



HIGHLIGHTS

- Based on popular 8 bit Atmel AVR micro-controller.
- Hands on course structure, 30% lectures and 70% lab sessions.
- Programming of micro-controller in C rather than Assembly language.
- No pre knowledge of micro-controllers or Electronics is required. Course will start from very basics and can also be taken by **non Electronics** stream students.
- No advance knowledge of C is required. We just expect students to be familiar with **if, else, while loops** and basics of **functions**.
- Demo of all the modules during lectures through projector for better understanding of the topic.
- Excellent for students who want to learn to implement and design projects based on micro- controllers.
- Work with Bread Board and trouble shooting.
- **Embedded C** classes for all students.
- Organization of Exhibitions at various centers.

KIT INCLUDES

plug and play AVR kit is a student learning kit, designed and developed to create keen interest in embedded systems and automation.

Components:

- * Atmega-16 microcontroller
- * DB-9 male connector (1)
- * DB-9 female male connector (1)
- * LEDs (8 green & 8 orange)
- * Green connectors (6)
- * I293D (H-Bridge) (2)
- * 7805 regulator (1)
- * Diodes (1)
- * Resistors (1)
- * Tact switches (3)
- * Power LED (2)
- * Buzzer(1)
 - Jumper(2)
 - Robot chassis with two DC Moter and caster
 - 2 IR sensors

Course Details (60 Hours)

- Introduction of embedded system.
- Features of embedded system.
- Application of embedded system.
- Introduction to Microcontrollers
- Microcontroller vs. Microprocessor
- Which microcontroller to chose and why?
- Atmel Atmega-16 Architecture , Pin configuration
- How microcontroller works?
- Introduction of devepment board.
- How microcontroller is programmed?
- Designing first programmer (bit banging based)
- Introduction to Eclips (compiler)
- Basics of embedded C programming
- Digital Input / Output Ports
- **Demo: Writing first program, giving output, LED glowing/blinking , taking input, controlling LED glow though switch, glowing LED patterns**

Interfacing 16x2 LCD

- **Demo: Printing strings / numbers on LCD. Displaying moving strings.**

Timers, CTC and PWM Mode

- **Demo: using Timers in CTC and PWM Mode, displaying results on Digital Multimeter .**

ADC (Analog to Digital Converter)

- **Demo: Displaying ADC values on LCD and transferring them to computer using UART.**

UART Communication (Universal Asynchronous Receiver Transmitter)

Interfacing computer with microcontroller using UART with IC-MAX232

Interfacing another microcontroller using UART

- **Demo: Data communication b/w microcontroller and computer and 2 microcontrollers using UART.**

- SPI Communication (Serial Peripheral Interface)

- Interfacing two microcontrollers using SPI

- **Demo: Data communication b/w and 2 microcontrollers using SPI.**

- Interrupts, Software and Hardware

- **Demo: Using External interrupt**

EXPERIMENTS IN EMBEDDED SYSTEM

DIGITAL INPUT AND OUTPUT

- Glowing an LED connected to the uC (Microcontroller).
- Blinking the previous LED.
- Taking input from switch and displaying it on LED.
- Taking input from multiple switches.
- Connecting 8 LEDs to glow them in a fancy pattern.
- Changing the pattern of glowing LEDs using switch.

LCD

- Printing your name (constant string) on LCD.
- Printing an integer.
- Printing a floating point number.
- Printing strings in loops. (advertisements)

ADC

- To vary voltage on the ADC pin of uC using a potentiometer and displaying the corresponding digital (8 bit and 10 bit) values on LEDs.
- To vary voltage on the ADC pin of uC using a potentiometer and displaying the corresponding digital (8 bit and 10 bit) values on LCD.

INTERRUPTS

- To Display messages on the LCD whenever external interrupts are provided using switch.

LECTURES

Introduction of Robotics (Hardware section)

- Basic concept of robotics.
- Various types of robots.
- Use of robots in industries.
- Discussion on Robotics.
- Various parts of Autonomous Robot .
- Mechanical aspects of robotics.
- Use of caster wheel.
- Chassis making for the robot.

Introduction of motors

- Introduction to DC, Stepper and Servo Motors
- Driving DC Motor using Relay
- Direction control using H Bridges
- IC L-293, L-298
- Speed and Direction control of DC Motor from microcontroller using L- 293
- **Demo: Circuit implementation for driving DC Motor from microcontroller using L-293**
- Introduction to MOSFETs.
- Designing H bridge using MOSFET

Introduction of Sensors

- Introduction to Infrared Sensors
- Designing Analog Infrared sensor, used as distance and color sensor.
- **Demo: Implementing Analog Sensor and Interfacing with microcontroller to display results on LCD.**
- Digital Infrared Sensor: **TSOP 1738**, used as distance and color transition sensor.
- **Demo: Implementing TSOP sensor circuit and interfacing with microcontroller to display results on LCD.**

Robotics/Automation

- How to design a Line Following Robot?
- Assembling all the circuit on the Robot Body. Writing basic control programs.
- Discussion on Autonomous Robots such as :
 - Line Following Robot
 - Object avoidance Robot
 - Line counting Robot
 - Wall sensing Robot

Projects in Robotics / Automation

Students will be encouraged to implement their own ideas into projects using the KIT provided. Following are few examples,

- Line Following Robot
- Object avoiding Robot
- Wall sensing Robot
- Automatic room lighting system
- Attendance system
- IR beam Security system
- Electronic door locking
- Manual Robot
- Never falling Robot
- Line counting Robot
- Colour Sensing Robot
- Keypad controlled Robot

Introduction of DTMF.

- Cellphone controlled Robot.





