

ECPC3001 MICROPROCESSORS AND MICROCONTROLLERS (3-0-0)

Course Objectives:

This course provides a comprehensive understanding of microprocessor and microcontroller architectures, focusing on the 8086, 8051, and ARM. Students will learn assembly/C programming, peripheral interfacing, and system design. Practical skills include using simulation tools (Keil, Proteus) to develop and debug embedded applications for real-world problem-solving.

Module-I: 8086 Microprocessor Architecture and Programming (07 hours)

Register Organisation of 8086, Architecture of 8086, Pin Configuration of 8086, Memory Organisation, Minimum/Maximum Mode Configuration, Machine Language Instruction Format, Addressing Modes, Instruction Set, Assembler Directives, Assembly Language Programming, Interrupts and its Handling.

Module-II: 8086 Interfacing and Peripherals (08 hours)

8255 PPI: Modes 0, 1, 2 – Programming and Interfacing, 8253 Programmable Interval Timer, 8279 Keyboard/Display Controller, 8259 Programmable Interrupt Controller, Interfacing ADC and DAC, 8251 USART, Stepper Motor Interfacing, Memory Interfacing and I/O-mapped I/O.

Module-III: 8051 Microcontroller Architecture and Programming (06 hours)

8051 Architecture and Pin Configuration, I/O Ports, Memory Organization and Stack, Instruction Set: Data Transfer, Arithmetic, Logical, Branching, and Bit Manipulation, Assembly Programming of 8051, Embedded C Basics For 8051.

Module-IV: 8051 Interfacing and Applications (06 hours)

Programming Timers/Counters, Interrupts in 8051, Interfacing LEDs, Switches, 16x2 LCD, and Sensor Interfacing, Serial Communication.

Module 5: Introduction to ARM Microcontrollers (3 hours)

RISC vs CISC concepts, Basics of ARM Architecture and Instruction Set, Pipelining concept.

Course Outcomes:

By the end of this course, students will be able to:

- CO1: Apply foundational knowledge of electronics, digital systems, and embedded systems to analyze microprocessor/microcontroller-based problems.
- CO2: Identify and analyze engineering problems in processor and peripheral interfacing, and propose effective solutions.
- CO3: Design embedded system solutions using microcontrollers for real-world applications, considering functional and practical constraints.
- CO4: Conduct experiments with microcontrollers, evaluate outputs, and interpret results for debugging and performance analysis.
- CO5: Use software tools (e.g., Keil, Proteus, MPLAB, STM32Cube IDE) and hardware kits for simulation, testing, and development of microcontroller-based applications.

Text Books:

1. Advanced Microprocessors and Peripherals, A.K. Ray, K M Bhurchandi, TMH Publication, 2007.
2. The 8051 Microcontroller and Embedded Systems, Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D.M C Kinlay, Pearson Education, Second Edition, 2008.
3. ARM System Developer's Guide – Sloss, Symes and Wright, Published by ELSEVIER INDIA, 2014.

References:

1. Microprocessors and Interfacing, Programming and Hardware, Douglas V Hall, TMH Publication, 2006.
2. Microcontrollers: Principles and Application, Ajit Pal, PHI Publication.
3. The Definitive Guide To ARM CORTEX M3 And CORTEX M4 Processors by Joseph Yiu, Newnes Publication, 3rd edition.