Objectives:

a) Become familiar with the Frances tool.
b) Understand the components Frances.
c) Introduce some syntax of a low level language.
d) Understand memory allocation and register use.

1) Background: Frances is a tool developed to help in the understanding of code generation. Frances can be found at [http://frances.cs.iastate.edu/](http://frances.cs.iastate.edu/). For most of our exercises we will use the C language for the high-level language. This is Frances’ default language. Use it unless otherwise directed.

2) Exercises:

a) We have discussed the code generated for the program that does nothing. Below is the generated assembly code for such program. Label each line below with a description of the assembly code and a brief explanation of its purpose in the program.

```assembly
main

lea 0x4(%esp),%ecx
and $0xffffffff0,%esp
pushl -0x4(%ecx)
push %ebp
mov %esp,%ebp
push %ecx
pop %ecx
pop %ebp
lea -0x4(%ecx),%esp
ret
```
b) Next, write the following code in Frances.

```c
int main()
{
    int x, j;
    float a;
    x = 7;
    a = 5.2;
    j = 3;
    if (j < x)
        a = 4.6;
}
```

i) For each assignment statement and the if statement above, write the corresponding assembly code next to it.

ii) What denotes a memory address? What denotes a value? What denotes a register?

iii) Name the memory locations of x, j and a, in hexadecimal and in decimal.