

**GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT**  
**COURSE CURRICULUM**

Course Title: Basic of Electrical Engineering  
(Code: 3320901)

Diploma Programmes in which this course is offered	Semester in which offered
Electronics & Communication Engineering	<b>First Semester</b>
Plastic Engineering, Power Electronics Engineering,	<b>Second Semester</b>

### 1. RATIONALE

Use of basic of electrical engineering principles occurs in different occupations. It is therefore necessary for diploma engineering students of almost all the branches to know some of the fundamentals of electrical engineering concepts. Therefore, this course has been designed to take care of this need.

### 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. Use different types of electrical test and measuring instruments

### 3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
L	T	P		Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	150
3	0	2	5	70	30	20	30	

**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
<b>Unit – I Fundamentals of Electric and Magnetic Circuits</b>	1.1 Explain concepts of electric and magnetic parameters 1.2 Differentiate electric and magnetic circuits 1.3 Apply Faraday's laws in different circuits 1.4 Differentiate Statically and dynamically induced EMFs	1.1 Concepts of EMF, Current, Potential Difference, Power and Energy. 1.2 Concepts of M.M.F, magnetic force, permeability, hysteresis loop, reluctance, leakage factor etc. 1.3 Concepts of magnetic and electric circuits Faraday's laws of electromagnetic induction. 1.4 Dynamically induced emf. 1.5 Statically induced emf.-(a) Self induced emf (b) Mutually induced emf. 1.6 Equations of self & mutual inductance.
<b>Unit – II A.C. Circuits</b>	2.1 Explain the various basic parameters of AC fundamentals 2.2 Solve simple numericals related to AC circuits 2.3 Derive the current and voltage relationship in star and delta connections 2.4 Find currents and voltages in series and parallel AC circuits	2.1 A.C. circuit parameter: Cycle, Frequency, Periodic time, Amplitude, Angular velocity, current, RMS value, Average value, Form Factor & Peak Factor, impedance, phase angle, and power factor. 2.2 Vector representation of emf and current. 2.3 Mathematical representation of an alternating emf and current 2.4 A.C. through pure a) resistors, b) inductors and c) capacitors 2.5 A.C. through R-L series, R-C series, and R-L-C series & parallel circuit 2.6 Power in A. C. Circuits. Concept of power triangle. 2.7 Voltage and Current relationship in Star and Delta connections.
<b>Unit– III Transformer</b>	3.1 Explain the construction and working of a single phase transformer 3.2 Calculate transformer performance parameters 3.3 Describe working principle of auto transformer	3.1 General construction and principle of transformers. 3.2 Emf equation and transformation ratio of transformers. 3.3 Various losses in transformers and efficiency equation. 3.4 auto transformers.
<b>Unit– IV Electrical Machines</b>	4.1 Describe the construction of a typical single phase motor 4.2 Explain working principle of single phase induction motors 4.3 Explain the working of induction motor starters	4.1 Construction and Working principle of single phase A.C. motor. 4.2 Various types of single phase motors 4.3 Starting methods for induction motors 4.4 Applications of single phase motors
<b>Unit– V Protection</b>	5.1 Justify the need for protection and the use of MCB, MCCB and ELCB 5.2 List the different types of electrical related personal protective equipment. 5.3 State the need for electrical Earthing. 5.4 Describe the type of Earthing used in domestic and industrial applications.	5.1 Different protective devices such as fuse, MCB, MCCB and ELCB. 5.2 Electrical related Personal Protective Equipment 5.3 Earthing systems: purpose, material used for Earthing, types of Earthing system

## 5. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks (Duration – .....Hours)			
			R Level	U Level	A Level	Total
1.	Fundamentals of Electric and Magnetic Circuits	10	8	5	2	15
2.	A.C. Circuits	10	8	5	4	17
3.	Transformer	07	5	4	2	11
4.	Electrical Machines	08	5	5	4	14
5.	Protection	07	4	5	4	13
	<b>Total</b>	<b>42</b>	<b>30</b>	<b>24</b>	<b>16</b>	<b>70</b>

### Legends:

R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

## 6. SUGGESTED LIST OF EXPERIMENTS

The experiments should be properly designed and implemented with an attempt to develop different types of skills leading to the achievement of the above mentioned expected competency.

S. No.	Unit No.	Experiment
1	II	Measure voltage, current and power in 1-phase circuit. (with resistive load)
2	II	Measure voltage, current and power in R-L series circuit.
3	III	Measure transformation ratio K of 1-phase transformer.
4	III	Connect single phase transformer and measure input & output quantities.
5	IV	Make Star & Delta connection in induction motor starters and measure the line and phase values
6	V	Identify switches, switch fuse and fuse switch units, MCB, MCCB & ELCB.
7	V	Measure voltage, current and power using analog and digital instruments.

## 7. SUGGESTED LIST OF PROPOSED STUDENT ACTIVITIES

- Interpret the name plate ratings and identify the parts of an induction motor
- Connect the various types of meters to measure the current and voltage of induction motor
- Interpret the name plate ratings and identify the parts of a transformer
- Make star delta connections of transformer
- Study of various electrical Earthing systems
- Study of various safety equipments used for preventing electrical hazards.

## 8. SUGGESTED LEARNING RESOURCES

### A. List of Books

S.No.	Author	Title of Books	Publication/Year
1	Prasad P.V and Sivanagaraju S.	Electrical Engineering: Concepts and Applications	Cengage Learning India, New Delhi, 2012
2	Bhattacharya S.K	Electrical Machine	Tata McGraw Hill; New Delhi, 2010
3	Thereja B.L.	Electrical Technology	S. Chand & Company Ltd; New Delhi 2010

### B. List of Major Equipment/ Instrument

- Analog and Digital Ammeter, Voltmeter, Wattmeter, Multimeter, Megger, Clamp on meter

- ii. Single phase Transformer, Auto transformer
- iii. Single phase AC Motors
- iv. Different types of starters

### **C. List of Software/Learning Websites:**

- i. <http://www.animations.physics.unsw.edu.au/jw/AC.html>
- ii. <http://en.wikipedia.org/wiki/Transformer>
- iii. <http://www.alpharubicon.com/altenergy/understandingAC.htm>

## **9. COURSE CURRICULUM DEVELOPMENT COMMITTEE**

### **Faculty Members from Polytechnics**

- **Prof. S.S.Mehta.** Lecturer, Electrical engg.Dept. B&B Institute of Technology, Vallabhvidyanagar.
- **Prof. B. R. Shrotriya.** Lecturer,Electrical Engg.Dept Govt. Polytechnic, Junagadh.
- **Prof. A. S. Pandya.** HOD. Electrical Engg.Dept Govt. Polytechnic, Rajkot.
- **Prof. V. R. Kotdawala.** Lecturer, Electrical Engg.Dept Govt. Polytechnic, Himmatnagar.
- **Prof. A.A.Parmar** Lecturer, Electrical Engg.Dept. B&B Institute of Technology, Vallabhvidyanagar.
- **Prof. P.S. Chaudhary.** Lecturer,Electrical Engg.Dept. B&B Institute of Technology, Vallabhvidyanagar.

### **Co-ordinator and Faculty Member from NITTTR Bhopal**

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