



NANO SCIENTIFIC RESEARCH CENTRE

An ISO: 9001:2008 Certified Company

#404, Opp. Lane to R.S. Brothers, Siri Estates, Ameerpet, Hyderabad, Telangana 500016. Ph: 040-23754144

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Advanced Diploma in Embedded Systems

ADVANCED C

Introduction

- What is a program?, What is a programming language?, Evolution of C language, Features of C, Structure of a C program, Compilation and execution?
- Keywords in C, constants, variables, data types, Comments in C, Format strings, escape sequences, Basic I/O instructions

Operators

Classification of operators

- | | |
|------------------------|---------------------------------|
| ✓ Arithmetic operators | ✓ Increment/Decrement operators |
| ✓ Relational operators | ✓ Bitwise operators |
| ✓ Logical operators | ✓ Conditional operator |
| ✓ Assignment operators | ✓ Other operators |

Flow control instructions

Decision Control Instructions

- If, if-else, if-else-if, nested if-else

Loop control instructions

- for loop, while loop, do while, use of break and continue

Selection instructions

- switch

Functions

Arrays

Pointers

Strings

Structures and Unions

Storage classes and scoping

Files

Other Features

Preprocessor

OBJECT ORIENTED PROGRAMMING C++

Introduction to C++

1. Introduction to Object Oriented Programming
2. Procedure Oriented Vs Object Oriented

3. Difference between C and C++
4. C++ Output/ Input



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5. Keywords in C++

6. New Style of header files Specification

7. Comments in C++

8. Variables in C++

Classes and Object

a. Structures in C

b. Structure in C++

c. Access Specifier

d. Classes

e. Objects in C++

- More on Classes and Objects
- Dynamic Memory Management
- Constructor and Destructor
- Inheritance
- Virtual Functions and Inheritance
- Operator Overloading
- Constructor- Destructor Invocation
- Templates
- Exception Handling
- Working with input and output and files
- Basic understanding of standard template library
- the string of C++
- Miscellaneous concept of C++

8051 MICRO CONTROLLER

Introduction to Embedded systems

- What is Embedded System?
- Types of Embedded System
- Classifications of Embedded Systems
- Characteristics of an Embedded System
- Applications of embedded system

8051 (8-bit) microcontroller Architecture & Programming

- Block diagram and Pin description
- Ports
- Timers
- Serial communication
- Interrupts



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Lab Sessions:

- Session 1: Software Introduction (Keil Micro vision), Projection Creation
- Session 2: Port programming
- Session 3: Timer programming
- Session 4: Serial Communication
- Session 5: Interrupts
- Session 6: Practice

89S52 interfacing with

- | | |
|----------------------------------|----------------------------|
| Session 1: PCB Express Tool | Session 7: Keypad & Serial |
| Session 2: Seven segment display | Session 8: ADC (0809) |
| Session 3: LED's | Session 9: DC Motor |
| Session 4: LCD (16*2) | Session 10: Stepper Motor |
| Session 5: Keypad (4*4) | Session 11: Relay |
| Session 6: LCD & Keypad | |

89S52 Interfacing with Modules

Different Types of Modules, Features of Different Modules, and Uses of Different modules interface

- | | |
|-----------------|-------------------------|
| Session 1. RFID | Session 4: Zigbee |
| Session 2. GSM | Session 5: Finger print |
| Session 3. GPS | Session 6: Voice Module |

Practical Projects

- RFID and Keypad based ATM security.
- GSM based electrical Device Control.
- GPS Data Logger
- Zigbee based wireless data communication system.
- GSM & GPS based Vehicle Tracking
- RFID based time and Attendance

ARM7 MICRO CONTROLLER

ARM (32-bit) Processor Architecture & Programming

Introduction to ARM7

- | | |
|-------------------------------------|------------------------|
| • Introduction to ARM family | • Ports |
| • LPC2148 features | • Timers |
| • block diagram and pin description | • Serial communication |
| • register set | • Interrupts |



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Lab Sessions

Session 1: Software Introduction (Keil Micro vision)
Session 2: Port programming
Session 3: Timer programming

