Nation
Innovation

Master Embedded System (Arduino Boards) & PCB Designing

Course Overview:

This comprehensive training program covers the fundamentals and advanced techniques in embedded systems using Arduino boards, combined with practical PCB design skills. Participants will gain hands-on experience in programming Arduino boards, designing circuits, and creating professional-grade printed circuit boards (PCBs) using EasyEDA and other industry-standard tools.

Who Should Attend?

- **Students** in electronics, electrical, computer engineering, or related fields seeking practical experience in embedded systems and PCB design.
- **Professionals** looking to upgrade their skills in embedded programming and PCB design for career advancement.
- **Hobbyists and makers** interested in creating their own electronic projects and learning about Arduino and PCB design.

Prerequisites

- Basic understanding of electronics and circuit design.
- Familiarity with programming concepts (no specific language required).
- A computer with internet access and the ability to install software.

Course Objectives:

- By the end of this course, participants will be able to:
- Understand the fundamentals of Arduino and its applications in embedded systems.
- Write, test, and debug Arduino programs for various applications.
- Design, simulate, and prototype circuits using EasyEDA.
- Develop professional-grade PCB layouts and ensure they meet industry standards.
- Integrate sensors and actuators into embedded systems projects.
- Validate and troubleshoot designs effectively.

Course Outline (Arduino):

Module 1: Introduction to Arduino

- Overview of Arduino and its applications.
- Different types of Arduino boards.
- Setting up the Arduino development environment.

Module 2: Getting Started with Arduino

- Installing the Arduino IDE.
- Configuring the Arduino board and USB drivers.
- Writing and uploading your first program.

Module 3: Arduino Pinout Diagram

- Understanding the pin layout of Arduino boards.
- Digital vs. analog pins.
- Power supply and ground connections.

Module 4: Blink Program

- Introduction to digital output.
- Writing a simple LED blink program.
- Modifying the blink rate and using different pins.

Module 5: Read and Write Function

- Understanding digital read and write functions.
- Interfacing with push buttons and switches.
- Controlling LEDs based on input.

Module 6: Serial Monitor | Part 1

- Using the serial monitor for debugging.
- Sending and receiving data via the serial interface.
- Basic serial communication commands.

Module 7: Serial Monitor | Part 2

- Advanced serial communication techniques.
- Interfacing with serial devices.
- Creating interactive serial-based applications.

Module 8: Declaration and Uses of Variables in Arduino | Part 1

- Introduction to variables and data types.

- Declaring and initializing variables.
- Using variables in simple programs.

Module 9: Declaration and Uses of Variables in Arduino | Part 2

- Advanced variable types and scope.
- Manipulating variables for complex logic.
- Best practices for using variables in Arduino.

Module 10: Loops in Arduino | Part 1

- Introduction to loops: `for`, `while`, and `do-while`.
- Using loops for repetitive tasks.
- Creating time-based operations with loops.

Module 11: Loops in Arduino | Part 2

- Nested loops and loop control statements.
- Optimizing loops for performance.
- Implementing complex logic using loops.

Module 12: Conditional Statements

- Understanding `if`, `else if`, and `else` statements.
- Using conditional logic to control program flow.
- Implementing decision-making in projects.

Module 13: Communication Protocols

- Overview of I2C, SPI, and UART protocols.
- Interfacing Arduino with sensors and modules.
- Implementing communication between multiple devices.

Course Outline (PCB Design):

Module 14: Introduction to PCB Designing

- Understanding PCB technology and its importance.
- Types of PCBs: single-layer, double-layer, and multi-layer.
- Common applications and industries using PCBs.

Module 15: Introduction to EasyEDA Tool

- Overview of EasyEDA and its features.
- Creating a new schematic design.
- Selecting and placing components from the library.
- Using wiring and label features for clarity.
- Adding finishing touches for professional schematics.
- Cross-verifying footprints with schematic symbols.
- Creating layout designs and generating 3D diagrams.

Module 16: 3D Model View and Verification

- Generating a 3D model of the PCB layout.
- Inspecting and verifying the design visually.
- Checking for design rule violations and corrections.

Module 17: IR Sensor

- Introduction to IR sensors and their applications.
- Designing circuits with IR sensors and actuators.
- Integration with Arduino for real-world applications.

Module 18: Designing Other Circuits

- Voltage regulator circuit design.
- Using the 555 timer for various applications.
- Designing multi-power supply circuits.

Module 19: Arduino Board Development

- Identifying the proper circuit for specific applications.
- Validating circuits using datasheets and specifications.
- Designing power supply circuits.
- Creating professional circuit schematics.
- Developing power supply and ATmega328p-PU schematic parts.
- Component placement strategies.
- Routing a single-layer PCB (challenging task).
- Validating layout designs.
- 3D model validation for final design checks.

Module 20: Verification from Trainer

- Reviewing designs with a trainer for expert feedback.
- Implementing final adjustments based on verification results.

- Preparing designs for fabrication and production.

Assessments:

- **Quizzes and Tests:** Periodic quizzes to test understanding of key concepts.
- **Hands-on Projects:** Practical projects to apply learning in real-world scenarios.
- **Final Project:** A comprehensive project combining Arduino programming and PCB design.

Resources:

- **Arduino IDE and Libraries:** Access to the latest Arduino software and libraries.
- **EasyEDA Tutorials:** Step-by-step guides for using EasyEDA.
- **Online Forums and Communities:** Access to Arduino and PCB design communities for additional support.
- **Reference Materials:** PDFs, books, and online articles for deeper learning.

Duration:

- 4 weeks with 2-3 hours of lectures per week and 4-5 hours of project work per week

Additional Features:

- Live Instructor Classes
- Doubt Sessions
- Project Hands-On
- Certification on Course Completion
- Recorded Sessions
- Evening Classes

For Registration/More Details: https://www.nationin.com/traininginternship/master-embedded-system-%26-pcb-designing