GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT
COURSE CURRICULUM

Course Title: Electrical & Electronic Workshop
(Code: 3312401)

Diploma Programmes in which this course is offered	Semester in which offered
Power Electronics Engineering	**First Semester**

1. RATIONALE

This course will help the student to use and test different types of electronics components, different basic electrical instruments, cables/wires used in electrical & electronics circuits and systems. Moreover the course is useful in developing the installation and maintenance related skills.

2. COMPETENCY

The course content should be taught and implemented with the aim to develop different types of skills leading to the achievement of the following competency:

i. **Test various electrical and electronics components, and measure circuit parameters**

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	**T**	**P**	**C**	**ESE**	**PA**	**ESE**	**PA**	**100**
0	1	4	5	00	00	40	60	

Legends: L-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** - Practical; C – Credit;
ESE - End Semester Examination; **PA** - Progressive Assessment.

4. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes	Topics and Sub-topics
1.Electronic materials	1.1 Differentiate the Conductor, insulator and semiconductor materials 1.2 Distinguish P-type and N-type semi-conductors	1.1 Definition, properties and difference of conductor, insulator and semiconductor and its energy band diagram 1.2 Atomic structure of semiconductor, covalent bonds intrinsic and extrinsic semiconductor 1.3 P-type and N-type semiconductor their formation and properties, majority and minority carriers.
2. Cables, Connectors and Switches	2.1 Differentiate various Cables, Connectors 2.2 Differentiate the various Switches & their usage. 2.3Connect and use cables, connectors and switches	2.1 CABLES General specifications of cables- characteristic impedance, current carrying capacity, flexibility. Types of cables – SWG Single core, Multi core, Single strand, Multi strand and their types, Armoued cable, Shielded wires, Coaxial cables, Twisted pair, Flat ribbon cable' Teflon coated wires, Fiber cables , optical Fiber Cable 2.2 CONNECTORS General specifications of connectors- contact resistance, breakdown voltage, insulation resistance ,Constructional diagram, applications of BNC, D series, Audio, Video, printer, edge, FRC, RJ 45 connectors. Constructional diagram and applications of Phone Plug & Jacks 2.3 SWITCHES Toggle switch- SPDT, DPDT,TPDT, Centre off, Without centre off, Rotary switch types depending on their poles and positions Rocker switch, Push button latch and non latch, Tactile switch, Micro switch, Limit switch, DIP switch, Thumb wheel switch- BCD, Decimal, Membrane switch
3.Protective devices	3.1 Use Electrical Protective devices –fuses, relay and MCB 3.2 Differentiate Switch and relay	3.1 FUSES Glass ,Ceramic fuse, Resettable fuse, Shunt fuse- MOV,HRC fuse 3.2 RELAYS construction, working and application of General purpose relay, NO,NC contact, Difference between switch & relay 3.3 MCB Construction working and applications
4. Electrical and Electronics Components	4.1 Identify various Resistors, capacitors, inductors and transformers. 4.2 Use components as per the requirement of the circuits. 4.3 Use Soldering technique, tools and PCB	4.1 Resistors Resistors, classification of resistors, Materials used for resistors, maximum power rating, tolerance, temperature co-efficient, Carbon film resistors, standard Wire wound resistors, Colour Coding, LDR 4.2 Capacitors Materials used for capacitors, working voltage, Capacitive reactance. Coding of capacitors Fixed Capacitor types: Disc, Ceramic capacitor, Aluminium electrolytic capacitor, Variable capacitor types: Air Gang,PVC gang capacitor, Trimmer mica capacitor 4.3 Inductors

Unit	Major Learning Outcomes	Topics and Sub-topics
		Air core, iron core, ferrite core inductor, frequency range Inductors-A.F. ,R.F., I.F., toroidal Inductor 4.4 Transformers in electronic circuits Use of diodes and Special Diodes: Zener diode, Tunnel diode, Varactor diode, LED, photo diode, Schotty diode, PIN diode. 4.5 ICs Monolithic IC, thick & thin film IC, Hybrid IC, Linear IC, Digital IC , IC packages-SIP, TO 5 ,Flat , DIP, Pin Identification, Device pattern Identification 4.6 SMT & SMD: Ratings and their uses Soldering and Desoldering technique, requirement and methods, tools -- nose pliers, wire stripper, wire cutter diagram and use. Breadboard wiring, general purpose PCB soldering/wiring.
5.Measuring instruments	5.1 Use Analog & digital multimeter, CRO and Function generator 5.2 Test various electrical and electronic components Test various electrical and electronic components	5.1 Front panel controls of Analog multimeter, Digital multimeter, CRO, Function generator. 5.2 Checking of continuity, measurement of AC-DC voltage and resistance using Analog multimeter & Digital multimeter 5.3 Measurement of AC-DC voltage and resistance using CRO Measurement of time and frequency of AC voltage using CRO 5.4 Testing of various component-resistor, capacitor, inductor, transformer and diodes with the help of Analog multimeter, Digital multimeter and CRO. 5.5 Measurement of voltage, time and frequency of different types of wave with the help of CRO and Function generator.

