Advance Embedded Systems and Windows Mobile Applications.

Synopsis

"Getting the Right Knowledge to the Right People at the Right Time"

Miracle Corporate Solutions (P) Ltd is leading in the software training industry with its unique and result oriented training methodologies on cutting edge domains. We have more than 2000 success stories in a very short span. We believe in quality and commitments.

Here we target specially the wireless applications based on the client server architecture. As we are moving towards 4G communication world, we are trying to put more and more services on our mobile terminal, offered through the cellular systems. Because of the limited memory and processing capability of the mobile handsets, embedded technologies are coming as right design possibilities for these services.

This course creates a strong foundation for an embedded systems developer. After this course the student will be capable to design and implement the Mobile Applications using cutting edge development tools.

The Student will be capable to write applications to communicate with a GSM modem through a Bluetooth based environment. He will be comfortable in writing Pocket PC application and other such applications for handheld devices on WinCE 5.0 operating systems for an ARM9 based Platform.

"Genius might be that ability to say a profound thing in a simple way."

—dCharles Bukowski

Course Objectives:

After completing this course, trainees will acquire following things:

- Gaining Expertise in C & C++ Programming with data structures.
- Hands on debugging expertise in MSDEV VC++ environment,
- Developing applications using VC++ 6.0, MFC, Win32 frameworks.
- Understanding of Real Time Operating Systems.
- Strong Debugging and Bug fixing skills.
- Gaining Expertise on WinCE 5.0 Mobile Platform.
- Learning Device Driver Development on WinCE 5.0 platform.
- Learning Microsoft CETK Framework and Writing Test Code for Auto testing.
- Working on Visual Studio 2005,
- Developing Application on HTC Windows Mobile phones.
- Developing applications on WINCE/Symbian Mobile Phones.

- Understanding Communication protocols (GSM/GPRS/UMTS) and Wireless Network Architecture.
- Understanding Bluetooth Protocol and Writing Bluetooth Applications
- Learning Modem communication and AT commands.
- Signaling Systems, call flow for an MO/MT call.
- Client/Server Architecture and developing TCP/IP Applications.
- Understanding VOIP Protocol and Developing VOIP Applications.
- Expertise in developing MFC based Rich Graphical user Interfaces.
- Developing Serial Communication application through Bluetooth Serial port profile.

Suitable for

Technical professionals; IT and business managers who need to learn about current and future mobile wireless technologies; students studying or researching wireless communications and cell-phone technologies

Prerequisites

A degree (B.E., B.Tech, MCA, M.Tech) in Electronics/Electrical, Computer Science or Information Technology.

Programming experience in C. Working capability on any one operating system (Windows, Linux).

Delivery

This is instructor led Embedded Systems and Mobile Communication training. Each section of the material covered by the tutor is followed by hands-on practical exercises for which worked examples of the solutions are typically provided.

Contents

1. C PROGRAMMING (32HRS.)

1.1. Introduction to C

- Features of C language
- Broad structure of C
- Data type:
- Escape sequences
- Operators

1.2. Decision Making and Looping

- Decision Structure
- Looping Structure
- Break and Continue statement

1.3. Functions

- What are Functions?
- Steps Involved In Processing A Function.
- Recursion Functions.
- Types of functions
- Functions Returning Pointers
- Assignments

1.4. Arrays, Structures and Unions

- Defintion of Arrays
- Comparision between arrays and pointers
- Single Dimension Array
- Two Dimensional Arrays
- Structures & Unions
  - Memory layout
  - Bit fields in structure
  - passing structures in a function
  - Assignments

1.5. Pointers

- Declaration of pointers
- Rules valid for pointers
- Pointer usage
- Pointers addressing,referencing and dereferencing
- Passing pointers to a function
- Strings with Pointers
- Assignments

1.6. Strings

- Accessing individual characters
- Printing strings with printf
- Printing strings with puts
- Inputting strings with scanf
- Inputting strings with gets
- String Library (strcpy(),strcat(),strcmp(),strchr(),strstr(),spintf(), sscanf(), atoi())
- Assignments

1.7. Memmory Allocation

- Overview of memory management
- Allocating new heap memory
- Deallocating heap memory
- Checking for successful memory allocation
- Memory errors
- Using memory you don't own
- Faulty heap management

- Assignments

1.8. Operation in C

- What are files?
- File naming
- Opening a file
- Writing and reading a file
- Character input and output
- Direct file input and output operations
- Closing and flushing of files
- Sequential and random files
- Assignments

2. Data Structures. (8hrs.)

2.1. Array and pointer:

- Array creation:
- Array notation(pointer, direct etc)
- Review of pointer fundamentals
- Review of Pointer operations. Parameter passing as pointers.

