

16MT201 ELECTRICAL MACHINES

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P	WA/RA	SSH/HS	CS	SA	S	BS
45	-	30	20	20	-	-	2	2



Course Description and Objectives:

This course aims to equip the students with a basic understanding of DC machines and Transformer fundamentals, machine parts and helps to gain the skills for operating DC machines and Transformers. The course objectives are to enhance students' ability to understand and analyze the equivalent circuits of DC machines and Transformers, provide a basic understanding of AC machinery fundamentals, machine parts and the skills for operating AC machines. The course also equips students with the ability to understand and analyze the phasor diagrams and equivalent circuits of AC Induction and Synchronous Machines.

Course Outcomes:

The students will be able to:

- understand the constructional details and principle of operation of DC machines and AC machines.
- analyze the performance of the DC Machines under various operating conditions using their various characteristics.
- evaluate the performance of Transformers using phasor diagrams and equivalent circuits.
- select appropriate DC motor as well as to choose an appropriate method of speed control for any industrial application.
- analyze the performance of the AC Induction and Synchronous Machines using the phasor diagrams and equivalent circuits.
- select appropriate AC machine for any application and appraise its significance.

SKILLS :

- ü *Estimate the design parameters of machine for a particular drive.*
- ü *Troubleshoot the problems and performance associated with DC and AC machines and transformers.*
- ü *Design and assess generator systems in renewable energy conversion systems.*
- ü *Troubleshoot the parallel operation of transformers, alternators and assess their performance*
- ü *Improve their operating performances of the Electrical Machines*

ACTIVITIES:

- *Select a single phase transformer for different applications for house hold as well as bulk power usage.*
- *DC series motor applications and speed control.*
- *DC shunt motor applications and speed control.*
- *Fractional kilowatt DC motors for toys and electronics applications.*
- *Single phase motors winding.*
- *Single phase power transformer winding.*
- *Three phase power transformers winding in different connections.*
- *Teritary winding design.*
- *Synchronous machine winding.*

UNIT - 1**L-10**

DC Machines : Parts, Principle of operation, types. Generators, equation, electrical characteristics, armature reaction. Motors torque equation and mechanical characteristics.

UNIT - 2**L-12**

Transformers : Principle of operation, types, basic construction, equivalent circuit, regulation and efficiency, auto transformer. Three phase transformer connection, Scott connection, all day efficiency, Sumpner's test, parallel operation of transformers

UNIT - 3**L-10**

Poly phase induction motors : Construction, principle and types - equivalent circuit, circle diagram starting and speed control, Induction generators.

Single phase induction motors, construction, principle and type, double revolving field theory, equivalent circuit.

UNIT - 4**L-8**

Alternators : Construction, principle and types, armature reaction, load characteristics, voltage regulation, two reaction theory.

UNIT - 5**L-5**

Synchronous motors : Synchronous machines on infinite bus bars, phasor diagram, V and inverted V curves, current, Hunting and its suppression, Starting methods.

LABORATORY EXPERIMENTS**LIST OF EXPERIMENTS**

Total hours:30

1. Open circuit and load characteristics of DC shunt/compound generator.
2. Swinburne's test and Speed control of DC shunt motor.
3. Load test on DC shunt motor.
4. Load test on DC series motor.
5. Open circuit and short circuit test on single phase transformer.
6. Load test on single phase transformer.
7. Sumpner's test.
8. Parallel operation of single phase transformer.
9. Electrical braking in DC shunt motor.
10. Three phase transformer connections.
11. Load test on 3 phase induction motor.
12. No load and blocked rotor test on 3 phase induction motor.
13. Load test on grid connected induction generator.
14. Load test on self-excited induction generator.
15. Load test on single phase induction motor.