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Course Title	**Electric Machines 1**
Course Code	**EE3306**
No. of Credit Hrs (Lecture + Tutorial + Lab)	**3 (2+0+1)**
No. of Contact Hrs (Lecture + Tutorial + Lab)	**4 (2+0+2)**
Level-Year	**6-3**
Prerequisite (if any)	**EE3300**

1) Course Objectives:

This course aims at providing the basic knowledge required by practicing engineers to have a good understanding of electromechanical energy conversion principals. The different types of direct-current machines and transformers are discussed throughout this course which is necessary for the students in order to:

1. Enhance the knowledge on the main types of direct-current machines and transformers
2. Understand the main characteristics of direct-current machines and transformers
3. Be able to design direct-current machines and transformers
4. Derive the equivalent circuit of direct-current machines and transformers
5. Comprehend the main characteristics of transformers and their type and routine tests
6. understand the concept of instrument transformers.

2) Expected Learning Outcomes:

Upon completion of this course, student will be able to:

1. Summarize and evaluate the advantages and disadvantages of different methods used to control the speed of direct-current motors, engaging in continuous learning. PLO9 [7]
2. Identify and distinguish the different types of direct-current machines and transformers. PLO1 [1]
3. Create and formulate mathematical models for different types of direct-current machines and transformers. PLO4
4. Solve and analyze problems related to direct-current machines and transformers, and validate their performance. PLO1 [1]
5. Investigate and examine the different methods of controlling the speed of direct-current motors. PLO3 [6]
6. Conduct experiments on the fundamental concepts and working principles of various electrical machines, analyze results, and conclude findings. PLO3 [6]

3) Course Contents:

1. An overview of the electromagnetic energy conversion
2. Transformer types and basic principles and theory of transformers operation
3. Equivalent-Circuit and the characteristics of ideal transformer
4. Transformer's voltage regulation and efficiency calculations
5. Parameter's calculation of transformers from open circuit test and short circuit test data
6. Cooling methods of power transformer
7. Autotransformer (Step-Up and Step-Down)
8. Three-Phase Transformers
9. An overview of the electromagnetic energy conversion
10. Construction and theory of operation of direct-current machines
11. Magnetic circuit and armature reaction of direct-current machines

12. Performance analysis of the different types of direct-current generators and motors.

4) Lab content

1. Assembly and disassembly of DC machine and speed control of separately excited DC motor.
2. Study of torque vs. speed characteristics of DC shunt motor and calculation of regulation and efficiency.
3. Study of torque vs. speed characteristics of DC series motor and calculation of regulation and efficiency.
4. Transformer open/short circuit tests.
5. DC generator loaded/No-loaded performance test.

5) Teaching Methods:

- Lectures and Discussion
- Videos
- Self-learning
- Laboratory demonstrations

6) Mode of Evaluation: Course Assessment Methods

- Quizzes , Assignment, Homeworks, Reports, Presentations etc.
- Lab Work
- Mid Exam
- Final Exam

Evaluation

No	Assessment Activities *	Percentage
1.	Assignments/Quizzes/HomeWorks/Mini-Projects/Presentations/Reports+Quizzes	15%
2.	Mid Exam	25%
3.	Lab/Tutorial (Lab Exam)	10%
4.	Lab/Tutorial (Lab Reports)	10%
5.	Final Exam	40%

7) Textbook(s):

- P. C. Sen, Principles of Electric Machines and Power Electronics
- Stephen J. Chapman, Electric Machinery Fundamentals

8) References:

- Course Notes: Presentation slides is submitted to student every lecture
- Recommended Books: Theodore Wildi, Electrical Machines, Drives and Power Systems Periodicals, Web Sites, … etc: To be cited during the course