



Hewlett Packard Enterprise

Course Datasheet

Embedded & Robotics - Basics and Advanced

Education Services course product number – HPE-ERB&A-v1.0

Course length – 70 Hrs.

Delivery mode – Instructor Led Training (ILT)

Virtual Instructor Led Training (vILT)

Embedded systems are involved in almost every facet of modern life and all modern luxury equipment like Digital Cameras, Mobile Phones, GPS Devices, Televisions, DVD Players, Video Games, Microwave Ovens, Fax Machines, Spacecraft are some of the examples of Embedded Systems. Embedded domain involves, software development, design and manufacture and even re-engineering of new and existing reference designs, development of device drivers, wired and wireless stacks and even porting of network protocols.

Course Objective

The tremendous number of applications for embedded computing has given rise to high demand for professionals with experience in designing and implementing embedded systems. The 70 hours training program in embedded systems and Robotics will help the students learn the interfacing of Atmega-16 with different electronics components such as LED, LCD, MOTOR,RF Module(Wireless Controlling),LDR,PIR Sensor(Motion Detector),Accelerometer(Toread values on different axis)which in turn will help them to create different projects in Embedded Systems and Robotics.

Prerequisite

No experience is required but fundamental knowledge of C is essential.

Course Modules

Embedded Basic (Atmega-16)

Chapter 01 – Introduction of Electronics

- Introduction to Basic Components
- Introduction of power supply
- Introduction of signals signals
- Digital systems
- Introduction of Digital Circuit
- Introduction of Logic Gate
- Introduction of Microprocessor & Microcontroller
- Introduction of Architecture of Microcontroller

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- Introduction of embedded system.
- Features of embedded system.
- Application of embedded system.
- Introduction to Microcontrollers
- Microcontroller vs. Microprocessor
- Which microcontroller to choose and why?
- Atmega-16 Architecture , Pin configuration

Chapter 02 – EMBEDDED ELECTRONICS DIGITAL (I/O)

- How microcontroller works?
- Introduction of development board.
- How microcontroller is programmed?
- Introduction to CAVR (compiler)
- Basics of embedded C programming
- Digital Input / Output Ports
- Demo: Writing first program, giving output, LED glowing/blinking , taking input, controlling LED glow through switch, glowing LED patterns

Chapter 03 – Embedded Electronics-II (LCD, ADC, Timers)

- Interfacing 16x2 LCD
- Demo: Printing strings / numbers on LCD. Displaying moving strings.
- ADC (Analog to Digital Converter)
- Demo: Displaying ADC values on LCD.
- Timers, CTC and PWM Mode
- Demo: using Timers in CTC and PWM Mode.

Chapter 04 – Embedded Electronics-III (UART, SPI)

- UART Communication (Universal Asynchronous Receiver Transmitter)
- Interfacing computer with microcontroller using UART with IC-MAX232
- Demo: Data communication b/w microcontroller and computer.
- SPI Communication (Serial Peripheral Interface)
- Interfacing two microcontrollers using SPI
- Demo: Data communication b/w and 2 microcontrollers using SPI.

Chapter 05 – Projects in Embedded System

- Students will be encouraged to implement their own ideas into projects using the KIT provided. Following are few examples,
- Calculator Interfacing switch and LCD
- Midi-player Interfacing buzzer and keypad
- Stop-watch Interfacing Switches and LCD
- Digital Voltmeter Interfacing ADC and LCD
- Digital Clock Interfacing switches and LCD
- Electronic Voting Machine Interfacing keypad and LCD

Embedded Advanced

Chapter 01 - INTRODUCTION TO ROBOTICS (HARDWARE)

- Basic concept of robotics.
- Various types of robots.
- Use of robots in industries.
- Discussion on Robotics.
- Various parts of Autonomous Robot.

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- Mechanical aspects of robotics.
- Use of caster wheel.
- Chassis making for the robot.
- Chapter 02 – INTRODUCTION TO MOTORS
- Introduction to DC, Stepper and Servo Motors
- Driving DC Motor
- Speed control of DC Motor using PWM (Pulse Width Modulation)
- 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

Chapter 02 – INTRODUCTION TO SENSORS

- Introduction to IR Sensors
- Demo: Implementing Digital Sensor and Interfacing with microcontroller to display results on LCD.

Chapter 03 – 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

Chapter 04 - PROJECTS IN ROBOTICS AND AUTOMATION

- Line Following Robot
- Object avoiding Robot
- Never falling Robot
- Never fall from height robot
- Object Following Robot
- Computer controlled Robot.

Chapter 05 - Interfacing Accelerometer

- Reading the value of accelerometer in X,Y,Z Axis on lcd
- Led controlling using accelerometer
- LCD task using accelerometer
- To give idea how to make a gesture control robot using accelerometer

Chapter 06 - Interfacing PIR Sensor

- Perform the operation of pir sensor
- Led control using Pir sensor
- Detect the motion of moving body
- LCD control using pir sensor

Chapter 07 - Interfacing LDR

- Perform the operation of ldr
- Reading the value from LDR with the help of ADC
- Street light controlling using ldr

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Chapter 08 – Interfacing RF Module

- Synchronization of rf module
- Led controlling using rf module
- Lcd controlling using rf module
- To give idea how to make a wireless control robot using Rf module