Course Title: Microprocessor
Course no: CSC-153 Full Marks: 60+20+20
Credit hours: 3 Pass Marks: 24+8+8
Nature of course: Theory (3 Hrs.) + Lab(3 Hrs.)
Course Synopsis: This course contains of fundamental concepts of computer organization, basic 110 interfaces and Interrupt operations.
Goal: the course objective is to introduce the operation, programming and application of microprocessor

Unit 1: Introduction (3 hrs)

- Definition of microprocessor and its application
- Evolution of microprocessor
- Von Neumann architecture
- Basic organization of microprocessor
  - o Microprocessor: Arithmetic and logic unit (ALU), Control unit (CU), Registers
  - o Memory
  - o Input/Output
  - o System bus: Data, Address and Control bus

Unit 2: Basic Computer Architecture (10 hrs)

- Sap-I architecture: Block diagram, and function of each block 2 hrs
  - o 8-bit "W" bus
  - o 4-bit program counter
  - o 4-bit memory address register (MAR)
  - o i6x8 bit memory
  - o 8-bit instruction register (IR)
  - o 8-bit accumulator
  - o 8-bit B register
  - o 8-bit adder-subtracter
  - o 8-bit output register
- SAP-I instructions 1 hr
  - o LDA, ADD, SUB, OUT, HLT
- Fetch and execution cycle of SAP-I instructions 2 hrs
  - o Fetch cycle: Address state, increment state, Memory state
  - o Execution cycle of LDA, ADD instructions
- Microprogram 1 hr
  - o Micro instructions of SAP-1 instructions
- SAP-2 architecture: Block diagram and functions of each block 2 hrs
- Architectural differences with SAP-I *0.5* hr
  - o Bidirectional registers
  - o Flags
- Instruction sets 1 .*5* hrs

Unit 3: Instruction Cycle (3hrs)

• Instruction cycle, machine cycle and T states 1 hr
  o 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 1.5 hrs
  o Timing diagram of MOV, MVI, IN, OUT, LDA, STA
• Fetch and execute overlap 0.5hr

Unit 4: Intel 8085/8086/8088 (8 hrs)

• Intel 8085 microprocessor 4.5 hrs
  o Functional block diagram
  o Pin configuration
  o Description of each blocks: Registers, Flag, Data and address bus, Timing and control unit, Interrupts
  o Instructions- opcode and operands
  o Addressing modes
  o Instructions and data flow
• Intel 8086/8088 microprocessor 3.5 hrs
  o Functional block diagram of 8086 microprocessor and description of each block: Registers, Flags, Address and Data bus
  o Introduction to 8088 microprocessor and its block diagram
  o Comparison with 8085 microprocessor
  o Assembly instructions- mnemonic and operands
  o Addressing modes

Unit 5: Assembly Language Programming (9 hrs)

• Programming with Intel 8085 microprocessor *4.5* hrs
  o Instruction format
  o Instruction types: Data transfer, Arithmetic, Logic, Branching, Miscellaneous
  o Simple sequence programs, Branching, Looping
• Programming with Intel 8086 microprocessor 4.5 hrs
  o Assembly instruction format
  o Mnemonics and Operands
  o Macro assembler
  o Assembling and linking
  o Assembler directives, comments
  o Instruction sets

– Data transfer:- MOV, IN, OUT, LEA
– Arithmetic and logic:- ADD, SUB, INC, DEC, MUL, DIV, AND, OR, XOR, NOT, CMP, DAA, AAA, ROR, RCR, ROL, RCL, SHL, SHR
– Branching:- JMP, CALL, RET, LOOP
– Stack: PUSH, POP

o INT 2Ih functions
– O1H, 02H, 09H, OAH, 4CH
o INT 10h functions
– OOH, O1H, 02H, 06H, 07H, 08H, 09H, OAH
o Simple sequence programs, Branching, Looping

o Debugging
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Unit 6: Basic I/O, Memory R/W and Interrupt Operations (6 hrs)

• Memory read/write, Input/output read/write operation in 8085 microprocessor based system 1 hr
• Direct memory access (DMA) 1.5 hrs
  o Introduction, advantage and application
  o DMA controller 8237 interfacing
• Interrupt 1 .5 hrs
  o 8085 interrupt pins and interrupt priority
  o Maskable and non-maskable interrupts
  o Vector and polled
• *8259* operation 2 hrs
  o Block diagram and explanation
  o Priority modes and other features

Unit 7: Input/output Interfaces (6 hrs)

• Parallel communication introduction and applications *0.5* hr
• Serial communication 1.5 hrs
  o Introduction and applications
  o Introduction to Programmable Communication Interface 8251
  o Basic concept of synchronous and asynchronous modes
• Simple I/O, strobe I/O, Single handshake I/O, double handshake 1/0 0.5 hr
• 8255A and its working 1 .5 hrs
  o Block diagram
  o Modes of operation
  o Control word
• RS-232: Introduction, pin configuration (9 pin and 25 pin) and function of each pin. Interconnection between DTE-DTE and DTE-DCE 1 hr
• Keyboard and display controller: Introduction to 8279 1 hr

References:

Ramesh S. Gaonkar, Microprocessor Architecture, Programming, and Applications with 8085, Prentice Hall
(For unit 1, 3, 4, 5, 6 and 7)
2. A. P. Malvino and J. A. Brown, Digital Computer Electronics, Tata McGraw Hill (For unit 2)
3. D. V. Hall, Microprocessors and **Interfacing** Programming and Hardware, McGraw Hill (For unit 4, 5, 6 and 7)
4. Peter Abel, **IBM PC** Assembly Language Programming, McGraw Hill (For unit 4 and 5)