**ECE 4240 Microcomputer System Design**

**Catalog Description**

**CMPS 4240 (4)**

Introduce microprocessor architecture and organization. Cover bus architectures, types and buffering techniques, Memory and I/O subsystems, organization, timing and interfacing, Peripheral controllers and programming. Design a microprocessor system.

**Prerequisite:** ECE 2070 and ECE 3200.

**Prerequisite by topic:**

Assembly Programming Skill

Electronics

Digital Circuits

**Units and Contact Time:** 4 semester units: 3 units lecture (150 minutes), 1 unit lab (150 minutes).

**Type:** Selected elective for CS, CE and EE.

**Required Textbook:**

An Introduction to the Intel Family of Microprocessors. James L. Antonakos. Prentice Hall, 7ed Edition. ISBN13: 978-1418038458 | ISBN10: 1418038458. This book is available in the CSUB Bookstore and at retail and Internet bookstores.

**Recommended Textbook and Other Supplemental Materials:**

The Intel Microprocessors 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, and Pentium Pro Processor Architecture, Programming, and Interfacing. (8ed Edition) Barry B. Brey. Prentice Hall. ISBN-10: 0135026458 | ISBN-13: 9780135026458

**Coordinator(s)**

Wei Li

**Student Learning Outcomes**

This course covers the following ACM/IEEE Body of Knowledge student learning outcomes:

CE-CSE: Computer System Engineering

CE-CAO: Computer Architecture and Organization

ABET Outcome Coverage

The course maps to the following performance indicators for Computer Science (CAC/ABET) and Computer Engineering (EAC/ABET) and Electrical Engineering (EAC/ABET):

1. Apply knowledge of mathematics, probability, and engineering in microprocessor based system design and design and conduct experiments related to microprocessor based system design and to analyze their outcomes (EAC 3a, EAC 3b).

2. Design, debug and test a small scale microprocessor system, identify, formulate, and solve engineering problems in microprocessor based system design, function as an effective team member (EAC 3c, EAC 3e).

3. Use design tools for microprocessor system design, test and evaluation (EAC 3k).

4. Engage in self-learning (EAC 3i).

**Lecture Topics and Rough Schedule**

Week 01 Introduction to 80x86 Processor Architecture: Processor Model, Programmer’s model, and Designer’s Model

Week 02 Processor Architecture: 8086 hardware details, and Clock generator 8284A,

Week 03 Processor Architecture: Bus buffering and latching, Processor Read & Write bus cycles

Week 04 Processor Architecture: Ready and wait state generation, and Minimum versus Maximum mode operation

Week 05 Memory Interfacing: Processor-Memory interfacing, and Address decoding techniques.

Week 06 Memory Devices: ROM, EPROM, SRAM, FLASH, and DRAM devices

Week 07 Memory Devices: Memory internal organization, Memory read and write timing diagrams, and DRAM Controller

Week 08 Basic I/O Interfacing: Parallel I/O, Programmed I/O, and I/O port address decoding.

Week 09 Basic I/O Interfacing: The 8255A Programmable Peripheral Interface (PPI), and programming 8255, Operation modes

Week 10 Basic I/O Interfacing: Keyboard matrix, LCD/7-Segment Display, Printer, stepper motor, A/D and D/A converter

Week 11 Serial I/O Interface: Asynchronous communication, and Physical communication standard-EIA RS232

Week 12 Serial I/O Interface: Programmable Communication Interface - UART 8251, Interfacing serial I/O devices- mouse, modem, and PC Keyboard

Week 13 Interrupts: Interrupt driven I/O, and Software & Hardware interrupt, and the 8259A Programmable Interrupt Controller (PIC)

Week 14 Direct Memory Access: Basic DMA operation, DMA Controlled I/O, The 8237 DMA Controller, Disk Memory Systems- Floppy disk, Hard disk, optical disk memory systems, video displays

Week 15 Bus Interfaces: PC bus standards & interfaces – PCI, USB, and so on

**Grading Policy**

 A 93%

A- 90%

 B+ 87%

 Lab/Hw Assignments ....35% B 83%

 Midterm 1 ......................20% B- 80%

 Midterm 2 ......................20% C+ 77%

 Final Project....................25% C 73%

 C- 70%

 D+ 67%

 D 63%

 D- 60%

 F below 60%

**Prepared By**

Wei Li on June 20, 2014

**Approval**

Approved by CEE/CS Department on July 30, 2014

**Effective Fall 2016**