King Saud University
College of Computer and Information Sciences
Department of Computer Engineering

CEN433 – Digital Systems Design (3,0,1)
Semester I, Academic Year 2011-2012
Required – Course Time (Su,Tu 10:00-12:00am)

Course Description (Catalog):
Architecture and Instruction set of different 16 bit microprocessors; Microprocessor chips and LSI technology; Supporting chips (Buffers, decoders, system clock generator, reset system); Memory chips and subsystems Interfacing 16-bit Microcomputers. Architecture of Microprocessor based systems, design technique, memory and I/O devices interfacing to the microprocessor, interfacing technique, I/O techniques: Interrupts, Direct memory access; System development and design tools techniques: hardware, and software.

Prerequisite: Courses CEN316
Topics Basic computer organization, Processor organization, Machine and Assembly language programming, Memory organization, I/O operations.

Textbook(s) and/or Other Required Materials:

Primary: Barry B. Brey, The Intel Microprocessors: 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, and Pentium 4, 6th Edition, 2005, Prentice Hall.

Supplementary: Intel manuals and data sheets.

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Course Learning Outcomes: This course requires the student to demonstrate the following:

1. Design digital systems to meet with the desired needs.
2. Interface the microprocessors with ROM, RAM , Flash, and DRAM..
3. Analyze the timing waveforms of components of a digital system.
4. Check the interface compatibility among microprocessors, memory chips, and I/O chips.
5. Perform logic design of the interface including needed buffering.
6. Understand basic functionality of standard chips (parallel interface, serial interface, interrupt controller, DMA controller, etc.) and understand their application in a system design.
7. Write programs to configure different I/O chips.
8. Interface a digital system with parallel/serial I/O devices.
9. Implement a digital system with different interrupts requesting different services.
10. Implement different applications based on timers.
11. Apply knowledge of engineering.
12. Identify and design the solutions of engineering problems.
13. Design and conduct experiments, as well as to analyze and interpret data.

Major Topics covered and schedule in weeks:

Internal Architecture of 8088/8086 Microprocessors	2
8088/8086 Assembly language	1
Memory Devices (ROM, SRAM, Flash, DRAM)	1
Address Decoding	1
Introduction to I/O Interface	1
Programmable Peripheral Interface (8255A)	2
Programmable Interrupt Controller 8259A	2
USART (8251A) - Timer (8254)	1
DMA (8237A)	1
Review and evaluation	2

Assessment Plan for the Course

Student's performance in homework, quizzes, exams, and class-projects

Contribution of Course to Meeting Curriculum Disciplines:

Curriculum Discipline	Percentage
Mathematics and Basic Science	
Engineering Science	20%
Engineering Design	80%
General Education	

Relationship of Course to Program Outcomes

Outcome	Program Outcome Description	Level of Contribution
(a)	an ability to apply knowledge of mathematics, science, and engineering	H
(b)	an ability to design and conduct experiments, as well as to analyze and interpret data	H
(c)	an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability	H
(d)	an ability to function on multidisciplinary teams	
(e)	an ability to identify, formulate, and solve engineering problems	H
(f)	an understanding of professional and ethical responsibility	
(g)	an ability to communicate effectively	
(h)	the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context	
(i)	a recognition of the need for, and an ability to engage in life-long learning	
(j)	a knowledge of contemporary issues	H
(k)	an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	H

H=High, **M**= Medium, **L**=Low

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