GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

DC MACHINES AND TRANSFORMERS

Course Code: GR15A2036 L:3 T:1 P:0 C:4
II Year I Semester

Prerequisites: In-depth knowledge of Physics oriented towards dynamics, heat, electricity, magnetism and calculus, analytical co-ordinate geometry and trigonometry.

Objectives
- To provide students with a strong back ground in different types of electrical machines.
- To train the students to have the solid foundation in mathematical and technical concepts required for engineering problems.
- To prepare the students to excel in post graduate programs or to succeed in industry.
- To provide a foundation in the theory and applications of electrical machinery and their different types with respect to their design.

Outcomes
- An ability to understand energy conversion principles in DC machines & Transformers.
- An ability to find role of electrical machinery in simple & complex applications.
- Articulate importance of extensive research in electrical machines.
- Design real time applications.
- Ability to model DC Machine for given specification.
- Ability to draw armature winding for DC Machines
- Ability to find voltages, currents, torque and speed of given machine.

Unit–I
D.C.Generators: Principle of operation– Action of commutator– constructional features– armature windings– lap and wave windings– simplex and multiplex windings–use of laminated armature– E.M.F Equation.Armature reaction–Cross magnetizing and de-magnetizing AT/pole– compensating winding–commutation–reactance voltage–methods of improving commutation. Methods of Excitation – separately excited and self excited generators–build-up of E.M.F-critical field resistance and critical speed-causes for failure to self excitation and remedial measures. Load characteristics of shunt, series and compound generators.

Unit–II

D.C Motors: Principle of operation–Back E.M.F.-Torque equation–Characteristics and application of shunt, series and compound motors–Armature reaction and commutation.

Speed control of D.C. Motors: Armature voltage and field flux control methods. Motor starters (3 point and 4 point starters).

Testing of D.C. machines: Losses–Constant &Variable losses– calculation of efficiency–condition for maximum efficiency.

Unit-III

Methods of Testing: Direct, indirect and regenerative testing–Brake test–Swinburne's test – Hopkinson's test – Field's test-separation of stray losses in a D.C .motor test.

Unit-IV

Transformers: Single phase transformers-types - constructional details-minimization of hysteresis and eddy current losses-EMF equation-operation on no load and on load- phasor diagrams Equivalent circuit- losses and efficiency-regulation. All day efficiency- effect of variations of frequency &supply voltage on iron losses.

Unit-V

Tests: OC and SC tests - Sumpner's test - predetermination of efficiency and regulation-separation of losses -parallel operation with equal and unequal voltage ratios- Auto transformers- equivalent circuit- comparison with two winding transformers. Poly phase transformers-Poly phase connections-Y/Y, Y/D, D/Y, D/D and open D.

Teaching Methodologies

1. DC Machines and Transformers PPTS
2. Assignments uploaded in website

Text Books

1. Electric Machines by I.J. Nagrath&D.P. Kothari, TataMcGraw Hill Publishers, 3rd edition, 2004.
2. Electromechanics–I (D.C. Machines) S. KamakshaiahHi-Tech Publishers.

Reference Books

1. Performance and Design of D.C Machines–by Clayton &Hancock, BPB Publishers
2. Electric Machinary–A.E.Frizgerald, C.Kingsleyand S.Umans, McGraw-Hill Companies, 5thediton
3. Electrical Machines–P.S. Bimbra., Khannapublishers
4. Electro mechanical Energy Conversion with Dynamics of Machines by R.D.Begamudre, New AgeInternational(P)Ltd., Publishers, 2ndedition, 1998.
5. Electric Machines–M.V. Deshpande, Wheeler Publishing,1997.
6. Electrical Machines-S.K. Battacharya,