

Subject Code: 1ET4030302	Subject Title: Electrical Machine - I
Pre-Requisite	--

RATIONALE:

This course deals with single phase transformer and DC Machines which are widely used in power systems, industries and commercial applications. This course will enable the students to develop skills to select, install, operate, and maintain various types of DC machines and transformers. Practical aspects of the course will make the students capable of performing various tests on these machines. It is therefore very important for every electrical engineer to learn this course if he/she wants to excel in his/her professional life.

COURSE OBJECTIVE:

1. Understand about the DC Machines (Motor & Generator)
2. Understand about the Single Phase Transformer
3. Understand about the Different Test Perform on the DC motor.
4. Familiar with Different Parts of DC Motor & Generator
5. Understand the concept of Electromagnetic Induction, Fleming's Right & Left Hand rule.
6. Understand about the Different Test Perform on the Single phase Transformer
7. Able to Calculate the Different Parameters of DC Motor & Generator.
8. Understand the Principles of Energy Conversion & Energy Conservation
9. Understand about the Test perform on Single phase Transformer.
10. Understand the Principles of DC Motor, Generator, & Single phase Transformer.

TEACHING AND EVALUATION SCHEME:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)			
Lecture	Tutorial	Practical	Credit	Theory		Practical	
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment
4	-	4	6	60	40	40	60

DETAILS OF COURSE CONTENTS:

Sr. No	Topic and Subtopic	Total Hours	Weightage %
1	ENERGY CONVERSION PRINCIPLES Law of conservation of energy, Role of electrical	04	8

	energy and uses, Electro-mechanical energy conversion principle, singly excited and doubly excited electrical machines.		
2	D.C.GENERATORS Construction and materials used for various parts of DC generator, Functions of various parts of DC generator, EMF equation of DC generator, working principle of DC generator, Simplex lap and wave winding, Different types of DC generators, Characteristics of various types DC generators, Efficiency and losses of DC generator, Calculate losses and efficiency, Armature reaction and its effects and commutation, Given the data diagnose the problems of DC generators	14	25
3	D.C. MOTORS Working principle of DC motor, back emf, Torque equation for DC motor. Classify different types of D.C. Motors, Construction & working of Series, Shunt and Compound DC Motors, Performance characteristics of DC Series, Shunt and Compound motor, Speed control of D.C. motor, Need of DC motor starters & Construction and working of DC motor starter, Losses in DC motors, Calculate losses & Efficiency Brake test, Swinburne's test, field test perform on D.C. Motor, Applications of DC Series, Shunt and compound motor.	14	25
4	SINGLE PHASE TRANSFORMERS Explain the working of a single phase transformer with sketches, Derive EMF equation of transformer and transformation ratio, Differentiate between core and shell type transformer with sketches, State the materials used for the different parts of the transformer, Explain the performance of the transformer on no load, resistive, inductive and capacitive loads with phasor diagrams, Explain various losses in transformer, Derive expression for efficiency and the condition for maximum efficiency of a single phase transformer, Describe the significance of voltage regulation, Explain the various parameters for the transformer equivalent	16	27

	circuit, Solve numerical problems		
5	TESTING OF SINGLE PHASE TRANSFORMER Direct load test, OC and SC test and Sumpner's Test along with connection diagrams, efficiency and regulation of transformer, Equivalent circuit and its related parameters, Need of parallel operation, essential and desirable conditions for parallel operation, Load sharing of single phase transformer, Construction and working of auto-transformer	08	15

COURSE OUTCOME:

After successful completion of the course, student will be able to

- Know energy conversion principle.
- Know dc generator principle and related theories.
- Know dc motor principle and related theories.
- Know single phase transformer and related theories.
- Perform various tests on single phase transformer.

LIST OF PRACTICAL:

- 1 Identify various parts of DC machine
- 2 Identify various parts of single phase transformer
- 3 Test the performance Characteristics of DC shunt generator
- 4 Test the performance Characteristics of DC series generator.
- 5 Test the performance Characteristics of DC compound generator
- 6 Study about three point starter and Identify all the parts of starter.
- 7 Perform the speed control of DC Shunt motor by armature and field control.
- 8 Perform Swinburne's test of DC machine.
- 9 Perform Load test on single phase transformer.
- 10 Perform OC and SC test of single phase transformer.
- 11 Perform polarity test on single phase transformer.
- 12 Perform parallel operation of two single phase transformer.
- 13 Perform back to back test on single phase transformer.

LIST OF REFERENCES:

1. B.L. Thereja, A text book of Electrical Technology, Volume-II
2. J.B. Gupta, Electrical Machines(AC & DC Machines)



Faculty of Engineering and Technology
Diploma Engineering Semester III
(Electrical Engineering)
In Effect from Academic Year 2021-22