

# CETPA INFOTECH PVT. LTD.

## CURRICULUM FOR ADVANCE EMBEDDED SYSTEM DESIGN (USING PIC)

### INTRODUCTION TO EMBEDDED SYSTEMS

- History & need of Embedded System
- Basic components of Embedded System
- Hardware Classification of Embedded System
- Programming Language Classification of Embedded System

### CLASSIFICATION OF MICROPROCESSOR & MICROCONTROLLER

- Difference between Microprocessor & Microcontroller
- Classification based on Architecture
- Classification based on Instruction Set
- Type of Microcontroller
- Memory Classification

### BRIEF INTRODUCTION TO COMPUTER ARCHITECTURE

- Classification of Von-Neumann and Harvard Architecture
- Difference between RISC and CISC
- Memory Classification
  - Primary
  - Secondary

### COMPUTER LANGUAGES

- Low Level Languages
- Middle Level Language
- High Level Language
- Advantage & Disadvantage of Low level & High level programming language of Embedded System
- Interaction of language with Compilers

### EMBEDDED DEVELOPMENT TOOLS

- Assembler
- Interpreter
- Compiler
- Simulator
- Emulator
- Debugger

### INTRODUCTION OF EMBEDDED C

- Why C
- Benefits of C over Assembly
- Constants, Variables & Data Types
  - Keywords & Identifiers
  - Data type & its memory representation
  - User Define data types (Structure)
  - Array
  - Pointers
- **Operators**
  - Arithmetical Operator
  - Logical Operator
  - Bitwise Operators
- **Control Statement and Loops**
  - If
  - Switch
  - For
  - While
  - Do While
- Introduction to preprocessor directives
- Assembly within C (Inline Assembly)

### INTRODUCTION TO PIC18 COMPILER/ SIMULATOR

- MPLAB Compiler
- MPLAB C 18 Compiler
- Micro Pro C Compiler
- PIC16 Simulator IDE
- PIC18 Simulator IDE
- Proteus

### REAL WORLD INTERFACING – LED

- Brief introduction to P-N Junction Semiconductor Devices and LED
- Circuit Description of Interfacing LED
- LED Programming Patterns

### REAL WORLD INTERFACING – 7 SEGMENTS

- Theory of 7-Segment Displays
- Writing Decoding Chart for 0-f character
- Writing one digit UP/DOWN Counter Program
- Programming 2 Digit/3 Digit /4 Digit Counter
- Introduction To TLC (Traffic Light Controller) Programming

### WORLD INTERFACING – MOTORS

- Different kind of Motors
- Interfacing of DC Motors and Stepper Motor
- Motor Drivers Interfacing
  - L293D
  - ULN2003
- DC Motor Speed Control using PWM

### SERIAL COMMUNICATION PROGRAMMING

- Introduction to the Communication System
- Types of communication System
  - Analog / Digital
  - Serial / Parallel
  - Synchronous/ Asynchronous
- **Introduction to Serial Communication**
  - Simplex
  - Half Duplex
  - Full Duplex
- Description of SFR associated with Serial Communication
- Data Framing and UART Introduction
  - RS232 Protocol
- Introduction & Interfacing of UART
  - MAX 232 IC
- Programming of UART

### INTERRUPT DRIVEN PROGRAMMING

- SFR associated with Interrupts
- Interrupt Handling Methods
- Programming Timer Interrupts
- Programming Serial Interrupts

### USING AND CONFIGURING ADC

- Introduction to ADC
- ADC Initialization
- Writing programs to read voltages

### INTRODUCTION OF SENSORS

- Introduction of Transducers
- Types of Sensors
- Sensor Interfacing
  - IR Sensor
  - Temperature Sensor

## DESIGNING WITH MICROCONTROLLERS

- Introduction to 8051 and Family
- Introduction to Microchip and Family
- Block Description of PIC 16F877 and PIC 18F458
- PIN diagram Description of PIC 16F877 and PIC 18F458
- Introduction of File Register (RAM)
- Introduction To RAM Architecture
- Access Bank
- Special Features of PIC 16F877 and 18F458

## INTRODUCTION TO ASSEMBLY LANGUAGE

- Instruction set
  - Data Transfer Instruction
  - Jump Instruction
  - Arithmetic Instruction
  - Logical Instruction
  - Jump and Branching Instruction
  - Loop Instruction
  - Compare Instruction
- Addressing modes

## REAL WORLD INTERFACING – LCD

- Block Diagram of LCD
- Types of LCD
- Pin Structure of 16x2 LCD
- Hardware Interfacing Circuit
- LCD Command set
- Writing program to drive LCD

## TIMER/COUNTER

### PROGRAMMING

- Description of SFR associated with Timer/Counter
- Configuring as a Timer
- Configuring as Counter
- Delay Count Calculations

## INTERFACING OF SWITCHES & KEYBOARD MATRIX

- Introduction to Switches & Keyboard Matrix
- Interfacing Circuit of Switches & Keyboard Matrix
- Programming of Keyboard Matrix & Switches.
- Controlling of LED's by using Switches
- Key board Matrix & LCD Interfacing Program

## INTRODUCTION TO SIGNAL DECODER IC

- DTMF

## PROTOCOL INTERFACING

- SPI Protocol
  - Introduction to SPI Protocol
  - SPI Protocol Framing
  - Programming of SPI
- I2C Protocol
  - Introduction to I2C Protocol
  - I2C Protocol Framing
  - Programming of I2C

## INTRODUCTION TO CCP AND ECCP PROGRAMMING

- Standard CCP Module
- Enhanced CCP Module
- Compare mode programming
- Capture mode programming

## USING INTERNAL/EXTERNAL MEMORIES

- Introduction to External Memory Interfacing using Intel Bus Timing
- SFR configuration to read/write Internal Memory (EEPROM)
- Using library to read/write Internal EEPROM

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