# EE 210: ELECTRICAL TECHNOLOGY (3-0-2:4)

**Module-1: Direct Current machines:**

Construction, operating principle, derivation of EMF equation & types of excitation. Armature reaction and its effect on the performance, methods adopted for compensation of armature reaction. Losses & Efficiency.

Characteristics of DC generator: separately excited, shunt, series and compound generators. Compensating winding, Commutation and function of commutators. Improvement of commutation: Brush shift and interpoles.

Direct Current motors: Review of types of DC motors. Torque equation, speed torque characteristics: shunt, series and compound motors. Starting & speed control of DC motors. 3-Point starter & its step calculation. 4-Point starter. Speed control by controlling armature resistance, field excitation and armature voltage.

**Module 2: Transformer**

Core and shell type construction, EMF equation, no load and on load operation, phasor diagram and equivalent circuit, losses of a transformer, open and short circuit tests, regulation and efficiency calculation. Introduction to 3-phase transformer. Auto-transformer.

**Module 3: 3-phase Induction machines**

Types, construction, rotating magnetic field, principle of operation, slip, development of equivalent circuit. Performance equations, torque slip characteristics & power slip characteristics. Starting and speed control of Induction motors. Efficiency and Losses.

**Module 4: Synchronous machines**

Operation and Construction, Types, EMF Equation, Starting Methods of Synchronous Motors, Synchronous Condenser, Voltage Regulations and its Calculation.

**Module 5: Special machines**

Servo Motor, Stepper Motor, BLDC Motor.

**Module 6**: Measurement of power & energy. Introduction to Generation of Electrical Power, Introduction to Transmission of Electrical Power, Introduction to Distribution of Electrical Power, Electric Power Tariff System, Power Factor Improvement.

**Suggested Practical**

1. Study of the OCC characteristics of a separately excited D.C generator.
2. Studies of the characteristics of a D.C shunt motor.
3. Speed control of a D.C motor.
4. Study of the characteristics of a compound D.C generator.
5. Measurement of the speed of a D.C series motor as a function of load torque.
6. OC and SC Tests on single phase transformer.
7. Polarity test on single phase transforms and study of the different connections of three-phase transformer.
8. Study of the equivalent circuit of three-phase induction motor by No-Load & Blocked-Rotor tests.
9. Calibration of energy meter.
10. Simulation of DC distribution by network analyzer.

**Text books:**

1. Electrical Machinery, P.S. Bhimra, Khanna Publishers.
2. Electric Machines, I.J. Nagrath & D.P. Kothari, TMH

**Reference books:**

1. Electrical Machnery, S.K.Sen, Khanna Publishers.
2. Electric Machinery & Transformers, Bhag S.Guru & H. R. Hiziroglu, Oxford
3. Electrical Machines: Theory & Practice, M.N. Bandoyopadhyay, PHI.
4. Electrical Machines, P K Mukherjee & S Chakrabarty, Dhanpat Rai Pub.
5. Electrical Power System — C.L.Wodhwa, New Age International
6. Power System Engineering — Nagrath & Kothary, TMH