EC-212 **ELECTRICAL ENGINEERING & MEASUREMENTS** **L T P C**
4 - - 3

COURSE OBJECTIVES:

1. To understand how E.M.F & Torque is developed using Static and Time varying Electrical and Magnetic Felids.
2. To understand constructional, operational details of D.C machine, A.C machine, Transformer, Induction machine along with mathematical equations.
3. To understand about various analog instruments and bridges used in electrical measurements.
4. To understand the Cathode Ray Oscilloscope.
5. To understand about different Transducers.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. analyze DC Generators and Motors.
2. analyze single-phase transformers and single & three phase Induction motors.
3. describe the operation of voltage, current, power, resistance, self-inductance and capacitance measuring instruments/bridges.
4. analyze analog/digital and storage cathode ray oscilloscope.
5. understand resistive, inductive and capacitive transducers operation.

UNIT I *Text Book - 1* **(12)**

D.C Generators : Introduction, Principle of operation of DC generator, EMF equation, types of generators, Applications, Simple problem on types of generators & EMF equation.

D.C Motors : Principle of operation of DC motor, Back EMF, Torque equation, types of DC motors, Applications, and simple problem on types of Motors & Torque equation.

UNIT II *Text Book - 1* **(12)**

1-Φ Transformers : Principle, operation, EMF Equation, Phasor diagram on no load and load, equivalent circuit. Simple problem on EMF Equations and equivalent circuit.

3-Φ Induction Motors : Construction, Types, Principle of operation of Induction Motors, Rotating magnetic field. Applications, Simple problems related to synchronous speed, slip, rotor speed.

1-Φ Induction motors : Construction, Principle of operation, Starting methods, double field revolving theory, comparison between 3-Φ and 1-Φ induction motors.

UNIT III *Text Book - 1* **(12)**

Measuring Instruments : Principles and operation of moving - coil and moving-iron instruments, Dynamo meter-type wattmeter.

DC & AC BRIDGES : Wheatstone, Kelvin, Guarded Wheatstone, Maxwell, Hay, Schering and Wein bridges, Wagner ground connection.

UNIT IV *Text Book - 1* **(10)**

Cathode Ray Oscilloscope : Introduction, Cathode ray oscilloscope, Storage and sampling oscilloscopes, Digital storage oscilloscope, Spectrum analyzer.

UNIT V *Text Book - 2* **(12)**

Transducers : Introduction, Classification of transducers, Analog transducers, Resistive transducers, Potentiometers, Strain gauges, Types of strain gauges, Resistance strain gauges, Semiconductor strain gauges, Resistance thermometers, Thermistors, Application of Thermistors, Thermo couple construction, Measurement of thermocouple output, Compensating circuits, Advantages and disadvantages of thermocouples, Variable inductance type transducer, Variation of self inductance, Variation of mutual inductance, Linear variable differential transformer, Capacitive transducers, Piezo-electric transducers.

LEARNING RESOURCES:

TEXT BOOK(s):

1. V.K.Mehta and Rohit Mehta - Principles of Electrical Machines, 2nd Edition, S. Chand Publications, 2002.
2. A.K.Shawney - Electrical & Electronic Measurement & Instruments, Dhanpat Rai & Co 17th edition 2000.

REFERENCE BOOK(s):

1. Nagsarkar, Sukhija - Basic Electrical Engineering, 2nd Edition, Oxford Publications.
2. H Cotton - Advanced Electrical Technology, AH Wheeler & Co., 1990

WEB RESOURCES:

http://nptel.iitm.ac.in/courses/