

EMBEDDED SYSTEM TRAINING
An Overview of the Syllabus Coverage

VHDL PROGRAMMING Design

- **Dataflow Modeling** : Introduction,
 - continuous assignments,
 - expressions delays,
 - datatypes
- **Behavioural Modeling** : Introduction,
 - process statements,
 - other statements under process statement,
 - if-then statement,
 - when statement,
 - case statement,
 - while statement,
 - Structural Modelling
 - Mixed Modelling
- **Structural & Mixed Modeling**
- **VERILOG Design**

Embedded Linux Training

- An overview, open source concept,
- Linux file system,
- Development environment and tools
- Linux file system
- Kernal space and its interface to user space,
- Shell and basic shell commands,
- Basic IP filters
- Linux basic model,
- Scheduling and priorities,
- Comparing linux to other RTOS,
- Tools chain overview
- POSIX Thread
- Synchronization and communications
- C signals
- /proc and /sys for kernel 2.6
- Dynamic modules and Procs

PCB Design Training

- **PCB DESIGN PROCESS AND OVERVIEW** Conception Level Introduction: Specifying Parts, Packages and Pin Names, The Partlist, The Netlist, Making Netlist Files, Placing Parts, Routing Traces, Adding Text, Plot and Drill Files, PCB Layout, Layer List and Selection Mask, Panning and Zooming, Projects, PCB Elements.
- **PCB DESIGN PROCESS** Board Outline; Parts-Anatomy of a Part, Partlist, Editing Parts, Reference Designator; Mounting Holes; Nets, Ratlines and Routing; Nets- Netlist; Ratlines; Vias; Modifying Traces, Swapping Pins; Importing Netlist; Copper Areas; Text; Solder Mask Cutouts; Groups; Design Rule Checking; Exporting Drill and Gerber Files; Drills; Footprints and Libraries Adding and Editing Pins, Polylines.
- Application Oriented Design and Fabrication Schematic Diagram, Creating the Project, Importing the Netlist File, Drawing the Board Outline, Adding Mounting Holes, Placing Parts, Adding Parts and Editing Nets, Adding Copper Areas, Routing, Nets, Ratlines and Routings, Adding Text, Checking Design Rules, Making Gerber and Drill Files, Fabrication Process and Methodology.

Matlab Training

- Introduction to Matlab - Matlab as {best} calculator, Standard Matlab windows, Operations with variables : Naming , Checking existence , Clearing , Operations,
- Arrays : Columns and rows: creation and indexing , Size & length , Multiplication, division, power, Operations ,
- Writing script files: Logical variables and operators, Flow control , Loop operators ,
- Writing functions : Input/output arguments, Function visibility, path. c) Example: Matlab startup
- Simple graphics : 2D plots , Figures and subplots , Data and data flow
- Data types : Matrix, string, cell and structure , Creating, accessing elements and manipulating of data of different types ,File Input-Output , Matlab files , Text files , Binary files , Mixed text-binary files
- Communication with external devices : Serial port , Parallel port , Sound card , Video input Matlab course Fall 2004 ,
- Function minimization and parameters search. 1. Polynomial fit a) 1D and 2D fits b) Data windowing c) Error bounds 2. Arbitrary function fit a) Error function b) Fixing parameters
- Goodness of fit :criteria , Error in parameters
- Handle graphics and user interface: Pre-defined dialogs , Handle graphics , Graphics objects , Properties of objects , Modifying properties of graphics objects , Menu-driven programs , Controls: uimenu and uicontrol , Interactive graphics , Large program logic flow

8051 Microcontroller

- **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
 - Liner keyboard & Matrix keyboard
 - DC motor & Stepper motor
 - Relay
 - Internal Watchdog timer

PIC

- **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

16x2 LCD display

Graphics on Character LCD

Introduction Graphic LCD

Graphic LCD Controller and Commands

Interfacing and making Graphics for 128x64 GLCD

ARM Controller

- **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.

Embedded System with C

- 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

Embedded System with C++

- Inheritance
- Polymorphism
- Storage Management
- Input Output C++ Programs
- Exceptions
- Templates

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**

- **VHDL & Verilog programming** : XILINX (ISE Simulator-free download available)
- **Embedded Linux Training**: RTLINUX
- **PCB Design Training** :ULTIBOARD, ORCAD, EXPRESS LAB
- **8051 Microcontroller** : KEIL
- **PIC** : PIC simulator IDE (microchip)
- **ARM Controller** : KEIL MDK