Microprocessors
And
Microcontrollers

COURSE CONTENT

Unit 1 - Intel 8085 microprocessor: Basic concepts of microprocessor, microcomputer, microcontroller. Architecture (pins, signals, buses, register set), addressing modes, instruction set (instruction format, opcode, mnemonic), subroutines, timing diagrams and t-states of different instructions, programming, recursive programs, vectored and non-vectored interrupts and interrupt handling of 8085.

Unit 2 - Intel 8086 microprocessor: Architecture (pins, bus interface unit, execution unit, register set, pipelining), memory addressing, segmentation, instruction set (data transfer, arithmetic, logic, string, long and short control transfer and processor control), timing diagrams, operating modes, programming, assemblers, address-objects, parameter passing to subroutines, hardware and software interrupts and interrupt handling of 8086.

Unit 3 - Interfacing of microprocessors: Interfacing a microprocessor with RAM and ROM chips, address allocation and decoding techniques. Interfacing with LED, LCD, ADC, DAC, toggle switch and keypad. Memory-mapped i/o. Interfacing with 8255 programmable peripheral interface (architecture, ports, i/o modes and BSR mode). Basic architecture and features of 8254 programmable timer, 8257 programmable DMA controller, 8259 programmable interrupt controller, 8279 programmable keyboard and display controller and 8087 math coprocessor.

Unit 4 - Microcontrollers: 8051 microcontroller: architecture, i/o ports, memory organization, addressing modes, instruction set, simple programs. Introduction to IoT: basic architecture, sensing and actuating, application domains.

Unit 5 - High-end microprocessors and microcontrollers: Important features of 32-bit processors, RISC and Pentium. Implementation of memory management schemes like segmentation, paging and virtual memory at the hardware level. Introduction to Arduino: basic architecture, hardware and software, simple programs.

Guidelines for practical work:

1. **Write an assembly program to generate the numbers of the Fibonacci series.**
2. **Write an assembly program to clear all flags without using any data transfer instruction.**
3. **Write an assembly program to search for a number in a list.**

4. **Write an assembly program to sort a list.**
5. **Write an assembly program to copy a list from one part of the memory to another.**
6. **Write an assembly program to multiply two numbers using successive additions.**
7. **Write an assembly program to calculate the square root of a number.**
8. **Write an assembly program to calculate the factorial of a number using recursion.**
9. **Write a self-replicating assembly program.**
10. **Interface 8255 with a microprocessor and use all its modes.**
11. **Interface 8254 with a microprocessor and use it to generate differ types of clock signals.**
12. **Interface 8259 with a microprocessor and use all its features.**
13. **Interface 8257 with a microprocessor and write a program to control a keypad and a LED display.**
14. **Design digital systems with Arduino and simple sensors and actuators.**

SUGGESTED READINGS

1. **Ramesh S. Gaonkar, "Microprocessor Architecture, Programming, and Applications with the 8085" Prentice Hall.**
2. **D. V. Hall, "Microprocessor and Interfacing Programming & Hardware" TMH – 2nd Edition.**
3. **S. P. Morse, "8086 Primer: An Introduction to Its Architecture, System Design and Programming" Hayden Book Co.**
4. **S. Monk, "Programming Arduino: Getting Started with Sketches", 2nd Edition, McGraw-Hill.**
5. **M.A. Mazidi et. al. "The 8051 Microcontroller and Embedded Systems: Using Assembly and C" Pearson Publishers.**

Syllabi for III Semester ICE / EE departments

Course Code	Type	Subject	L	T	P	Credits	CA	MS	ES	CA	ES	Pre-requisites
ICCSC05	CC	Data structure	3	0	2	4	15	15	40	15	15	