

**Course Name** : Electrical Engineering Group

**Course Code:** EE/EP

**Semester** : Fourth

**Subject Title** : D.C. Machines & Transformers

**Subject Code:** 9061

**Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme						
TH	TU	PR	Paper Hrs	TH	TEST	PR	OR	TW	TOTAL
03	--	02	03	80	20	50#	--	25@	175

**Rationale:**

This subject is classified under core technology group which intends to teach facts, concepts, principles & procedure for operation & testing of electrical machines, such as DC generators, DC motors and single & three phase transformers. Student will be able to analyze the characteristics of DC motors, Transformers & Qualitative Parameters of these machines.

These machines are used in transmission, distribution & utilization systems. Knowledge gained by the students will be helpful in the study of technological subjects such as utilization of electrical energy, switch gear & protection, manufacturing processes & testing & maintenance of electrical machines

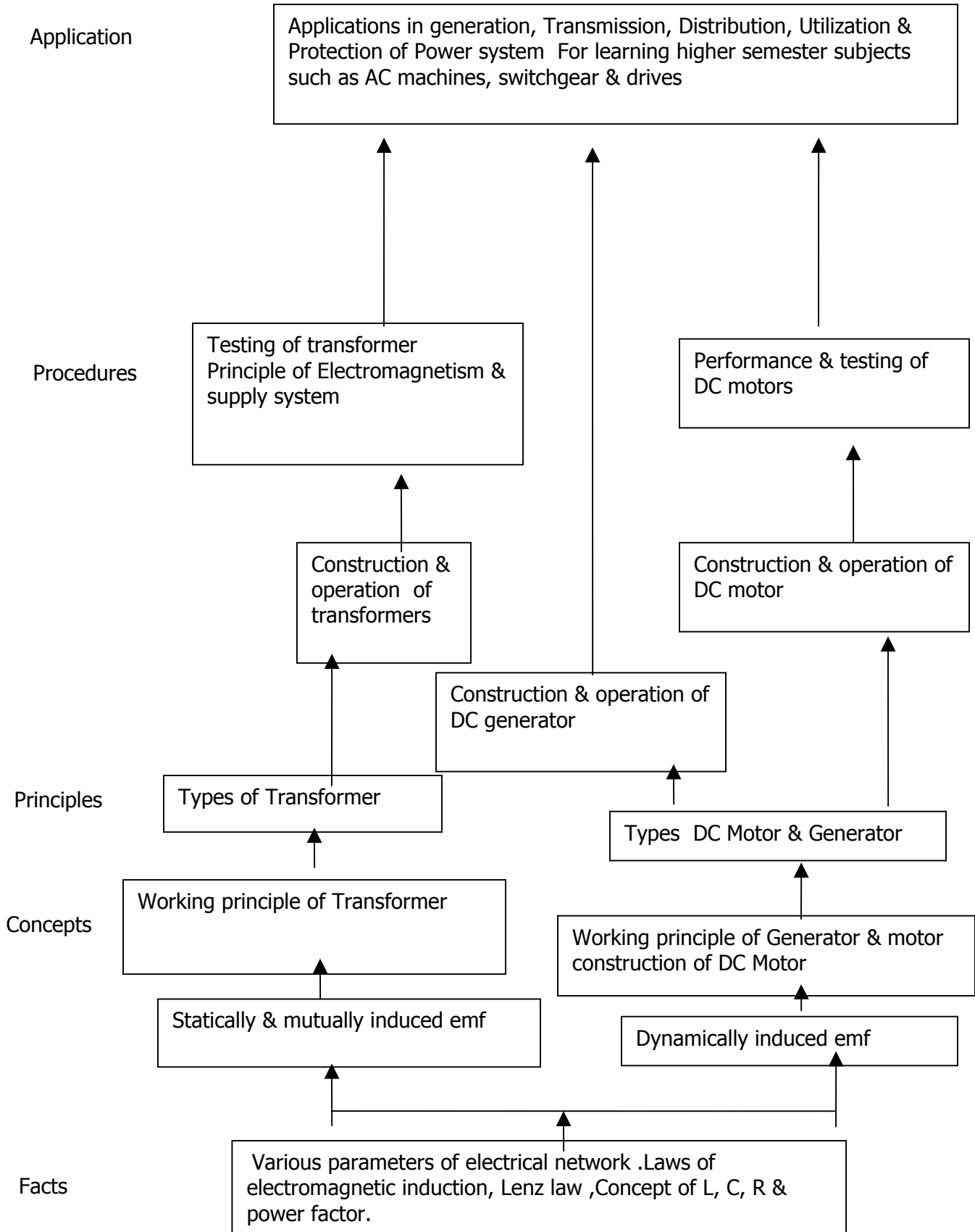
The knowledge & the skills obtained will be helpful in discharging duties such as supervisor, controller & R & D technician.

