Oriented Programming in C++

Lab Objectives

In this activity, students should demonstrate the following abilities:

1. Create and instantiate classes in C++
2. Overload operators for class types
3. Create a library for class types

Lab Assignment

In this lab, you will create a new type to manipulate complex numbers in C++. Follow the directions below.

1. Create a class **`Complex`** that has two data members of type **`double`**, one for the real part and one for the imaginary part. Define two constructors for the class, a default constructor and one with two parameters. The default constructor should initialize the real part and the imaginary part to **0**. Add appropriate getters and setters to the class.

2. Overload the following operators for the class **`Complex`**: **+**, **–** (subtraction), *****, **==**, **!=**, **>>**, and **<<**. All the operator overloading functions should be member functions of the class except for the operators **>>** and **<<** which should be defined outside the class.

3. Define the class interface in the file **`complex.h`** and the class implementation in the file **`complex.cpp`**. Create a static library **`libcomplex.a`** that contains the object file of the class implementation (**`complex.o`**)

4. Write a C++ program to manipulate complex numbers. The program reads a text file that contains a pair of complex numbers on each line. For each line, the program performs the overloaded operations on the pair of complex number and stores the results in an output file as shown in the sample run below. The program uses the overloaded operators from the library **`complex`** to perform the operations on complex numbers. The order of the operations, in the output file, is as follows: **+**, **–**, *****, **==**, **!=**.

5. Create a makefile to build your program in a main folder named **`assignment4`**. Submit folder **`assignment4`** zipped on courseSite.

```
>>./ccalc input_file output_file
```

Input file contents

```
1     1+i
i     1+i
1+i   1
1+i   i
1+i   1+i
1-i   1+i
1+i   1-i
1-i   1-i
```

Output file contents

```
1          1+i        2+i        -i         1+i        false      true
i          1+i        1+2i       -1         -1+i       false      true
1+i        1          2+i        i          1+i        false      true
1+i        i          1+2i       1          -1+i       false      true
1+i        1+i        2+2i       0          2i         true       false
1-i        1+i        2          -2i        2          false      true
1+i        1-i        2          2i         2          false      true
1-i        1-i        2-2i       0          -2i        true       false
```