

Course Name : Electrical Engineering Group
Course Code : EE/EP
Semester : Second
Subject Title : Fundamentals of Electrical Engineering.
Subject Code : 9013

Teaching and Examination Scheme:

Teaching Scheme			<i>Examination Scheme</i>						
TH	TU	PR	PAPER HRS	TH	TEST	PR	OR	TW	TOTAL
03	--	02	03	80	20	50@	--	--	150

Rationale:

The Diploma Course in Electrical Engineering mainly involves the study of Electrical machines, equipments and instruments. In order to understand the working principle, construction, operation and applications of the various Electrical machines, equipments and instruments; the basic concepts, rules and laws of Electric and Magnetic Circuits must be studied and understood by the students of Electrical Engineering Course.

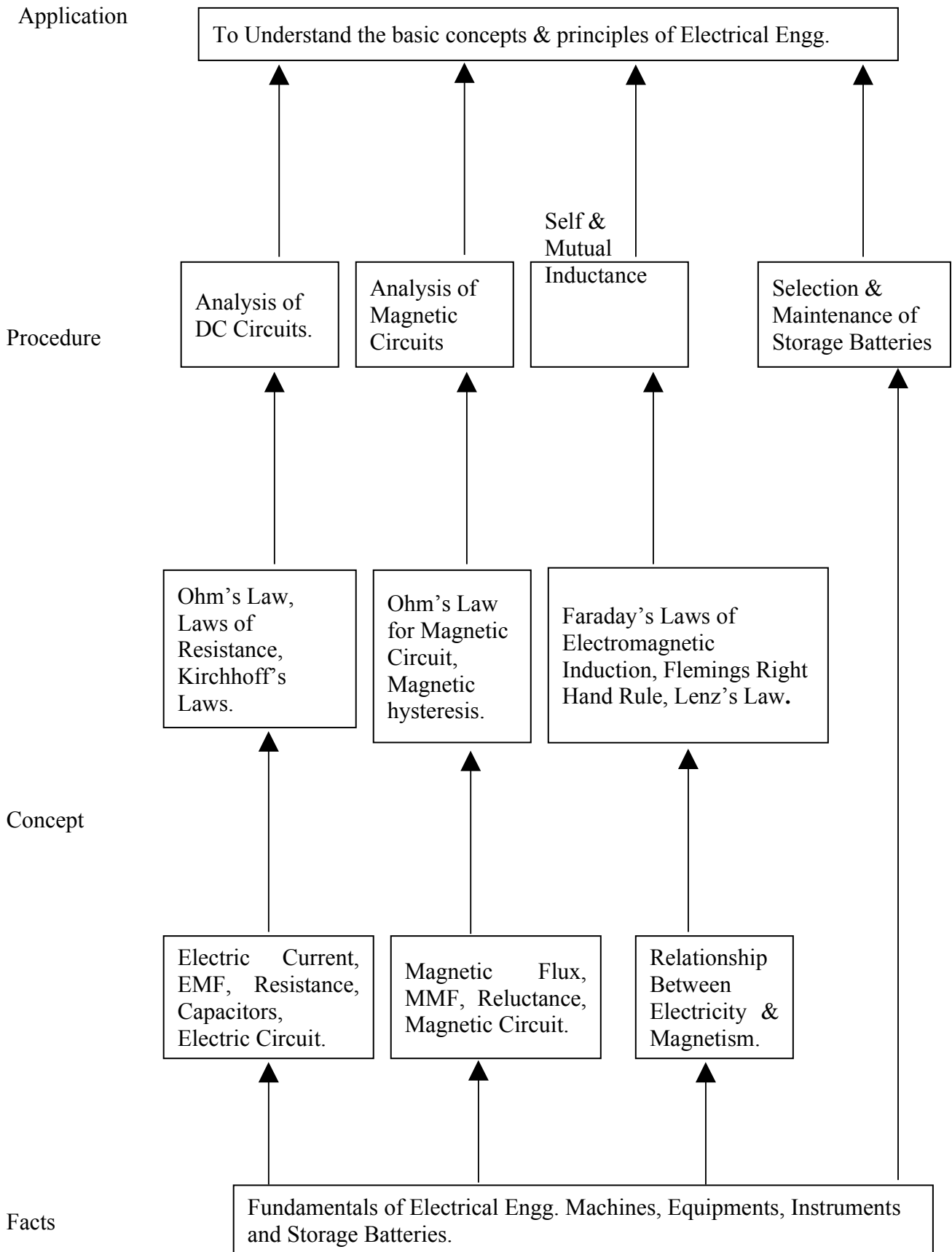
This subject will help the students to study, understand and comprehend the fundamentals of various facts, the basic concepts, rules and laws of Electric and Magnetic Circuits. This subject is classified as Engineering Science subject.

