ENGR 2700

Division: Natural Science and Mathematics
Department: Engineering and Computer Science
Course: ENGR 2700
Title: Digital Circuits
Catalog Description:

This course is an introduction to digital systems, logic gates, combinational logic circuits, and sequential logic circuits. It includes minimization techniques and implementation with encoders, decoders, multiplexers, and programmable logic devices. Mealy and Moore models of state machines, state minimization, and state assignment are considered. A hardware description language is also introduced.

General Education Requirements: N/A
Semesters Offered: Spring
Credit/Time Requirement: Credit: 3; Lecture: 3; Lab: 0
Clock/Hour Requirements: 0
Offered for Non-Credit: No
Prerequisites: MATH 1050

Corequisites: ENGR 2705

Justification:

This course is designed as a component of the standard pre-professional curriculum in electrical engineering and computer engineering. It enables the student to transfer with junior-level status into a four-year engineering program. Similar courses are offered in university engineering schools. This course is to be taken during the sophomore year of the pre-engineering curriculum and will prepare the student for subsequent course work. It serves as the first digital circuits course for students in electrical engineering and computer engineering, and as a service course for students in other engineering fields.

Student Learning Outcomes:

Students will understand and be able to work with the number systems around which digital computer hardware is designed, including conversion between number systems, two's complement binary numbers, and binary arithmetic.

Students will be able to use Boolean algebra as a tool in the design of digital circuits which are to perform a given logic function, and to use Karnaugh maps to find the minimal realization of such circuits.

Students will have a basic understanding of digital logic to prepare him or her to transfer into the professional engineering program at a university, and there continue the study of digital logic at an advanced level.

Content:

The following topics will be covered in this course:

- Number systems
- Switching functions
- Combination logic circuits
- Sequential logic circuits
- Minimization of logic circuits
- Modular logic devices
- Programmable logic devices
- Hardware description language.

General Education Outcomes:

1) Read effectively, constructively, and critically.

Students will read the text throughout the course. They will also be required to read and understand specifications of problems assigned as homework so that a solution can be developed. For example, a written description of a digital circuit will be given. The student will be required to read the description, understand what is expected, and then produce an appropriate digital circuit.

6) Apply computational skills to a variety of contexts.

Students will be required to solve about 10 homework problems per chapter, many of which require computation. These will include conversion between number systems, simplifying Boolean expressions, and solving arithmetic problems in base-2.

7) Apply scientific reasoning to a variety of contexts.

Students will be able to approach problems logically and develop solutions by applying the development process. This will include understanding the problem statement, developing a solution, and verifying the solution.

Key Performance Indicators:

Daily homework: 10%-20% of final grade

8-12 quizzes: 15%-25% of the final grade

2-5 examinations: 30%-60% of the final grade

Comprehensive final examination: 15%-35% of the final grade

Representative Text and/or Supplies:

S. Brown and Z. Vranesic, *Fundamentals of Digital Logic with Verilog Design*, current edition, McGraw-Hill

Optimum Class Size: 20
Maximum Class Size: 30

Signatures:

I hereby submit this course syllabus:

Garth O. Sorenson, MS, Associate Professor

I hereby find this course consistent with the goals and resources of the Engineering and Computer Science Department:

Garth O. Sorenson, MS, Associate Professor, Chair

I hereby find this course consistent with the goals and resources of the Natural Science and Mathematics Division:

Dan Black, EdD, Associate Professor, Dean

I have discussed the need for library resources related to this class with the person submitting the syllabus:

Lynn Anderson, MLIS, Technical Services Librarian (Main Campus)

Michelle Olsen, MLS, Campus Librarian (Richfield Campus)