EMBRY-RIDDLE AERONAUTICAL UNIVERSITY
Department of Computing and Mathematics
COURSE OUTLINE FOR

Course No.: CEC222 **Title: Digital Circuit Design Laboratory**
Cr Hrs: 1

Lecture Hours: 0 **Laboratory Hours: 2**

COURSE DESCRIPTION:

"Hands-on" experience through laboratory experiments. The experiments will involve designing digital circuits using Electronic Work Bench (EWB) simulator and digital logic breadboards. Through these experiments, the students will learn how the integrated circuits such as basic gates, decoders, Flip-Flops, seven segment LEDs, adders, comparators and other devices work and how they can connect these devices to build a functional digital circuit. The use of other digital circuit simulators such as Logic Works and Xilinx are encouraged. Corequisite for this course is CEC220

GOALS:

The purpose of the course is to have students acquire an understanding of digital circuits, become familiar with lab equipment's such as Oscilloscope, Multimeter, logic probe, logic analyzer, etc., understand numbering system, understand Boolean algebra, understand digital signal timing, be able to design complex digital circuits and build it, appreciate the role of hardware in computer operations; understand and use ICs in the design of the digital circuits and to be able to apply digital systems in a real life applications.

PERFORMANCE OBJECTIVES:

1. Understand numbering systems (binary, hex, etc.)
2. Be able to use the logic simulator
3. Be able to use Multimeter, Oscilloscope, and other lab equipment.
4. Understand manufacturer's data sheets for IC devices
5. Design and build Combination Logic circuits
6. Understand sequential logic circuits
7. Analyze electronic circuits.
8. Understand Integrated Circuits.
9. Understand Flip-Flops, decoders, multiplexers, adders, Comparators, shift registers and be able to use them in a design.
10. Explain the operation of the above circuits.

11. Understand Combination and sequential logic.

12. Understand programmable Logic Devices.

Department of Computing and Mathematics
COURSE OUTLINE FOR CEC222, Continued

TEXTBOOK:

Floyd, L. Thomas, *Digital Fundamentals,* 7th edition, Prentice Hall, 2000.

LAB MANUAL:

David Buchla, *Experiments in Digital Fundamentals*, 5th edition, Prentice Hall, 2000

SUGGESTED SUPPLEMENTAL MATERIALS:

a. Baumgarter, W.H., *Pulse Fundamentals in Small Scale Digital Circuits*, Reston Publishing.
b. Garrod & Borns, *Digital Logic Analysis, Application & Design*. Sanders Collage Publishing 1991.
c. *Practical Digital Design Using IC's*, Grrenfield, Prentice Hall
d. *Digital Logic Circuit Analysis & Design*, Victor P. Nelson, etc. Prentice Hall 1995
e. Search the World Wide Web for related materials in Digital Circuit Design.

PREREQUISITE KNOWLEDGE BY TOPIC:

1. Collage algebra

	TOPIC	CLASS HOURS	COURSE OBJECTIVES
1.	Introduction to Laboratory and equipment and simulators	2	Laboratory Instrument Familiarization and introduction to logic circuit simulator operation and functions.
2.	Number systems, operation and codes	2	Experiment in number system. Build a circuit for binary to seven-segment display.
3.	Logic gates and their functions.	2	Experiment with logic gates to construct truth table and use the functionally complete basic gates to construct other logic gates.
4.	Interpreting Manufacturer's Data Sheet	2	Interpreting Manufacturer's Data Sheet by measuring the static electrical specifications for TTL and CMOS logic.
5.	Boolean Laws and Theorem	2	Experimentally verify Boolean Laws and DeMorgan's Theorem.
6.	Logic circuit simplifications	2	Using Karnaugh map to simplify the Boolean expression, build and test the circuit for the simplified expression.

7.	Combination Logic Design	2	Be able to design a combination logic for a simple control system.

	TOPIC (cont.)	CLASS HOURS	COURSE OBJECTIVES (cont.)
8.	Design and build combination circuits such as an adder and a magnitude comparator.	2	Be able to combine combination logic ICs to design and build circuits.
9.	Multiplexers and Demultiplexers	2	Experiment with multiple input and multiple output combination logic.
10.	Sequential Logic	2	Construct and test D latch from basic gates. Experiment with various configurations for a J-K flip-flop including asynchronous and synchronous inputs.`
11.	Asynchronous Counters	2	Build and analyze asynchronous up and down counters
12.	Design a sequential logic controller	2	Design and build a sequential counter that is controlled by input variables to control a traffic light.
13.	Programmable Logic Arrays and Devices	2	How to use a PLD to implement logic functions and circuits.

COMPUTER USAGE:

Access to the laboratory with Logic breadboards Multimeters, Oscilloscope, and other lab equipment. Access to logic circuit simulators on the university network.

GRADING SYSTEM:

Lab grade is determined as a combination of in-lab performance and the lab reports collected one week following the lab – no late reports will be accepted.

ESTIMATED CONTENT:

Skills: 90 %
Content: 10 %