COMPUTING METHODS FOR PHYSICS
8 SEPTEMBER 2020

You must submit your exam by **Tuesday, Sep 8, at 13:30** following the instruction at http://www.roma1.infn.it/people/rahatlou/index.php?link=Didattica&sublink=cmp/exams

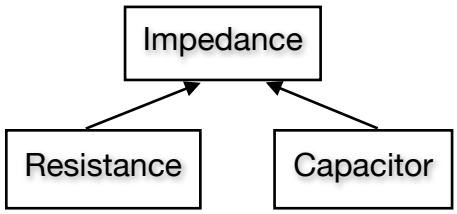
Circuit Elements with Impedance

Write a class **`Complex`** to implement the algebra of complex numbers. For simplicity, the default constructor accepts the real and imaginary parts in cartesian coordinates.

- Provide **`re()`** (real part), **`im()`** (imaginary part), **`mag()`** (magnitude) member functions
- provide a copy constructor
- Overload the necessary operators to perform the calculations with both complex and real numbers, e.g.:

```
Complex z, w, y, i(0,1);
w = 2*i;
y = 3 + w/3;
z = 1/y;
```

Implement a **`Resistance`** and a **`Capacitor`** class inheriting from an abstract class **`Impedance`**.



- An **`Impedance`** is characterised by
  - a name
  - a frequency **`ω`**
- Implement the **`operator +`** to add two elements in series
- Implement the function **`impedance()`** to return the complex impedance of an element
- Check that you can add a capacitor and a resistance in series and obtain the correct total impedance

Provide source and header files of **`Complex, Element, Capacitor, Resistance`** for evaluation.

Evaluation will be based on: successful compilation, separation of the code in header and source files, correct use of C++ syntax, return type and arguments of functions, choice of data members and interface of classes, unnecessary void functions, use of unnecessary C features, and correct mathematical and physical operations.

During the discussion you will be asked to write a working example to test the submitted classes.