COURSE DESCRIPTION

Dept., Number	EL E 335	Course Title	Principles of Digital Systems
Semester hours	3	Course Coordinator	Mustafa M. Matalgah, Associate Prof.

Current Catalog Description

Binary numbers, number system conversion, coding schemes; Boolean algebra, axioms, theorems, Karnaugh map; logic design, Boolean functions, minimization; implementation of transform methods; asynchronous systems.

Textbook

Donald D. Givone, *Digital Principles and Design*, McGraw-Hill: 2003.

References

Course Outcomes

Upon completion of the course, students can:

1. analyze combinational logic circuits that include mixed logic signals;
2. synthesize combinational logic circuits that include mixed logic signals;
3. design combinational logic circuits that solve real-world problems presented as English language statements;
4. use minimization techniques for combinational logic circuits based on different metrics;
5. analyze sequential state machines;
6. synthesize sequential state machines;
7. design sequential state machines that solve real-world problems presented as English language statements;
8. incorporate ethical considerations regarding health and safety into design;
9. recognize that digital systems develop rapidly and require lifelong learning.

Relationship between Course Outcomes and Program Outcomes

Course outcomes 1, 2, 4, 5, and 6 contribute to program outcomes (a) and (j); course outcomes 3 and 7 contribute to program outcomes (b) and (c); course outcome 8 contributes to program outcomes (e) and (g); and course outcome 9 contributes to program outcome (h).

Prerequisites by Topic

Fundamental computer programming concepts and skills (CSCI 111 or 251)

Major Topics Covered in the Course

1. Number systems (decimal, binary, octal, hexadecimal) and digital codes. Representation of negative numbers. Addition and subtraction. Overflow. (3 classes/ 3hours).
2. Boolean Algebra. DeMorgan's theorems. Logic Conventions and the representation of logic gates (inverter, AND, OR, NAND, NOR). Truth table representation of Boolean Algebra functions. (4 classes/4 hours)
3. Analysis of mixed logic circuits. (3 classes/3 hours)
4. Synthesis of mixed logic circuits. Circuit synthesis using a single type of gate. (3 classes/3 hours)
5. Design of combinational logic circuits from word problems. Recognition and classification of input and output signals. (2 classes/2 hours)
6. Minimization of combinational logic circuits using a Karnaugh map and Tabular minimization. (3 classes/3 hours).
7. MSI Digital circuits, (adders, decoders, encoders, multiplexers, demultiplexers, parity generators and checkers, ROMs, PLDs). Use of MSI circuits to minimize chip count and connections. Introduction to VHDL. (5 classes/5 hours)
8. Circuits involving feedback. Timing Diagrams. S-R, D, J-K, and T flip-flops. (3 classes/3 hours)
9. Analysis of sequential state machines. (2 classes/2 hours)
10. Synthesis of sequential state machines. (2 classes/2 hours)
11. Design of sequential state machines (2 classes/2 hours)
12. Techniques for minimizing sequential state machines and converting between Mealy and Moore machines (3 classes/3 hours)
13. Ethical considerations during design (1 class/1 hour)
14. Tests (3-4 classes/3-4 hours)
15. Introduction. Review and consolidate material. (5-6 classes/5-6 hours)

Assessment Plan for the Course

The primary assessment tool for this course is an online evaluation done by the students at the end of each semester. Questions on the evaluation address the course objectives. Success is characterized by at least 70% of students either agreeing or strongly agreeing with each evaluation statement. Results are reviewed by an electrical engineering departmental committee once per calendar year to determine if the course objectives are being met, and changes may be made in the course to achieve the course objectives if deemed appropriate by the committee.

How Data in the Course are Used to Assess Program Outcomes (unless adequately covered already in the assessment discussion under Criterion 4)

Estimate Curriculum Category Content (Semester hours)

Area	Core	Advanced	Area	Core	Advanced
Algorithms			Software design		
Data structures			Concepts of programming languages		