

**ELECTRICAL TECHNOLOGY**

**COURSE OBJECTIVES:**

1. The constructional features of DC machines, different types of DC machines and their characteristic.
2. The constructional details of single phase transformer and their performance characteristics by conducting suitable tests.
3. The analysis of three phase balanced and unbalanced circuits, three phase induction motors and their characteristics.
4. The constructional feature and operation of synchronous machines.

**UNIT I**

**DC Generators:** Generators – Principle of Operation – Constructional Features – E. M.F Equation– Numerical Problems – Methods of Excitation – Separately Excited and Self Excited Generators – Build-Up of E.M.F - Critical Field Resistance and Critical Speed - Load Characteristics of Shunt, Series and Compound Generators-Applications

**Learning Outcomes:**

- To know about principle of operation of a DC machine working as a generator
- To distinguish between self and separately excited generators and classification
- To know how Emf is developed
- To distinguish between critical field resistance and critical speed
- To know about various characteristics of different types of generators

**UNIT-II**

**D.C.Motors:** Motors – Principle of Operation – Back E.M.F. –Torque Equation – Characteristics and Application of Shunt, Series and Compound Motors-Speed Control of D.C. Motors: Armature Voltage and Field Flux Control Methods. Three Point Starter-Losses – Constant & Variable Losses – Calculation of Efficiency - Swinburne's Test.

**Learning Outcomes:**

- To know about principle of operation of DC machine working as a motor
- To know about torque developed
- To know about how to control speed of DC shunt motor
- To know about necessity of starter
- To know about various load characteristics of various types of DC motors



### UNIT-III

**Single Phase Transformers & Three Phase A.C. Circuits:** Introduction - Single Phase Transformers- Constructional Details and Applications - Emf Equation - Operation on No Load and on Load - Phasor Diagrams-Equivalent Circuit - Losses and Efficiency-Regulation- OC and SC Tests - Predetermination of Efficiency and Regulation. Analysis of Balanced Three Phase Circuits – Phase Sequence- Star and Delta Connection - Relation between Line and Phase Voltages and Currents in Balanced Systems - Measurement of Active and Reactive Power in Balanced and Unbalanced Three Phase Systems.

#### Learning Outcomes:

- To understand the principle of operation of 1- $\phi$  transformer
- To understand computation and predetermination of regulation of a 1- $\phi$  transformer
- To know about basics of three phase circuits
- To distinguish between phase voltages, currents, line values and phase values
- To distinguish between balanced and unbalanced three phase circuits and power measurement

### UNIT-IV

**3-Phase Induction Motors:** Polyphase Induction Motors-Construction Details and Applications of Cage and Wound Rotor Machines- - Principle of Operation – Slip- Rotor Emf and Rotor Frequency - Torque Equation- Torque Slip Characteristics – Losses and efficiency.

#### Learning Outcomes:

- To know about principle of operation of three phase induction motor
- To distinguish between squirrel cage and slip ring induction motors
- To know about various losses and computation of efficiency of induction motor
- To know about the torque developed by the induction motor
- To understand various characteristics of induction motor

### UNIT-V

**Synchronous Machines:** Principle and Constructional Features of Salient Pole and Round Rotor Machines – E.M.F Equation- Applications , Voltage Regulation by Synchronous Impedance Method- Theory of Operation of Synchronous Motor.

#### Learning Outcomes:

- To know about principle of working of alternator
- To distinguish between salient pole and cylindrical rotor machines
- To know about emf equation
- To know about predetermination of regulation of alternator by synchronous impedance method
- To know about principle of operation of synchronous motor





**TEXT BOOKS:**

1. I.J.Nagrath&D.P.Kothari, “Electric Machines”, 7<sup>th</sup> Edition, Tata McGraw Hill,2005
2. T.K.Nagsarkar and M.S. Sukhija, “ Basic Electrical Engineering”, 3<sup>rd</sup> Edition, Oxford UniversityPress2017.

**REFERENCE BOOKS:**

1. B. R. Gupta, “Fundamentals of Electric Machines”, VandanaSinghal, 3<sup>rd</sup> Edition, New age International Publishers,2005.
2. S. Kamakashiah, “Electromechanics – III”, overseas publishers Pvt.Ltd.
3. V.K. Mehta and Rohit Mehta, “Principles of Electrical Engineering”, S.Chand Publications,2005.

**COURSE OUTCOMESS:**

*After completing the course, the student should be able to:*

1. Calculate the e.m.f. generated on DC Generator also able to control speed of different DC motors.
2. Conduct open circuit and short circuit tests on single phase transformer for knowing their characteristics.
3. Analyse three phase circuits, three induction motor operating principle and know their torque slip characteristics.
4. Able to have knowledge on synchronous machine with which he/she can able to apply the above conceptual things to real-world problems and applications