2.2. Sorting and searching methods

- Various sorting techniques
  - Bubble sort
  - Merge sort
  - Quick sort
- Various search techniques
  - Sequential search
  - Binary search
  - Radix search

2.3. Stack and queue

- Stack Fundamentals
  - Stack implementation
- Queue Fundamentals
  - Queue Implementation

2.4. Linked list Fundamentals

- Link list basics
- Elementary link list functions

2.5. Linked list Advanced

- Reversing link list(different methods)\
  - By swapping
  - By recursion
- Doubly link list
  - Basics of doubly link list
- Circular link list

3. WinCE 5.0 Mobile Operating System (12 Hrs).

3.1 Understanding Real Time O/S.
3.2 Windows CE 5.0 Overview

- Configure, build and down load an OS Design using Platform Builder
  - .bib file configuration
  - .reg file configuration
  - .dat file configuration
- BSP Directory Architecture Details.
- Details of PUBLIC/PRIVATE folders.
- Debugging using Platform Builder
- Debug Zones

3.3 Windows CE 5.0 Kernel Features

- Process and thread management
- Synchronization Objects
- Virtual Memory Architecture
- System Calls and Thread Migration

3.4 Hands On Exercises

- Build a sample emulator platform and show different debugging options
- Demo applications for demonstrating each of the synchronization objects
- Application and dll to illustrate the debug zones concept

3.5 Device Driver Architecture

- What is a device driver?
- Driver models and design types
- Device Manager
- Registry Enumerator
- Interrupt Handling

- Memory Management
- Driver Priorities.

3.6 Hands On Exercises (Addition & deletion of drivers & applications)

- Sample driver
- Sample usage application
- Sample load application
- Sample unload application

3.7 Windows CE BSP Development Cycle

- BSP development cycle
- OS Boot Sequence

3.8 Creating SDK Packages.

- Exporting BSPs.
- Comparative Analysis of Windows Mobile and WinCE.

3.9 Developing OEM Adaptation Layer

- OAL Architecture and Design
- Required OAL functions: OEMInit, Interrupt Handling, System tick timer etc.
- Optional OAL functions: RTC, OEMGetExtensionDRAM

3.10 Processes Threads and Virtual Memory.

- Virtual Memory
- Virtual Memory Model
- Static Mapped Virtual Address
- Process Model
- Process Memory
- Modules
- Heaps
- Stacks

3.11 Hands On Exercises

- A Critical Section Problem.
- Using Mutex
- Using Semaphores
- Using Events.
- Using CETK

3.12 Windows CE Test kit

- Tux Server

- Kato logging Engine
- Device Driver Loader and Tux Extender
- Custom Tux Tests

3.13 OAL Architecture

- Kernel Image Libraries
- Kernel Scheduler Interfaces
- Kernel States
- KITL
- Production Quality OAL
- Required OAL Functions
- Optional OAL functions

3.14 File System Architecture

- Storage Manager Architecture
- Storage Manager Components
- FS Architecture
- FS Types
- FileSys.exe Boot Process
- FS Filter Drivers

3.15 System Architecture

- NK.exe & FileSys.exe
- device.exe & gwes.exe
- services.exe
- Thread Migration

3.16 Kernel Core

- Thread Priority Map
- Thread API
- Interrupt Model
- Interrupt Processing
- Interrupt API
- Installable ISRs

3.17 DirectX Application Framework.

- WinCE DSHOW Architecture.

3.18 Hands On Exercises

- Developing a Media Player Application.
- Developing Camcorder Application.

3.19 Support for User Interface from WinCE (Creation of windows, buttons, its configuration etc,)

- Details on the MFC, Win32APIs APIs.
- Usage of External Database.
- Developing a Sample Image Viewer Application.

4. ARM Architecture (2hrs)

- RISCVs CISC Processors
- Von Neuman and Harvard Architecture
- ARM9 Board Description.
- Understanding board peripherals.

5. Learning VC++ as a Development Platform. (4hrs.)

- Understanding VC++ Platform
- Understanding a workspace
- Creating a workspace using Win32 Console Application
- Creating and Running a simple “Hello World” application.

6. Debugging on VC++ 6.0. (6hrs.)

- Understanding Breakpoints.
- Watch Window and Variable Window
- Reading Memory Footprints
- Controlling Execution Flow.

7. Writing Win32 Applications (8 hrs)

- Windows architecture overview.
- Understanding the WIN32 framework
- What are APIs? How API provide flexibility to the architecture.
- Migration from C/C++ to Window Programming
- First Scratch program in window API and the Significance of the Program.
- Adding Resources in to a win32 Application.
- Understanding Event Manager and Eventing through callback funtions.

8. Gearing Up To MFC Applications (8hrs)

- Sequence of Steps take place when MFC based Windows program get execute in MFC.
- What is Message Map?
    - How to use Message Map in MFC?

- What are Messages and How they are connected to message Map?
- Difference b/w Queued and Non-Queued Message.

