Microprocessor

Course Objective:

To familiarize students with architecture, programming, hardware and application of microprocessor.

1. Introduction(4 hours)
   a. Introduction and History of Microprocessors
   b. Basic Block Diagram of a Computer
   c. Organization of Microprocessor Based System
   d. Bus Organization
   e. Stored program Concept and Von Neumann Machine
   f. Processing Cycle of a Stored Program Computer
   g. Microinstructions and Hardwired/Microprogrammed Control Unit
   h. Introduction to Register Transfer Language

2. Programming with 8085 Microprocessor(10 hours)
   a. Internal Architecture and Features of 8085 microprocessor
   b. Instruction Format and Data Format
   c. Addressing Modes of 8085
   d. Intel 8085 Instruction Set
   e. Various Programs in 8085
       i. Simple Programs with Arithmetic and Logical Operations
       ii. Conditions and Loops
       iii. Array and Table Processing
       iv. Decimal BCD Conversion
       v. Multiplication and Division

3. Programming with 8086 Microprocessor(12 hours)
   a. Internal Architecture and Features of 8086 Microprocessor
       i. BIU and Components
       ii. EU and Components
       iii. EU and BIU Operations
       iv. Segment and Offset Address
   b. Addressing Modes of 8086
   c. Assembly Language Programming
   d. High Level versus Low Level Programming
   e. Assembly Language Syntax
       i. Comments
       ii. Reserved words
       iii. Identifiers
       iv. Statements
       v. Directives
       vi. Operators
       vii. Instructions
   f. EXE and COM programs
   g. Assembling, Linking and Executing
   h. One Pass and Two Pass Assemblers
   i. Keyboard and Video Services

j. Various Programs in 8086
- i. Simple Programs for Arithmetic, Logical, String Input/Output
- ii. Conditions and Loops
- iii. Array and String Processing
- iv. Read and Display ASCII and Decimal Numbers
- v. Displaying Numbers in Binary and Hexadecimal Formats

4. Microprocessor System(10 hours)
- a. Pin Configuration of 8085 and 8086 Microprocessors
- b. Bus Structure
  - i. Synchronous Bus
  - ii. Asynchronous Bus
  - iii. Read and Write Bus Timing of 8085 and 8086 Microprocessors
- c. Memory Device Classification and Hierarchy
- d. Interfacing I/O and Memory
  - i. Address Decoding
  - ii. Unique and Non Unique Address Decoding
  - iii. I/O Mapped I/O and Memory Mapped I/O
  - iv. Serial and Parallel Interfaces
  - v. I/O Address Decoding with NAND and Block Decoders (8085, 8086)
  - vi. Memory Address Decoding with NAND, Block and PROM Decoders (8085, 8086)
- e. Parallel Interface
  - i. Modes: Simple, Wait, Single Handshaking and Double Handshaking
  - ii. Introduction to Programmable Peripheral Interface (PPI)
- f. Serial Interface
  - i. Synchronous and Asynchronous Transmission
  - ii. Serial Interface Standards: RS232, RS423, RS422, USB
  - iii. Introduction to USART
- g. Introduction to Direct Memory Access (DMA) and DMA Controllers

5. Interrupt Operations(5 hours)
- a. Polling versus Interrupt
- b. Interrupt Processing Sequence
- c. Interrupt Service Routine
- d. Interrupt Processing in 8085
  - i. Interrupt Pins and Priorities
  - ii. Using Programmable Interrupt Controllers (PIC)
  - iii. Interrupt Instructions
- e. Interrupt Processing in 8086
  - i. Interrupt Pins
  - ii. Interrupt Vector Table and its Organization
  - iii. Software and Hardware Interrupts
  - iv. Interrupt Priorities

6. Advanced Topics(4 hours)
   a. Multiprocessing Systems
      i. Real and Pseudo-Parallelism
      ii. Flynn's Classification
      iii. Instruction Level, Thread Level and Process Level Parallelism
      iv. Interprocess Communication, Resource Allocation and Deadlock
      v. Features of Typical Operating System
   b. Different Microprocessor Architectures
      i. Register Based and Accumulator Based Architecture
      ii. RISC and CISC Architectures
      iii. Digital Signal Processors

Practical:

There will be about 12 lab exercises to program 8085 and 8086 microprocessors.

References:

1. Ramesh S. Gaonkar, "Microprocessor Architecture, Programming and Application with 8085", 5th Edition 2002, Prentice Hall
2. Peter Abel, "IBM PC Assembly Language and Programming", 5th Edition 2001, Pearson Education Inc.
3. D. V. Hall, "Microprocessor and Interfacing, Programming and Hardware", 2nd Edition 1999, Tata McGraw Hill
4. John Uffenbeck, "Microcomputers and Microprocessors, The 8080, 8085 and Z-80 Programming, Interfacing and Troubleshooting" 3rd Edition 1999, Prentice Hall
5. Walter A. Triebel and Avtar Singh, "The 8088 and 8086 Microprocessors, Programming, Interfacing, Software, Hardware and Applications", 4th Edition 2003, Prentice Hall
6. William Stalling, "Computer Organization and Architecture", 8th Edition 2009, Prentice Hall