ECE 4525/5525 DIGITAL DESIGN

FALL 2025

Homework Assignment #5

Total: 90 pts.

Due 11:30am, Friday, October 24, 2025

Download the Data Sheets of the **SN74ALS169B Synchronous 4-Bit Up/Down Binary Counter** from Texas Instruments' Web site. Use the current **AMD/Xilinx Vivado tools to design, simulate and compile** a **functionally equivalent** circuit on your **Xilinx Artix-7 FPGA** chip. However, downloading the .bit file to your Nexys A7 Board is **NOT** required.

Tasks:

a) Turn in an electronic copy of the **.vhd** file for your design. (40 pts.)

b) **Map** your design to the FPGA chip specified above by running the **Implement** step. **Add** a **customized version of the Nexys A7.xdc file** to your project files such that the **CLK input** is assigned to the **CLK100MHZ** on-board clock, **all other inputs should be assigned to on-board Switches** and **all outputs should be routed to on-board LEDs**, respectively. **You should do the actual assignments**.
Turn in an **electronic copy of your .xdc file** and **only the top page of the Project Summary Report**. (20 pts.)

c) Develop a **script** (**.tcl file**) to verify the correct operation of your circuit. Your .tcl file should implement the **time diagram published on Page 4 of the Data Sheets**. Run the **post-route simulations**.
Turn in an electronic copy of your **.tcl** file along with an electronic copy of the **simulation waveforms**. **Comment on** the simulation results for full credit. (30 pts.)

Fall back position: turn in electronic copies of your **.vhd**, **.xdc** and **.tcl** files along with comments for partial credit if you couldn't compile your design due to some fatal error.

Electronic submission: submit your single **.pdf** file through the **appropriate Dropbox in eLearning**.

Bonus Homework Assignment #5

Total: 40 pts.

Due 11:30am, Friday, October 24, 2025

Download the **.bit** file to your Nexys A7 Board and prototype your circuit. **Create a narrated, short video clip** (**.mp4** file, up to **4mins**) to illustrate that your circuit works. Submit the .mp4 file through the **appropriate Dropbox in eLearning**.