

MICROPROCESSORS AND MICROCONTROLLERS

ENEX 251

Lecture : 3
Tutorial : 1
Practical : 3

Year : II
Part : II

Course Objectives:

The objective of this course is to provide knowledge of microprocessors and microcontrollers to be able to develop assembly and C level programming and to develop a microprocessor/microcontroller-based system.

- 1 Introduction (5 hours)**
 - 1.1 Introduction and history of microprocessor
 - 1.2 Microprocessor based system
 - 1.3 Bus organization of a microprocessor
 - 1.4 Stored program concept (SPC) and Von Neumann architecture, Harvard architecture
 - 1.5 Control Unit: definition, types, block diagram and comparison

- 2 The 8085 Microprocessor (10 hours)**
 - 2.1 Features of 8085
 - 2.2 Pin description and internal architecture
 - 2.3 Instruction and data formats
 - 2.4 Addressing modes and instruction set
 - 2.5 Assembly programming examples
 - 2.5.1 Basic data transfer operations
 - 2.5.2 Basic arithmetic and logical operations
 - 2.5.3 Conditions and loops
 - 2.5.4 Array and table processing
 - 2.5.5 8-bit and 16-bit multiplication and division operations
 - 2.5.6 Data conversion: bcd to binary, binary to bcd
 - 2.6 Interrupts: interrupt pins, interrupt priorities, types of interrupts, interrupt instruction, processing sequence of interrupt

- 3 The 8086 Microprocessor (10 hours)**
 - 3.1 Features of 8086
 - 3.2 Internal architecture and pipelining
 - 3.3 Addressing modes and instruction set

- 3.4 Assembly language syntax: comments, identifiers, reserve words, operators, statement, directives
- 3.5 Assembling, linking and execution
- 3.6 DOS function / keyboard & video services: int 10h, int 21h
- 3.7 Assembly programming examples
 - 3.7.1 Simple programming for data transfer, arithmetic and logical operations
 - 3.7.2 Conditions and loops
 - 3.7.3 Array and string processing
 - 3.7.4 8-bit and 16-bit multiplication and division operations
 - 3.7.5 Use of input and output devices
 - 3.7.6 Data conversion: bcd to binary, binary to bcd, etc
- 3.8 Interrupt: interrupt pins, priorities, instructions, types, ivt & its organization

4 Microprocessor System (10 hours)

- 4.1 Memory: classification, hierarchy
- 4.2 Address decoding and mapping i/o: definition, types
- 4.3 Address decoding for I/O ports (NAND Gate and Decoder) and memory (RAM, ROM) (NAND Gate and Decoder) for 8085
- 4.4 Interfacing: definition, needs, types, comparison
- 4.5 Serial Interface: synchronous & asynchronous transmission, RS 232
- 4.6 Parallel Interface: simple, strobe, single and double handshaking
- 4.7 PPI Device 8255: block diagram, modes of operations and control words generations
- 4.8 DMA and DMA controller
- 4.9 Bus timing diagram and rtl (register transfer language) for various instructions in 8085

5 The 8051 Microcontroller (10 hours)

- 5.1 Microcontroller survey: 4-bit, 8-bit, 16-bit and 32-bit microcontrollers
- 5.2 Introduction to 8051 microcontroller and its family
- 5.3 Pin description, internal architecture and programming model
- 5.4 Internal memory organization and SFR (Special Function Registers)
- 5.5 The timer control (TMOD) and special function registers
- 5.6 The timer mode control (TCON) and special function registers
- 5.7 Timer modes of operations (Mode 1, Mode2, Mode 3)
- 5.8 Addressing modes and instruction set
- 5.9 Programming examples in assembly and c
 - 5.9.1 Basic data transfer, arithmetic and logic operations
 - 5.9.2 Multiplication and division
 - 5.9.3 Conditions and loops
 - 5.9.4 Array processing and look up table
 - 5.9.5 Use of timers for delay and pulse generations
 - 5.9.6 Interfacing with seven segment display and liquid crystal display

Tutorial (15 hours)

1. Assembly programming examples in 8085 for different group of instructions
2. Assembly programming examples in 8086 for different group of instructions
3. Examples covering address decoding for input port, output port and memory
4. Assembly and C programming examples in 8051 for different group of instructions

Practical (45 hours)

1. Familiarization with data transfer instructions in 8085
2. Familiarization with arithmetic instructions in 8085
3. Familiarization with logical instructions in 8085
4. Familiarization with branching and stack operations in 8085
5. Familiarization with miscellaneous problems in 8085
6. Familiarization with assembly language programming in 8086
7. Familiarization with dos service int 21h in assembly language programming in 8086
8. Familiarization with bios service int 10h in assembly language programming in 8086
9. Solving miscellaneous problems with assembly language programming in 8086
10. Familiarization with data transfer, arithmetic and logical instruction in 8051
11. Familiarization with branching and bit manipulation operations in 8051
12. Familiarization with timers for delay and wave pulse generation in 8051

Final Exam

The questions will cover all the chapters in the syllabus. The evaluation scheme will be as indicated in the table below:

Chapter	Hour	Marks Distribution *
1	5	4
2	10	12
3	10	12
4	10	12
5	10	12
2,3 and 5	-	8
Total	45	60

* There may be minor deviation in marks distribution.

References

1. Gaonkar, R. (2002). Microprocessor Architecture, Programming and Applications with the 8085. United States: Pearson Prentice Hall.
2. Abel, P. (2001). IBM PC Assembly Language and Programming. Pearson Education Inc.

3. Hall, D. V. (1999). Microprocessor and Interfacing, Programming and Hardware. Tata McGraw Hill.
4. Ayala, K. J. (1991). The 8051 microcontroller: Architecture, Programming and Applications. United States: West.
5. Shibu, K. V. (2018). Introduction To Embedded Systems. India: McGraw Hill Education (India) Private Limited.