

HANDS-ON TRAINING PROGRAM

PCB Design Training

Course Content | Schematic to Fabrication to Bring-up

Course modules

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|---|------------------------------------|----|-------------------------|
| 1 | PCB Design Fundamentals | 6 | Advanced PCB Design |
| 2 | Electronic Components & Schematics | 7 | Manufacturing & DFM |
| 3 | Schematic Design | 8 | PCB Testing & Debugging |
| 4 | PCB Layout | 9 | PCB Design Tools |
| 5 | Power & Signal Integrity | 10 | Hands-on Projects |

TOOLS KiCad, Altium Designer, or tools as required

PROJECTS STM32, ESP32/IoT, power, sensor, motor, relay, RS232/RS485/CAN

FINAL Full cycle from requirement to hardware bring-up

FOR ECE, EEE, EIE, Electronics and Embedded students, freshers, professionals

1 PCB Design Fundamentals

- Introduction to PCB and PCB types
- PCB layers and stack-up
- Schematic vs PCB layout
- Through-hole vs SMD components
- Single-layer, double-layer and multilayer PCBs
- PCB design workflow
- Design rules and industry standards

2 Electronic Components & Schematics

- Resistors, capacitors, inductors and diodes
- Transistors, MOSFETs and ICs
- Regulators and power-management components
- Connectors and interfaces
- Reading electronic schematics
- Component datasheets and specifications
- Creating and managing component libraries

3 Schematic Design

- Schematic capture
- Component selection
- Symbol creation
- Net naming and connectivity
- Power and ground connections
- Hierarchical schematics
- Electrical Rule Check (ERC)
- Design validation

4 PCB Layout

- PCB board outline
- Component placement
- Routing techniques
- Track width and spacing
- Via selection and placement
- Ground planes
- Power planes
- Copper pours
- Design Rule Check (DRC)

5 Power & Signal Integrity

- Power distribution
- Decoupling and bypass capacitors
- Grounding techniques
- Analog and digital ground
- Noise reduction
- EMI/EMC basics
- Signal integrity fundamentals
- High-speed signal considerations

6 Advanced PCB Design

- Multilayer PCB design
- Differential pairs
- High-speed interfaces
- Controlled impedance
- Length matching
- Clock routing
- DDR / USB / Ethernet routing concepts
- Thermal management

7 Manufacturing & DFM

- PCB fabrication process
- Gerber files
- Drill files
- Pick-and-place files
- BOM generation
- Design for Manufacturing (DFM)
- Design for Assembly (DFA)
- PCB panelization
- PCB manufacturing constraints

10 Hands-on Projects

- STM32 Development Board
- IoT / ESP32 Board
- Power Supply Board
- Sensor Interface Board
- Motor Driver Board
- Relay & Control Board
- Industrial Communication Board - RS232 / RS485 / CAN
- Custom Embedded System Board

8 PCB Testing & Debugging

- PCB inspection
- Continuity testing
- Multimeter-based debugging
- Power-rail validation
- Oscilloscope basics
- Common PCB design mistakes
- Hardware bring-up
- Debugging PCB failures

9 PCB Design Tools

- Practical training on industry-relevant EDA tools
- KiCad
- Altium Designer
- Other tools based on the training requirement

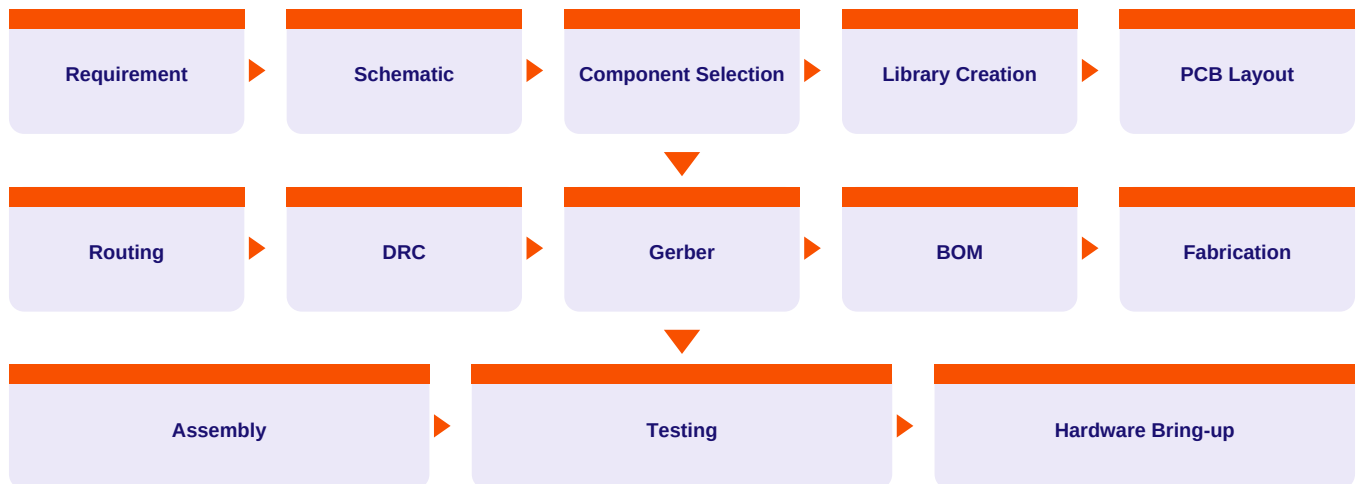
Classroom & lab

Students design and develop real boards, then walk the fabrication file set: Gerber, drill, pick-and-place and BOM.

Final Project

Complete PCB Development Cycle

Students apply the full industrial flow on a custom embedded board - from requirement capture through fabrication files, assembly and hardware bring-up.



Outcome

Design and develop production-minded PCBs such as STM32, ESP32/IoT, power, sensor, motor driver, relay/control, industrial RS232/RS485/CAN, and custom embedded boards. Leave with schematic, layout, Gerber, BOM and a hardware bring-up checklist.

Enquire / enrol

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