# CMPE 323 Microprocessors

<table>
<thead>
<tr>
<th><strong>Department:</strong></th>
<th>Computer Engineering</th>
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<tr>
<td><strong>Program Name:</strong></td>
<td>Computer Engineering</td>
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<tr>
<td><strong>Course Number:</strong></td>
<td>CMPE323</td>
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<tr>
<td><strong>Credits:</strong></td>
<td>4 Cr</td>
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<tr>
<td><strong>Year/Semester:</strong></td>
<td>2012-13 Fall</td>
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- **Prerequisite(s):** CMPE224 Computer Architecture-1

## Catalog Description:
Introduction to computing: CPU-RAM-ROM. 80x86 microprocessor: registers, program and data segments, logical and physical addresses, stack, push, pop, flag register, addressing modes. Assembly Language Programming: Directives, linking, and .exe files, data types and data definition. Data Transfer, Arithmetic Logic and Control Instructions unsigned, signed, bcd, packed-bcd and ascii number conversion, rotate and shift instructions. Bios and DOS function calls. Macro definitions. 8088 PC/XT expansion slot, 80286 and the ISA bus, Memory interfacing: EPROM, SRAM and DRAM devices, address decoding circuits, ISA bus memory interfacing. ISA bus I/O address decoding and simple I/O ports, Programmable Peripheral Interface 8255 and LED, 7-segment and LCD-display, switch, stepper motor interfacing. D/A converters, A/D converters. Serial Data Communication and 8251 USART.

## Course Web Page:
[http://cmpe.emu.edu.tr/courses/cmpe323](http://cmpe.emu.edu.tr/courses/cmpe323)

## Textbook(s):

**Indicative Basic Reading List :**
- TASM Assembler, Proteus Circuit Simulator, KC51 8051 C compiler.

## Topics Covered and Class Schedule:
*(4 hours of lectures per week)*

- **Weeks 1-2** Introduction to computing: CPU-RAM-ROM. 80x86 microprocessor: registers, mov and add instructions, program segments, data segments, logical and physical addresses, stack, push, pop, flag register, addressing modes.
- **Weeks 3-4** Assembly Language Programming: Directives, .asm, .lst, .obj, .map, linking, and .exe files, control transfer instructions, data types and data definition.
- **Weeks 5-6** Arithmetic Logic Instructions: multiplication and division, unsigned, signed, bcd, packed-bcd and ascii number conversion, rotate and shift instructions. Bios and DOS function calls: bios display and keyboard interrupts. Quiz1.
- **Week 7-8** Macro definitions: mouse button and cursor position. 8088 PC/XT expansion slot, 80286 and the ISA bus, (Midterm Exam)
- **Weeks 9-10** Memory and memory interfacing: EPROM, SRAM and DRAM devices, address decoding circuits, ISA bus memory interfacing. Memory mapped and Isolated I/O methods and device interfacing: ISA bus I/O address decoding and simple I/O ports,

## Laboratory Schedule:
*(2 hours of laboratory per week)*

- **week 4** Introduction to TASM, EDIT/DEBUG and Emu86 Assembler tools
- **week 5** TASM Data Types, and Effect of ALU instructions on Flags.
week 6: Simple Virtual 8086 Development Board
week 7: BIOS and DOS Service Interrupts, Macros, Subroutines, Signed Numbers, Look-up Tables.
week 10: 8051 Microcontroller I/O and External Memory Interface, Simulation on ISIS.
week 11: 8051 Memory Decoders and Memory Interface, Simulation on ISIS.
week 12: 8086 and 8051 Memory Mapped I/O and 8255A Interfacing, Simulation on ISIS.
week 13: Allocated for free study on project-homework

**Course Learning Outcomes:**

Students must be able to:

1. know 8086 microprocessor registers, program and data segments, logical and physical addresses, stack, push, pop, flag register, addressing modes.
2. use arithmetic-logic, data transfer, and control instructions in assembly programs
3. use BIOS and DOS programming in assembly programs
4. analyze and design simple memory subsystems and interfacing, Isolated I/O subsystems Memory and I/O address decoding.
5. analyze and Design Simple digital I/O ports
6. design 7-segment display, switch, button, keypad, stepper motor interfacing, and D/A and A/D converter circuits using Programmable Peripheral Interface 8255.
7. write programs to initialize, receive and transmit serial data using a USART device

**Assessment**

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<tr>
<th>Method</th>
<th>No</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Midterm Exam(s)</td>
<td>1</td>
<td>25%</td>
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<tr>
<td>Quizzes</td>
<td></td>
<td>10%</td>
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<tr>
<td>Project+HW</td>
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<td>15%</td>
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<tr>
<td>Labs</td>
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<td>15%</td>
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<tr>
<td>Final Examination</td>
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<td>30%</td>
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<tr>
<td>Attendance</td>
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**Contribution of Course to Criterion 5**

Credit Hours for:

Mathematics & Basic Science : 0  
Engineering Sciences and Design : 4  
General Education : 0

**Relationship of Course to Program Outcomes**

The course has been designed to contribute to the following program outcomes:

a) apply knowledge of mathematics, science, and engineering,

e) identify, formulate, and solve engineering problems,

k) use the techniques, skills, and modern engineering tools necessary for engineering practice,

l) knowledge of probability and statistics, mathematics through differential and integral calculus, discrete mathematics, basic sciences, computer science, and...

**Prepared by:** Dr. Mehmet Bodur  
**Date Prepared:** Sep 19, 2012