

ECPC2001 ELECTRICAL MACHINES (3-0-0)

Module I (06 Hours)

DC Machines:

DC Generators: Construction, principle of operation, types: shunt, series, compound generators, EMF equation, characteristics: open circuit characteristics, internal characteristics, external characteristics of DC shunt generators.

DC Motors: Principle of operation, back EMF, torque equation, types: shunt, series, compound motors, characteristics: speed-current characteristics, torque-current characteristics, speed-torque characteristics of DC shunt motors, Speed control of DC shunt motors by field control and armature control methods.

Module II (06 Hours)

Transformers:

Single-phase transformers:

Construction, types, principle of operation, EMF equation, phasor diagrams on NO-Load and ON-Load, equivalent circuit, losses and efficiency, Testing of transformers: open circuit test and short circuit tests, voltage regulation, all day efficiency.

Three-phase transformers: types of connections (Y-Y, Y- Δ , Δ -Y, Δ - Δ), applications.

Module III (06 Hours)

Synchronous Generators (Alternators):

Working principle, salient pole type and cylindrical rotor types, EMF equation, Armature reaction, Voltage regulation by EMF and MMF methods.

Synchronous motors:

Principle of operation, starting methods, 'V' and inverted 'V' curves, hunting.

Module IV (06 Hours)

Three-phase induction motors:

Construction, principle of operation, types, squirrel cage rotor, slip ring induction motor, slip and torque equations, torque-slip and torque-speed characteristics, equivalent circuit of induction motor, starting methods: DOL starting, star-delta starting, speed control, crawling and cogging.

Module V (06 Hours)

Single-phase induction motors:

Construction, principle of operation, double field revolving theory, capacitor start, capacitor run single phase induction motors, equivalent circuit, performance characteristics.

Course Outcomes (COs)

CO1: Understand the principles and working of DC machines, their characteristics, and applications.

CO2: Analyze the operation, testing, and efficiency of single-phase and three-phase transformers.

CO3: Evaluate the performance of synchronous machines and understand their applications in power systems.

CO4: Assess the operation, characteristics, and control of three-phase induction motors.

CO5: Demonstrate knowledge of single-phase induction motors and their applications in domestic and industrial use.

Textbooks:

1. "Theory & Performance of Electrical Machines" by J.B. Gupta, 15th edition, S. K. Kataria & Sons, reprint 2015.
2. Fitzgerald & Kingsley's "Electric Machinery", Stephen D. Umans, 7th edition, McGrawHill publishers, 2014.

Reference books:

1. "Electric Machinery" by P.S. Bimbhra, 2nd edition, Khanna Publishing House, 2022.
2. "Electric Machines" by D.P. Kothari and I.J. Nagrath, 5th edition, McGrawHill publishers, 2017.
3. "The Performance and Design of Alternating Current Machines", by M. G. Say, CBS Publishers & Distributors, 2005.