EEPC2002 Electrical Machines-I (3-0-0)

Module I **6Hours**

Electromechanical Energy Conversion: Introduction to magnetic circuits,Magnetically induced EMF and MMF, Review of Faraday's Law and Lenz's Law, Hysteresis and Eddy-current losses.

Module II **8 Hours**

DC Generators: Principle of operation, Commutator action, Constructional features, Armature windings, Lapand wave windings, Simplex windings, E.M.F. Equation, Methods of excitation: separately excited and self-excited generators, Build-up of E.M.F., Critical field resistance and critical speed, Armature reaction: Crossmagnetizing and demagnetizing AT/pole, Compensating winding, Commutation, Reactance voltage, Methodsof improving commutation, Internal and External characteristics for self and separately excited DC generator,Load characteristics of shunt, series and compound generators, Parallel operation of DC generators.

Module III **8Hours**

DC Motors: Principle of operation, Back E.M.F., Torque equation, Characteristics and application of shunt,series and compound motors, Starting of DC motor, Necessity of a starter, Constant & Variable losses,Calculation of efficiency, Condition for maximum efficiency. Speed control of DC Motors: Armature voltageand field flux control methods, Ward Leonard method. Methods of Testing: Brake test, Swinburne's test.

Module IV **8Hours**

Single-phase Transformers: Single phase transformer, Constructional details, Principle of operation, EMF equation,Magnetizing current and core losses, Phasor diagrams at no-load and load conditions of an ideal transformerand practical transformer, Equivalent circuit, losses and efficiency, All day efficiency, Voltage regulation,Determination of parameters from tests (Polarity Test, Open Circuit Test and Short Circuit Test, Back to Backtest), Parallel operation of transformers and load sharing. Auto Transformer: Basic constructional features, VAconducted magnetically and electrically, Saving of copper, Applications.

Module V **10Hours**

Three phase Transformer: Constructional features of three phase transformers, As a single unit and as a bankof three single phase transformers, Three phase connection of transformers: Various phasedisplacements (0^0,180^0, $+30^0$and -30^0), Connection diagrams and Phasor diagrams of various vector groups (Yy0, Dd0, Dz0,Yy6, Dd6, Dz6, Yd1, Dy1, Yz1, Yd11, Dy11, and Yz11), Scott connection, Open delta connection, Paralleloperation.

Course Outcomes: On completion of this course, students are able to:

CO-1: Understand the concepts of Magnetic circuits.
CO-2: Understand the operation of DC Generators.
CO-3: Understand the operation and concepts of DC Motors.
CO-4: Understand the operation of single-phase transformers &auto transformer.
CO-5: Understand three phase transformers circuits.

Text Book(s):

1. I. J. Nagrath and D. P. Kothari, “Electric Machines”, McGraw Hill Education,2010.
2. P. S. Bimbhra, “Electrical Machinery”, Khanna Publishers,2011.

Reference Book(s):

1. Electric Machinery – Fitzgerald, Charles Kingsley Jr., S. D. Umans – Tata McGraw Hill.
2. Electric Machinery and Transformers – Guru & Hiziroglu – Oxford University Press, 2010.

Syllabus Preparation as per NEP

1. Each subject should have pre-requisites (if any), 5 Modules with minimum 30 contact hours.
2. Each subject COs, POs & PSOs are to be articulated as per Blooms Taxonomy.
3. In each subject, at least two Textbooks and relevant Reference books are to be mentioned.