**Advanced VLSI Design Project (assigned 2/18/2014)**

1. Design a 32 bit ripple carry adder which adds two 32 bit positive integers without a carry input. The adder produces a 33 bit sum. This is similar to your HW 1 except that you are designing a bigger adder circuit. Your inputs will be captured in two 32-bit parallel-load input registers which will then feed into the combinational adder circuit. The output will be produced in a 33-bit output register. The input and output registers are controlled by a common system clock.
2. Design a 32 bit sequential ripple carry adder that performs the same function as the above designed adder.
   1. Your adder will have registers that will capture the inputs in a parallel fashion using a system clock. You will have a single 1-bit adder which takes two 1 bit inputs and produces a 1 bit sum and 1 bit carry outputs.
   2. The 32-bit adder inputs, captured in parallel input registers, will be fed sequentially into the 1-bit adder while the output will be sequentially shifted in the output register.
   3. After 32 cycles of a fast clock (also supplied externally), your adder will have performed its function and the next set of inputs will be loaded into the registers.

Your designs must satisfy the following constraints:

1. Your design can use any technology file from the PTM (predictive technology model) website (<http://ptm.asu.edu/>) as long as it is 45nm technology or better. Both designs must use the same technology file.
2. Your adders must work at the fastest possible clock without malfunctioning. You should be able to show the fastest possible clock by monitoring the critical path timing.
3. You have to apply 100 random vectors to your adder at the fastest clock and calculate the total power dissipated by your design. Both the designs must use the same 100 patterns, which should include a vector pair that activates the critical path.

Submit a 1 page “hypothesis” or proposal outlining which design will be faster, smaller, and consume less power. Provide a brief reasoning for each based on your intuition. **(Due 02/24/2014)**

Submit a project report in an IEEE paper format comparing the two designs. **(Due 04/21/2014)**

1. Highlight the key differences in each design approach.
2. Compare and contrast the advantages and disadvantages of each design.
3. Comment on each adder's area, timing, and power overhead. Especially comment if your results matched your initial “hypothesis”. Provide a brief reason on why the results were as expected or not as expected.
4. In your conclusion, summarize what you have learned from the project, identify what you would have done differently if you were to do the project again, and what future direction you would want to take your project if you were given more time.