



Jagadish Chandra Bose Research Centre  
G.B. Nagar, U.P.  
Ph. No. : 0120-2663236  
e-mail : jcbrolabs@gmail.com

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## Summer Training on Embedded Systems using 8051/AVR

Embedded Systems is a field that covers almost all the spheres of technology, whether it is Mechanical, Electronics, and Computer Programming, Designing Techniques or any other technical skills based on respective applications.

This course is designed to clear your concepts in embedded systems using complete practical approach. You will develop various interesting & innovative projects using micro-controller, LEDs, Led Matrix, LCD, DC Motors, Stepper Motor, Buzzer, IR Sensors, USART Communication, PWM, DTMF, Keypad & Wireless Module.

**Course Duration:** 30 Days

### Course Content:

#### 1. Introduction to Embedded Systems

- History of Embedded
- Why Embedded System
- How Embedded System works
- Application of Embedded System
- Current Industrial Embedded System
- Future of Embedded System

#### 2. Anatomy of Embedded Systems

- What are Basic Modules?
- Why Need of Basic Modules
- Working Approach on Embedded System

#### 3. Introduction of Electronic Components

- What is Electronic Component?
- History of Electronic Component
- Various Electronic Component
- Application of Electronic Component



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- How to use Electronic Component

#### **4. Introduction to Sensors**

- What is Sensor?
- Various Basic Industrial Sensors-IR- Analog Sensor
- IR Digital Sensor
- Color IR\_TSOP Sensor
- Light Sensor
- Sound Sensor
- Selection of Sensor
- Basic working Technique of Sensor
- Application of Sensor
- How to Interface Sensor

#### **5. Introduction to Computational Devices**

- What is Computational Device?
- Transistor
- Logic Gates
- Microprocessor
- Microcontroller
- Difference B/W Various Computational Devices
- Application of various Computational Devices
- Selection of Computational Devices
- How to use Various Computation Devices
- Work on 8051 Family with S Series

#### **6. Introduction to Programming Languages**

- Various programming Languages
- Selection of programming Language
- Need of Flow Diagram
- How to write First LED BLINKING Code in Embedded C
- Why always First LED BLINKING Code?
- Practice on various LED Pattern
- Debugging of Error Program

#### **7. Interfacing to Actuator**

- What is Actuator?



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## **8. How to work on Educational & Engineering Level Actuator**

- DC Motor
- DC Geared Motor
- Stepper Motor
- Servo Motor

## **9. How to Drive Motor**

- H-Bridge Motor Drive
- Programming for Motor Driver

## **10. Introduction to LCD Display**

- Pin Description of 16x2 LCD Display
- Application of 16x2 LCD Display
- Programming of 16x2 LCD Display

## **11. Introduction to 7-Segment Display**

- What is 7-Segment Display
- Types of 7- Segment Display
- Application of 7-Segment Display
- Programming of 7-Segment Display

## **12. Introduction to 4-bit Keypad and Matrix Keypad**

- Use of Keypad
- How it works
- Interfacing of keypad of your application
- Programming of 4-bit Keypad and Matrix Keypad

## **13. Introduction to Timer/Counter**

- What is Timer/Counter
- Application of Timers/Counter
- Registers of Timers/Counter's Different Modes
- Programming on AT89S52 Timers/Counter



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## 14. Introduction to Interrupts

- What is interrupts
- Application of Interrupts
- Registers of Interrupts Different Modes
- Programming on AT89S52 Interrupts

## 15. ADC

- What is ADC?
- Use of ADC
- What is Resolution?
- Uses of different ADC Registers
- Interfacing of Analog Devices with Digital World

## 16. Serial Communication

- Difference between Parallel and Serial Communication
- USART / UART Protocol
- RS232 Standard
- TTL Converter
- UART Programming

## 17. Real Time Clock Interfacing Using DS1307

### Training Kit

#### *AVR(ATmega 16) Embedded Systems Training Kit Content*

- 1 x AVR Development Board with ATMEGA16 Controller
- 1 x MAX232 IC
- 1 x DS1307 IC
- 1 x ULN2003 IC
- 1 x 16x2 LCD (Female)
- 1 x 8 Pin Female to Female Connecting Wire
- 1 x 3 Pin Female to Female Connecting Wire
- 2 x 4 Pin Female to Female Connecting Wire
- 6 Pin Female to Female Connecting Wire



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- AVR Programmer
  - Software CD with more than 30 Working Codes for different Projects

## Projects Covered

- LED Blinking
- Running LEDs
- Sand Glass Filling of LEDs
- Decoration LEDs/ LED Patterns Etc.
- Sensor Interfacing
- DC Motor Driving
- DC Motor Driving using 4Bit Keypad
- Stepper Motor Driving
- Servo Motor Driving
- Displaying your Name on LCD
- Blinking Text on LCD
- Scrolling Text on LCD
- Automatic Counting of Numbers using LCD
- Seven Segment Display
- Seven Segment Multiplexing
- Matrix Keypad Interfacing
- Counting of Numbers using Matrix Keypad
- Blinking of LEDs using Timer0
- Blinking LEDs using Interrupts
- Digital Voltage Measurement
- PC to  $\mu$ C Communication
- $\mu$ C to PC Communication
- PC -  $\mu$ C Full Duplex Communication
- Digital Visitor Counter
- Electronic Voting Machine
- Traffic Light Controller
- Home Security System
- Digital Clock with Alarm Set
- Temperature Controlled Fan
- Digital Thermometer
- Real Time Clock using DS1307



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## **Who Could Attend?**

- College students seeking future in Embedded System.
- Education Faculty & Staff in Embedded System.
- Electronics, Instrumentation & Communications Students.
- Students from any branch can attend the Summer Training Program.

## **Course Material & CD**

- Software tool kit CD having (Study E-Book, Videos, Softwares)
- 1 Take Away Robotic Kit will be provided to all the groups (each having 4students)