The University of Texas At Dallas
Electrical Engineering Department
EE 2110: Beginning Digital Logic and Computer System Fundamentals
Experiment #6 – Developing a Simple MIPS Program

1. **Introduction:** The purpose of Laboratory Experiment 6 is to provide programming experience using primarily the register-register instructions, memory reference instructions, and system calls. The program is relatively simple, and should take no more than one-two hours to complete, if the student programmer has been keeping up to date in class, including completing homeworks and work sheets per the syllabus schedule.
2. **Goals of this exercise:** The major goals of this exercise are to gain experience in (1) designing a basic program, (2) using SPIM, (3) using MIPS register-to-register instructions, (4) using MIPS load and store instructions, and (5) using system calls for data input and output.
3. **Basis of experiment:** The SPIM assembler is a PC application package which simulates the MIPS computer, and assembles and runs programs that are composed on a text editor. SPIM will recognize programs stored with ".s" extension in the PC SPIM folde, although the extension is optional. This experimental exercise is to write a MIPS assembly-language program that emphasizes that performs mathematical functions and inputs and outputs data to the console.
4. **Experimental Equipment List:** The following items are required for this experimental procedure:

    - **Pervin text for reference.**
    - **SPIM installed on your PC. See Lecture # 12 if you have not loaded SPIM onto your PC yet (and note that you are LATE in getting started!).**
    - **Calculator to check the mathematical accuracy of your program calculation.**

5. **Pre-Work:**

    - **Make sure that you have read all the software-related readings (both Pervin and P&H) in the EE 2310 syllabus.**
    - **Read the program description below. Make sure that you clearly understand it before you begin to write the program.**
    - **To assist you and your partner in understanding how the program is to work, flow-chart it to make sure that you understand the processing sequence as the program executes.**
    - **Both lab partners should work on and attempt to complete the program before coming to lab. You should try to assemble it several times in order to debug it as much as possible, and leave little to do in the classroom. The software exercises are the only part of EE 2110 where you may work on a lab problem outside class.**

6. **Program Description:** You are to write a program that does the following:

    - **Inputs the values of three coefficients: a, b, c. Inputs another value, x.**
    - **Computes the value of the expression ax^2+bx+c.**
    - **The numbers a, b, c, and x should be input from the keyboard using the proper syscall, and stored appropriately in temporary registers.**

- **There should be a prompt to tell the user to input each of the values (a, b, c, x) which is displayed on the simulated MIPS console (computer screen).**
- **In order to limit the size of the computed number, there should be an initial prompt that limits all numbers to one or two digits.**
- **After the value is computed, it should be output to the simulated console, using the appropriate syscall. The number should be preceded by the statement on the screen: "The value of ax^2+bx+c is ."**

7. **Experimental Procedure:** Note: Bring a floppy disk or thumb drive to class with your program on it.

   - **Load your program onto the PC.**
   - **Open SPIM and begin debug if you have not yet done so. If you have any serious issues or problems, please consult the TA.**
   - **If the program runs, make sure that you can input the desired variables and get the correct answer. Bring a calculator to check your answer.**
   - **When your program runs correctly, please call the TA to verify correct operation with a demonstration.**
   - **When your program is verified, you have completed the exercise.**

8. **Software Removal:** The experimental procedure is complete. Please close the PCSPIM program. Using Windows Explorer®, delete the program from the C-drive SPIM folder and then shut down Windows properly. Make sure that your work area is clean before leaving.

9. **Laboratory Report:** As before, your laboratory report should follow the standard form. In your write-up, discuss any problem you had getting the program to run, and the actual verification of the correct assembly of each. Be sure to include a complete print-out of the final program (team members may use copies of the same printout). Also include answers to the following questions in your report:
   - **What would happen if you did not restrict the input numbers to only a few digits?**
   - **What was the biggest difficulty that you had in completing the program?**
   - **Note any problems that you had with loading SPIM on your computer or using it either at home or in the lab.**
   - **What was the hardest thing for you to master in this exercise, in comparison with high-level-language programming such as Java or C++?**