Objectives:

The students will be able to,

1. State the definitions and units of various quantities used in Electricity, Magnetism and Electromagnetic Induction.
2. State and explain the various rules, laws of Electric and Magnetic circuits and Electromagnetic Induction.
3. Apply the laws of Electrical circuits to analyse Electrical circuits (DC).
4. Apply the laws of Magnetic Circuits to solve problems on Magnetic circuits.
5. Select and maintain the storage batteries.

LEARNING STRUCTURE:



Contents: Theory

Chapter	Name of the Topics	Hours	Marks
01	<p>Basic Concepts:</p> <p>1.1 Concept of Electric Current.</p> <p>1.2 Concept of Electric Potential, Potential Difference(P D) and Electro-Motive-Force (EMF).</p> <p>1.3 Concept of Resistance, - Laws of Resistance, - Concept of Resistivity and Conductivity, - Effect of Temperature on Resistance, Temp. co-efficient of Resistance (simple numerical)</p> <p>Classification of Electric Current: - Direct Current (DC) - Alternating Current (AC) Sources of Electric Current (DC)</p> <p>Concept of Voltage Source: Ideal and Practical Concept of Current Source: Ideal and Practical Source Conversion. (simple numerical)</p> <p>1.6 Effects of Electric Current (Only Introduction) Heating Effect, Magnetic Effect, Chemical Effect</p> <p>1.7 Concept of Electrical Work, Power and Energy. - Their SI units (simple numerical)</p> <p>1.8 Types of Resistors and their Applications. - Carbon Composition - Deposited Carbon - High Voltage Ink Film - Metal Film - Metal Glaze - Wire Wound - Cermet</p>	08	12
02	<p>D.C. Circuits:</p> <p>2.1 Ohm's Law, Concept of Voltage drop and Terminal Voltage.</p> <p>2.2 Resistance in Series, Voltage Division Formula. Resistance in Parallel, Current Division Formula.</p> <p>2.4 Calculations of Equivalent Resistance of simple Series, Parallel and Series Parallel Circuits.(Simple Numericals)</p> <p>2.5 Duality Between Series and Parallel Circuits.</p> <p>2.6 Definitions of terms Related to Electric Circuits, Circuit Parameters, Linear Circuit, Non-linear Circuit, Bi-lateral Circuit, Uni-lateral Circuit, Electric Network, Passive Network, Active Network, Node, Branch, Loop, Mesh.</p> <p>2.7 Kirchhoff's Laws - Kirchhoff's Current Law - Kirchhoff's Voltage Law (Simple Numerical)</p> <p>2.8 Mesh Analysis - (Simple Numerical with two equations)</p> <p>2.9 Nodal Analysis (Simple Numerical with two equations)</p> <p>2.10 Star/Delta and Delta/Star Transformation. (Simple Numerical)</p>	12	20
03	<p>Capacitors:</p> <p>3.1 Concept and Definition of Capacitor</p>	07	12

