

**II Year II Semester**

**Code: 20EC4746**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

## **ADVANCED MICRO CONTROLLERS**

### **Course Objectives:**

1. To familiarize with the basic concepts of microprocessor and microcontrollers
2. To understand the features and architecture of 8085, 8086 microprocessors and PIC, MSP430, ARM Cortex Microcontrollers.
3. To understand the architecture and programming model of 8051 Microcontrollers
4. To apply and implement programs on 8051 microcontrollers
5. To implement real time features of 8051 microcontrollers

### **UNIT-I: Introduction to Microprocessors**

**Important terminology in digital prime:** Bits, Bytes, Clock, Latch, flip-flop, Registers, Counters, buffer, encoder, decoder, multiplexer, demultiplexer.

**Components of microprocessor system:** Data Bus, Address Bus, Control bus, RAM and ROM memories, Relation between microprocessor and size of memories, Input and Output devices. General registers- Program counter, Instruction pointer, stack pointer, Accumulator. History of microprocessors, features of 8085, 8086, 8088 and comparisons.

### **UNIT-II: Introduction to Microcontrollers**

History of microcontrollers, Differences between microprocessors and microcontrollers, Advantages and Disadvantages, Block diagram of microcontroller – basic operation, RISC and CISC architectures, Von-Neumann architectures, Various Microcontroller families, 8 bit, 16 bit, 32 bit Microcontrollers, Design of Power Supply for Microcontrollers, Power Supply Design Considerations. Examples of sensors, actuators.

### **UNIT-III: 8051 Microcontrollers**

Overview and features of 8051 microcontrollers, Architecture, Register set signals and pin configuration, I/O ports, Memory organization, memory banks and stack, addressing modes, instruction set, assembler directives, ALP format. Simple programs based on addressing modes and basic instructions, Generating delay loops and calculations.

### **UNIT-IV: 8051 Real Time Control**

**8051 Timers & counters:** Timers and counters, TCON and TMOD registers, Timer Modes, delay generation with timers, programming timers and counters. **8051 Serial Communication:** serial communication basics, RS232 and MAX232 IC, 8051 serial programming registers, Programming 8051 for serial data transmission and reception. **8051 Interrupts:** Interrupts Vs Polling, Interrupt vector address and interrupt service routines, Interrupt programming registers, Timer interrupts, and External hardware interrupts, serial communication interrupts.

### **UNIT-V: Advanced Microcontrollers**

**MSP430 Microcontrollers:** Introduction to MSP430 Microcontroller. Features of MSP430, MSP430 Architecture. Register set, Programming Methods, Introduction to Lunchbox Platform. Clock and Reset System. Low power modes.

**ARM Cortex M4 Microcontrollers:** Introduction to ARM CORTEX M profile: CORTEX M0 and M4 cores, CPU Registers, CPU Operating Modes, Memory Map, Bus Interface, interrupt handling, NVIC (Nested Vectored Interrupt Controller), system tick timer, Debug system

**Course Outcomes:**

A student who successfully fulfils this course requirement will be able to:

S.No	Course Outcome	BTL
1.	Describe the fundamental concepts of microprocessors	L2
2.	Analyze the fundamental concepts of microcontrollers	L4
3.	Understand and apply the architecture and programming of 8051.	L3
4.	Develop advanced real time concepts with 8051 Microcontroller	L6
5.	Summarize the features of MSP430 and ARM cortex microcontrollers	L2

**Correlation of COs with POs& PSOs:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	-	-	-	-	-	-	-	-	-	1	-
CO2	1	2	2	-	-	-	-	-	-	-	-	-	2	-
CO3	1	2	2	1	-	-	-	-	-	-	-	-	2	-
CO4	1	3	2	2	-	-	-	-	-	-	-	-	2	-
CO5	1	1	1	-	-	-	-	-	-	-	-	-	1	-

**Text Books:**

1. Microcontrollers: Theory and Applications – Ajay V. Deshmukh, McGraw Hill, 2005.
2. The 8051 Microcontroller –Kenneth Ayala, West Publishing Company, Third Edition, 1991.
3. The 8051 microcontroller and embedded systems– Muhammad Ali Mazid, PHI, 2000.

**Reference Books:**

1. Microprocessors and Microcontrollers – Krishna Kanth, PHI, Second Edition, 2012.
2. MSP430 Microcontroller Basics – John H. Davies, Newnes, Second Edition, 2008,
3. ARM Microprocessor Systems: Cortex-M Architecture, Programming, and Interfacing – Muhammad Tahir and Kashif Javed, Second Edition, 2017.