

# **Introduction to Digital Logic Lab for Transfer Students**

# ECE 2067

# **Credit Hours:**

0.50 - 0.50

#### **Course Levels:**

Undergraduate (1000-5000 level)

# **Course Components:**

Lab

#### **Course Description:**

Laboratory-only component of ECE 2060 for transfer students. Laboratory practice with and application of the theory of combinational and clocked sequential networks.

#### **Prerequisites and Co-requisites:**

Prereq: 2061, and CPHR 2.00 or above.

#### **Course Goals / Objectives:**

- Be competent in synthesizing networks of combinatorial, digital logic elements
- Be competent to design and synthesize digital clocked sequential circuits
- Be familiar with modern computer tools for digital design, verification and simulation
- Be familiar with how to implement their design schematics to hardware using modern FPGAs
- Be competent in working in teams for lab experiments
- Be familiar with digital circuit design methods
- Be competent in reporting standards
- Be competent in using laboratory instruments and laboratory methodology
- Exposure to methodology for critical troubleshooting skills

#### **Course Topics:**

- Introduction to lab Equipment: Signal Generator and Oscilloscope, how to measure digital signals using the oscilloscope and the motivation for using digital signals
- Introduction to Quartus and the DE2 Board: HDL files, basic RTL components for simulation. Quartus's onchip debugging tools, Signal Tap II and the In-System Memory Content Editor.
- Using the CODEC: Students are shown how to use the DE2's audio CODEC chip to perform conversions between analog and digital signals.
- Introduction to the Synthesizer: build a synthesizer, Students also learn how to use Matlab to create memory contents for ROM look-up tables. Finally students are introduced to bit shifting as a means of scaling signed and unsigned numbers.
- Electronic Keyboard: Students build a circuit that takes signals from PS2 keyboard and converts them into musical tones by applying the concepts and skills they have learned in the previous 5 labs.
- Demo Player Feature for an Electronic Keyboard: Students add an auto play feature to the electronic keyboard that automatically plays a short tune. Emphasizes the use of sequential components, testing of large Quartus project.

# **Designation:**

Elective Required