PCB Designing and Fabrication

CREDIT DISTRIBUTION, ELIGIBILITY AND PREREQUISITES OF THE COURSE

Course title& Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
PCB Designing and Fabrication	2	0	0	2	Class XII	NIL

Learning Objectives

The Learning Objectives of the course are as follows:

- To give a comprehensive understanding and hands-on exposure to the various processes, industrial tools, protocols, and design specifics which are involved in PCB Designing
- To enable the students to design an electronic printed circuit board for a specific application using industry-standard software after going through the complete procedural steps of developing circuit schematic, board files, image transferring, assembly, soldering, and testing.

Learning Outcomes

After Studying this course, the student will be able to:

- Identify the various types of devices/components that may be mounted on PCB
- Understand the PCB layout techniques for optimized component density and power saving.
- Perform design and printing of PCB with the help of various image transfer and soldering techniques
- Understand the current trends and scope of the PCB industry

Syllabus

Practical

Unit 1: PCB Fundamentals **12 hours**

PCB Advantages, components of PCB, Electronic components, Microprocessors and Microcontrollers, IC‘s, Surface Mount Devices (SMD). Classification of PCB - single, double, multilayer, and flexible boards, Manufacturing of PCB, PCB standards.

Unit 2 : Schematic & Layout Design **16 hours**

Schematic diagram, General, Mechanical, and Electrical design considerations, Placing and Mounting of components, Conductor spacing, routing guidelines, heat sinks and package density, Net list, creating components for a library, Tracks, Pads, Vias, power plane, grounding.

Unit 3: PCB Design Processes **20 hours**

Design automation, Design Rule Checking; Exporting Drill and Gerber Files; Drills; Footprints and Libraries Adding and Editing Pins, copper-clad laminates materials of copper-clad laminates, properties of laminates (electrical & physical), types of laminates, soldering

techniques. Film master preparation, Image transfer, photo printing, Screen Printing, Plating techniques, Etching techniques, Mechanical Machining operations, Lead cutting and Soldering Techniques, Testing, and quality controls.

Unit 4 : PCB Technology **12 hours**

Introduction of PCB prototyping machines, Schematic Entry, PCB Parts creation, Auto Routing, Post Design, Brief overview of various models available, Recent Trends, and environmental concerns in the PCB industry.

Exercises

PCB Designing, Fabrication, Component Mounting and Testing using Standard Procedures (Hardware)

A. Analog Electronic Circuits

1. Verification of Thevenin theorem
2. Designing of RC Low Pass Filter and High Pass Filter circuits
3. To study current-Voltage characteristics of a p-n junction diode (forward bias and reverse bias)
4. Designing of Centre tapped full wave rectifier – without and with shunt capacitance filter.
5. Simple circuit to glow an LED
6. Design, fabrication, and testing of a 9 V power supply with Zener regulator
7. Design and study of voltage divider biasing.
8. Designing of a CE based amplifier of given gain

B. Digital Electronic Circuits

1. To verify and design AND, OR, NOT and XOR using NAND gates
2. Design a Half adder and Full Adder
3. Design a Half Subtractor and Full Subtractor

PCB Design Softwares recommended

- KiCAD (Open Source Electronics Design Automation Suite) https://www.kicad.org/
- EasyEDA (Online PCB Design Tool) https://easyeda.com/
- PADS - Siemens EDA (PCB Design Software) https://eda.sw.siemens.com/en-US/pcb/pads/
- Any other similar PCB designing software

Essential/recommended readings

- Printed Circuit Board – Design & Technology, Walter C. Bosshart, Tata McGraw Hill, 2008.
- Printed Circuit Board –Design, Fabrication, Assembly & Testing, R.S. Khandpur, First Edition, Tata Mcgraw-Hill Education Pvt. Ltd., 2005.
- Printed Circuit Board Design Using Autocad, Chris Schroeder, Newnes Publisher, 1998.
- Printed Circuits Handbook, Clyde F. Coombs, Jr, Happy T. Holden, Sixth Edition, Publisher: McGraw-Hill Education, 2016.

Examination scheme and mode:

Evaluation scheme and mode will be as per the guidelines notified by the University of Delhi.