10B11CI401: Microprocessors and Controllers

Course Credit: 4
Semester: IV

Introduction

This course involves study of the hardware implementation of 8086 and to explore fundamental capabilities of Intel series of microprocessors from 8086 through Pentium. The course also includes study of 8051 as an embedded system controller.
The course will be supplemented by a seperate Lab course in which small software-component prototypes will be written using the assembly development tools (MASM611). Students are assumed to be familiar with programming in C/C++ and in x86 assembly language.
The format of the course will be lecture-discussions, assignments. Students are strongly encouraged to participate actively in class discussions.

Course Objectives (Post-conditions)

Knowledge objectives:

At the conclusion of the course, following learning objectives are expected to be achieved:

1. You will broaden your knowledge of standard Intel Architectures.
2. You will become aware of the Intel processors' seldom-used capabilities.
3. You will increase your proficiency in assembler language.
4. You will know how to access service-functions provided in BIOS firmware.
5. You will gain practical experience in programming peripheral I/O devices.
6. You will acquire the background for understanding next-generation CPUs.
7. You will learn a microprocessor programming model at a level that enables you to write assembly language programs for the processor meeting given specifications.
8. You will learn concepts associated with interfacing a microprocessor to memory and to I/O devices.
9. You will learn how to control components of a microprocessor based system though the use of interrupts.

Application objectives:

The lab work and homework portions of the course are intended to help you apply your understanding,

1. to develop, implement, and debug 8086 assembly language programs that meet stated specifications.
2. to understand and be able to explain bus transactions, memory organization and address decoding, basic I/O interfaces and port addressing.
3. to understand how to control components of a computer system through the use of hardware and software interrupts.
4. to lay a foundation for pursuing some additional career options.

Expected Student Background (Preconditions)

Students are expected to have a solid grasp of the fundamentals of computer system, including a basic understanding of the operation of the computer, especially CPU. In addition, students are expected to know application development environment and programming concepts. Assembly

programming ability will be helpful, as we will be looking at implementations of microprocessor operations.

Topics Outline:

S NO	Topics	Hrs
1	Introduction to Microprocessor. Overview of the Inlet Family of the Microprocessors	2
2	The 8086 microprocessor architecture	2
3	Addressing Modes	1
4	Data movement Instructions	1
5	Arithmatic and Logic Instructions	1
6	Program control instruction	1
7	Using Assembly Language	1
8	8086 programming	1
9	8086 hardware specifications,8284,8288	5
10	8086 Memory Interface	8
11	Basic I/O Interface, 8255,8254,16550,DAC830,ADC804 IO controllers	10
12	Interrupts and 8259A interrupt controller	2
13	8237 DMA controller and DMA controlled IO	2
14	Arithmatic coprocessor x87 and MMX, SIMD Technologies in 8086 family	2
15	Bus Interface	2
16	Intel 80186, 80286	1
17	Intel 80386, 80486	1
18	Intel Pentium processors	2
19	Embedded Systems and 8051 Register architecture, Internal architecture, hardware specifications	2
20	8051 Memory System	1
21	8051 I/O interfacing	2
22	8051 programming	3
20	System Design And Testing	1
	Total	54

References

1. “The Intel Microprocessor 80x86, Pentium, Pentium Pro processor, Pentium II Pentium III, Pentium IV Architecture, Programming, and Interfacing ” by Berry B.Brey, Eighth Edition, Prentice Hall, 2009. ISBN 978-81-317-2622-8.
2. “The 8051 microcontroller” by Kenneth Ayala is recommended for 8051 only.

3. Yu-cheng Liu,Glenn A. Gibson , “The 8086/8088 Family Architecture, Programming & design”, Second Edition, PHI.
4. Douglas Hall, “Microprocessors & Interfacing, Programming & Hardware”,2nd Edn. Tata McGraw Hill.
5. Kenneth Ayala “The 8086 microprocessor programming and Interfacing the PC”.
6. Tom Shanley, Protected Mode Software Architecture, Addison-Wesley (1996), ISBN 0-201-55447-X .

Evaluation Scheme:

S.No	Examination	Marks
1	T-1	15
2	T-2	25
3	T-3	35
4	*Internal Marks	25

*Internal Marks Breakdown:

Assignments	9 marks (3x3)
Quizzes	12 marks (3x4)
Regularity	4 Marks