COURSE DESCRIPTION

Department and Course Number: ENGR 597

Course Title: Special Projects

Current Catalog Description: Approved investigation of an original problem under direction of a staff member.

Total Credits: 1-3 hours

Coordinator: CIS sections coordinated by H. Conrad Cunningham, Chair and Associate Professor of Computer and Information Science.

Textbook: Varies with project.

References: Varies with project.

Course Goals: To investigate an original problem under direction of a staff member.

Prerequisites by Topic: Advanced undergraduate or graduate standing.

Major Topics Covered in the Course: Varies with topic.

Laboratory projects: Varies with topic.

Estimate of ABET/CAC Category Content:

	CORE	ADVANCED		CORE	ADVANCED
Data Structures			Computer Organization and Architecture		
Algorithms			Concepts of Programming Languages		
Software Design		3			

COURSE DESCRIPTION

Department and Course Number: EL E 335

Course Title: Principles of Digital Systems

Current Catalog Description: Binary numbers, number system conversion, coding schemes; Boolean Algebra, axioms, theorems, Karnaugh maps; logic design, Boolean functions, minimization, implementation of transform methods; asynchronous systems.

Total Credits: 3 hours

Coordinator: Mark D. Tew, Associate Professor of Electrical Engineering

Textbook: Roth. *Fundamentals of Logic Design*, Thomson, 4th Ed., 1992.

Other required materials: None

References: None

Course Goals: To introduce students to the principles of digital systems design. To develop and build skills necessary for advanced courses in digital design or software engineering.

More Specifically:

1. Students are to learn to analyze combinational logic circuits that include mixed logic signals;
2. Students are to learn to synthesize combinational logic circuits that include mixed logic signals;
3. Students are to learn to design combinational logic circuits that solve real-world problems presented as English language statements;
4. Students are to learn to use minimization techniques for combinational logic circuits based on different metrics;
5. Students are to learn to analyze sequential state machines;
6. Students are to learn to synthesize sequential state machines;
7. Students are to learn to design sequential state machines that solve real-world problems presented as English language statements;
8. Students are to learn to incorporate ethical decisions regarding health and safety into design.

Prerequisites by Topic:

1. Fundamentals of computers and programming (e.g., CSCI 111 or 251).
2. Algebra.

Corequisite: Digital Systems Laboratory I (ELE 336)

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)

Laboratory projects:

See corequisite course description, ELE 336, Digital Systems Lab.

Estimate of ABET/CAC Category Content:

	CORE	ADVANCED		CORE	ADVANCED
Data Structures			Computer Organization and Architecture	3	
Algorithms			Concepts of Programming Languages		
Software Design					