COURSE TITLE : BASIC ELECTRICAL ENGINEERING
COURSE CODE : 2031
COURSE CATEGORY : B
PERIODS/WEEK : 4
PERIODS/SEMESTER : 60
CREDITS : 4

TIME SCHEDULE

MODULE	TOPICS	PERIODS
1	Fundamentals of Electricity	15
2	DC Circuits and Network Theorems	15
3	Electrostatics	15
4	Magnetism and electromagnetism	15
Total		**60**

Course Outcome

Sl.	Sub	**On completion of this course the student will be able:**
1	1	To understand the basic concepts of electricity. (AC , DC, voltage, current, resistance)
	2	To understand the concepts of power and energy.
2	1	To understand the series, parallel and combination connections of resisters.
	2	To comprehend the DC network theorems and apply D.C network theorems to solve electrical circuit problems.
3	1	To comprehend about static electricity
	2	To know the concepts and working of capacitor.
4	1	To understand the magnetism.
	2	To understand the electromagnetism

Specific Outcome:

MODULE I Fundamentals of electricity.

1.1.0 **To understand the basic concepts of electricity. (AC , DC, Voltage, Current, Resistance).**

1.1.1 To illustrate the structure of atoms
1.1.2 To define voltage, current, resistance
1.1.3 To State Ohm`s law and laws of resistances.
1.1.4 To explain the phenomenon of electric shock.
1.1.5 To define specific resistances.
1.1.6 To state Kirchhoff's voltage and current law.
1.1.7 To compute unknown value of current using Kirchhoff's laws.
1.1.8 To describe the effect of temperature on resistance of a material (conductor, insulator and semiconductor).
1.1.9 To solve simple problems related to Ohm`s law, laws of resistance and temperature coefficient of resistance.

1.2.0 To understand the concepts of power and energy.

1.2.1 To define electric power
1.2.2 To define energy
1.2.3 To compute monthly electricity bill.
1.2.4 To solve problems related to D.C and single phase power.
1.2.5 To compute energy spent for a given period of time.

MODULE II DC circuits and network theorems

2.1.0 To understand the series, parallel and combination connections of resisters.

2.1.1 To explain the series, parallel and combination connections of resisters.
2.1.2 To compute the effective resistance of DC series, parallel and series parallel combination.
2.1.3 To determine the unknown value of current and voltage in any branch of series, parallel and series parallel combination

2.2.0 To comprehend the DC network theorems and apply D.C network theorems to solve electrical circuit problems.

2.2.1 To state the DC network theorems.
2.2.2 To state superposition theorem.
2.2.3 To apply superposition theorem to find the current in a particular branch of electric circuit.
2.2.4 To state Thevenin`s theorem and understand the Thevenizing the given network.

2.2.5 To find the Thevenin's equivalent voltage and resistance at the output of the complex D.C circuit.

2.2.6 To state Norton`s theorem and understand the Nortonizing the given network.

2.2.7 To state and explain maximum power transfer theorem.

2.2.8 To state and explain reciprocity theorem.

MODULE III Electrostatics

3.1.0 To comprehend about static electricity

3.1.1 To state laws of electrostatics.

3.1.2 To define permittivity ,absolute permittivity and relative permittivity

3.1.3 To illustrate the electric field and electrostatic field.

3.1.4 To define electric flux, density, field strength and to solve for simple problems.

3.1.5 To distinguish between electrical potential and potential difference.

3.1.6 To derive the expression of potential at a point in

a) Air

b) Medium.

3.1.7 To understand basic concept of lightning phenomenon.

3.1.8 To illustrate the potential gradient, breakdown voltage and dielectric strength.

3.2.0 To know the concepts and working of capacitor.

3.2.2 To describe the construction and concepts of elementary capacitor.

3.2.3 To derive expressions for parallel plate capacitor in a uniform dielectric medium.

3.2.4 To illustrate the idea of fixed and variable capacitor.

3.2.5 To solve the problems in the combination of capacitors in series, parallel and series Parallel circuits.

3.2.6 To list the applications of capacitors.

3.2.7 To derive the expression of energy stored in a capacitor.

MODULE IV_Magnetism and electromagnetism

4.1.0 **To understand the magnetism**

4.1.1To define permeability, absolute permeability and relative permeability.

