**20EE2201-ELECTROMECHANICAL ENERGY CONVERSION - II**

**(EEE)**

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| **Course Category:** | Professional core | **Credits:** | 3 |
| **Course Type:** | Theory | **Lecture-Tutorial-Practical:** | 3-0-0 |
| **Pre-requisite:** | Fundamentals of energy conversion and three phase connections | **Sessional Evaluation:****External Exam Evaluation:****Total Marks:** | 4060100 |

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| **Course Objectives** | Students undergoing this course are expected to learn: |
| 1. The basic fundamentals related to the principle, construction and operation and testing of a transformer
2. To measure the performance of a transformer by conducting transformer tests.
3. Learn the important concepts related to different poly-phase transformer connections.
4. The principle, construction and operation of Induction Motor.
5. The performance and characteristics of an Induction motor using different tests.
6. The speed control techniques of an Induction Motor and the principles of double cage motor and Induction generator.
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| **Course Outcomes** | After completing the course the student will be able to |
| CO1 | Acquire the knowledge of principle, construction, operation and testing of a transformer |
| CO2 | Understand the working of transformer under no load, loaded conditions and analyse the equivalent circuit of a transformer. |
| CO3 | Identify different connections of a poly-phase transformer. |
| CO4 | Demonstrate the principle, construction and operation of Induction Motor.  |
| CO5 | Assess the performance and characteristics of an Induction motor using different testing methods. |
| CO6 | Analyse the speed control techniques of an Induction Motor and understand the principles of double cage motor and Induction generator. |
| **Course Content** | **UNIT-I****1- ф Transformers:** Constructional details - Principle of operation – EMF Equation -Ideal transformer - Leakage flux - Phasor diagram of ideal and practical transformer on no load and loaded condition.**Autotransformer:** Principle-saving of copper - realization of two winding transformer asauto-transformer.**UNIT-II****Testing of 1-ф Transformers:** Pre-determination of performance from OC and SC tests - Equivalent circuit - determination of parameters of equivalent circuit – Losses, efficiency and regulation – Sumpner’s test - separation of hysteresis and eddy current losses -Parallel operation of transformers - equal and unequal voltage ratios- load sharing.**UNIT-III****Poly-phase transformers:** Poly-phase connections – Star/Delta, Delta/Star, Star/Star,Delta/Delta, Star/zigzag Star, Delta/zigzag Star connections and their Phasor diagrams - Scott connection - Open Delta connection - Testing of three phase transformers (Ratio test, Transformer vector group test, Polarity test and magnetic balance test).**UNIT-IV****3-ф Induction motor:** Constructional details – types - production of rotating magnetic field -principle of operation - Torque equation - Starting and maximum torques - Maximum output - Slip for maximum output - Torque-slip characteristic - losses and efficiency - phasor diagram - Equivalent circuit. **UNIT-V****Testing and starting of 3-ф Induction motor:** No load and blocked rotor tests - determination of equivalent circuit parameters, Brake test, Pre-determination of performance from no loadand blocked rotor tests - circle diagram - Auto transformer, star delta and rotor resistance starters.**UNIT-VI****Speed control of Induction motors:** Pole changing - cascade connection - injection of EMFinto rotor circuit - introduction to V/f control of three phase Induction motor.**Double cage induction motor**: Construction theory - equivalent circuit - characteristics and applications - Induction generator - Theory, construction, operation, equivalent circuit and applications. |
| **Text Books & Reference Books** | **TEXT BOOKS:**1. “Theory and performance of Electrical machines”, by J.B Gupta, SK Kataria publishers, 2013 Reprint.
2. “Electrical Machines”, by AshfaqHussain ,DhanpatRai& Co, 3rd Edition,2016.
3. “Principles of Electrical Machines” by V.K Mehta, Rohit Mehta – S.Chand, Reprint Edition 2006.

**REFERENCE BOOKS:**1. “Electrical Machinery”, by Dr. P.S Bimbhra, Khanna publishers,2011.
2. “Electrical Machines” by I.J.Nagarath and D.P.Kothari 4th Edition, Tata McGraw-Hill, 2010.
3. “Performance & Design of Alternating Current machines” by M. G. Say, CBS publishers, 2012.
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