14:332:233 - Digital Logic Design Laboratory

Course Catalog Description:
14:332:233 - Digital Logic Design Laboratory (1)
Hands-on experiments with digital circuits of increasing complexity from simple gates to state machines.

Pre-Requisite Courses: None

Co-Requisite Courses: 14:332:231

Pre-Requisite by Topic:
1. Boolean algebra.
2. Electrical concepts from physics.
3. Basic skills in using multimeters, power supplies, oscilloscopes.
4. General computer skills.

Textbook & Materials:
Laboratory manual supplied by the instructor.

References:
The OneKey access from Prentice Hall can be helpful to prepare the laboratory.

Overall Educational Objective:
To provide practical experience with the implementation of digital circuits. Gives a good basis for studying computer engineering.

Course Learning Outcomes:
A student who successfully fulfills the course requirements will have demonstrated:
1. An ability to operate laboratory equipment.
2. An ability to construct, analyze, and troubleshoot simple combinational and sequential circuits.
3. An ability to design and troubleshoot a simple state machine.
4. An ability to measure and record the experimental data, analyze the results, and prepare a formal laboratory report.

How Course Outcomes are Assessed:
- Homework problems are not collected (0%)
- Two midterm exams (30% + 30%)
- Final exam (40%)
N = none  S = Supportive  H = highly related

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Level</th>
<th>Proficiency assessed by</th>
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<tbody>
<tr>
<td>(a) an ability to apply knowledge of Mathematics, science, and engineering</td>
<td>H</td>
<td>Laboratory work and report</td>
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<tr>
<td>(b) an ability to design and conduct experiments and interpret data</td>
<td>H</td>
<td>Laboratory work and report</td>
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<tr>
<td>(c) an ability to design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability</td>
<td>H</td>
<td>Setting up experiments, performing experiments, and circuit simulations</td>
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<tr>
<td>(d) an ability to function as part of a multi-disciplinary team</td>
<td>H</td>
<td>Each experiment done by a team</td>
</tr>
<tr>
<td>(e) an ability to identify, formulate, and solve ECE problems</td>
<td>H</td>
<td>Performing laboratory experiments</td>
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<td>(f) an understanding of professional and ethical responsibility</td>
<td>S</td>
<td>Conducting the experiments and reporting the results</td>
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<td>(g) an ability to communicate in written and oral form</td>
<td>H</td>
<td>Laboratory reports</td>
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<tr>
<td>(h) the broad education necessary to understand the impact of electrical and computer engineering solutions in a global, economic, environmental, and societal context</td>
<td>N</td>
<td></td>
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<td>(i) a recognition of the need for, and an ability to engage in life-long learning</td>
<td>S</td>
<td>Report written at home</td>
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<td>(j) a knowledge of contemporary issues</td>
<td>N</td>
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<td>(k) an ability to use the techniques, skills, and modern engineering tools necessary for electrical and computer engineering practice</td>
<td>H</td>
<td>Laboratory work and reports</td>
</tr>
<tr>
<td>Basic disciplines in Electrical Engineering</td>
<td>S</td>
<td>Laboratory instruction</td>
</tr>
<tr>
<td>Depth in Electrical Engineering</td>
<td>S</td>
<td>Laboratory instruction</td>
</tr>
<tr>
<td>Basic disciplines in Computer Engineering</td>
<td>H</td>
<td>Laboratory work and reports</td>
</tr>
<tr>
<td>Depth in Computer Engineering</td>
<td>H</td>
<td>Laboratory work and reports</td>
</tr>
<tr>
<td>Laboratory equipment and software tools</td>
<td>H</td>
<td>Laboratory work</td>
</tr>
<tr>
<td>Variety of instruction formats</td>
<td>S</td>
<td>Laboratory instruction, office hour discussions</td>
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</tbody>
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**Topics Covered week by week:**

Week 1: General introduction to the laboratory.
Week 2 and 3: Introduction to hardware.
Week 4 and 5: Combinational SSI circuits.
Week 6 and 7: Combinational MSI circuits.
Week 8 and 9: Four bit arithmetic circuit.
Week 10 and 11: Sequential Circuits. State machine analysis.
Week 12 and 13: State machine synthesis.
Week 14: Review.

Computer Usage:
At present time, the students are not using a computer. If a simple digital logic design program will become available, the laboratory will be redesigned accordingly.

Laboratory Experiences:
Moderate design experience in arriving at circuits on which experiments are conducted.

Design Experiences:
Conducting the circuit simulation and writing the laboratory reports.

Contribution to the Professional Component:
(a) College-level mathematics and basic sciences: 0.25 credit hours
(b) Engineering Topics (Science and/or Design): 0.75 credit hours
(c) General Education: 0 credit hours
Total credits: 1

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