# CSE 331 - Computer Organization
# Project-4: I-Type MIPS II (Addition of lw and sw)

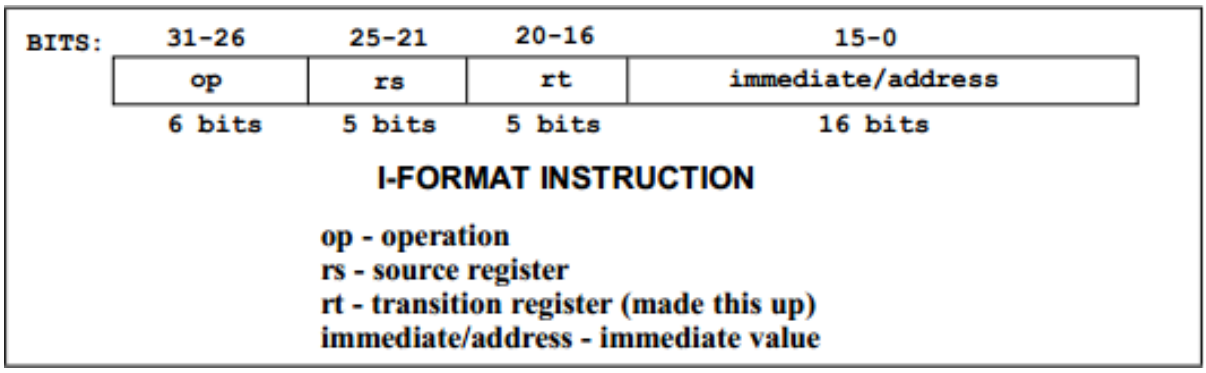
**Due to December 10 Wednesday–23:00**

In this project, you will use Altera Quartus II with Verilog. You will design **another small** part of the 32-bit MIPS processor.

The **only** supported instructions in your design will be **lw, sw** and **Project 3 instructions**, which were **addi, addiu, andi, ori, lui, sltiu, slti, beq and bne** instructions. Your top block will get NO inputs, but you should initialize the Instruction memory with the desired assembly program.

You will write the contents of the **registers**, the **instruction memory** and the **data memory** before and after the execution of instructions using **`writememh`** in your testbench verilog code. You will initialize all memory contents using **`readmemh`**. Also you will have a Program Counter register that shows the next instruction.

**YOU WILL NOT SUPPORT R-TYPE INSTRUCTIONS. Therefore do not put any additional logic for that.**




1. **Other than the parts you used in Project 3 you need a Data Memory to load data from it and to store data to it. Data Memory will be a 4GB memory with 32-bit address input.**

2. **Also you have to insert Instruction Memory to your design. Its size will be 4K.**

3. **You will insert a PC register to show the address of the next instruction. Therefore beq and bne instructions must also work as they work in the real case.**

4. **Do not use behavioral Verilog other than for the memory modules.**

Read the rules on the next page too!!

**Your design should not support R-type or J-type instructions. Only the instructions listed above.**

**Please be sure that your design simulates correctly. Designs that are not even simulating can get at most 25 points. Therefore at least support a subset of instructions correctly to get more points.**

**Submit your Altera Project folder as a zip file to Moodle. We will simulate your design using not only your testbench but also our testbench to see whether all instructions are executing correctly or not.**

**No late submissions even if it is 5 minutes. No medical reports. No excuses. No cry. So start early.**

**Any cheating attempt with the previous years' projects or with your friends or Internet will result in at least -100 and at most -300. No matter you gave or take the code. Protect your code.**