	<p>3.2 Parallel Plate Capacitor:</p> <ul style="list-style-type: none"> - Uniform Di-electric Medium - Medium Partly Air. - Composite Medium. (Simple Numerical) <p>3.3 Capacitors in Series, Capacitors in Parallel</p> <p>3.4 Calculations of Equivalent Capacitance of simple Series, Parallel and Series Parallel Combinations of Capacitors. (Simple Numerical)</p> <p>3.6 Energy Stored in Capacitor. (No Derivation and Simple Numerical)</p> <p>3.7 Charging and Discharging of Capacitor (No Derivation and Simple Numerical)</p> <p>3.8 Concept of Breakdown Voltage and Di-electric strength</p> <p>3.9 Types of Capacitors and their Applications.</p> <ul style="list-style-type: none"> - Electrolytic , Non-Electrolytic (Paper, Mica, Plastic Film, Ceramic, Glass) 		
04	<p>Magnetic Circuits:</p> <p>4.1 Magnetic Circuit - Ohm's law of Magnetic Circuit.</p> <p>4.2 Definitions Concerning Magnetic Circuit.</p> <ul style="list-style-type: none"> - Magneto-Motive-Force (MMF), Ampere Turns (AT), Reluctance, Permeance, Reluctivity. <p>4.3 Comparison Between Electric and Magnetic circuit.</p> <p>4.4 Composite Series Magnetic Circuit.</p> <p>4.5 Parallel Magnetic Circuit.</p> <p>4.6 Calculations of Amp.-Turns for simple Series, Parallel Magnetic Circuit. (Simple Numerical)</p> <p>4.7 Concept of Leakage Flux, Useful Flux & Fringing.</p> <p>4.8 Magnetisation Curve (B - H Curve)</p> <ul style="list-style-type: none"> - Magnetisation Curve for Magnetic and Non-Magnetic Materials. - Magnetic Hysteresis, Hysteresis Loop. - Hysteresis Loops for Hard & Soft Magnetic Materials. - Area of Hysteresis Loop, Hysteresis Loss. (No Derivation and No Numericals) <p>4.9 Types of Magnets and their applications.</p> <ul style="list-style-type: none"> - Permanent Magnet, Electromagnet. 	07	12
05	<p>Electromagnetic Induction:</p> <p>5.1- Relation Between Magnetism and Electricity.</p> <p>5.2- Production of Induced E.M.F. and Current.</p> <p>5.3- Faraday's Laws of Electromagnetic Induction. Faraday's First Law, Faraday's Second Law (No Numerical)</p> <p>5.4 Induced E.M.F: Statically Induced E.M.F., Dynamically Induced E.M.F. (Simple Numerical)</p> <p>5.5 Direction of Induced E.M.F. and Currents.</p> <ul style="list-style-type: none"> - Fleming's Right Hand Rule - Lenz's Law <p>5.6 Dynamically Induced E.M.F.</p> <p>5.7 Statically Induced E.M.F.</p>	10	20

	<p>Self Induced E.M.F., Mutually Induced E.M.F.</p> <p>5.8 Self Inductance</p> <p>5.9 Coefficient of Self-induction (L), (Simple Numerical)</p> <p>5.10 Mutual Inductance</p> <p>5.11 Coefficient of Mutual Inductance (M) (Simple Numerical)</p> <p>5.12 Coefficient of Coupling (No Derivation and No Numerical)</p> <p>5.13 Inductances in Series. (No Derivation and No Numerical)</p> <p>5.14 Inductances in Parallel. (No Derivation and No Numerical)</p> <p>5.15 Types of Inductors and their Applications.</p> <ul style="list-style-type: none"> - Air Cored Inductors - Iron Cored Inductors - Ferrite Cored Inductors. <p>5.16 Energy Stored in Magnetic Field (No Derivation and No Numerical)</p>		
06	<p>Storage Batteries:</p> <p>6.1 Concept of Cell and Battery</p> <p>6.2 Electrical Characteristics of Batteries. E.M.F., Terminal Voltage, Internal Resistance, Amp.Hour Capacity, Efficiency: AH Efficiency and Watt Hr Efficiency</p> <p>6.3 Necessity of Series Connection of Batteries</p> <p>6.4 Necessity of Parallel Connection of Batteries</p> <p>6.5 Charging of Batteries</p> <ul style="list-style-type: none"> - Constant Current Charging Method - Constant Voltage Charging Method - Precautions During Charging - Indications of Fully Charged Cells <p>6.6 Maintenance of Lead Acid Batteries.</p> <p>6.7 Applications of Storage Batteries.</p>	04	04
Total		48	80

LIST OF PRACTICALS:

Skills to be developed

Intellectual Skills :

1. Identify ranges of instruments
2. Recollection of Laws & Rules of Elect. Engineering

Motor Skills :

1. Accuracy in measurement
2. Proper connections
- (1) To determine the temperature coefficient of resistance of copper.
- (2) To identify the nature of D.C. and A.C. Voltage.
- (3) To Verify Kirchoff's Laws (KCL and KVL)
- (4) To determine the equivalent resistance (R_{eq}) of :
 - (a) Series connected resistances.
 - (b) Parallel connected resistances.
- (5) To plot the charging and discharging curves of a capacitor and determine the

- time constant.
- (6) To plot the B H curve for magnetic material and determine the relative Permeability.
 - (7) To plot the hysteresis loop for magnetic material and determine hysteresis loss.
 - (8) To Verify Faraday's First Law of Electromagnetic Induction (For Dynamically & Statically Induced EMF)

Learning Resources:

Books:

Sr. No.	Name of Book	Author	Publisher
1.	A Text Book of Electrical Technology Vol-I (Basic Electrical Engg.)	B. L. Theraja A. K. Theraja	S. Chand and Co.
2.	Basic Electrical Engg.	V. N. Mittle	Tata McGraw-Hill
3.	Electrical Technology	Edward Hughes	Pearson Education, New Delhi