

WIZTECH AUTOMATION SOLUTIONS (P) LTD

(An ISO 9001:2000 Certified Company)

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EMBEDDED SYSTEM TRAINING SYLLABUS

C Programming:

- ❖ Fundamentals of C and Flow of C Program
- ❖ Console Input/output
- ❖ Data Types
- ❖ Operators and Expressions
- ❖ Control and Looping Statements
- ❖ Functions and Program Structure
- ❖ Data Structure (Static & Dynamic)
- ❖ Pointers and Types
- ❖ Arrays
- ❖ String Manipulation
- ❖ Macros

Advanced C Programming:

- ❖ Storage Classes
- ❖ The C Preprocessor and Preprocessing Directives
- ❖ Structures
- ❖ Unions
- ❖ Typedef, Type casting
- ❖ Enumeration
- ❖ File Handling
- ❖ Bit field, bit masking
- ❖ Memory management

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Embedded C Programming:

- ❖ C and Embedded C
- ❖ Working of Embedded C Compiler
- ❖ Variables and Constants in Embedded C
- ❖ Number System and Data Types in Embedded C
- ❖ Embedded C Program Structure
- ❖ Bit Masking /Extracting / Monitoring
- ❖ Programming & Debugging

Electronics:

- ❖ Resistor
- ❖ Capacitor
- ❖ Diodes
- ❖ Regulator
- ❖ Connector
- ❖ Transistor
- ❖ Integrated Circuit
- ❖ Soldering / Breadboard / PCB board

Microprocessor and Microcontroller:

- ❖ Difference between Microprocessor and Microcontroller
- ❖ Classification Based On Architecture
- ❖ Registers and Memory

MICRO CONTROLLER:

PIC16F Microcontroller:

- ❖ Features of PIC microcontroller
- ❖ Datasheet analysis
- ❖ Architecture - RISC vs. CISC
- ❖ GPIO
- ❖ Peripheral Interfacing
- ❖ Timer & Counter
- ❖ ADC
- ❖ Sensor Interfacing
- ❖ Interrupt
- ❖ Compare, Capture, PWM
- ❖ Motor Interfacings
- ❖ EEPROM
- ❖ Watchdog Timer
- ❖ Serial Communication Protocols

Software Tools:

- ❖ CCS C Compiler
- ❖ HI-TECH C Compiler
- ❖ MP LAB
- ❖ Proteus
- ❖ PIC Kit3

AVR Microcontroller:

- ❖ Features of AVR microcontroller
- ❖ AVR IC Families
- ❖ Datasheet analysis (ATMEGA 16 / ATMEGA 32)
- ❖ Architecture - RISC vs. CISC
- ❖ GPIO
- ❖ Peripheral Interfacing

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- ❖ Timer & Counter
- ❖ ADC
- ❖ Sensor Interfacing
- ❖ Interrupt
- ❖ Compare, Capture, PWM
- ❖ Motor Interfacings
- ❖ EEPROM
- ❖ On Chip Devices
- ❖ Serial Communication Protocols

Software T ools:

- ❖ ATMEL STUDIO 7
- ❖ AVR GCC Compiler
- ❖ Proteus

Arduino:

- ❖ Basics of Arduino Programming
- ❖ Keywords, built-in function, Libraries
- ❖ Creating a sketch file
- ❖ Working with Arduino UNO IDE
- ❖ Hardware specifications
- ❖ Digital GPIO programming
- ❖ Peripheral interfacing
- ❖ Timer & Counters
- ❖ ADC
- ❖ Interrupt
- ❖ Sensor Interfacing
- ❖ Motor Interfacing
- ❖ Serial communication with PC
- ❖ HC-05 Bluetooth

Projects:

1. Password based Locker System using PIC16F877A
2. Smart Traffic Management System using ATMEGA32
3. Automatic Door opening system using PIR Sensor
4. Line Follower Robot using Arduino
5. Digital Voltmeter
6. Speed Control of RC Car Using DC Motor in Arduino

ARM7 LPC2148:

