

# Embedded Systems Training

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## Embedded Systems

### 1. Embedded Systems

- Overview of Processors & Microcontrollers
- Memory (RAM, ROM, EPROM, EEPROM, FLASH)
- I/O Interfaces
- Host & Target Development environment
- Cross Compilers
- Downloading Techniques

### 2. 8051 Microcontroller

- Architecture
- Addressing modes
- Instruction Set
- Assembly and C Language Programming

### 3. AVR Microcontroller

- Architecture
- Addressing modes
- Instruction Set
- C Language Programming

### 4. PIC Microcontroller

- Architecture
- Addressing modes
- Instruction Set
- C Language Programming

### 5. ARM Processors

- Architecture
- Addressing modes
- Instruction Set
- C Language Programming

### 6. 80386 Microprocessor

- Architecture
- Addressing modes
- Instruction Set
- C Language Programming
- Overview of I/O Interfacing (8251, 8253/54, 8255 8257, 8259, 8279)

### 7. PCB Layout Design

- Floor Planning and Placement
- Routing Connections
- Auto Routing
- RF Design
- High Speed Constraints
- Design Verification
- Generating Reports
- Printing and Plotting the Design
- Generating Manufacturing Files

### 8. Programming Environment

- Review of C Programming
- Data Structures
- Embedded Systems Design, Implementation and Testing
- Overview of Networking and Packet Switching Concepts
- OSI Reference Model and TCP/IP Protocol Suite
- LAN Protocol Suite
- Application Layer Protocols
- Embedded Network Protocols

## Embedded Systems

- Security Issues in Embedded Systems
- Video and Audio Standards

### 9. Object Oriented Programming and Design

- C++
- Java
- Introduction to UML
- Software Development Life Cycle
- Project Management

### 10. Real Time Operating Systems

- Introduction to OS
- Process Management and Inter Process Communication
- Memory management
- I/O subsystem
- File System Organization
- POSIX Thread Programming
- Introduction to Real-Time / Embedded Operating Systems
- Real Time Scheduling
- Performance Metrics of RTOS
- Linux and RTLinux Internals
- Programming in Linux and RTLinux
- Configuring and Compiling RTLinux
- Overview of other RTOS / EOS

### 11. Embedded System Programming

- Embedded Systems Design Issues
- Challenges and Trends in Embedded Systems
- Assemblers, Compilers, Linkers, Loaders, Debuggers
- Profilers and Test Coverage Tools
- Utilities like make, ranlib, obj copy and obj dump
- Configuring and Building GNU Cross-Tool chain
- Building RTOS / EOS Image for Target Hardware
- Porting RTOS and Embedded Operating Systems
- Writing Time and Space Sensitive Programs
- Writing Device Drivers
- Interrupt Handling in C
- Combining C with Assembly
- Current events and emerging technologies

### 12. Microcontroller Interfacings

- LEDs
- Switches
- DC Motor
- Stepper Motor
- Servo Motors
- Relay
- Real Time Clock
- ADC

**Duration**  
**80 Hours**

## Embedded Systems

- DAC
- Temperature Sensor
- Humidity Sensor
- Pressure Sensor
- IR Sensor
- Ultrasonic Sensor
- Accelerometer
- RF Modules
- Zigbee Modules
- Thumb Scanner
- I Button
- RF Card
- Serial Communication
- LCD
- Graphical LCD
- Color LCD
- DTMF
- GSM
- GPS
- Smart Card
- RF ID
- Touch Screen
- Bluetooth

### 13. Digital Signal Processing

- Architecture of Digital Signal Processors
- Digital Signal Processor vs Conventional Processor
- Fixed Point and Floating Point Arithmetic
- Digital Signal Processing for Embedded Systems
- DSP-based Embedded Systems Design Process

### 14. Communication & Network

- ISO OSI/IP layers
- Internet addresses, Address resolution problem & ARP implementation, RARP Implementation
- Internet protocol, Routing IP Datagram's through IP, Routing with IP addresses, ICMP Protocol
- Super net & Subnet extensions, UDP, TCP
- Overview on Boot p, DHCP, FTP, DNS, Telnet, NFS, SMTP, SNMP.
- Future of TCP/IP
- Sockets, Socket Addresses, Socket Data Structures, Elementary Socket System calls.
- Advanced Socket System Calls, Socket Implementation
- TCP, UDP Implementation Using Sockets

### 15. Wireless Embedded System

- Protocol Design & Validation
- Network Embedded Systems
- Bluetooth and IrDA
- Wireless Sensor Networks and ZigBee
- Wireless LAN - IEEE 802.11
- RFID
- GSM and GPRS
- Ubiquitous Computing

### 16. Project work in Embedded Systems