**17EE2101-ELECTRO MECHANICAL ENERGY CONVERSION -I**

**(EEE)**

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| **Course Category:** | Professional core | **Credits:** | 4 |
| **Course Type:** | Theory | **Lecture-Tutorial-Practical:** | 3-2-0 |
| **Pre-requisite:** | Fundamental concepts of Electrical and Magnetic coupled circuits. | **Sessional Evaluation:**  **External Exam Evaluation:**  **Total Marks:** | 40  60  100 |

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| **Course Objectives:** | To make the student learn about:   1. The conversion principle of electrical and mechanical energy 2. The constructional details, working principles & winding diagrams of DC machines. 3. The characteristics of DC machines & speed control methods of DC motors. 4. Different performance tests on DC machines. | |
| **Course Outcomes:** | After completing the course the student will be able to | |
| CO1 | Understand the basics of electromechanical energy conversion. |
| CO2 | Empathize the working principle of Generator and its winding diagrams. |
| CO3 | Identify the suitable DC generator for specific applications. |
| CO4 | Ascertain the suitable DC motor for specific applications. |
| CO5 | Calculate the efficiency of DC machine and understand the parallel operation of DC generators. |
| CO6 | Conduct different tests on DC machines. |
| **Course Content:** | **UNIT- I**  **Principles of Electro- Mechanical Energy Conversion**: Introduction, flow of Energy in electromechanical Devices, Energy in Magnetic systems ( defining energy and Co-energy ), singly excited systems, determination of mechanical force, Mechanical Energy, Torque equation, Doubly Excited Systems, Energy stored in Magnetic field, Electromagnetic torque, Generated EMF in machines, torque in machines with cylindrical air gap.  **UNIT – II**  **DC Generators**: Simple DC Generator working Principle-Constructional details of DC machine -operation - Armature windings - types of armature windings and winding Drawings-Problems – Generated EMF equation - Armature reaction - its effects and compensating Methods-Problems.  **UNIT – III**  **Types of DC Generators:** Characteristics of different types of generators – critical field resistance and critical speed – applications – Problems - commutation - methods of improving commutation - Compensating windings.  **UNIT – IV**  **DC Motors:** working principle – types of DC motors -Torque and Power developed by armature – characteristics of DC motors – Applications & Problems - Speed control of DC motors –Problems - Starting of DC motors - Constructional details of 3 - Point and 4 - Point starters – problems.  **UNIT – V**  **Losses and efficiency of DC machine**: Various losses in DC machine and efficiency, condition for maximum Efficiency-Problems  **Parallel operation of DC generators**: Parallel operation of DC shunt, series and compound Generators-Problems.  **UNIT – VI**  **Testing of DC machines**: Brake test - Swinburne’s test - Hopkinson’s test – Field’s test - Retardation test - Separation of iron and friction Losses-Problems. | |
| **Text Books & Reference Books:** | **TEXT BOOKS:**   1. “Theory and performance of Electrical machines” by J.B Gupta - SK Kataria   publishers,2013.   1. “Principles of Electrical Machines” by VK Mehta, Rohit Mehta – S.Chand,2006. 2. “Electrical machines” by I.J. Nagarath and D.P. Kothari 4th Edition, Tata   Mc Graw Hill.  **REFERENCE BOOKS:**   1. “Electrical Machinery” by P.S Bimbhra - Khanna publishers, 2011. 2. “Performance of DC machines” by M.G. Say, Second Edition, CBS Publishers 3. “A Textbook of Electrical Technology: Volume 2 AC and DC Machines” by Theraja B. L, Theraja A.K. S. Chand,2006. | |
| **E-Resources:** | http://nptel.ac.in/courses  http://iete-elan.ac.in  <http://freevideolectures.com/university/iitm> | |