

**CSCE 611**  
**Lab 6**  
**MIPS Branch and Jump Instructions**  
**Due Date: 12/2 (by midnight)**

**Objective**

In this lab you will expand the EX and WB stages of your MIPS pipeline to add support for the following instructions:

- Branch: **beq, bne, bgez**
- Jump R-type: **jr**
- Jump J-type: **j, jal**

**Testing Procedure**

Test your CPU with the test program (from the lecture slides) as well as your own program that computes the square root of the value on the switches and outputs the result to the HEX displays in (8,5) base-10 format.

The objective of your test program is to perform the following steps:

1. read the binary value on the 18 DE2 switches,
2. compute the square root of the value
3. display the value using (8,5) base-10 representation on the DE2 HEX 7-segment LEDs

Use the algorithms described in lecture 9 for computing the square root of a number and converting the (32,14) binary value to a (8,5) decimal value.

You will **not** need to demonstrate the operation of your design and program on the DE2 board but it may be useful for testing your design.

Your design and your MIPS program must achieve (32,14) binary precision for both your square root and hex display.

Submit your projects through the course Moodle site (<http://dropbox.cse.sc.edu>). Upload all Verilog source, assembly code, hexfiles, and testvector files.

No demo required. Before submitting, ensure that:

1. Your design is compatible with the standard testbench available on the Dropbox (top-level module and port list match).
2. Your instruction RAM loads your program file from the current directory.
3. Your square root program must execute all six of the new instructions, even if they do not directly contribute to the square root algorithm.