## 5178 - MICROPROCESSORS (8086)- III

| Teaching Schedule Per Week | | | Progressive Assessment | | Examination Schedule (Marks) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Lectures | Practical | Credits | | | Theory | | Practical Ex. | | Total | |
| 3 | 2 | 5 | 25 | 25 | 3 Hrs | 100 | | - | 150 | |

| Pre-requisite | | Source | | | Theory | Test | Total | TW | PR | Gr Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 4142 | | EXN | Semester | | 75 | 25 | 100 | 50 | – | 150 |

**Rationale:** Advanced microprocessors focuses on the architecture, related hardware and programming aspects for the 8086- Microprocessor. It serves as a first step in learning the later processors like INTEL 80186, 80286, 80386, 80486 & the Pentium.

| COURSE CONTENTS | Hrs | Mks |
|---|---|---|
| **1. INTRODUCTION TO 8086 MICROPROCESSOR** | 2 | 5 |

Pin-out diagrams and pin description, operating modes of 8086. Min. system mode & max. system mode

| | Hrs | Mks |
|---|---|---|
| **2. ARCHITECTURE** | 4 | 10 |

Architecture - Bus interface unit- segment registers, Instruction queue, instruction pointer, Execution unit—general purpose registers, flag register & description of different flags, stack pointer & base pointer registers, index registers. Memory segmentation. Generating a memory address

| | Hrs | Mks |
|---|---|---|
| **3. ADDRESSING MODES** | 2 | 6 |

Different addressing modes- Register & immediate modes, memory addressing modes (direct & indirect), I/O port addressing mode, relative addressing mode, implied addressing mode.

| | Hrs | Mks |
|---|---|---|
| **4. INSTRUCTION SET** | 12 | 20 |

Classification-Data transfer, arithmetic, bit manipulation (logical, shift, rotate), string, branch & processor control instructions. Description of instructions-Syntax, interpretation, flags affected.

| | Hrs | Mks |
|---|---|---|
| **5. ASSEMBLY LANGUAGE PROGRAMMING** | 14 | 25 |

Introduction - Constructing the machine codes for 8086 instructions, writing programs for us with an assembler, assembly language program development tools, and assembler directives. Flags, jumps & WHILE-DO implementation, REPEAT-UNTIL implementation, debugging assembly language programs. IF – THEN – ELSE structures, procedures & macros, IF-THEN, IF-THEN-ELSE & multiple IF-THEN –ELSE programs, writing & using procedures, writing & using assembler macros.

| | Hrs | Mks |
|---|---|---|
| **6. TIMING AND TROUBLE SHOOTING** | 4 | 8 |

8086-bus cycle -read machine cycles & writes machine cycle. Addressing memory & ports in microcomputer systems. 8086 tuning parameters. Troubleshooting a simple 8086 based microcomputer. Interfacing the 8086 with memories & with I/O ports.

| | Hrs | Mks |
|---|---|---|
| **7. INTERRUPTS** | 3 | 10 |

Types of interrupts - Hardware, interrupts & software interrupts, predefined interrupts, internal Interrupts, external maskable interrupts. Priorities of 8086 interrupts, Interrupt pointer table. Interrupt responses

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| **8. CO-PROCESSORS** | 7 | 16 |

Need for a numeric co-processor. Overview of the 8087 math co-processor. 8087 data types. 8087 internal architecture. 8087 instruction set -arithmetic, data transfer, compare, transcendental, load special constant instructions Brief overview of 80186, 80286, 80386, 80486 and Pentium microprocessors. Typical system based on 8086 microprocessor & 8087

| | | |
|---|---|---|
| **Total** | 48 | 100 |

**PRACTICALS:** (Minimum 10 practicals to be performed)
1. To find the largest number in a given string
2. To find the smallest number in a given string
3. Addition of two 8 byte binary numbers
4. Subtraction of two 8 bytes binary numbers.
5. Multiplication of two 4-byte numbers.
6. Division of a 4-byte number by a 2-byte number
7. To check for presence of a byte in a string
8. To find length of a string of bytes
9. To reverse the order of a string of bytes
10. To sort a number of bytes in ascending order
11. To sort a number of bytes in descending order
12. To convert a 16-digit unpacked BCD number to a packed BCD number.
13. To compute LCM of two 16-bit unsigned integers
14. To compute GCD of four 16-bit unsigned integers
15. To compute factorial of an 8-bit number
16. To check if a given 16-bit unsigned integer is a prime number or not
17. Using 8087 co-processor, compute hypotenuse of a right-angled triangle given the 2 sides as real numbers.

**REFERENCE BOOKS:**

1. Microprocessors & Interfacing by Douglas .V. Hall
2. Microprocessors: Theory & Applications by M. Rafiqzzaman
3. Advanced Microprocessors & IBM-PC assembly language programming by K.U. Kumar & B.S. Umashankar
4. Introduction to Microprocessors by Aditya P. Mathur
5. The 8088 & 8086 Microprocessors by W.A Trielbel & Avtar Singh
6. Microprocessors & its applications by R. Theagarajan, S. Dhanasekaran & S. Dhanapal
7. Fundamentals of Microprocessors & Microcomputers by B.Ra
8. Microcomputer systems: The 8086/8088 family by Yu Cheng Liu & Glenn A. Gibson
9. Microprocessor lab primer by K. A. Krishmamurthy