CMPEN 275
Digital Design Laboratory
Required Course in Computer Engineering

Catalog Data: Digital Design Laboratory (1)
Introduction to digital design techniques.
Concurrent: CMPEN 271; Physics 212.

Program supplied Laboratory Manual

Course Objectives: This laboratory provides sophomore students with experience in digital circuit design.
Students are exposed to the design, implementation, and debugging of both combinational and sequential circuits.

Primary Course Outcomes: Upon completion of the course, students should possess the following skills:

- Be able to use standard digital laboratory equipment to aid in the design, implementation, and debugging of combinational and sequential circuits.
- Be able to implement combinational and sequential circuits using typical breadboarding techniques and/or other implementation technologies.
- Be able to use digital design and debug software tools.
- Be able to record laboratory and experimental results in a professional manner.

Relationship to Undergraduate Program Outcomes: CMPEN 275 is a companion laboratory to the lecture course CMPEN 271. As such it provides students with hands on laboratory experience with the topics and concepts learned in CMPEN 271. As such it builds a foundation for later junior/senior laboratory/design courses.

CMPEN 275 supports the following program outcomes:

- Demonstrate basic laboratory skills, including the use of standard laboratory equipment.
- Analyze and design circuits, devices, and systems using differential and integral calculus and principles of electricity, magnetism, and modern physics.
- Design the electronic/logic circuits that form the basic building blocks of a computer system.
- Write clear and effective prose.
- Be able to discuss major trends in industry and current research activities within the discipline.

Required Topics: Number systems, base conversion and codes (1 week).

“Using Real Logic Devices” (Laboratory introduction and equipment familiarization) (2 classes).
Combinational Design (1 class).
Sequential Circuits (1 class).
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Programmable Logic Devices (1 class).
Logic Circuit Building Blocks (1 class).
Designing with Building Blocks (2 classes).
Elevator Simulator (3 classes).
Traffic Light Simulator (2 class).

Class Format: Once a week laboratory for 2 hours.
Professional Component: CMPEN 275 introduces students to practical engineering design experiences. This course also lays the necessary foundation in digital/logic design and laboratory experience required in higher level courses which add breadth and depth in the areas of digital design and computer architecture. Students also learn to use various engineering software packages, including ABEL or VHDL design and PLD programming, as well as building on their computer experience with a schematic capture or VHDL design & simulation tool, first introduced in CMPEN 271. Laboratory equipment used includes an oscilloscope, logic analyzer, DC power supply, digital multimeter and signal generator. In the design process, students consider economic factors in terms of attempting to achieve minimal designs and practice their technical writing skills. Students work in teams of two throughout the semester.

Evaluation: Students are evaluated by their participation in the laboratory work, successful implementation, debug if necessary, and demonstration of their designs, and effective laboratory documentation.

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