- Concept of Handle.
- Working with Edit, Button Control.
- Creating Edit and Button Control Dynamically and Statically.
- Dialog Boxes
    - Modal and Modaless Dialog boxes.
    - Creating a modal dialog box
    - Creating a modaless dialog box
- Handling Mouse and Keyboard
- Interaction .with Mouse and Keyboard Event Programming.
    - Concept for the mouse programming and uses.
    - Mouse Events.
    - Concept for keyboard programming.
    - Keyboard Events.
- Working With Timers, Application of Timers.
- Using Status Bar & Toolbar.
- Guide Lines for Practical Session
    - Developing a drawing Application with mouse events, displaying the cursor position in the status bar and use timer to display system current time.
    - Developing Editor Application using keyboard events.

9. Libraries (2 hrs)

- Concept of DLL and LIB
- Advantage and Disadvantage of DLL and LIB
- Type of DLL, Regular DLL , Extended DLL
- Difference b/w Regular DLL and Extended DLL.
- Creation and Calling DLL directly through Win APIs.
- Creation of the LIB.
- Guide Lines for Practical Session Home Work

- Developing a paint application in which apply all the special affects in the DLL and Call the DLL function from the program.

10. Understanding Communication Protocol. (2hrs) (Optional)

- Understanding different protocols
  - GSM - 2G
  - GPRS - 2.5G
  - EDGE - 2.5G
  - UMTS - 3G
  - CDMA 2000 -3G
  - Understanding Bluetooth Specifications. (Optional)

11. Client/Server (TCP/IP) Application Development (14 hrs)

- OSI Model Vs TCP/IP.
- Little Endian , Big Endian
- Developing a program to determine the type of processor of your system.
- Wrting a TCP Server Application.
  - Sockets?
  - Elementary functions for creating a TCP server
    - WSAStartup()
    - socket()
    - bind()
    - listen()
    - accept()
- Wrting a TCP Client Application.
- Writing Multithread Chat Server Application. (Optional)
- Writing a TCP/IP application to control a device remotely. (Optional)

12. Bluetooth Application Development(12 hrs).

- What is bluetooth?
- Brief description about the protocol stack layer
- Understanding Bluetooth SDK.
  - Initialization of bluetooth
  - Status of the bluetooth dongle
  - Inquiring about other bluetooth devices
  - Pairing with one of the bluetooth device
  - Browsing the features of the bluetooth device

- Connecting with one of the feature of the bluetooth device
- De-initializing the bluetooth

13. Serial Port Communication (6hrs)

- Understanding serial port
- Developing a serial port between
  - PC to PC
  - PC to Mobile

14. AT Commands, GPRS Modem Communication (2hrs)

- What are AT commands
- Making a Call through modem
- Receiving a Call
- Sending SMS
- Receiving SMS
- Finding Network Status
- Finding Battery Status.
- PDU mode and Text Mode

15. GSM/GPRS Network Architecture. (4hrs)

- Cellular Communication.
- Bandwidth Planning.
- Frequency Reuses.
- Network Components
- Siganaling Systems.

16. Understaning GPRS Call Signalling. (4Hrs)

- MO Call Details
- MT Call Details.
- Location Update Details.(optional)

17. Understanding GIS and GPS Systems(Optional). (4hrs)
18. GPS APIs in a Nokia's Symbian Phone(Optional) (2hrs)

- Review of symbian basics
- Understanding GPS APIs.

Projects :

- **Design & Developing VOIP application to communicate between two mobile phones in a WiFi network. (4hrs)**
- **Design & Developing Bluetooth Marketing Server Application using Object Push Profile.**
- **Design & Developing Bluetooth Security Dongle Application.**
- **Design & Developing Virtual Mobile Simluator Application.**
- **Tracking the Location of a Symbian Mobile Phone through GPS.**
- **Design and Developing DSHOW Player application for Windows Mobile phone (HTC).**
- **Design and Developing camcoder application for a Windows Mobile phone (HTC).**
- **Design and Developing Image Scanner application for Windows Mobile Phone (HTC).**

FACULTY:- CORPORATE PROJECT LEADER FROM CMM LEVEL 5 COMPANY

NOTE: - All training will be given by Corporate Trainers only. All trainers from IIT (M.Tech.) background having four to seven years experience in respected field, working with CMM Level 5 companies

Duration 4.5 Months

The major aims of the Program are to:

1. Provide a strong foundation in the emerging disciplines of Mobile Application, Telecom Systems and its applications for professionals in the software development industry.

2. Will improve the required skill set of the system software professional.

3. Program will provide excellent exposure in VC++ 6.0 and eVC++ 4.0, and its applications in up coming field like Telecom, Wireless communications, Network Management, Automation and Process Controls.

4. Incorporates the required skills and experience on Embedded Systems and RTOS in the professionals for the exponentially growing industrials demands on this line.

Features:

- The study material and references will be provided to the trainees by Miracle Embedded Systems.
- This reference material is developed by our corporate trainers and software engineers from top notch industries.
- There will regular attendance of the student. One has to show at least 75% attendance then only he will be eligible for certification.
- The grades will be assigned on the basis of regular test results.
- There will be recognitions and rewards for well performing candidates.