Session 4: Serial Communication
Session 5: Interrupts
Session 6: Practice

LPC2148 interfacing with Modules

Session 1: Seven segment display
Session 2: LED's
Session 3: LCD (16*2)
Session 4: Keypad (4*4)
Session 5: LCD & Keypad

Session 6: Keypad & Serial
Session 7: ADC (0809)
Session 8: DC Motor
Session 9: Stepper Motor
Session 10: Relay

LPC2148: Interfacing with Modules

Different Types of Modules, Features of Different Modules, and Uses of Different Modules interface

Session 1: RFID
Session 2: GSM
Session 3: GPS

Session 4: ZIGBEE
Session 5: Finger print
Session 6: Voice Module

LINUX OPERATING SYSTEM

Operating Systems

Learning of operating system concepts will help you in understanding Desktop, Embedded & Real-time Operating Systems easily in less time.

- Introduction
- Processes
- Threads
- CPU Scheduling
- Process Synchronization
- Deadlocks
- Memory management
- Virtual Memory.
- File management & Disk management

Linux Basic Commands

Linux System programming

- Program, Process, Process IDs,
- Processes Priorities, Process States, CPU Scheduling
- Process Management API – fork, vfork, exec, wait and exit.

- Zombie and Orphan Process
- Pthread Programming and Thread Attributes
- Process Synchronization Techniques.
- Semaphores, Mutex, Spinlock, Memory Barriers



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- Inter Process Communication Techniques
- Pipe, FIFO, Signals, Shared Memory
- Timer API – Jiffies, kernel Timers, wait queues, sleeps

- Interrupt and Exception API – Task lets, Work queues
- Kernel Debugging – kgdb, printk, jprobs, kprobs

Linux Device Drivers Programming

- Introduction to Device Drivers
- Device Number, Major and Minor Numbers
- Inbuilt and Modular Drivers
- User Space and Kernel Space Communication.
- dev directory and device files
- Character, Block and Network Driver.
- Advanced Driver API – fcntl, ioctl
- Unified Device Model (udev)
- Proc File System, sys file system.

- usbfs file system.
- Character Device Driver Programming
- Block Device Driver Programming
- Serial Port Driver Programming
- Parallel Port Driver Programming
- USB Device Driver Programming
- Network (Ethernet) Driver Programming
- Flash Drive Driver Programming

Linux Network Programming:

- Networking Architecture in Linux.
- TCP/IP defector model and layer in kernel.
- Client – Server Programming API.
- TCP, UDP, RAW, UNIX, FTP, TFTP
- VOIP Protocol Programming.

- Arithmetic Server, Concurrent Server.
- Broadcast Server Programming
- Wireless Architecture and Programming

Real -Time Operating System (RTLinux) Programming

- Real Time Concept, RTLinux Installation.
- Scheduling and Preemption Programming.
- GPOS and RTOS API Programming.
- FIFO and Round Robin Scheduling Programming
- Task Management, synchronization, Intertask Communication
- Timers, Interrupt API in RTOs.
- Signals, Events handling API in RTOs.
- Priority Inversion/Inheritance.



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ARM 9/ARM11– Linux Programming

- ARM Architecture and ARM Processor family.
- ARM Microcontroller ICs in Market.
- ARM Development Boards and features.
- Friendly ARM Development Boards.
- Mini2440, Mini6410, Mini210 Development Boards.
- Raspberry Pi Development Board.
- Beagle Bone Development Board.
- Boot loader Configuration and Compilation for ARM
- Kernel Configuration and Compilation for ARM.
- File System Configuration and Compilation for ARM.
- Porting Linux / Android OS on Development Boards.
- DNW Tools, USB Push, Hyper Terminal Tool.

QT CREATOR-OPENCV-ARM9/ARM11

- Installing QT Framework.
- Installing Opencv and Pocket Sphinx.
- Application Development Using QT Creator.
- Sensors and modules Programming in QT Creator.
- Wireless Protocol Programming in QT Creator.
- Image and Video Processing Programming in Opencv.
- Audio Processing Programming in Pocket Sphinx.
- Interfacing Opencv with QT Creator.
- Interfacing Pocket Sphinx with QT Creator.
- Creating HTML and HTTP pages for ARM Board.
- Setting Cross Compiler in QT for ARM.
- Executing Cross Compiled project file on ARM Board.