RGPV (DIPLOMA WING) BHOPAL	OBE CURRICULUM FOR THE COURSE	FORMAT-3	Sheet No. 1/2

Branch	Electronics and Telecommunication Engineering	Semester	V

Course Code		Course Name	PCB Designing & Minor Project Lab

Course Outcome 1	Apply different types of EDA tools for PCB designing.	Teach Hrs	Marks
Learning Outcome 1	Select appropriate type of PCB and EDA tool for a particular application.	10	10
Contents	**Printed Circuit Board (PCB)**- introduction, Types of PCBs: Single Sided (Single Layer), Multi-Layer (Double Layer), List of PCB Materials with their advantages/disadvantages (Standard FR-4 Epoxy Glass, Multifunctional FR-4, Tetra Functional FR-4, NelcoN400-6, GETEK, BT Epoxy Glass, Cyanate Aster, Polyimide Glass, Teflon) **Electronic design automation (EDA) tools*** - classification and comparison, Choice and availability trade-off of EDA tools, system requirement and installation of EDA software, need and importance of circuit simulation, discussion on EDA tools popular in industry and academia.		
10Method of Assessment	External		
Learning Outcome 2	Demonstrate the process of PCB designing on any EDA tool.	10	10
Contents	**Identification and use of following components/parts in any EDA tool for implementing simple circuits** – 1. Active Components – Diode, Transistor, MOSFET, LED, SCR, Integrated Circuits (ICs) 2. Passive Components – Resistor, Capacitor, Inductor, Transformer, Speaker/Buzzer 3. Component Package Types - Through Hole Packages - Axial lead, Radial Lead, Single Inline Package(SIP), Dual Inline Package(DIP) Transistor Outline(TO), Surface Mounted Device-Pin Grid Array(PGA), Metal Electrode Face(MELF), Leadless Chip Carrier(LCC), Small Outline Integrated Circuit(SOIC), Quad Flat Pack(QPF) and Thin QFP (TQFP), Ball Grid Array(BGA), Plastic Leaded Chip, Carrier(PLCC) **Use of any EDA tool for schematic design** – Schematic Entry, Net listing, PCB Layout Designing, Prototype Designing, Design Rule Check(DRC), Design For Manufacturing(DFM), ***Note:-*** *Faculties are requested to encourage students to use any free/open source EDA tool for this subject.*		
Method of Assessment	Internal		

*Suggested list of EDA tools for simple comparative discussion-

Proprietary - OrCAD, Proteus, Eagle, TINA-Pro, Multisim etc.

Free/Open Source - KiCAD, e-Sim, LTSpice, TINA-TI, PCB wizard etc.

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Branch	Electronics and Telecommunication Engineering	Semester	V

Course Code		Course Name	PCB Designing & Minor Project Lab

Course Outcome 2	Construct PCB for a given electronic circuit.	Teach Hrs	Marks
Learning Outcome 3	Identify different PCB layers on any EDA tool.	10	10
Contents	**Working with PCB Layers on any EDA tool -** Electrical Layers- Top Layer, Mid Layer, Bottom Layer, Mechanical Layers- Board Outlines and Cutouts, Drill Details, Documentation Layers- Components Outlines, Reference Designation, Text **Keywords & Their Description** Footprint, Pad stacks, Vias, Tracks, Color of Layers, PCB Track Size Calculation Formula **Rules for Track** Track Length, Track Angle, Rack Joints, Track Size, **Study of IPC Standards for** Schematic Design, PCB Designing, PCB Materials, Documentation and PCB Fabrication **Understanding of some concepts** like- Auto-routing, Gerber-generation in EDA software **Final Demonstration of Process of PCB Making from a design-** Printing, Etching, Drilling, Assembly of components		
Method of Assessment	Internal		
Learning Outcome 4	Develop a PCB for a simple electronic circuit.	15	20
Contents	**Hands-on practice of PCB Making for Minor project-** Hands on working of PCB fabrication in Step-by-step implementation of printing, etching, drilling and component placement and soldering to make simple PCB mounted electronic circuits as the minor projects*.		
Method of Assessment	External		

*Basic Analog Electronic Circuits (rectifier, amplifier, oscillator etc.), Power Supplies and interfacing different sensor based modules (temperature, humidity, ultrasonic, gravity etc.) in simple electronic circuits as the minor projects.

Suggested List of Experiments:

S.N.	Experiment
1.	Study of different types of PCBs based on layers and material used.
2.	Installation and setup of an EDA* tool on a computer.
2.	Identify different active components (like Diode, Transistor, MOSFET, LED, SCR, Integrated Circuits) and passive components (like Resistor, Capacitor, Inductor, Transformer, Speaker/Buzzer) from the given components in the laboratory and find the equivalent virtual component in the EDA software.
4.	Identify different component package types provided in the laboratory and find the equivalent virtual component package type in the EDA software.
5.	Make small electronic circuits (like rectifiers, oscillators, timer based multivibrators, Op-Amp based circuits, transistor amplifiers etc.) on breadboard and simulate them on EDA tools. (at-least five circuits)
6.	Prepare the PCB layouts of the circuits tested in experiment number 5 using EDA software.
7.	Print PCB layouts of experiment 6 on the raw PCB plates. (at least two PCB per student).
9.	Etching of these printed PCBs (at least two PCB per student).
10.	Drilling holes on these PCBs for placing the components. (at least two PCB per student).
11.	Placing and soldering the components on PCB plates. (at least two PCB per student).
12	Testing and troubleshooting of these PCBs.
13	Follow steps given in experiment number 5 to 11 to make your own PCB as your minor project. (one PCB per student)

***Whichever is available (Suggested list given below):**

Free/Open Source - KiCAD, e-Sim, LTSpice, TINA-TI, PCB wizard etc.

Proprietary - OrCAD, Proteus, Eagle, TINA-Pro, Multisim etc.

Reference Books/Web Portals:

S.N.	Title	Author/Publisher
1	Printed circuit boards design, fabrication, assembly and testing	By Raghbir Singh Khandpur, McGraw Hill professional
2	Electronic Product Design Volume-I	By S D Mehta, S Chand Publications
3	KiCad Like a Pro, 2nd Edition	By Dr. Peter Dalmaris, Tech Explorations
4	How to Create Printed Circuit Boards?	https://www.wikihow.com/Create-Printed-Circuit-Boards
5	spoken-tutorial.org	
6.	nptel.ac.in	
7.	swayam.gov.in	