8051 Microcontroller and an Introduction to an Embedded System

Duration : 30 Hours	Exam Marks : 50

Objectives:

This course is specially designed for B.Sc. (Non-Electronics) and BCA students. The course is designed for 30 hrs of theory and 20 hrs of Practicals . The students will have both theoretical as well as hands on experiments with the electronics.

Student will be able to

- Understand basic digital sequential logic circuits.
- Understand the working of Microprocessor and Micro-controller (Specifically 8051).
- Program 8051 microcontroller in assembly level language.
- Program 8051 microcontroller using Embedded C language.

Scope:

- Students can do their own projects using 8051 Microcontroller.

They can make use of the knowledge in building any devices using Microcontroller. Hence they can start with their own startups based on embedded systems.

Module I: Digital Electronics	**6 Hours**

Flip-flops-Basic SR flip flop, JK Flip Flop

Registers -4 bit serial in serial out, serial in parallel out, parallel in serial out, parallel in parallel out, Applications.

Counters-Asynchronous counters- Logic diagram, Truth table and timing diagrams of Decade counter.

Synchronous counters- Decade counters, Up/down synchronous counters

Module II: Introduction to Microcontrollers:	**6 Hours**

Introduction, Comparison between Microprocessors and Microcontrollers, RISC & CISC CPU Architectures, Harvard & Von-Neumann CPU architecture.

The 8051 Architecture: Introduction to 8051 Microcontroller Hardware, Input/Output Pins, Ports and Circuits- Port 0, Port1, Port2 and Port3.

External memory- Connecting external memory

Counters and Timers and interrupts.

Module III: Addressing Modes and Instructions Sets:	**6 Hours**

Addressing modes: Immediate Addressing, Register addressing, Direct Addressing,Indirect addressing

Data transfer instructions, Byte level logical Operations, Bit level logical Operations, Jump and Call Instructions. (Example programs on all instructions).

Module IV: 8051 programming in C:	**6 Hours**

Data types and time delays in 8051C, I/O programming, logic operations, data conversion programs, accessing code ROM space, data serialization.

Programming 8051 Timers, Counter Programming, programming timers 0 and 1 in 8051C

Interrupts Programming: 8051 Interrupts, Programming Timer Interrupts, External Hardware Interrupts.

Programming serial data transfer, Programming the Serial Communication Interrupts, Interrupt programming in C.

Interfacing with 8051: Interfacing 8051 to LCD, Keyboard, ADC, DAC, Stepper motor.

Module V: Introduction to embedded systems:	**6 Hours**

An embedded system, block diagram, processor, processor selection for an embedded system, hardware unit, software embedded into a system, memory devices,
Embedded processors: ARM family, PIC family.

Lab Experiments: **20 hrs**

8051 Programming using Trainer Kit:

1. Program to add and subtract two 8-bit numbers.
2. Program to find 2's complements of an 16-bit number.
3. Program to find the sum of N 8-bit numbers.
4. Program to multiply two 8-bit numbers.
5. Program to multiply two 16-bit numbers.
6. Program to solve the linear equation y = mx + c.
7. Program to find the square of a number from look-up table.
8. Program to find largest of N numbers.
9. Program to find smallest of N numbers
10. Program to verify the truth tables of logic gates.
11. Program to find whether the given data is palindrome.
12. Program to arrange the numbers in ascending order.

8051 Programming using KEIL Software:

1. Toggling of ports.
2. Experiments related with timer in mode1.
3. Experiments related with timer in mode2.
4. Experiments related with serial data transfer with baud rate 4800.
5. Experiments related with serial data transfer wit baud rate 9600.
6. Experiments related with interrupts.
7. DAC interfacing.
8. Stepper motor interfacing.
9. Keyboard interfacing.
10. Traffic control interfacing.

Scheme of Evaluation:

- Conduct the theory exam for 25 marks
- Conduct the Practical exam for 25 marks