FACULTY OF ENGINEERING AND TECHNOLOGY

First Year Bachelor of Technology

In Effect from Academic Year 2016-17

Subject Code: 1ET1000103	**Subject Title: ELEMENTS OF ELECTRICAL ENGINEERING**

Course Objective: To provide introduction of the Electrical Engineering to the students of various branches of engineering.

Teaching Scheme (Hours per week)				**Evaluation Scheme (Marks)**				
				Theory		**Practical**		**Total (T+P)**
Lecture	**Tutorial**	**Practical**	**Credit**	**University Assessment**	**Continuous Assessment**	**University Assessment**	**Continuous Assessment**	
3	-	2	4	70	30	-	20	120

Subject Contents			
Sr. No.	**Topic**	**Total Hours**	**Weight (%)**
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**: Faradays 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. Series Circuits** : 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. Parallel Circuits** : Parallel circuits; Power in AC circuit, Power factor improvement; Resonance in parallel circuits, Q-factor, Bandwidth and Selectivity	03	10
7	**Three Phase A.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	03	6

	& Earthing - Importance of grounding and earthing, equipment for grounding, Methods of earthing; Circuit protection devices: Fuses, MCB, ELCB & Relays.		

Course Outcome:

After learning the course the students should be able to:

1. Know electrical current, potential difference, power and energy, resistance and its behavior with temperature.
2. Use the Ohm's Law and the Kirchhoff's Law and star delta transformation for solving series, parallel and series-parallel circuits.
3. Define Electric field, lines of force, electric field intensity, electric flux, flux density and permittivity. Capacitor, charging and discharging phenomena of capacitors and calculations of capacitance for capacitors connected in series and parallel circuits.
4. Describe the magnetic field, Faradays Laws; Lenz's Law; Fleming's Rules. Flux density, permeability, the Effect of magnetic field on current carrying conductor. Perform calculation of Magnetic circuits. Concept of statically and dynamically induced EMF, self-inductance, mutual inductance and coefficient of coupling.
5. Know AC Quantities, the mathematical operation on AC waveforms, Draw phasor diagram and waveforms for purely resistive, purely inductive and purely capacitive as well as series and parallel R-L-C circuits and also circuit Resonance and Q-factor and derive resonance frequency for such circuits.
6. Know Concepts of Real power, Reactive power, apparent power and Power factor and perform calculations of these quantities for series and parallel R-L-C circuits.
7. Explain three phase supply and its advantages. Understand the star and delta connection and their relationships. Draw phasor diagram for balanced and unbalanced three phase circuit. Calculate power and it's measurement by wattmeter.

List of References:

1. B.L. Theraja (2012), Electrical Technology,Vol – 1, S. Chand Publication.
2. U.A.Patel (2012),Elements of Electrical Engineering, Atul Publication.
3. D.P. Kothari and I.J. Nagrath (2013), Theory and Problems in Basic Electrical Engineering,Prentice Hall, India.
4. 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-watt meter method.