

17ES001 MICROCONTROLLERS FOR EMBEDDED SYSTEMS

Hours Per Week :

L	T	P	C
3	-	3	5

Total Hours :

L	T	P	WA/RA	SSH/HS	CS	SA	S	BS
45	-	45	15	30	-	5	5	-

Course Objectives:

The objective of this course is to study the fundamentals of Microcontrollers and design of embedded systems by using various Microcontrollers. This course familiarize the students with the programming and interfacing of microprocessors and microcontrollers

Course Outcomes:

- Understand the Architecture of Microcontrollers, Programming the Microcontrollers, Interfacing various real data collection sensors to Microcontrollers and design and developing a prototype embedded systems using Microcontrollers.

SKILLS :

- Design a 8051 microcontroller based embedded system.
- To do case study experiences for microcontroller based Design synchronous and applications.
- Gain knowledge on ARM based system design.

ACTIVITIES:

- Programming with 8051
- Programming with ARM

UNIT - I

Overview of 8051

8051 MICROCONTROLLER ARCHITECTURE: Architecture-memory organization -addressing modes-instruction set – Timers - Interrupts – I/O ports- serial communication. Arithmetic – logical - bit operations –time delays using Timers / Counters – Interrupts – serial Communication.

UNIT - II

ARM ARCHITECTURE & PROGRAMMING: ARM Design Philosophy, Registers, Program Status Register, Instruction Pipeline, Interrupt and Vector Table, ARM Processor Families. Instruction set: Data Processing Instructions, Addressing Modes, Branch, Load- Store instructions, PSR instructions, and Conditional instructions.

UNIT - III

ARM CORTEX-M3: Introduction- Background of ARM and ARM Architecture- Instruction Set Development- The Thumb-2 Technology and Instruction Set Architecture. - Overview of the Cortex-M3: Fundamentals – Registers - Operation Modes.

UNIT - IV

ARM THUMB INSTRUCTION & PROGRAMMING: Thumb Instruction set: Register usage, Branch instructions, Data Processing Instructions, Single-Register and Multi Register Load-Store instructions, stack, software Interrupt Instructions. Interrupts, Interrupt handling schemes.

UNIT - V

INTERFACING & APPLICATIONS: Interfacing of LCD, Seven Segment display, keypad, stepper motor, DC motor. Generating pulses like PWM for motor control, Sensors (Temp, Pressure, Humidity, etc) interfacing and data acquisition using ADC/DAC. Developing simple applications by using Zigbee, Bluetooth, GPS and GPRS Modules (Any Two)

TEXTBOOKS:

1. Andrew N. SLOSS, Dominic SYMES, Chris WRIGHT “ARM System Developer’s Guide: Designing and Optimizing System Software” Elsevier. 2008
2. Kenneth J Ayala “ The 8051 Microcontroller Architecture, Programming and Applications”, Delmar Cengage Learning; 3rd edition. 2012
3. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D.McKinlay “The 8051 Microcontroller and Embedded Systems: Using Assembly and C”, Pearson. 2013
4. Joseph Yiu , “The Definitive Guide to ARM® Cortex®-M3 and Cortex®-M4 Processors” 2014

REFERENCE BOOKS:

1. Myke Predko, “Programming and Customizing the 8051 Microcontroller” , McGraw Hill, 2000.
2. Steve Furber, “ARM System-on-Chip Architecture “, Second Edition, Pearson Education.2012

List of Experiments (based on ARM cortex-M series)

1. Calculator type keyboard
2. 4-Digit,7-segment LED Display
3. Dual DAC
4. TXDR Interface Using PT100 with ADC
5. Stepper Motor
6. Elevator Interface
7. 4*4 Matrix Hex Keypad
8. Temp Sensor
9. 16 Channel 8-bit ADC
10. Logic Controller
11. Traffic Lights
12. Musical Tone Generator
13. Opto Isolated Input Interface
14. Opto Isolated Output Interface
15. DC Motor