# CE341: MICROPROCESSOR ARCHITECTURES AND ASSEMBLY PROGRAMMING

**Credits and Hours:**

| Teaching Scheme | Theory | Practical | Tutorial | Total | Credit |
|---|---|---|---|---|---|
| Hours/week | 3 | 2 | - | 5 | 4 |
| Marks | 100 | 50 | - | 150 | |

**Pre-requisite courses:**

- Digital Electronics
- Data Communication

**Outline of the Course:**

| Sr. No. | Title of the unit | Minimum number of hours |
|---|---|---|
| 1. | The Processor: 8086 | 06 |
| 2. | 8086 Instruction set and Assembler Directives | 06 |
| 3. | The Art of Assembly Language Programming with 8086 | 06 |
| 4. | Special Architectural features and related Programming | 06 |
| 5. | DMA Controllers, Multi-microprocessor systems | 03 |
| 6. | 80286 Processor | 07 |
| 7. | 80386 Processor | 07 |
| 8. | Current Era of Microprocessors | 04 |
| | Total hours (Theory) : | 45 |
| | Total hours (Lab) : | 30 |
| | Total hours : | 75 |

**Detailed Syllabus:**

| | | | |
|---|---|---|---|
| **1.** | **THE PROCESSOR: 8086** | **05 Hours** | **10%** |
| | Register Organisation of 8086, Architecture, Signal Descriptions, Physical Memory Organisation, General Bus Operation, I/O Addressing Capability, Special Purpose Activities, Minimum & Maximum Modes 8086 System and Timings. | | |
| **2.** | **8086 INSTRUCTION SET AND ASSEMBLER DIRECTIVES** | **10 Hours** | **20%** |
| | Machine Language Instruction Formats, Addressing Modes, Instruction Set, Assembler Directives and Operators | | |

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| **3.** | **THE ART OF ASSEMBLY LANGUAGE PROGRAMMING WITH 8086** | **15 Hours** | **30%** |
| | A Few Machine Level Programs, Machine Coding the Programs, Programming with an Assembler, Assembly Language Example Programs | | |
| **4.** | **SPECIAL ARCHITECTURAL FEATURES AND RELATED PROGRAMMING** | **10 Hours** | **20%** |
| | Introduction to Stack, Stack Structure, Interrupt and Interrupt Service Routines, Interrupt Cycle of 8086, Non-Maskable Interrupt, Maskable Interrupt, Interrupt Programming, MACROS, Timing and Delays. | | |
| **5.** | **DMA CONTROLLER, MULTIMICROPROCESSOR SYSTEMS** | **10 Hours** | **20%** |
| | DMA Controller, Interconnection Topologies, Software Aspects of Multi-microprocessor Systems, Tightly Coupled and Loosely Coupled Systems | | |
| **6.** | **80286 PROCESSOR** | **07 Hours** | **17%** |
| | Salient Features of 80286, Internal Architecture of 80286, Signal Description of 80286, Real Addressing Mode, Protected Virtual Address Mode (PVAM) | | |
| **7.** | **80386 PROCESSOR** | **07 Hours** | **17%** |
| | Salient Features of 80386DX, Architectural and Signal Descriptions of 80386, Register Organisation of 80386, Addressing Modes, Data Types of 80386, Real Address Mode of 80386, Protected Mode of 80386, Segmentation. | | |
| **8.** | **CURRENT ERA OF MICROPROCESSORS** | **04 Hours** | **06%** |
| | Core i3, i5, i7, xen Processor, multi core processors. | | |

**Course Outcome (COs):**

At the end of the course, the students will be able to

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| CO1 | Recognize elements of digital logic circuit. Moving from design of single bit function to multibit function. (Flip flop, Logic Gates, Combinational Circuit). Design circuit for fixed function arithmetic function. Understand the notation of writing register transfer language. |
| CO2 | Design and examine the different Arithmetic, Logic and Shift circuit & Design control unit of Arithmetic, Logic and Shift Circuit. |
| CO3 | Differentiate and conceptualize instruction and arithmetic level parallelism & Identify and compare different methods for computer I/O mechanisms. |
| CO4 | Demonstrate and evaluate computer arithmetic operations on integer and real |

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| | numbers using hardwired algorithm. |
| CO5 | Categorize memory organization and understand functioning of internal cache memory hardware. |
| CO6 | Understand and differentiate n-way set associative memory. |

**Course Articulation Matrix:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| CO2 | 3 | 3 | 3 | - | - | - | - | 1 | 1 | - | - | 1 | 2 | - |
| CO3 | 3 | 3 | 3 | 1 | - | - | - | 1 | 1 | - | - | - | 2 | - |
| CO4 | 2 | 2 | 3 | - | - | - | - | 1 | 1 | - | - | - | 2 | - |
| CO5 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | 2 | - |
| CO6 | 3 | 3 | - | - | - | - | - | - | - | - | - | - | - | - |

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

**Recommended Study Material:**

- **Text book:**
  1. "Microprocessors and Interfacing Programming and Hardware", Douglas V Hall, McGraw-Hill Education India Pvt. Ltd.
  2. "Advanced Microprocessor and Peripherals –Architecture, Programming and Interfacing", A.K.Ray & K.M Bhurchandi, Tata Mc Graw Hill, 2006.
  3. "8086 Programming and Advance Processor Architecture", M. T. Savaliya, Wiley-India.

- **Reference book:**
  1. "Microcomputer systems: The 8086 / 8088 Family architecture, Programming and Design", Yncheng Liu,Glenn A.Gibson, second edition, Prentice Hall of India , 2006

2. The 8088 and 8086 Microprocessors: Programming, Interfacing and Applications, Walter A.Triebel, Avtar Singh, Prentice-Hall of India Pvt. Ltd.
3. “IBM PC Assembly language and programming”, Peter Abel, fifth edition, Pearson education / Prentice Hall of India Pvt. Ltd, 2007.

❖ **Software:**

1. 8086 Simulator & Emulator