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

Course No.: CEC420 **Title: Computer Systems Design I**
Cr Hrs: 3

Lecture Hours: 3 **Laboratory Hours: 0**

COURSE DESCRIPTION:

This course and CEC421 form a one year senior design project . In CEC420 the students are given a set of system requirements and they are to design a system using hardware and software to satisfy those requirements. The students will work in teams to create the system design, system partitioning into hardware and software , hardware design and software design. The team will follow a project management plan to include, brainstorming, creation of alternative solutions, analysis of alternative solutions, selection of best solution, resource allocation , risk assessment, risk management, cost analysis, and scheduling

GOALS:

The purpose of the course is to have students: understand the role of hardware and software in the solution of a problem; understand the use of project planning tools to progress from problem requirements to a system solution; plan a complete hardware/software project ; partition hardware and software into multiple tasks; define the function and interface of each hardware and software task; assign task responsibility to team memebers; document indiviual and team decisions in engineer's notrebooks and bimonthly team status reports; document high level sytem design in System Acquisiton document; define tasks and interfaces in greater detail for Preliminary Design Review document; produce final build plan and task specifications and interfaces for Critial design Review document.

PERFORMANCE OBJECTIVES:

1. Understand how to translate system requirements into functions to be performed.

2. Understand how to partition functions into hardware and software tasks.

3. Define the interaction of all tasks and data to be transferred between tasks.

4. Estimate manpower and schedule for all software and hardware tasks and assign tasks to specific team members.

5. Assign a risk of low, medium, or high to every task and specify a "fall back" plan for any task considered high risk.

6. Generate detailed functional descriptions and functional flow charts for all software tasks.

7. Determine software platform and operating system to be used.

8. Determine programming languages to be used.

9. Define the interface between the hardware and software

10. Define the protocol to be used for communication between hardware and software. Define commands and data transfer sizes for interface.

11. Define signals to be used on the hardware interface to include pin numbers of connector and timing diagrams for all interface signals.

12. Design hardware to the register level.

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COURSE OUTLINE FOR CEC420, 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.	Design Project Requirements	3	Understand the requirements from the customer for the design project.
2.	Development of hardware and software options to be considered for use in project design	3	Brainstorming session to explore what hardware and software tools, platforms, languages, and technology are availabale, understood and applicable to solution of given project requirements
3.	Selection of above options for use in senior design project	3	Understand the selection process of hardware and software options targeted to a particular design project

4.	Partition hardware and software into major functional tasks and assign tasks to individual team members	3	Understand the process of dividing the entire task into individual hardware and software tasks

	TOPIC (cont.)	CLASS HOURS	COURSE OBJECTIVES (cont.)
5.	Define interaction of all hardware and software tasks, all inputs and outputs to every task, and define detailed functions for all tasks	3	Understand the process of completely defining the function of each task and interdependencies of all tasks
6.	Risk analysis for all tasks	3	Understand the process of analyzing the risk of each task into low, medium or high based on whether the technology required for the task has been done before (low), has not been done before but know how to do it (medium), or has not been done previously and will need to researh to do (high).
7.	Risk Management Plan	3	Understand the process of managing project risk by determining a plan of actions and alternative solutions for all tasks with risk of medium or high.
8.	System Acquisiton Plan document and presentation	3	Learn to generate a system planning document which is required to contain: 1.Project Definition and Requirements 2. Description of Software Tasks and Manpower estimates 3. Description of Hardware Tasks and Manpower estimates 4. Test Plan and Hardware Cost estimates 5. Risk assessment for each HW and SW task 6. Risk management plan 7. Individual Responsibilities 8 Software Milestones and Schedule
9.	Preliminary Design Review document and presentation	9	Understand how to develop a top-down design and produce a preliminary design review document containing: 1. Project Definition and Requirements 2. Fault/Action Matrix 3. SW Flow Chart and Definition of Software Tasks (inputs, outputs, function, 4. HW Block Diagrams and Definition of Hardware Tasks (inputs, outputs, function) 5. Test Plan 6. Risk assessment for each HW and SW task 7. Risk management plan for tasks at moderate or high risk 8. Individual Responsibilities 9. Software Milestones and Schedule 10. Hardware Milestones and Schedule11. Manpower Profile 12. Funding Profile

10.	Critical Design Review document and presentation	9	Understand how to develop detailed hardware and software top-down designs and generate a critical design review document containing: 1. Project Definition and Requirements 2. Fault/Action Matrix 3. SW Flow Chart and Definition of Software Tasks (inputs, outputs, function, 4. HW Block Diagrams and Definition of Hardware Tasks (inputs, outputs function) 5. Test Plan 6. Risk assessment for each HW and SW task 7. Risk management plan for tasks at moderate or high risk 8. Individual Responsibilities 9. Software Milestones and Schedule 10. Hardware Milestones and Schedule 11. Manpower Profile.12. Funding Profile

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:

15 %	System Acquisition Plan (SW group grade and HW group grade)		
15%	Preliminary Design review (SW group grade and HW group grade)		
20%	Critical Design Review (SW group grade and HW group grade)		
15%	Biweekly status Reports (SW group grade and HW group grade)		
5%	Engineer's Design Notebook (individual grade)		
10%	Test grades (individual grade)		
20%	Individual Assignments:		
	Peer Grade		5%
	Manager's Grade	5%	
	Customer's Grade	10%	