

Course Title: Electrical Machinery Fundamentals

Course Code: EEEG 215

Credit Hours: 3

Course Description:

This course provides an understanding of the fundamentals, performance and applications of various electrical machines.

Course Contents:

Unit 1: Transformers Fundamentals

Importance and applications of transformers; Types and construction, Ideal transformer; Theory and operation of single-phase transformers, EMF equation, Vector diagram, No load and transient characteristics, Voltage regulation, Losses and efficiency, Equivalent circuits parameter, Transformer tests, Three phase transformers, Delta star connections, Introduction to pulse transformers and autotransformers

Unit 2: Electromechanical Energy Conversion

Forces and torque in magnetic field systems; Energy balance; singly excited system, Multiple excited system; Dynamic equations

Unit 3: DC Generators

Introduction to simple linear machine; Generator principles, Construction, Winding, generator types, Losses and efficiency, No load and load characteristics, Armature reaction and commutation, Parallel operation of generators, Induced voltage and torque equations, Equivalent circuit magnetization curve

Unit 4: DC Motors

Motor principles, Types, Construction and output characteristics of different motors, Speed control, starting, applications, Losses and efficiency; Introduction to brushless DC motors; Testing of DC machines; Reversing and braking

Unit 5: AC Machines

Types and applications of AC machines: Induction and synchronous machines; Principles of operations of AC machines; Single phase induction motor: torque-speed characteristics and applications of split-phase, capacitor start, Permanent split-capacitor, Two-value capacitor and shaded pole motors, Comparison of performance, Speed control and reversing of single-phase motors;

Unit 6: Fractional Horse-Power Motors

Introduction to reluctance motors, Repulsion motors, Hysteresis motors, Stepper motors, Linear induction motors, Universal motors, Synchronous servo machines;

References:

1. Fitzgerald, Kingsley and Umans, *Electric Machinery*, McGraw-Hill

2. Irving & Kosow, *Electrical Machinery & Transformer*, Prentice Hall
3. I J Nagrath & D P Kothari, *Electrical Machines*, Tata Mc Graw Hill
4. Stephen J Chapman, *Electric Machinery Fundamentals*, McGraw-Hill
5. A F Puchstein, Lyod & Conrad, *Alternating Current Machinery*, Wiley
6. H Cotton, *Advanced Electrical Technology*, Wheeler Publication
7. A S Langsdorf, *Theory of Alternating Current Machinery*, Tata Mc Graw Hill
8. P S Bhimbhra, *Theory of Electric Machine*, Khanna Publications