Introduction to Digital Logic Lab for Transfer Students

ECE 2067

**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.

**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 on-chip 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.

**Grades Breakdown:**

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<thead>
<tr>
<th>Aspect</th>
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<tr>
<td>Lab Reports</td>
<td>100%</td>
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**Designation:**

- Elective
- Required

**Instruction Modes:**

- In Person (75-100% campus; 0-24% online)

**Representative Textbooks and Other Course Materials:**

<table>
<thead>
<tr>
<th>Title</th>
<th>Author</th>
<th>Year</th>
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<tbody>
<tr>
<td>Fundamentals of Logic Design</td>
<td>Roth, Jr. and Kinney</td>
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