

GUJARAT TECHNOLOGICAL UNIVERSITY

COURSE NAME :ELECTRICAL CIRCUITS

1. RATIONALE :

1. RATIONALE :

This is a basic technology course which will be a bridge course between science subjects and applied technology courses. Diploma electrical engineering student has to develop certain important technology related skills. To develop these skills he has to study applied technology courses. To learn applied technology courses Electrical Circuit is an important course in which fundamentals of D.C. and A.C. circuit, magnetism, electro-magnetism and dielectric circuits are included

2. SCHEME OF TEACHING :

TOPIC NO.	NAME OF TOPIC	NO.OF HOURS		
		LECT	PRACT	TOTAL
1.	Fundamental Concepts of D.C. Circuit	06	16	22
2	Magnetic Circuit	07	06	13
3	Electro-magnetic Induction	08	06	14
4	Dielectric Circuit	06	08	14
5	A.C. Fundamentals	10	06	16
6	A.C. Series and Parallel Circuit	13	08	21
7	Three Phase Circuit	06	06	12
TOTAL		56	56	112

3. OBJECTIVES :-

- (1) Understand the concept of electric current, voltage, resistance, power and energy.
- (2) Solve electrical circuit using Ohm's law and Kirchhoff's laws.
- (3) Compute current and voltage in different sections when resistances are connected in series and parallel.
- (4) Understand magnetic and dielectric circuit parameters.
- (5) Apply Cork - screw rule, right hand gripping rule, Fleming's left hand rule.
- (6) Solve series magnetic circuit
- (7) Compare electric circuit with magnetic circuit.
- (8) Explain Faraday's law of electro-magnetic induction.
- (9) Explain Fleming's right hand rule and Lenz's law.
- (10) Differentiate statically induced e.m.f and dynamically induced e.m.f.
- (11) Apply the concept of magnetic hysteresis for selecting materials.
- (12) Apply the concept of energy stored in magnetic field in relation to lifting magnet.

4. COMMUNICATION SKILLS :

1. Ask pertinent questions as well as to answer them.
2. Speak fluently using proper intonation, expression before individuals and groups.

GUJARAT TECHNOLOGICAL UNIVERSITY

3. Take-down lecture notes.
4. Develop detailed write-ups from lecture notes.
5. Write assignments (classroom, library, home).

5. TOPICS AND SUB-TOPICS :

- 1. FUNDAMENTAL CONCEPTS OF D.C CIRCUIT** **6 Hrs.**
 - 1.1 Voltage, current, resistance, power and energy.
 - 1.2 Ohm's law and Kirchhoff's laws.
 - 1.3 Resistances in series and parallel.
 - 1.4 Effect of temperature on resistance.
 - 1.5 Star - Delta transformation and Superposition theorem.
- 2. MAGNETIC CIRCUIT** **7 Hrs.**
 - 2.1 Magnetic circuit parameters, m.m.f, magnetising force, reluctance, Flux, Flux density, permeability, inductance etc.
 - 2.2 Force on a current carrying conductor placed in a magnetic field.
 - 2.3 Series magnetic circuit.
 - 2.4 Comparison between magnetic circuit and electric circuit.
- 3. ELECTRO-MAGNETIC INDUCTION** **8 Hrs.**
 - 3.1 Faraday's laws, and Lenz's law.
 - 3.2 Statically and dynamically induced e.m.f.
 - 3.3 Self and mutual inductance.
 - 3.4 Hysteresis and hysteresis loop.
 - 3.5 Energy stored in magnetic field.
 - 3.6 Rise and decay of current in magnetic circuit.
- 4. DIELECTRIC CIRCUIT** **6 Hrs.**
 - 4.1 Dielectric circuit parameters, capacitance, permittivity, potential gradient etc.
 - 4.2 Capacitor and its types.
 - 4.3 Capacitors in series and parallel.
 - 4.4 Charging and discharging of capacitor.
 - 4.5 Capacitance for parallel plate, multiple and composite plate.
- 5. A.C. FUNDAMENTALS** **10 Hrs.**
 - 5.1 Terms related with alternating current.
 - 5.2 Phase and phase difference.
 - 5.3 Vector representation of A.C. and voltages.

GUJARAT TECHNOLOGICAL UNIVERSITY

- 5.4 Addition and subtraction of Alternating current and Voltages.
- 5.5 Form factor and peak factor.
- 6. A.C. SERIES AND PARALLEL CIRCUIT 13 Hrs.**
- 6.1 A.C. through pure resistance, pure inductance and pure capacitor.
- 6.2 R.L., R.C., R.L.C. series circuit.
- 6.3 Resonance in R.L.C. series circuit.
- 6.4 A.C. parallel circuits using vector and admittance method.
- 6.5 Resonance in parallel circuit.
- 7. THREE PHASE CIRCUIT 6 Hrs.**
- 7.1 Generation of 3-phase voltage.
- 7.2 3 phase Star and Delta connection and relation of current, voltage and power.
- 6. LABORATORY EXPERIENCES :**
- | | |
|---|--------------|
| 1. Verify Ohm's law. | 4 Hrs |
| 2. Verify series-parallel law's of resistance. | 4 Hrs |
| 3. Test the effect of temperature on the resistance of a conductor. | 4 Hrs |
| 4. Verify Superposition theorem. | 4 Hrs |
| 5. Test the hysteresis characteristic of given magnetic core using C.R.O. | 6 Hrs |
| 6. Verify series-parallel laws of capacitors. | 4 Hrs |
| 7. Measure power and power factor in R.L.circuit. | 4 Hrs |
| 8. Measure power and power factor in R.L.C. circuit. | 4 Hrs |
| 9. Measure inductance and resistance of a tube light choke. | 6 Hrs |
| 10. Identification of electrical components using black box (R.L.& C.) | 6 Hrs |
| 11. Measurement of R.C.time constant. | 4 Hrs |
| 12. Varification of voltage and current relation in 3 phase star and delta connections. | 6 Hrs |
- 7. REFERENCES :**
- | | |
|---|------------------|
| 1. Fundamentals of Electrical Engineering and Electronics | by B.L.Theraja |
| 2. Fundamental of Electrical Technology | by V.K.Mehta |
| 3. A text book of Electrical Engineering | by S.L.Uppal |
| 4. Electrical Technology | by H.Cotton |
| 5. Examples in Electrical calculations | by Admiralty |
| 6. Electrical technology | by Edward Hughes |