The need for Programming Languages

Computers are very simple devices in that they only understand a handful of simple commands, like adding two numbers or reading a value from memory. The set of commands understood by a computer is called *machine code*.

The processor is the component of a computer that executes the commands in a program. Each processor has its own machine code.

A program needs to be stored in the memory of the computer, so it can be executed. Information is stored in a computer in binary format, i.e, information is encoded as a sequence of 0’s and 1’s.

Below is a binary program in machine code for an old processor called 8086. This program prints the word “hello” on the screen.

```
10111010000011000000000011011010000001001110011
01001000011011100000000000100110011001101001000
00010100100001100101011011000110110001101111100
10110000100000010101111011011111011100100110110 0
01100100000100001000011010000110001101111
```

Binary code is hard for humans to understand, as a sequence of 0’s and 1’s has no meaning to us.

Compare the above binary program with the following equivalent python program

```
print ("hello")
```

Python is called a high level programming language and it was designed to make computer programs readable to humans. However, a computer does not understand python, java, C++, or any other high level programming language.

A compiler is a piece of software that translates programming language into code that the computer can understand.

In this course we will be writing programs in java. A java program must be stored in a file with the extension .java. A java compiler does not directly produce machine code, but it translates the java program into another language called *java bytecode*. Java bytecode is a kind of *intermediate language*.

Java bytecode is stored in files with the extension .class. A java *interpreter* or *virtual machine* can execute the java bytecode.

Eclipse has an integrated java compiler that runs as you type your program. If you want to compile your java program for a terminal or command window, the name of the java compiler is javac and the name of the java interpreter is java.