

**MICROCONTROLLERS AND APPLICATIONS****Course Code:** 13EC2204**L P C**  
**4 0 3****Course Outcomes:**

At the end of the course the student will be able to

CO1:Comprehend the architecture and instruction set of microcontrollers.

CO2:Acquire knowledge on real time control interrupts & timers.

CO3:Design interface control peripherals and high power devices.

CO4:Analyze real time operating system for MCUs & MCU based industrial applications.

CO5:Comprehend the architecture of 16-bit (8096/80196) & ARM microcontrollers.

**UNIT- I            8051 Family Microcontrollers Instruction Set:**

Architecture of 8051microcontroller- internal and external memories, Basic assembly language programming – Data transfer instructions – Data and Bit manipulation instructions – Arithmetic instructions – Instructions for Logical operations on the Bytes among the Registers, Internal RAM, and SFRs – Program flow control instructions – Interrupt control flow

**UNIT- II            REAL TIME CONTROL: INTERRUPTS:**

Interrupt handling structure of an MCU – Interrupt Latency and Interrupt deadline – Multiple sources of the interrupts – Non-maskable interrupt sources – Enabling or Disabling of the sources – Polling to determine the Interrupt source and assignment of the priorities among them –Interrupt structure in Intel 8051.

**REAL TIME CONTROL: TIMERS**

Programmable Timers in the MCUs – Free running counter and real time control – Interrupt interval and density constraints.

**UNIT- III            SYSTEMS DESIGN :**

Synchronous serial-cum-asynchronous serial communication – ADC Circuit Interfacing – DAC Circuit Interfacing – stepper motor - Digital and Analog Interfacing Methods, Switch, Keypad and Keyboard interfacings – LED and Array of LEDs – LCD interface – Programmable instruments interface using IEEE 488 Bus – Interfacing with the Flash Memory – Interfaces –Interfacing to High Power Devices – Analog input interfacing – Analog output interfacing.

**UNIT- IV REAL TIME OPERATING SYSTEM FOR MICRO CONTROLLERS:**

Real Time operating system – RTOS of Keil (RTX51) – Use of RTOS in Design – Software development tools for Microcontrollers.

**MICROCONTROLLER BASED INDUSTRIAL APPLICATIONS**

Optical motor shaft encoders – Industrial control – Industrial process control system – Prototype MCU based Measuring instruments.

**UNIT-V****16/32 - BIT MICROCONTROLLERS:**

**8096/80196 Family:** Hardware – Memory map in Intel 80196 family MCU system – I/O ports – Programmable Timers and High-speed outputs and input captures – Interrupts.

**ARM 32 Bit MCUs:** Introduction to 16/32 Bit processors – ARM architecture and organization – ARM / Thumb programming model – ARM / Thumb instruction set.

**TEXT BOOKS:**

- [1] Raj Kamal, “*Microcontrollers Architecture, Programming, Interfacing and System Design*”, 2nd Edition, Pearson Education, 2005.
- [2] Mazidi and Mazidi, “*The 8051 Microcontroller and Embedded Systems*”, 4th impression, PHI, 2000.

**REFERENCE BOOKS:**

- [1] Kenneth J. Ayala, “*The 8051 Microcontroller*”, 3rd ed., Cengage Learning, 2007.
- [2] A.V. Deshmukh, “*Microcontrollers (Theory & Applications)*”, 6th Reprint, TMH, 2007.
- [3] John B. Peatman, “*Design with PIC Microcontrollers*”, 2<sup>nd</sup> Edition, Pearson Education, 2005.