

## 8051 Microcontroller

Duration : 60 hrs

- **ARCHITECTURE OF 8051** Comparison of Microprocessor and Microcontroller - Block diagram of Microcontroller –Functions of each block - Pin details of 8051 – ALU –ROM – RAM – Memory Organization of 8051 - Special function registers – Program Counter – PSW register –Stack - I/O Ports – Timer – Interrupt – Serial Port – Oscillator and Clock - Clock Cycle – State - Machine Cycle – Instruction cycle – Reset – Power on Reset – Overview of 8051 family
- **INSTRUCTION SET OF 8051** Instruction set of 8051 – Classification of 8051 Instructions - Data transfer instructions – Arithmetic Instructions – Logical instructions –Branching instructions – Bit Manipulation Instructions
- **ASSEMBLER AND ADDRESSING MODES** Assembling and running an 8051 program –Structure of Assembly Language –Assembler directives - Different addressing modes of 8051
- **I/O** Bit addresses for I/O and RAM – I/O programming – I/O bit manipulation programming.
- **TIMER** Programming 8051 Timers – Timer 0 and Timer 1 registers – Different modes of Timer – Mode 0 Programming – Mode 1 Programming - Mode 2 Programming - Mode 3 Programming - Counter programming – Different modes of Counter – Mode 0 Programming – Mode 1 Programming - Mode 2 Programming - Mode 3 Programming .
- **SERIAL COMMUNICATION:** Basics of Serial programming – RS 232 Standards - 8051 connection to RS 232 – 8051 Serial Communication Programming – Programming 8051 to transmit data serially - Programming 8051 to Receive data serially.
- **INTERRUPT:** 8051 Interrupt s – Programming Timer Interrupts – Programming external hardware interrupts – Programming the serial communication interrupt – Interrupt priority in 8051.
- **Peripheral Interfacings**

- Port programming & led interfacing
- Seven segment display
- Linear keyboard & Matrix keyboard
- DC motor & Stepper motor
- Relay
- Internal Watchdog timer

## Embedded System with C

Duration : 60 hrs

- System Programming Vs Application Programming
- Why C for Embedded programming?
- Review of C language with embedded perspective
- Programming Time/Memory: Critical Systems
- Bitwise operator, Pointer Arithmetic, bit fields, Mixing Assembly and C
- Memory Allignment with Structures
- Memory Management in C
- Minimization Techniques
- Testing And Debugging

## PIC

Duration : 60 hrs

- **Introduction**  
Introduction to various technologies in Electronics Analog, Power and Digital electronics basics ,Comparison of different technologies Introduction to embedded system .Importance and evolution of Embedded system Comparison with other technologies Different architectures and elements used in embedded system
- **PIC 16f877 / 18f4520 microcontroller**  
Introduction to PIC architecture Comparison of PIC with other CISC & RISC systems PIC family Categories and importance (10F/12F/16F/18F)16f877 / 18f4520 pin details and specifications (with package detail) Instruction set / Bus architecture RAM, FLASH, UART and other peripherals. Interrupts, timer Counters Introduction to PIC ProBASIC programming KIT
- **Assembly language**  
Assembly Language (Instruction set, Mnemonics, Memory address)

Use of Assemblers & Simulator MPLAB Configuring of 16f and 18f Rules to write a code Programming for PIC Examples programs for PIC

Compilation and burning hex file on Programmer

- **Embedded C language**

Introductions to Embedded C Loops, String , Arrays, Pointers Functions and Macros Compilers , Editors and Burners( HI-TECH C , C18 )

- **Peripheral Interfacings**

- Port programming & led interfacing

- Seven segment display

- Liner keyboard & Matrix keyboard

- DC motor & Stepper motor

- Relay

- Internal Watchdog timer

- **Communication Protocols and Converters interfacings**

Serial RTC (I2C)

EEPROM (I2C)

UART (Serial Communication)(SPI)

8 – Channel Internal ADC, Sensors

- **Advance display modules**

Introduction to graphics

16×2 LCD display

Graphics on Character LCD

Introduction Graphic LCD

Graphic LCD Controller and Commands

Interfacing and making Graphics for 128×64 GLCD

## ARM Controller

Duration : 60 hrs

- **ARM PROCESSOR ARCHITECTURE:** The RISC and ARM design philosophy, Embedded System Hardware.
- **ARM PROCESSOR FUNDAMENTALS:** Data Flow model, Registers, modes of operation, Current Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector Table ARM nomenclature and families. Big Endian and Little Endian
- **ARM INSTRUCTIONS SETS AND INTERRUPTS:** ARM and Thumb Instruction Sets, Data Processing Instructions, Branch Instructions, Load- Store Instructions, Software Interrupt Instruction, Program Status Register Instructions, Conditional Execution, Stack Instructions, Software Interrupt Instruction.

- **ARM PROCESSOR EXCEPTIONS AND MODES:** vector table, priorities, link Register offsets, interrupts, and IRQ / FIQ exceptions interrupt stack design and implementation.
- **SIMPLE PROGRAM:** Addition, Subtraction, Multiplication in assembly
- **CACHE MECHANISM:** Introduction to cache memory, memory hierarchy and cache memory, Cache architecture and cache policies.
- **CONCEPT OF FLUSHING AND CLEANING CACHE:** Flushing and Cleaning ARM cache core.
- **CONCEPT OF CACHE LOCKDOWN:** Locking Code and Data in Cache. Cache and write buffer
- **MEMORY PROTECTION AND MANAGEMENT UNIT:** Introduction to protection unit, Protected Regions, and Demonstration of an MPU system. Virtual Memory working principle
- **EMBEDDED OS AND RTOS:** Fundamental Components to Embedded OS, Simple Little Operating System: Initialization, memory model, interrupts and exceptions handling, Scheduler, and context switch.
- **INTRODUCTION TO RTOS:** Real-time systems concepts, foreground/background systems, critical sections, resources, multitasking, Context switching, scheduling, re-entrancy, task priorities, mutual exclusion.
- **SYNCHRONIZATION AND IPC:** Introduction to Semaphores and types. Inter process communication: pipes and message box.

### **Designing Embedded Software Using Real-time Operating System**

*Note:Net Tech India also provides seasonal training and basic assistance for final year projects. We also provide placements for the upcoming fresher's and also for experienced holders.*

#### **EMBEDDED SYSTEM TRAINING** **List of the Software's Requirement**

- **8051 Microcontroller :** KEIL
- **PIC :** PIC simulator IDE ( microchip)
- **ARM Controller :** KEIL MDK