**Objectives:**

Student will be able to,

1. Know the constructional details & working principles of dc machines & transformers
2. Test motors & transformers
3. Evaluate the performance of dc motors & transformers by conducting various tests
4. Decide the suitability of dc generator motor & transformer for particular purpose
5. Write the specifications of dc machines & transformers as per requirement
6. Operate any machine properly

# Learning Structure:



## Contents: Theory

Chapter	Contents	Hours.	Marks
01	<b>DC MACHINES General</b> 1.1 definition 1.2 construction & types of DC machines 1.3 armature winding types : lap & wave. 1.4 emf equation 1.5 armature reaction 1.6 commutation – concept of reactance voltage 1.7 methods of improving commutation – emf commutation Numericals on e.m.f. equation	08	12
02	<b>DC Motors</b> 2.1 working, principle, back emf, torque equation 2.2 characteristics & application of series, shunt & compound motors 2.3 speed control of dc motor & numerical based on 2.1 to 2.3 2.4 starting of dc motor – 3 point starter 2.5 applications of above motors	08	12
03	<b>Single phase transformer</b> 3.1 introduction 3.2 principle of operation 3.3 emf equation, transformation ratio, kVA rating 3.4 types & construction of transformer 3.5 concept of ideal transformer 3.6 transformer on no load – vector diagram & numerical 3.7 transformer on load – phasor diagram of loaded transformer 3.8 equivalent circuit 3.9 direct method of finding performance of transformer, 3.10 finding the performance of 1 phase transformer by indirect method using OC& SC Test. 3.11 all day efficiency– numerical based on 3.10 & 3.11 3.12 polarity of transformer & polarity test 3.13 application 3.14 1 phase auto transformer – principle , advantages & disadvantages 3.15 comparison with 2 winding transformer & potential divider 3.16 Design of Transformer: Main Dimensions, No. of turns	20	(36) 12  12  12

Chapter	Contents	Hours.	Marks
	for Primary and secondary, Conductor cross section		
04	<b>Three phase Transformer</b> 4.1 construction 4.2 connections 4.3 voltage & current ratio 4.4 vector groups 4.5 3 phase auto transformer 4.6 application of 3 phase auto transformer	08	12
05	<b>Special purpose transformer</b> 5.1 current transformer 5.2 potential transformer 5.3 isolation transformer 5.4 welding transformer	04	08
	Total	48	80

### **Practical:**

Skills to be developed:

Intellectual Skills:

1. Analytical Skills
2. Identification skills

Motor Skills:

1. Measurement Skills
2. Connection Skills

### **List of Practicals:**

- 1) a) To identify the constructional parts of D. C. machine.  
 b) To plot the O.C.C. of a given d. c. machine and to find critical resistance.
- 2) To find the performance of d. c. series & shunt motor by conducting load test
- 3) a) To control the speed of d. c. shunt motor above and below normal speed.

- b) To reverse the direction of rotation of d. c. motor.
- 4) a) To identify the constructional details of 1-phase and 3-phase transformer.  
b) Visit to maintenance and repair workshop of a transformer and prepare a report.
- 5) To measure the performance of single phase transformer by direct loading and to find transformation ratio.
- 6) To measure the performance of single phase transformer by conducting O.C. and S.C. test.
- 7) To identify terminal polarity of corresponding phases of 3-phase transformer & to calculate transformation ratio.
- 8) To compare 1-phase auto transformer with two winding transformer by collecting literature from local dealer/manufacturer & compare the data on following points. Weight of iron, weight of copper, turns ratio, efficiency & percentage regulation.
- 9) To observe the phase difference between primary & secondary voltage of 3-phase transformer for various vector groups.

### **Learning Resources:**

#### **Books:**

Sr.No.	Title	Author	Publisher & Address
1	Electrical Technology	E. Hughes	Logmans, London
2	Electrical Technology	H. Cotton	C. B. S. Publisher New Delhi
3.	Electrical Technology Vol. II	B. L. Theraja	S. Chand & CO Delhi
4.	Electrical Machine Design	A. K. Sohawney	Dhanpatrai & Sons, New Delhi