

## MICROPROCESSORS And MICROCONTROLLERS

Course code: 18IS4DCMPM

L: P: T: S: 3: 0: 0: 0

Exam Hours: 03

Total Hours: 50

Credits: 03

CIE Marks: 50

SEE Marks: 50

### Course Objectives:

1. Understand the architecture of 8086 microprocessor
2. Able to write software and hardware programs using assembly language programming
3. Understand the difference between microprocessors and microcontrollers
4. Understand the architecture of ARM processor

### Course Outcomes: After completion of the course, the graduates will be able to

|     |  |
|-----|--|
| CO1 | Analyse the architecture of Microprocessor                                   |
| CO2 | Understand the concept of data accessing using different addressing modes    |
| CO3 | Apply the defined instruction set to design assembly level language programs |
| CO4 | Understand the difference between Microprocessors and microcontrollers       |
| CO5 | Understand the architecture of ARM processor.                                |
| CO6 | Identify and apply various addressing modes.                                 |

### Mapping of Course outcomes to Program outcomes:

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PS01 | PS02 | PS03 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | 3   | 1   | -   | -   | -   | -   | -   | -   | -   | -    | -    | -    | 3    | -    | -    |
| CO2 | 3   | 2   | -   | -   | -   | -   | -   | -   | -   | -    | -    | -    | 3    | 2    | -    |
| CO3 | 2   | 1   | -   | -   | -   | -   | -   | -   | -   | -    | -    | -    | 2    | -    | -    |
| CO4 | 2   | 1   | -   | -   | -   | -   | -   | -   | -   | -    | -    | -    | 1    | -    | -    |
| CO5 | 2   | 2   | -   | -   | -   | -   | -   | -   | -   | -    | -    | -    | 1    | -    | -    |
| CO6 | 2   | 1   | -   | -   | -   | -   | -   | -   | -   | -    | -    | -    | 1    | -    | -    |

| Unit | Course Content   | Hours | COs      |
|------|--|-------|----------|
| 1    | <b>Introduction, Microprocessor Architecture – 1</b><br>The Microprocessor-Based Personal Computer Systems. The Microprocessor and its Architecture: Internal Microprocessor Architecture, Real Mode Memory Addressing.  | 8     | CO1      |
| 2    | <b>Microprocessor Architecture – 2, Addressing Modes</b><br>Addressing Modes: Data Addressing Modes, Program Memory Addressing Modes, Stack Memory Addressing Modes  | 8     | CO1, CO2 |
| 3    | <b>Programming – 1</b> Data Movement Instructions: PUSH/POP, Load-Effective Address, String Data Transfers, Miscellaneous Data Transfer Instructions, Segment Override Prefix, Assembler Details. Arithmetic and Logic Instructions: Addition, Subtraction and Comparison, Multiplication and Division.<br><b>Programming – 2:</b> Arithmetic and Logic Instructions (continued): BCD and ASCII Arithmetic, Basic Logic Instructions, Shift and Rotate, String Comparisons. Program Control Instructions: The Jump Group | 8     | CO2, CO3 |
| 4    | Microprocessors versus Microcontrollers, ARM Embedded Systems :The RISC design philosophy, The ARM Design Philosophy, Embedded System Hardware, Embedded System Software, ARM Processor Fundamentals : Registers , Current Program Status Register<br><b>Text book 2:Ch 1:1.1 to 1.4, Ch 2:2.1 to 2.5</b>  | 8     | CO4      |

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|---|--|---|----------|
| 5 | Introduction to the ARM Instruction Set : Data Processing Instructions , Branch Instructions, Software Interrupt Instructions, | 8 | CO4, CO5 |
|---|--|---|----------|

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|---|--|--|
| Program Status Register Instructions<br>Text book 2: Ch 3:3.1 to 3.6 ( Excluding 3.5.2) |  |  |
|---|--|--|

**Self study component:**

**Note:**

1. Questions for CIE and SEE not to be set from self-study component.
2. Assignment Questions should be from self-study component only.

**Unit 1: Introduction :History of Microprocessors**

**Unit 3:Hardware Specifications, Memory Interface – 1**

Pin-Outs and the Pin Functions, Clock Generator, Bus Buffering and Latching, Bus Timings, Ready and Wait State, Minimum versus Maximum Mode. Memory Interfacing: Memory Devices

**UNIT 5 : I/O Interface – 2, Interrupts, and DMA: I/O Interface: The Programmable Peripheral Interface 82C55, Programmable Interval Timer 8254. Interrupts: Basic Interrupt Processing, Hardware Interrupts: INTR and INTA/; Direct Memory Access: Basic DMA Operation and Definition.**

## TEXT BOOKS

1. Barry B Brey: The Intel Microprocessors, 8th Edition, Pearson Education, 2009.
2. ARM system developers guide, Andrew N Sloss, Dominic Symes and Chris Wright, Elsevier,Morgan Kaufman publishers, 2008.

## Reference Books

1. Douglas V. Hall: Microprocessors and Interfacing, Revised 2nd Edition, TMH, 2006.
2. K. Udaya Kumar & B.S. Umashankar : Advanced Microprocessors & IBM-PC Assembly Language Programming, TMH 2003.
3. Ayala : The 8086 Microprocessor: programming and interfacing - 1st edition, Cengage Learning
4. The Definitive Guide to the ARM Cortex-M3, by Joseph Yiu, 2nd Edition ,Newnes, 2009
5. The Insider's Guide to the ARM7 based microcontrollers, Hitex Ltd.,1st edition, 2005
6. ARM System-on-Chip Architecture, Steve Furber, Second Edition, Pearson, 2015
7. Architecture, Programming and Interfacing of Low power Processors- ARM7, Cortex-M and MSP430, Lyla B Das Cengage Learning, 1st Edition

**Assessment Pattern:**

**CIE –Continuous Internal Evaluation Theory (50 Marks)**

| Bloom's Category  | Tests | Assignments | AAT1 | AAT2 |
|-------------------|-------|-------------|------|------|
| Marks (Out of 50) | 30    | 10          | 05   | 05   |
| Remember          | 05    | --          | 02   | 01   |
| Understand        | 05    | --          | 01   | 01   |

|          |    |    |    |    |
|----------|----|----|----|----|
| Apply    | 10 | 05 | 01 | 01 |
| Analyze  | 05 | 05 | 01 | 02 |
| Evaluate | 05 |    |    |    |
| Create   |    |    |    |    |

**\*AAT 1– Alternate Assessment Tool 1: Quiz**

**AAT 2 - Alternate Assessment Tool 2: Mini projects/ Case study/Seminar**  
**SEE –Semester End Examination Theory (50 Marks)**

| Bloom's Category | Marks Theory(50) |
|------------------|------------------|
| Remember         | 10               |
| Understand       | 10               |
| Apply            | 10               |
| Analyze          | 10               |