

Branch Name:	Electrical Engineering
Program Code:	ET109
Course Name:	Elements of Electrical Engineering
Course Code:	1ET1000103
Pre-requisite Course:	Basic fundamentals of physics

Course Objectives:

1. To understand the working and analysis of D.C circuits and its laws.
2. To identify different concepts about electrostatics and electromagnetics.
3. To understand various A.C series, parallel and 3-phase circuits.
4. To identify characteristics and structure of various safety and protective devices against electricity.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)								
Lecture	Tutorial	Practical	Credit	Theory				Practical				Total
				University Assessment		Continuous Assessment		University Assessment		Continuous Assessment		
				Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3	-	2	4	28	70	12	30	-	-	08	20	120

Course Contents:

Sr. No.	Topic	Total Hours	Weightage (%)
1	D.C.Circuits: Introduction of Electrical Current, Voltage, Power and Energy; Sources of Electrical Energy – Independent and Dependent Source, Source conversion; Ideal electrical circuit elements – Resistor, Inductor and Capacitor; Fundamental laws of electric circuits – Ohm's Law and Kirchhoff's Laws; Analysis of series, parallel and series-parallel circuits; Star-Delta conversion;	08	17
2	Electrostatics: Electric charge and Laws of electrostatics; Definitions - Electric field, lines of force, electric field intensity, electric flux and flux density; Gauss's law and its application; Dielectric strength; Capacitor; Capacitor in series and parallel, Energy stored in a capacitor.	03	7
3	Electromagnetism: Faraday's Laws; Lenz's Law; Fleming's Rules; Effect of magnetic field on current carrying conductor; Magnetic circuits; Statically and dynamically induced EMF; Concepts of self-inductance, mutual inductance and coefficient of coupling; Inductance in series and parallel; Hysteresis and Eddy current losses; Energy stored in magnetic fields.	06	15
4	A.C.Circuits: Single Phase A.C. Circuits: Generation of sinusoidal voltage, Definition of average value, root mean square value, form factor and peak factor; Phasor representation of alternating quantities, Analysis of Purely Resistive, Inductive and Capacitive Circuit.	08	20

5	A.C.SeriesCircuits: Series Circuit Analysis with phasor diagrams of R, L, C, R-L, R-C and R-L-C circuits; Concepts of Real power, Reactive power, Apparent power and Power factor, Series, Resonance in series circuits, Q-factor, Bandwidth and Selectivity	03	10
6	A.C.ParallelCircuits: Parallel circuits; Power in AC circuit, Power factor improvement; Resonance in parallel circuits, Q-factor, Bandwidth and Selectivity.	03	10
7	ThreePhaseA.C.Circuits: Necessity and Advantages of three phase systems, Generation of three phase power, Phase sequence, Balanced supply and Balanced load; Relationship between line and phase values of balanced three phase circuit; Power Measurement in balanced three phase circuits.	06	15
8	Safety&protection: Safety precautions in handling electrical appliances; Electric shock, First aid for electric shock, other hazards of electrical laboratories & safety rules; Grounding & Earthing- Importance of grounding and earthing, equipment for grounding, Methods of earthing; Circuit protection devices: Fuses, MCB, ELCB & Relays.	03	6

Text Books:

1. B.L. Theraja (2012), Electrical Technology, Vol-1, S. Chand Publication.
2. U.A. Patel (2012), Elements of Electrical Engineering, Atul Publication.

Reference Books:

1. D.P. Kothari and I.J. Nagrath (2013), Theory and Problems in Basic Electrical Engineering, Prentice Hall, India.
2. V.N. Mittal and A. Mittal (2012), Basic Electrical Engineering, Tata McGraw Hill, Publication.

List of Experiments:

1. To Study Standard Symbols used in Electrical Engineering.
2. To observe the effect of temperature on Resistance of winding.
3. Verification of Kirchhoff's Law.
4. To study the Capacitors in series and parallel DC circuit.
5. To plot the magnetizing characteristic and study the hysteresis loop for a magnetic material on CRO.
6. To obtain inductance, power and power factor of the Series R-L circuit with AC supply using Phasor diagram.
7. To obtain capacitance, power and power factor of the Series R-C circuit with AC supply using Phasor diagram.
8. To obtain inductance, capacitance, power and power factor of the Series R-L-C circuit with AC supply using Phasor diagram.
9. Determination of Resonant frequency, Bandwidth and Q factor for RLC network in Series and Parallel resonance.
10. Verification of current and voltage relations in three phase balanced Star and Delta connected loads.
11. Measurement of active and reactive power in balanced three phase circuit using two-wattmeter method.

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Know electrical current, potential difference, power and energy, resistance and its behavior with temperature.	1 Remembering
CLO2	Use the Ohm's Law and the Kirchhoff's Law and star delta transformation for solving series, parallel and series-parallel circuits.	3 Applying

CLO3	Understand basic concept of electrostatic and electromagnetic circuits.	2 Understanding
CLO4	Know A.C Quantities and application of A.C circuits.	1 Remembering
CLO5	Understand the basics of 3-phase circuits.	2 Understanding
CLO6	Know and apply the basic safety and protective devices.	1 Remembering 3 Applying

Mapping of CLOs with Pos & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1		L		H		M						M				L
CLO2	H				L	H		M		L			L		H	
CLO3				M			L				M		M			L
CLO4		L		H		M						M				L
CLO5				M			L				M		M			L
CLO6	H			H	L	M		M				M	L		H	L