- ❖ Introduction to ARM
- ❖ PLL & Crystal Oscillator
- ❖ Features of LPC2148
- ❖ Datasheet analysis
- ❖ Memory Mapping and Power Control
- ❖ GPIO programming
- ❖ Peripheral Interfacing
- ❖ ADC
- ❖ Interrupt
- ❖ Communication Protocols
- ❖ Timer
- ❖ Real Time Clock
- ❖ On-chip flash program memory
- ❖ On-chip static RAM
- ❖ Debugging

Software Tools:

- ❖ ARM Compiler (Keil vision)
- ❖ Proteusv8.7

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STM32:

- ❖ ARM-Cortex M3 & M4 Architecture
- ❖ STM32 Microcontroller Hardware
- ❖ ST HAL & LL Drivers
- ❖ Debugging With ST-Link v2 SWD
- ❖ GPIO
- ❖ Registers
- ❖ Peripheral Interfacings
- ❖ External Interrupt Pins & Interrupt Latency
- ❖ Timers & counters
- ❖ STM32 PWM
- ❖ STM32 ADC
- ❖ STM32 DAC
- ❖ Sensor Interfacings
- ❖ Motor Interfacing
- ❖ EEPROM
- ❖ Serial Communication Protocols

Software Tools:

- ❖ STM CUBE IDE
- ❖ STM CUBE MX
- ❖ KEIL VISION

Peripheral Interfacings:

- ❖ LED & Bar graph LED
- ❖ Seven segment display
- ❖ Switches and push button
- ❖ Alphanumeric LCD
- ❖ Linear Keypad
- ❖ Matrix Keypad

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- ❖ DC motor
- ❖ Stepper motor
- ❖ Servo motor
- ❖ Relay
- ❖ Buzzer
- ❖ ADC Interfacing
- ❖ Ext. EEPROM
- ❖ Real-Time Clock(RTC)
- ❖ Graphical LCD
- ❖ Dot Matrix Display
- ❖ MAX7221 Interfacing

Application Embedded:

- ❖ RF Transceiver
- ❖ IR Transceiver
- ❖ RFID
- ❖ Bluetooth
- ❖ DTMF
- ❖ GSM, GPRS
- ❖ Global Positioning System (GPS)
- ❖ SD card Interfacing

Sensor Interfacing:

- ❖ A/D conversion
- ❖ Sampling
- ❖ Quantization
- ❖ Resolution
- ❖ Calibration
- ❖ Infra-red sensor
- ❖ PIR sensor
- ❖ LDR sensor
- ❖ Temperature sensor
- ❖ IR Sensor
- ❖ Ultra Sonic Sensor

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COMMUNICATION PROTOCOLS:

- ❖ UART
- ❖ USART
- ❖ I2C
- ❖ SPI
- ❖ USB
- ❖ CAN
- ❖ ETHERNET

Raspberry Pi:

- ❖ Introduction to Raspberry Pi 4
- ❖ Program with Python 3
- ❖ Raspberry Pi OS installation
- ❖ Installation of Software and web server
- ❖ Control Raspberry PI GPIO with Python
- ❖ Peripheral Interfacing
- ❖ ADC
- ❖ Sensor Interfacing
- ❖ Working with USB Webcams
- ❖ Raspberry Pi Camera Module
- ❖ Introduction to Raspberry PI PICO
- ❖ MicroPython coding
- ❖ Raspberry PI PICO GPIO Pins
- ❖ Interrupt
- ❖ PWM
- ❖ UART
- ❖ Bluetooth Module
- ❖ Serial Communication

IOT:

- ❖ INTRODUCTION TO NODE MCU ESP32/ESP8266
- ❖ INSTALLATION OF NODE MCU IN ARDUINO IDE
- ❖ DIGITAL SENSOR INTERFACING
- ❖ ESP32 PINOUT
- ❖ ANALOG SENSOR INTERFACING
- ❖ PWM
- ❖ INTERRUPT TIMERS
- ❖ SERIAL COMMUNICATION PROTOCOLS
- ❖ IOT PROTOCOLS
- ❖ ESP32 EMAIL
- ❖ ESP32 TEXT MESSAGES
- ESP32 WIFI

PROGRAMMING TOOLS IN IOT:

- ❖ BLYNK
- ❖ NODE RED
- ❖ THINGSPEAK