16EC302 MICROPROCESSORS AND MICROCONTROLLERS

Hours Per Week :

L	T	P	C
3	-	2	4

Course Description and Objectives:

Thi s course i ntroduces basi c archi tecture and operati on of a mi croprocessor and a microcontroller to the student. The course objective is to study the architecture and addressing modes of 8086/8051 and to know the importance of different peripheral devices and their interfacing with 8086/8051.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Understand and analyze the architectures of 8086 microprocessors and 8051 micro controllers.

CO2: Identify various peripheral interfaces to 8051:

CO3: Understand the architecture of ARM Processor.

CO4: Create basic assembly language programs for 8086, 8051 and ARM processors.

CO5: Experiment to interface various peripherals to 8051:

CO6: Develop applications based on different processors and controllers.

SKILLS:

- ✓ *Identify a Microcontroller for a specific application.*
- ✓ *Design a Microprocessor based system.*
- ✓ *Design a Microcontroller based system.*
- ✓ *Do programming in assembly language.*

UNIT - 1 **L-9**

INTRODUCTI ON TO 8086 MI CROPROCESSOR: Evol ut i on of miroprocessors; 8086 micro processorArchitecture, Register model, Memory segmentation, Physical address generation, Addressing modes, Instruction set, Interrupts of 8086. Pin configuration of 8086; 8086 system bus architecture, Physical Memory organization.

UNIT - 2 **L-9**

INTRODUCTION TO 8051 MICROCONTROLLER: Comparing Microprocessors and icrocontrollers; 8051 Micro controller Architecture; Signal Description of 8051; Memory organization; Addressing modes of 8051; Instruction set; Assembly language program examples in 8051.

UNIT - 3 **L-9**

8051 MICROCONTROLLER HARDWARE AND PERIPHERAL INTERFACING: Parallel Ports in 8051; 8051 Timers; 8051 Serial ports; 8051 Interrupts**.**

Peripheral Interfacing- LCD and Keyboard Interfacing, ADC and Sensor Interfacing, DC Motor and Stepper Motor Interfacing Techniques.

UNIT - 4 **L-9**

IARM ARCHITECTURE : RISC Vs CISC systems – ARM Philosophy – ARM7TDMI Core Architecture – Functional Diagram – Programmer's Model – ARM State Register Set –THUMB state register set –Current Program Status Register – ARM 7TMI Operating modes – mode bits – Exceptions – Interrupt Vector Table – Interrupt Processing.

UNIT - 5 **L-9**

ARM INSTRUCTION SET : ARM Assembly Language – Instruction Syntax – ARM Instruction Set – Data processing, Branch, Load/Store Instructions. Miscellaneous Instructions.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours-30

PART I. Assembly Language Programming Experiments:

1. Programs on different Data Transfer Instructions using 8086.
2. Arithmetic operations: Addition, Subtraction, Multiplication, Division using 8086
3. Programs to analyze different addressing modes of 8051.
4. Program to sort the array of given numbers in ascending order.

PART II. Interfacing Experiments:

5. Interfacing 7 Segment LED Display to 8051
6. Alphanumeric LCD panel interface to 8051.
7. Hex keypad input interface to 8051.
8. ADC interface to 8051.
9. DAC interface to 8051 for waveform generation.
10. Stepper motor control interface to 8051.
11. Interface 7 Segment LED with LPC2148.
12. Interface LCD Module with LPC2148.

ACTIVITIES:

- *Interface a 16x2 LCD with 8051.*
- *Interface a 4X4 Hex keypad with 8051.*
- *Interface Stepper motor.*
- *Interface DAC, To generate Square and Triangular waves.*
- *Interface ADC, To convert analog signal to digital and to display it in 7-segment LED display.*
- *With the help of timer units in 8051 Count external pulses arriving on port pins.*
- *Design any microcontroller based system with more than seven peripherals.*

13. Interface 4x4 Hex keypad with LPC2148.
14. Interface and rotate DC motor with LPC2148 in clockwise direction with *increase* & decrease in speed.

Note: *Any 10 of the above experiments are to be carried in the lab.*

TEXT BOOKS:

1. Douglas V.Hall, "Microprocessors and Interfacing", 2nd edition, Tata McGraw Hill, 2006.
2. Kenneth J. Ayala, "The 8051 Microcontroller", 3rd edition, Cengage Learning India Pvt. Ltd, 2008.
3. Andrew N Sloss, Dominic Symes and Chris Wright, "ARM system developer's guide", Elsevier - Morgan Kaufmann Publishers, 2008.

REFERENCE BOOKS :

1. Barry B. Brey, "The Intel microprocessors 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Pentium Pro processor, Pentium II, Pentium III, Pentium 4, and Core2 with 64-bit extensions:architecture, programming, and interfacing", 8th edition, Pearson Prentice Hall, 2009.
2. Mohamed Rafiquzzaman, "Microprocessors and Microcomputer Based System Design", 2nd edition, CRC Press, 2007.
3. Steve Furber, "ARM System on Chip Architecture", 2nd edition, Pearson education, 2000.