MICROCONTROLLERS AND APPLICATIONS
(ELECTIVE – I)

Course Code:15EC2204

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Prerequisites: Switching theory and logic design, microprocessors and interfacing.

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: Able to 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 (10-Lectures)
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 (10-Lectures)
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 (10-Lectures)

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 (10-Lectures)

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 (10-Lectures)

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*", 2nd Edition, Pearson Education, 2005.