4.1.2To state Coulomb`s law.

4.1.3To define flux, flux density, reluctance, MMF and field intensity related to magnetic circuits.

4.1.4To draw the B-H curve and understand the various regions in the curve.

4.1.5To derive the relation between MMF, flux and reluctance in the magnetic circuits.

4.1.6To compute the ampere turns in a given magnetic circuit.

4.1.7To compare magnetic circuit and electric circuit.

4.2.1 To understand the electromagnetism

4.2.2To state Faraday`s laws of electromagnetic induction.

4.2.3To state and explain Lenze`s law.

4.2.4To solve problems using Faraday`s laws and Lenze`s law.

4.2.5To differentiate statically and dynamically induced EMF.

4.2.6To define and derive the expression of self inductance, mutual inductance and coefficient of coupling.

4.2.7To derive energy stored in an inductor and lifting power of electromagnet.

4.2.8To explain Fleming's left hand rule and right hand rule.

4.2.9To list various application of electro magnets.

CONTENTS

MODULE I

History of electricity, Classification-static electricity-dynamic electricity. Evolution of electrical engineering. Structure of atom- relation between valence band electrons and conductance of materials. Potential- potential difference-emf-Units. Electric current -unit-Water analogy of electric current--DC. Effects of electric current-physical – chemical- heat—magnetic- x-ray.

Ohm's law –Resistance – specific resistance – effect of temperature on Resistance-Temperature co-efficient of resistance -problems.

Electric circuit –source-DC and sources-control device –protection device-conductor –load. Classification of electric circuits--Open circuit-closed circuit-short circuit. Series circuit –Parallel circuit – Voltage and current divisions -series-parallel circuit-problems applying Ohm's law. Electric power- unit-problems. Electrical energy -unit-commercial unit -problems. Calculation of Electricity bill.

MODULE II

DC power sources- Batteries--Solar PV modules- Generators. Classification and lead id battery-charging – discharging-need of battery charger-care and maintenance of batteries.

Network Theorems - Kirchoff's Laws KVL-KCL- problems. Super position theorem-problems. Thevenin's theorem and Norton's theorem-problems in applying Thevenine's and Norton theorems. Maximum power transfer theorem and Reciprocity theorem.

MODULE III

Static electricity-basics- Laws of electrostatics. Absolute and relative permittivity of a medium, Dielectric constant. Electric field-electrostatic field-Field strength or field intensity-Electric flux density – simple problems. Potential at point in air and in other medium.- derivation of expression.
Lightning phenomena--Potential gradient - Breakdown voltage and dielectric strength.

Storage of electric charge-Capacitor –capacitance - Charging and Discharging . Spherical capacitor and parallel plate capacitor –derivation of equation for capacitance of parallel plate capacitor. Fixed and Variable capacitors - Capacitors in series, Capacitors in parallel. Energy stored in a capacitor derivation of equation. Applications of capacitors.

MODULE IV

Introduction-state coulombs law-magnetic permeability-absolute and relative-magnetic flux-field intensity-reluctance-mmf-magnetic circuit-BH curve-derivation of equation relating mmf, flux and reluctance.-calculation of ampere turns. magnetic circuit and electric circuit comparison-Electromagnetism-Electromagnetic induction-Faradays laws of electromagnetic induction - Lenz's law , statically and dynamically induced e mf-Expressions. Inductor-equation for energy storage. Self induction and mutual induction- self inductance and mutual inductance. coefficient of coupling.
Lifting power of electromagnet-applications of electromagnets.

Text book:

1. B.L Theraja. Electrical Technology Vol-1: S Chand & co.
2. S K Battacharya. Basic Electrical Engineering: Pearson