Microprocessor
Micro Syllabus
BSc. CSIT, IOST, TU

Microprocessor

Course Title: Microprocessor
Course No: CSC162
Nature of the Course: Theory + Lab
Semester: II

Full Marks: 60 + 20 + 20
Pass Marks: 24 + 8 + 8
Credit Hrs: 3

Course Description: This course contains fundamental concepts of Microprocessor operations, basic I/O interfaces and Interrupts operations.

Course Objectives: The course objective is to introduce the operation, programming and application of microprocessor.

Course Contents:

Unit 1: Introduction (4 Hrs.)

- Definition of microprocessor and its application
- Evolution of microprocessor, Von Neumann and Harvard architecture
- Components of microprocessor
    - Microprocessor: Arithmetic and Logic Unit (ALU), Control Unit (CU), Registers
    - Memory
    - Input / Output
- System Bus: Data , Address and Control Bus
- Microprocessor with Bus Organization

Unit 2: Basic Computer Architecture (7 Hrs.)

- 8085 Microprocessor Architecture and Operations
    - Address, Data And Control Buses
    - Internal Data Operation and Registers
    - Externally Initiated Operations
    - Addressing Modes
    - Memory and Memory Operations
    - Flag and Flag Register
    - 8085 Pin Diagram and Functions
    - Multiplexing and De-multiplexing of address/data bus
    - Generation Of Control Signals
- 8086 Microprocessor

- Logical Block Diagram
- Segment Registers,
- Memory Segmentation
- Bus Interface Unit and Execution Unit
- Pipelining

Unit 3: Instruction Cycle (3 Hrs.)

- Instruction Cycle, Machine Cycle and T-states
  - Machine Cycle of 8085 Microprocessor: op-code fetch, memory read, memory write, I/O read, I/O write, interrupt
- Fetch and Execute Operation, Timing Diagram
  - Timing Diagram of MOV, MVI, IN, OUT, LDA, STA
- Memory Interfacing and Generation of Chip Select Signal

Unit 4: Assembly Language Programming (10 Hrs.)

- Programming with Intel 8085 Microprocessor
  - Instruction and Data Format
  - Mnemonics and Operands
  - Instruction Sets
    - Data Transfer:- MOV, IN, OUT, STA,LDA, LXI, LDAX, STAX, XCHG
    - Arithmetic and Logic:- ADD, SUB, INR, DCR, AND, OR, XOR, CMP, RLC, RRC, RAL, RAR
    - Branching:- JMP, JNZ, JZ, JNC, JC, CALL
    - Stack:- PUSH, POP
  - Multiplication and Division
  - Simple Sequence Programs, Branching, Looping
  - Array(Sorting) and Table Processing
  - Decimal to BCD Conversion

- Programming with Intel 8086 microprocessor
  - Macro Assembler
  - Assembling and Linking
  - Assembler Directives, Comments
  - Instructions: LEA, MUL, DIV, LOOP, AAA, DAA
  - INT 21H Functions
    - 01H, 02H, 09H, 0AH, 4CH
  - INT 10H Functions (Introduction Only)
    - 00H, 01H, 02H, 06H, 07H, 08H, 09H, 0AH

- Simple String and Character Manipulation Programs
- Debugging

Unit 5: Basic I/O, Memory R/W and Interrupt Operations (6 Hrs.)

- Memory mapped I/O, I/O Mapped I/O and Hybrid I/O
- Direct Memory Access (DMA)
  - Introduction, Advantage and Application
  - 8237 DMA Controller and Interfacing
- Interrupt
  - 8085 Interrupt Pins and Priority
  - Maskable and Non-maskable Interrupts
  - RST Instructions
  - Vector and Polled Interrupt
- 8259 Interrupt Controller
  - Block Diagram and Explanation
  - Priority Modes and Additional Features

Unit 6: Input/ Output Interfaces (6 Hrs.)

- Parallel Communication – Introduction and Applications
- Serial Communication
  - Introduction and Applications
  - Introduction to Programmable Communication Interface 8251
  - Basic Concept of Synchronous and Asynchronous Modes
- Simple I/O, Strobe I/O, Single handshake I/O, Double handshake I/O
- 8255A and it's Working
  - Block Diagram
  - Modes of Operation
  - Control Word
- RS-232 – Introduction, Pin Configuration (9 pin and 25 pin) and function of each pin, Interconnection between DTE-DTE and DTE-DCE

Unit 7: Advanced Microprocessors (9 Hrs.)

- 80286: Architecture (Block Diagram) , Registers, (Real/Protected mode), Privilege Levels, Descriptor Cache, Memory Access in GDT and LDT, Multitasking, Addressing Modes, Flag Register
- 80386: Architecture (Block Diagram), Register organization, Memory Access in Protected Mode, Paging (Up to LA to PA)

Laboratory Works:
The laboratory work includes Assembly language programming using 8085/8086/8088 trainer kit. The programming should include: Arithmetic operation, base conversion, conditional branching etc. The lab work list may include following concepts:

1. Assembly language program using 8085 microprocessor kit and 8085 microprocessor simulator.
2. Use of all types of instructions and addressing modes.
3. Program including basic arithmetical, logical, looping, bitwise and branching.
4. Assembly language programming using 8086 microprocessor emulator, using any types of Assembler, including the different functions of 21H.

Text Books:
1. Ramesh S.Gaonkar, Microprocessor Architecture, Programming, and Applications with 8085, Prentice Hall

Reference Books:
1. A.P.Malvino and J.A.Brown, Digital Computer Electronics, 3rd Edition, Tata McGraw Hill D.V.Hall, Microprocessors and Interfacing– Programming and Hardware, McGraw Hill
2. 8000 to 8085 Introduction to 8085 Microprocessor for Engineers and Scientists, A.K.Gosh, Prentice Hall

Model Question

Bachelor Level/ First Year/ Second Semester/ Science — Full Marks: 60

Microprocessor (CSC 162) — Pass Marks: 24

Time: 3 hours.

Candidates are required to give their answers in their own words as for as practicable.

The figures in the margin indicate full marks.

Group A (Long Answer Question Section)

Attempt any TWO questions. **(2x10=20)**

1. Draw logical block diagram of 8086 microprocessor and explain its segmented memory structure.
2. What is machine cycle and instruction cycle? Draw a timing diagram for STA 2000h memory instruction. (Choose any memory locations for loading STA 2000h instruction)

3. Write an assembly language program to sort an array in ascending order using 8 bit microprocessor. (Assume appropriate array data and address where minimum array size of 10 should be considered)

Group B (Short Answer Question Section)

Attempt any EIGHT questions. (8x5=40)

4. Draw pin diagram of 8085 microprocessor with appropriate labelling.
5. Specify the output in PORT1 after the execution of the following program. Write comments for each instruction.

```
MVI A, AAH
MOV B, A
RRC
XRA B
OUT PORT1
HLT
```

6. What is DMA? Explain the sequence of events that occurs during DMA operation?
7. What is addressing mode? Explain different addressing mode in 8085 microprocessor.
8. Write a program to reverse a given a string using 16 bit microprocessor.
9. Explain memory interfacing in 8085 microprocessor along with appropriate diagram.
10. What are different operating modes in 80286 microprocessor? Explain in brief about each mode.
11. "Interrupt based I/O is efficient compared to polled I/O". Justify this statement with general working mechanism in both methods.
12. Write Short Notes (Any Two):
    a) Macro Assembler
    b) BSR Mode
    c) System Bus