

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

Course No.: CEC421
Cr Hrs: 3

Title: Computer Systems Design II

Lecture Hours: 3

Laboratory Hours: 0

COURSE DESCRIPTION:

CEC420 and CEC421 form a one year senior design project. In CEC420 the students were given a set of system requirements and they were to design a system using hardware and software to satisfy those requirements. That final design was defined in detail in the Critical Design Review Document. In CEC421 the students will work in teams to implement the design as defined in CEC420. The team will follow a "bottom up" implementation where pieces of both the hardware and software will be implemented, demonstrated and documented. These pieces will then be combined into larger pieces which will be demonstrated leading to the demonstration of the complete project.

GOALS:

The purpose of the course is to have students: understand the role and interaction of hardware and software in the solution of a problem; follow and understand a "bottom up" implementation plan; understand how to implement, test and debug software in functional pieces (tasks); understand how to implement, test and debug hardware in functional pieces; understand how to develop "test software" to test and debug pieces of the hardware; understand how to bring together, test and debug hardware and software subsystems; demonstrate functional pieces of the design; provide project briefings and demonstrations to DCM faculty, students, and guests.

PERFORMANCE OBJECTIVES:

1. Understand how to implement the hardware and software designs defined in CEC420.
2. Understand how to implement software in functional pieces and schedule demonstrations of these functional pieces.
3. Understand how to implement hardware in functional pieces and schedule demonstrations of these functional pieces.
4. Understand the need for and characteristics and requirements of "test software" for the testing and debugging of hardware
5. Understand how to modify or add "test software" during hardware debug and hardware/software integration to isolate problems based on observed results

6. Document the hardware used in the partial functional subsystem demonstrations, including block diagrams, gate level designs, gate level simulations.
7. Document the software used in the functional subsystem demonstrations, including flow charts, task definitions, task inputs and outputs and source code
8. Develop presentations and demonstrations of project requirements, and implementation to faculty and students.

**Department of Computing and Mathematics
COURSE OUTLINE FOR CEC421, Continued**

TEXTBOOK:

None.

SUGGESTED SUPPLEMENTAL MATERIALS:

- a. *Xilinx Spartan and Spartan-XL Families Field Programmable Gate Arrays, product Specification March 2, 2000*
- b. *Associated Professional Systems (APS) FPGA Board for Xilinx FPGAs, APS-X240 Board documentation, available on line at <http://www.associatedpro.com>*
- c. *APS-X240 FPGA Board Application Tech Note, available on line at*
- d. *<http://www.associatedpro.com>*
- e. *Foundation Tutorial, available on line at http://www.seas.upenn.edu:8080/%7Eee201/foundation/foundation_intro.html*
- f. *Foundation Series 2.1i In Depth Tutorials, available on line at <http://support.xilinx.com/support/techsup/tutorials/index.htm>*
- g. *Atmel , ATDH2200E Programming Kit User Guide*

PREREQUISITE KNOWLEDGE BY TOPIC:

1. Proficiency in Boolean algebra, logic design, combinatorial logic circuits.
2. Proficiency in assembly language programming techniques for microprocessors.
3. Understanding of digital computer organization
4. Familiarity with personal computer operation in DOS environment
5. Proficiency in C programming language and the UNIX programming environment
6. Proficiency in programming and interfacing to microprocessor systems
7. Understanding of linear circuit analysis
8. Understanding of the fundamental principles and methodologies of large software development

TOPIC	CLASS HOURS	COURSE OBJECTIVES
1. Preparation for Software and Hardware demonstration #1 and documentation of design	9	Understand both hardware and software tools be used to implement software and hardware for demonstration #1. Learn to modify software and hardware to isolate bugs based on observed results
2. Preparation for Software and Hardware demonstration #2 and documentation of design	9	Understand both hardware and software tools be used to implement software and hardware for demonstration #2. Learn to modify software and hardware to isolate bugs based on observed results

3.	Preparation for Software and Hardware demonstration #3 and documentation of design	9	Understand both hardware and software tools be used to implement software and hardware for demonstration #3. Learn to modify software and hardware to isolate bugs based on observed results. Begin to bring together previously tested tasks and test their interaction
4.	Preparation for Software and Hardware final demonstration of complete project and final design documentation	15	Learn to: bring together all pieces of the design; thoroughly test design against requirements; modify test approach based on observed bugs; modify hardware and software to isolate bugs; document complete hardware and software design

COMPUTER USAGE: IBM desktop computers and embedded processors contained in the Real Time Laboratory, APS and Insight development boards for Xilinx FPGAs, Xilinx Foundation FPGA design software, Prom Programmer, Logic Analyzer

GRADING SYSTEM: Each student's grade will consist of a group part and an individual part as follows:

Hardware Team Grading

Demo #1 Hardware (FPGA) design review	10%
Demo #1 and documentation	10%
Demo #2 Hardware (FPGA) design review	10%
Demo #2 and documentation	10%
Demo #3 Hardware (FPGA) design review	10%
Demo #3 and documentation	10%
Demo #4 Hardware (FPGA) design review	15%
Demo #4 and documentation	15%

Individual Team Members weekly notes	10%
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Software Team Grading

Software only Demo #1	10%
Software only Demo #2	10%
Software only Demo #3	10%
Software in support of Hardware demo #1	10%
Software in support of Hardware demo #2	10%
Software in support of Hardware demo #3	10%
Complete System Software Demo	30%

Individual Team Members weekly notes	10%
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