**EE 365: Final Project/Exam (Team Project)**

**Demo: Before December 15, 2022, by 12:00 pm**

**Report due: Upload the report before the demo**

Total 100 points

50 points for the project + demo

30 points for an oral exam

20 points for the report

Each member of the team will write their report on the project. The length of the report should be at most five pages. You should add all codes in the Appendix of your report. The appendix will not be included in the page count.

[Make appointments for project Demos.](https://docs.google.com/spreadsheets/d/1I2h39C5cdSeecuDljX2Xh5BEaZJrSEES/edit?usp=share_link&ouid=115367164352306877434&rtpof=true&sd=true)  Partners should demo separately for an oral exam.

There are three parts to the final project.

1. (10 points) You are required to complete the tutorial entitled “[Creating a custom IP in Vivado using the IP Integrator](https://digilent.com/reference/learn/programmable-logic/tutorials/zybo-creating-custom-ip-cores/start).” There also is a help file on OneNote on Moodle. The help file uses VHDL rather than Verilog. Modify the tutorial for Trenz’s Zynqberry board. This demo tutorial guides you through creating a basic PWM controller to manipulate the light intensity of 4 PMOD LEDs connected to the connector on the board. When you complete the project correctly, you will see the four PMOD LEDs pulsating at a software-controlled periodic rate.
2. (10 points) Complete the tutorial entitled “[Creating a custom IP block in Vivado](https://www.fpgadeveloper.com/2014/08/creating-a-custom-ip-block-in-vivado.html/).” The custom IP in this tutorial is a multiplier.
3. (30 points) Design a System using Zynqberry whose output is a sequence of ten 16-bit data stored in an array in a C program, as shown below.



The output of the system shall be displayed on

* 1. A PC Serial Terminal (such as Putty)
  2. A Sparkfun’s 7-segment display using either TTL serial or SPI protocol
  3. An LCD module

The data shall cycle continuously and update every second. The other requirements are:

* Use an AXI-Timer with a 1-sec interrupt
* Use custom IPs to communicate with the 7-seg display and the LCD module.