5. SPECIFICATION TABLE (for theory)

There is no theory paper and hence specification table for theory is not applicable

6. SUGGESTED LIST OF EXERCISES/PRACTICALS

The exercises should be properly designed and implemented with an attempt to develop different types of skills leading to the achievement of the competency

S. No.	Unit No.	Exercise/Practical	Hr.
1	II	Identify different types of cables & test it.	2
2	II	Identify different types of connectors & Discover their application.	2
3	II	Identify different types of Switches and discover its usage.	2
4	III	Identify different types of fuses & test it.	2
5	III	Identify different types of Relays and discover its usage.	2

S. No.	Unit No.	Exercise/Practical	Hr.
6	III	Identify different types of MCB with ratings and discover its usage.	2
7	IV	Identify, find value using colour code chart and test different types of Resistors.	4
8	IV	Identify, find value and test different types of capacitors.	4
9	IV	Identify, find value and test different types of Inductors.	4
10	IV	Connect Resister ,capacitor, inductor in series and parallel circuits	4
11	V	Draw front panel control of analog and digital multimeter and label it.	2
12	V	Demonstrate external controls of CRO & function Generator.	2
13	V	Measure amplitude & frequencies of different sine waveform using CRO & Function Generator.	4
14	V	Measure amplitude & frequencies of Different square waveform using CRO & Function Generator.	4
15	IV & V	Test resistor, capacitor, inductor, P-N junction Diode using CRO & Multimeter.	4
16	IV	Identify Various IC packages.	2
17	IV	Identify various SMD components.	2
18	IV	Interpret data sheet of various P-N junction diode and draw its base diagram.	2
19	IV	Interpret data sheet of various IC and SMD components.	2

Note: Minimum 16 experiments should be performed form the above.

7. SUGGESTED LIST OF PROPOSED STUDENT ACTIVITIES

Following is the list of proposed student activities such as:

i. To collect various electronics components & make a show case component wise.
ii. Collect specifications, Picture of electronics components from internet & present in class room.
iii. Visit nearby industry which manufactures any electronics component learned in this course.
iv. Knowledge of advance Electronics testing & measuring instruments. By draw, look and remember method.

Use of Tutorial Hours for Student Activities

The tutorial should be properly designed and implemented for student activities with an attempt to develop different types of skills leading to the achievement of the competency.

S. No.	Unit No.	Tutorial	Hr.
1	I	Objective type questions of different electrical and electronics material	1
2	VI, V	Join A and B (Multimeter, CRO, Function generator, Color code of resistors)	1
3	II,III	Match the A and B (switch, relay, fuse, connectors, cable) using diagram	1
4	-	draw diagram of different tools use in Electronics Assembly / Electrical Wiring - nose pliers, wire stripper, wire cutter	1
5		Using tools, switches, connectors, wire, fuse, MCB design an extension board.	1
6	-	Study of soldering techniques, materials and safety precautions	1
7	-	Study of breadboard and bread-boarding techniques.	1
8	-	The students can use general purpose PCB	1
9	IV	Assembling small electronics circuit	1
10	I, IV	Objective type questions of P and N type semiconductor, P- N junction diode, and other diodes	1
11	I TO V	QUIZ competitions, look and remember.	1
12	I TO V	Fill in the blanks of above all topic.	1
13	IV	To read data sheet of various P-N junction diode and draw its base diagram	1
14	IV	To read and interpret data sheet of various IC and SMD components.	1

8. SUGGESTED LEARNING RESOURCES

A. List of Books

S. No.	Author	Title	Publication
1	Raina K. B., Bhattacharya S. K., Juneja T.	Electrical engineering materials and electronic components	TTTI Chandigarh
2	Joshi Madhuri	Electronic Components and Materials	Shroff Publishers & Distributors private ltd.
3	Rains & bhatacharya	Electronics Engineering Materials	Khanna
4	DE	Basic Electronics	Pearson
5	Thomas H.Jones	Electronic Components Handbook	Reston Publishing
6	Dhir S.M.	Electronic Components and Materials	Tata McGraw Hills publishing company Ltd., N.Delhi ISBN: 0074630822

S. No.	Author	Title	Publication
7	Harper (Charles A.)	Handbook of components for electronics	Laxmi Enterprise
8	Grover &Jamwal	Electronic Components and Materials	Dhanpat Rai & Sons,
9	Sedha R.S.	Text book of Applied Electronics	S. Chand

B. Other Learning Resources

- Practical Semiconductor Data manuals: BPB Publications; New Delhi
- Some electronics engineering magazines.

C. List of Major Equipment/ Instrument

i. Function Generator
ii. Multimeter
iii. Cathode Ray Oscilloscope
iv. D.C. Power supplies
v. Educational Kits

D. List of Software/Learning Websites

- **http://www.electronics-tutorials.com/**
- **http://www.efymag.com/**
- **http://www.electronicsforu.com**
- **http://www.kpsec.freeuk.com/symbol.htm**
- **http://en.wikipedia.org/wiki/Electronic_component**
- **http://forum.shaarpmind.com/showthread.php/2159-How-to-Check-Basic-Electronic-Components-Using-a-Multi-Meter**

9. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Smt. J. M. Patel** ALPE, Power Electronics Dept. Dr. S. & S. S. Ghandhy Coll. of Engg. & Tech., Surat
- **Shri. S. A. Patel** LPE, Power Electronics Dept. Dr. S. & S. S. Ghandhy Coll. of Engg. & Tech., Surat

Coordinator and Faculty Members from NITTTR Bhopal

- **Prof. A. S. Walkey**, Associate Professor, Dept. of Electrical & Electronics Engg, NITTTR, Bhopal.
- **Prof. (Mrs.) S. S. Mathew**, Associate Professor, Dept. of Electrical & Electronics Engg, NITTTR, Bhopal