

22BEAS206 ELECTRICAL MACHINES AND POWER UTILIZATION

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Basics of Electromagnetics and AC&DC supply systems.

COURSE DESCRIPTION AND OBJECTIVES:

To obtain the introductory knowledge of magnetic circuits, to focus on the study of electro mechanical energy conversion & different parts of electrical machines, to address the concept of principle and working of electrical machines, Obtain the performance of transformer and induction motor and Evaluate the characteristics of DC Machines and Analyze the performance of DC machine under different testing conditions.

MODULE-1

UNIT-1

8L+0T+8P=16 Hours

MAGNETIC CIRCUITS: Electro motive force, magneto motive force, reluctance, laws of magnetic circuits, Comparison of electric and magnetic circuits, determination of ampere-turns for series and parallel magnetic circuits.

MEASUREMENT OF POWER : Balanced three phase system, Star and Delta connections, Active power, reactive power, apparent power and power factor, various methods of three phase power measurement.

UNIT-2

8L+0T+8P=16 Hours

DC GENERATOR: Principle and operation of DC Generator, EMF equation, types of DC generators and their characteristics.

DC MOTOR: Principle and operation of DC Motor, torque equation, types of DC motors and their characteristics, speed control methods.

PRACTICES:

- Measure the three phase power by using two wattmeter method.
- Measurement of reactive power by using single wattmeter in three-phase circuit.
- Conduct the Load test on DC shunt generator and obtain the internal and external characteristics.
- Conduct the direct load test on DC shunt motor and determine the efficiency.
- Obtain the Speed control of DC shunt motor by (i) armature voltage/Resistance control (ii) field control.

MODULE-2

UNIT - 1

8L+0T+8P=16 Hours

TRANSFORMERS:

Principle of working, construction of single phase transformer, EMF equation, Phasor diagram on load, leakage reactance, voltage regulation, equivalent circuit, efficiency, open circuit and short circuit tests.

UNIT - 2

8L+0T+8P=16 Hours

THREE PHASE INDUCTION MOTORS:

Construction, operation, phasor diagram, torque equation, effect of rotor resistance, starting and speed control methods.



Source: <https://lh3.googleusercontent.com/cDeg477xpl0FXu-JCZNjTufguqoFxFxGPS-Pc704bp0JQkmHuq0nvydvM4i05d5ojM1L-JazOkgs129>

SKILLS:

- ✓ Measurement of power for single phase & three phase system.
- ✓ Analyze the load characteristics of different DC generators
- ✓ Analyze the speed control & characteristics of DC motor.
- ✓ Test the transformer under no load and short circuit conditions and obtain the Equivalent circuit.
- ✓ Obtain the Equivalent circuit of induction motor from the testing data.
- ✓ Selection of electrical machines for desired applications.

SINGLE PHASE INDUCTION MOTOR: Double field revolving theory, equivalent circuit, characteristics, types of single phase induction motors.

PRACTICES:

- Conduct the Open circuit test on single phase transformer & find core loss and the shunt branch parameters.
- Determine the transformation ratio of single phase transformer.
- Conduct the short circuit test on single phase transformer & find copper loss and the shunt branch parameters.
- Conduct the Brake test on three Induction motor.
- Perform the load test on single phase induction motor.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Analyze the magnetic circuits and various three phase power measurement.	Analyze	1	1, 2, 6
2	Analyze the construction and characteristics of different single phase induction motor.	Analyze	2	1, 2
3	Evaluate the performance characteristics of DC motors through experimentation.	Evaluate	1	1, 2, 9
4	Evaluate the performance characteristics of three phase Induction motors.	Evaluate	2	1, 2, 6
5	Describe the construction and working principle of single phase Transformers.	Create	2	2, 3

TEXT BOOKS:

1. P.S. Bimbra, "Electrical Machinery", 7th edition, Khanna Publishers, 2011.
2. I.J. Nagrath and D.P. Kothari, "Basic Electrical Engineering", 4th edition, Tata Mc-Graw Hill Publishers, 2019.

REFERENCE BOOKS:

1. I.J. Nagrath and D.P. Kothari, "Electric Machines", 5th edition, Tata Mc-Graw Hill Publishers, 2017.
2. Bhattacharya. S. K, "Basic Electrical and Electronics Engineering", Pearson Education, New Delhi, 2011.