

# GUJARAT TECHNOLOGICAL UNIVERSITY

## ELECTRICAL AND ELECTRONICS WORKSHOP (Modified on 4<sup>th</sup> Feb 2014)

SUBJECT CODE: 2110017

B.E. 1<sup>st</sup> YEAR

**Type of course:** Laboratory, Basic Engineering

**Prerequisite:** Zeal to learn the subject

**Rationale:** Students of electrical allied programs will come across various types of electrical and electronic systems. Such systems require various power sources to make systems function. Such systems are built and interconnected using various components such as wires and cables, active and passive electrical/electronic components, and connectors. Electronic systems are built on printed circuit board (PCB) and breadboard. One need to use source instruments (power sources and signal sources), and appropriate measuring instruments to study behavior of a system. It is also require using various tools in assembling, interconnecting, and testing of such systems.

This course deals with basic introduction of system components of electrical and electronic systems, and provides hands on practice in assembling, interconnecting, testing, and repairing such system by making use of various tools used in electrical and electronic workshop.

### Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE (E)	PA (M)	ESE Viva (V)	PA (I)		
0	0	4	4	0	0	80#	20	100

L- Lectures; T- Tutorial/Teacher Guided Student Activity; P- Practical; C- Credit; ESE- End Semester Examination; PA- Progressive Assessment

### Content:

Workshop Practices
After completing this course students should be able to – <ol style="list-style-type: none"><li>1. Measure voltage, current, frequency, phase difference, power, power factor for single and three-phase supply</li><li>2. Wire fan, tube light, two-way control (staircase wiring).</li><li>3. Wire instrument panel with various accessories following standard codes.</li><li>4. Wire MCB, ELCB for a given load circuit</li><li>5. Preparing the drawing for wiring a newly built room, without any electrical wiring along with a bill of materials with specifications; the room may be a class-room, an office, a shop, a clinic, a small workshop etc</li><li>6. Compare specification for different types of tools (electrical, mechanical, pneumatic, hydraulic), wires, cables (and tubing), switches, batteries, connectors and sockets, electronic components (active, and passive), PCB, fuses, for a given application</li><li>7. Draw electrical/electronic circuit diagram using IEEE standard symbols.</li></ol>

8. Identify and rectify open circuit, and short circuit faults in PCB/System
9. Solder and de-solder electronic components on different types of PCB
10. Test assembled electronic circuit for various parameters and faults
11. Identify and test electrical/electronic active and passive components
12. Use basic source and measuring instruments (power supply, function generator, CRO, DMM)
13. Identify various types of ports and connectors

**Reference Books:**

1. Electronic Principles, Albert Malvino and David J Bates, Mc Graw Hill(7th Edition)
2. Electronic Devices, Thomas L. Floyd, Pearson (7th Edition)
3. Electronic Devices and Circuits, David A. Bell, Oxford Press (5th Edition)
4. Integrated Electronics, Jacob Millman, Christos, Tata McGraw Hill (2nd Edition)

**List of Experiments:**

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills so that students are able to acquire the competency.

Following is the list of experiments for guidance.

As it is laboratory course list is as per content given above

**Suggested List Of Student Activities:**

1. Collect various types of components and prepare chart/model
2. Collect specifications of similar types of tools and instruments and prepare report comparing them.
3. Assemble one electronic system on PCB, test, and demonstrate in functioning (mini – project given by faculty member)

**Open Ended Problems:** Apart from above experiments a group of students has to undertake open ended problem/design problem. Few examples of the same are given below.

1. To DESIGN a device for charging small battery during door opening and closing using Coil and/or Magnet based DAMPING mechanism.
2. To DESIGN a Passive method for cooling laptops by diverting the heat produced on to the un-utilized (TOP) surface of the laptop.
3. To DESIGN a mobile charger using Solar PV cell panel for offices and house hold. (The conventional charger may be eliminated).
4. To DESIGN/DEVELOP an INNOVATIVE electronic weighing machine.
5. To DESIGN develop an electronic lock for house in the workshop
6. To DESIGN/DEVELOP an innovative electrical bell using electronics components in the workshop.

**Major Equipments:****Components:**

Various types of resistors, capacitors, inductors, diodes, transistors, wires, cables, connectors, batteries, switches, relays, etc

**Tools:**

Pliers, cutters, strippers, screw driver, crimping, soldering iron, de-soldering pump, hot-air soldering and de-soldering station, multi-meter, tester, series lamp, megger, clamp-on-meter

**Instruments:**

1. CRO (At least 20MHz)
2. Function Generator (Frequency range upto 20 MHz) – need to have sine, square wave output.
3. Dual Power Supply (0-12V/15V DC)/3A
4. Micrometers for measurement of voltage and current with suitable ranges.
5. Multimeter
6. Megger
7. Clamp – on – meter
8. Soldering and de-soldering station
9. Various electrical and electronic tool kits for testing and assembly.

# **ESE Pr (V):**30 marks for Open Ended Problems, 50 marks for VIVA.

**Note: Passing marks for ESE Pract(V) will be 40 out of 80.**