

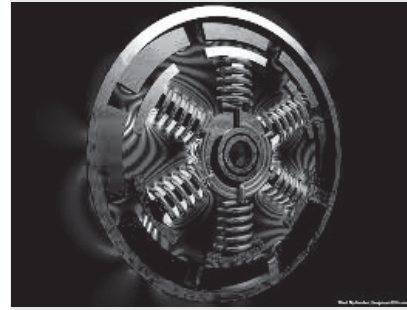
16EE202 DC MACHINES

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P	WA/RA	SSH/HSB	CS	SA	S	BS
45	-	30	15	30	2	5	5	-



Course Description and Objectives:

This course deals with construction, types, working principle, operation and applications of DC Generators and Motors. The objective of the course is to enable the students to understand the characteristics of DC Machines and analyze their performance under different testing conditions.

Course Outcomes:

The student will be able to:

- understand the construction and working principle of DC machines.
- understand the armature reaction and commutation in DC machines.
- distinguish different types and identify DC machine for a given application.
- operate DC machines in parallel.
- control speed of different types of DC motors.
- test performance of different DC machines.

SKILLS:

- ✓ Analyze magnetizing characteristics of DC Generators
- ✓ Analyze load characteristics of DC Generators
- ✓ Speed control of DC Motors
- ✓ Parallel operation of DC generators.
- ✓ Analyze performance of DC machines by conducting various tests.

ACTIVITIES:

- *Validate Faraday's laws.*
- *Design a simple loop DC generator.*
- *Speed control of DC motor.*
- *Design a battery operated cooling fan.*
- *Design a battery operated electric car.*

UNIT - 1**L-10**

CONSTRUCTION, WORKING OF D.C. GENERATORS AND EXCITATION METHODS: D.C. Generators - Constructional details, Principle of operation, Action of commutator; Armature windings types - lap and wave windings; E.M.F equation - Problems; Methods of excitation of generators - Separately excited and self excited; Causes of failure to self excitation and remedial measures.

UNIT - 2**L-9**

TYPES OF D.C. GENERATORS, ARMATURE REACTION AND COMMUTATION: Types of generators - Shunt, Series and compound, Problems; Armature reaction - Effect of armature reaction, Cross magnetizing and de-magnetizing AT/pole, Compensating winding, Interpoles; Commutation process - Reactance voltage, Methods to improve commutation.

UNIT - 3**L-10**

CHARACTERISTICS AND PARALLEL OPERATION OF D.C. GENERATORS: Build-up of E.M.F under no load, Critical field resistance and critical speed, Internal and external characteristics of shunt, Series and compound generators, Parallel operation of D.C. shunt and series generators, Use of equalizer bar and cross connection of field windings, Load sharing, Applications of DC generators.

UNIT - 4**L-8**

WORKING OF D.C. MOTORS, TYPES, SPEED CONTROL METHODS AND STARTERS: Principle of operation, Back E.M.F, Torque equation, Starting of DC motors - Necessity and types of starters, 3 point and 4 point starters; Characteristics of shunt, Series and compound motors, Speed control of DC Motors - Armature and field control, Ward-Leonard system; Applications of DC motors.

UNIT - 5**L-8**

TESTING OF D.C MACHINES: Types of losses - Constant and Variable losses; Calculation of efficiency - Condition for maximum efficiency; Methods of testing - Direct, Indirect and regenerative testing, Brake test, Swinburne's test, Hopkinson's test, Field's test, Retardation test, Problems.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS

Total hours: 30

1. Determination of critical field resistance and critical speed using magnetization characteristics of DC shunt generator.
2. Load test on DC shunt generator.
3. Load test on DC series generator.
4. Load test on DC compound generator.
5. Hopkinson's test on DC shunt machines.
6. Fields test on DC series machines.
7. Swinburne's test on DC shunt motor.
8. Brake test on DC compound motor.
9. Brake test on DC shunt motor.
10. Retardation test on DC shunt motor.
11. Separation of losses in DC shunt motor.
12. Speed control of D.C. shunt motor.

TEXT BOOKS:

1. P.S. Bimbra, "Electrical Machinery", 7th edition, Khanna Publishers, 2004.
2. I.J. Nagrath and D.P. Kothari, "Electric Machines", 3rd edition, Tata Mc-Graw Hill Publishers, 2004.

REFERENCE BOOKS:

1. S. Kamakshiah, "Electromechanics-I (D.C. Machines)", 1st edition, Right Publishers, 2005.
2. A.E. Clayton and Hancock, "Performance and Design of D.C Machines", 3rd edition, BPB Publishers, 2004.
3. R. D. Begamudre, "Electromechanical Energy Conversion with Dynamics of Machines", 2nd edition, New Age International (P) Ltd. Publishers, 2003.
4. M. V. Deshpande, "Electric Machines", 1st edition, Wheeler Publishing, 2000.
5. S.K. Battacharya, "Electrical Machines", 2nd edition, Tata Mc-Graw Hill Companies, 2006.