EE-2174
Digital Logic and Lab

Curricular Designation: EE: required       CpE: required

Catalog Description:
EE 2174 – Digital Logic and Lab Introduces analysis, design and application of digital logic. Includes Boolean algebra, binary numbers, logic gates, combinational and sequential logic, storage elements, schematic and hardware-description-language based synthesis.
Credits: 4.0 Lec-Rec-Lab: (3-0-1) Semesters Offered: Fall, Spring, Summer; Pre-Requisite(s): CS 1121 or CS 1131

Textbooks(s) and/or Other Required Materials:

Prerequisites by Topic:
1. Familiarity with computer programming.

Course Objectives:
1. Combinational logic design including familiarity with Boolean algebraic equations and mastery of Karnaugh maps.
2. Mastery of number representation in binary, octal and hexadecimal, twos complement addition, binary multiplication, and BCD addition.
3. Introduction to multiplexers, decoders, encoders and code converters.
4. Introduction to SR, JK, & T flip flops, familiarity with D flip flops
5. Familiarity with synchronous sequential logic design using D flip flops, including finite state machines.
6. Introduction to asynchronous sequential logic design, including races and hazards.
7. Familiarity with Verilog logic design.

Topics Covered:
1. Number Systems and calculations
   (a) Binary, Octal, Hex, BCD; Adding, Subtracting and Multiplying Binary
   (b) Representing Negative numbers in 2’s Complement

2. Combinational Logic
   (a) Boolean Algebra, algebraic manipulation of Boolean equations with 2–3 variables and Karnaugh maps with 4–5 variables
   (b) Decoders, Encoders, Multiplexers, Comparators, Adders, Subtractors and ALUs
   (c) Combinational Logic Design in Verilog

3. Sequential Logic
   (a) Latches, Flip-flops, Finite State Machines
   (b) Synchronous logic with D flip-flops
   (c) Asynchronous design with simplified assignments, hazards and races
### Relationship of the Course Content to Program Outcomes:

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<tr>
<th>Outcome</th>
<th>Important</th>
<th>Moderately</th>
<th>Minimally</th>
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<td>a. an ability to apply knowledge of mathematics, science and engineering</td>
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<td>b. an ability to design and conduct experiments, as well as to analyze and interpret data</td>
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<td>c. an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, health and safety, manufacturability and sustainability</td>
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<td>d. an ability to function on multi-disciplinary teams</td>
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<td>e. an ability to identify, formulate and solve engineering problems</td>
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<td>f. an understanding of professional and ethical responsibility</td>
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<td>g. an ability to communicate effectively</td>
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<td>h. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context</td>
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<td>i. a recognition of the need for, and an ability to engage in life-long learning</td>
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<td>j. a knowledge of contemporary issues</td>
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<td>k. the ability to use the techniques, skills, and modern engineering tools necessary for the practice of electrical engineering</td>
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### Contribution of Course to Meeting Degree Requirements:

4 Credit Hours – Engineering Topics

**Class/Laboratory Schedule** (note: 1 hour = 50 minutes):
Lecture: 42 hours = 3 hours/week for 14 weeks
Lab: 42 hours = 3 hours/week for 14 weeks

**Prepared by:**
Timothy Havens, Associate Professor, November 29, 2016