

Advanced Micro-Controllers Application & Programming

Part – 1: Programming Languages

Module 1 Introduction to Embedded Systems

What are and Why Embedded Systems?, Types of Embedded System, Classifications of Embedded Systems, Characteristics of an Embedded System, Applications of an Embedded Systems, Overview of Embedded Industry, Comparing Layers of GPC & Embedded System

Module 2 C Programming

What are Micro Processors?, What are Micro Controllers?, Difference between Micro controller and Microprocessor, System Design using Microcontroller and Microprocessor, Difference between Von Newman and Harvard Architectures, Difference between CISC & RISC Architectures, Overview of 8 bit, 16bit, 32bit & 64bit microcontrollers

Module 3 Advanced C Programming

Function, Storage Classes, Scope and Lifetime of a variable, Volatile, Recursive Functions, Stack Frame Analysis, Drawbacks of Functions, GDB, Basic Debugging Commands, Debugging a sample C Program, Arrays, Arrays and Functions, Pointer, Pointer Arithmetic, Pointers and Arrays, Pointers and Functions, String Handling Function like strcpy, strcat, strcmp, strlen, Pointers and Strings, Function Pointers, Variable Augmented Function,

Module 4 Data Structure Programming

Dynamic Memory Allocation, Memory Leaks and Dangling Pointers, Structure, Structures and Array, Structures and Functions, Structure Padding and Alignment, Union, Bit fields, Using Typedefs, Enumerations, Macros

Module 5 Embedded C Programming

Introduction to Data Structures, Types of Arrays, Coding Standard, Linked Lists, Singly Linked List, Doubly Linked Lists, Stacks and Queues.

Part – 2: Micro-Controllers

Module 6 Basics of Micro controllers

System Programming Vs Application Programming, Why C for embedded programming, Review of C language with embedded perspective, Bitwise operators programming, Bit field programming, Number System conversion program, Pointer Arithmetic programming, Register manipulation, Mixing Assembly and C.

Module 7 8051 Microcontroller MCS-51 Programming

8051 Architecture, AT89C51 specifications, Register architecture, Special function registers, KEIL IDE, ProgISP, Flash Magic, LED programs, switch, 7 segment, LCD and scrolling LCD, Keypad, DC and Steeper motor, UART Programming, Timer and Counters, Interrupt programming, Relay, PWM, MOSFET, Opt couplers, Parallel ADC ADC0804, ADC0809, Serial ADC, I2C RTC DS1307.

Module 8 Sensor Programming with 8051 Microcontroller

Temperature Sensor LM35, LDR Light detection Sensor, Ultrasonic distance sensor, PIR Motion detection sensor, humidity sensor, Level Sensor, MEMS Sensor, Gas Sensor,

Module 9 ARM 7 Microcontroller LPC2148 Programming

ARM Architecture, LPC2148 specifications, Register architecture, Special function registers, KEIL IDE, Flash Magic, GPIO Programming, LED programs, switch, 7 segment, LCD and scrolling LCD, Keypad, DC and Steeper motor, UART Programming, Timer and Counters, Interrupt programming, Relay, PWM, MOSFET, Opt couplers, Parallel ADC ADC0804, ADC0809, Serial ADC, Temperature Sensor LM35, LDR Sensor, Ultrasonic sensor, I2C RTC DS1307, SPI, USB.

Module 10 ARM 9 Board Bring up & Porting Embedded Linux

Understanding ARM development Board, Porting of Bootloader, Porting of Kernel, Porting of File System on Development Boards, Accessing Development board using UART cable, SSH and Ethernet cable.

Module 11 ARM 9 Architecture

ARM 9 Architecture, ARM 9 Instruction Set (ISA-v5TEJ), DNW tool, USB Push, Arm-linux-gcc, setting Qt library, Setting Opencv library, Understanding GPIO pins and ADC pins. GUI Programming using QT, Image and video processing using Opencv.

Module 12 Peripherals Programming on ARM 9 Board

Programming I/O Ports, Interfacing and Programming LEDs, Interfacing and Programming LCD, Interfacing and Programming KEYPAD, Interfacing and Programming ADC, Interfacing and Programming STEPPER MOTOR, Interfacing and Programming DC MOTOR.

Module 13 QT framework GUI Application Development on ARM 9

Qt creator installation, Qt creator configuration, Setting cross compiler environment in Qt, qmake role in programming, writing GUI application programming for RFID reader, GPS module.

Module 14 ARM Cortex Microcontroller LPC1768 Programming

Cortex Architecture, LPC1768 specifications, Register architecture, Special function registers, KEIL IDE, Flash Magic, GPIO Programming, LED programs, switch, 7 segment, LCD and scrolling LCD, Keypad, DC and Steeper motor, UART Programming, Timer and Counters, Interrupt programming, Relay, PWM, MOSFET, Opt couplers, Parallel ADC ADC0804, ADC0809, Serial ADC, Temperature Sensor LM35, LDR Sensor, Ultrasonic sensor, I2C RTC DS1307, SPI, USB, CAN.

Part – 3: Linux System Programming

Module 15 Linux Basic and Utilities

Unix / Linux / Windows History, Free Software Foundation, GNU Project, Booting Process of OS, Advantages and disadvantages of Linux, Features of Linux, Linux root File System, Virtual File system, Linux Kernel version, Shell and Shell Commands, system calls, file handling in Linux, Environmental variables, inodes and file permissions, error handling in linux, data types in linux.

Module 16 Programming Language Libraries in Linux

Shell Programming, Glibc, gcc compiler, gdb debugger, Makefile Utility, Compilation steps, Memory allocation in programming, C++ Library and manpages, Java Library support in Linux, Python and perl Language programming in Linux.

Module 17 Linux Kernel Programming

Linux Kernel Architecture, User & System Mode, Process Management, pid, fork , vfork, exec, orphan process, zombie process, wait, exit, POSIX standards, pthreads, pthread attributes.

Module 18 POSIX Thread Programming

POSIX standards, POSIX Threads, pthreads, pthread attributes, POSIX Message Queues, POSIX Semaphores, POSIX Shared memory , Asynchronous input and output, Threads in real-time, Multithread Vs Multiprocessing.

Module 19 Linux Synchronization Programming

Need of Synchronization, Deadlock problem ,race condition, critical section problem, Atomic operators, Deadlock, conditional variables, Mutex, Semaphores, System v API, POSIX API.

Module 20 Linux IPC (Inter Process Communication) Programming

Need of IPCs, pipe, FIFO, Shared Memory, message queue, Signals

Module 21 Linux Network Programming OSI Reference Model

Introduction to OSI Ref Model, Physical Layer Protocol Functions , Data Link Layer Protocol Functions , Network Layer Protocol Functions , Transport Layer Protocol Functions , Session Layer Protocol Functions , Presentation Layer Protocol Functions, Application Layer Protocol Functions

Module 22 Understanding TCP / IP

Origin of TCP/IP, TCP/IP Model, IP Addressing, Subnet masking, Assigning IP, Overview of Routing process, TCP/IP Stack, TCP/IP Characteristics, TCP/IP Utilities

Module 23 Linux Socket Programming

Socket API, Client Server Architecture, TCP Socket, UDP Socket, RAW Socket, Unix Socket, FTP Programming, Chat Programming, Concurrent Server Programming, Multiple client Programming, Arithmetic server.

Module 24 Project Development with 8051 /ARM7

Module 25 Project Development with ARM9 / ARM Cortex