

Year

Department of Electricity and Energy / Department of Electricity and Energy /						
Course Code	Course Name	Teorical	Practice	Laboratory	Credits	ECTS
AEK110	ELECTRICAL MACHINES	3.00	1.00	0.00	4.00	4.00
Course Detail						
Course Language	: Turkish					
Qualification Degree	: PreBachelor					
Course Type	: Optional					
Preconditions	: Not					
Objectives of the Course	: The aim of this course is to provide general knowledge, calculation, and application skills related to fundamental electrical machines such as transformers, direct current (DC) motors, asynchronous motors, synchronous motors, generators, and alternators.					
Course Contents	: Introduction to Electrical Machines Transformer and Rotational Motion Analysis of Single-Phase and Three-Phase Transformers Calculation of Equivalent Circuit Parameters Three-Phase Transformer Connections Voltage Regulation Instrument Transformers Steady-State and Transient Analyses of Linear DC Machines Structure of DC Machines Commutation in DC Machines Equivalent Circuits and Types of DC Generators and Motors Mathematical Model and Transient Analysis of DC Motors Brushless DC Machines Asynchronous and Synchronous Machines Structure and Working Principle of Asynchronous Motors Equivalent Circuit and Efficiency Calculation of Asynchronous Motors Structure, Working Principle, and Equivalent Circuit Parameters of Synchronous Motors					
Recommended or Required Reading	: Lecture Notes, Bal, G. (2012). Transformers. Ankara: Seçkin Publishing. Çolak, İ. (2010). Synchronous Machines. Ankara: Seçkin Publishing. Çolak, İ. (2008). Asynchronous Motors. Ankara: Seçkin Publishing. Bal, G. (2008). Direct Current Machines and Drivers. Ankara: Seçkin Publishing. Course Materials: Computer, Projector, Electrical Machines Laboratory.					
Planned Learning Activities and Teaching Methods	: Lecture, Laboratory experiments, Demonstration and practice, Problem-solving, Hands-on application, Individual and group work, Creative thinking development					
Recommended Optional Programme Components	: Reviewing course materials in advance Taking regular notes and ensuring attendance Utilizing additional resources to better understand the working principles of devices Actively participating in laboratory applications and gaining hands-on experience with devices Engaging in experimental studies Participating in group work to foster collaborative learning Analyzing sample problem solutions thoroughly to enhance problem-solving skills Using the question-answer method to ensure a deeper understanding of the topics					
Course Instructors	: Öğr. Gör. Tahir Karakoç					
Instructor's Assistants	: Lecturer Tahir Karakoç					
Presentation Of Course	: Face to face					
Update Date	: 2/7/2026 11:39:31 PM					
Dosya İndirilme Tarihi	: 2/7/2026					

Course Outcomes	
Upon the completion of this course a student :	
1	Can explain the transformer structure, property, equivalent circuit, connections and working principle.
2	Can describe the structure, properties and working principles of single and three-phase asynchronous motors.
3	Can explain the structure, properties and operating principle of synchronous machines and universal motors.
4	Can explain the structure, properties, equivalent circuits and working principles of direct current machines.
5	Can choose the appropriate motor according to the need.

Pre / Side Conditions							
Course Code	Course Name	Condition	Teorical	Practice	Laboratory	Credits	ECTS

Weekly Contents						
	Teorical	Practice	Laboratory	Preparation Info	Teaching Methods	Course Learning Outcomes
1.Week	*Basic Concepts and Electromagnetic Laws	*Experimental demonstration of the Law of Induction	*Magnetic field and the law of induction	*Ders notunun 1-8 sayfalar arasındaki bilgilere ön çalışma	*Explanation, Question-Answer and Problem Solving	Ö.Ç.1 Ö.Ç.2 Ö.Ç.3 Ö.Ç.4
2.Week	*Basic Concepts and Electromagnetic Laws	*Demonstration of the Law of Induction with Experiment	*Magnetic Field and Law of Induction	*Do some preliminary work on pages 9-17 of the course notes.	*Comprehension, Question-Answer and Problem Solving	Ö.Ç.1 Ö.Ç.2 Ö.Ç.3 Ö.Ç.4
3.Week	*Structure, working principle and types of transformers	*Connection and operation of transformers to the grid	*Structure, working principle and types of transformers	*Working on pages 18-39 of the course resource	*Explanation, Problem solving, Application	Ö.Ç.1
4.Week	*Transformer equivalent circuits and efficiency calculation	*Trafonun boşa, yükte ve kısa devre deney bağlantıları	*Operation of transformers in idle, on load and short circuit	*Working between pages 40-62 of the course resource	*Explanation, Application, Problem Solving	Ö.Ç.1
5.Week	*Explanation of star, delta and zigzag connection groups of three-phase transformer windings.	*Making star, delta and zigzag connections of three-phase transformer windings	*Star, delta and zigzag connections of three-phase transformer windings	*Study pages 63-84 of the course notes.	*Explanation, Practice, Question-Answer	Ö.Ç.1 Ö.Ç.2
6.Week	*Definition, Structure, Types, and Working Principle of Asynchronous Machines	*Connecting the asynchronous machine to the network	*Operating an Asynchronous Machine as a Motor	*Study pages 110-122 of the course notes.	*Explanation, practice, question and answer	Ö.Ç.2 Ö.Ç.5
7.Week	*Testing and analysis of characteristics of asynchronous motors under idle, short circuit and loaded operating conditions.	*Carrying out no-load, load and short circuit tests of asynchronous motor	*Asynchronous motor no-load, load and short circuit tests	*Study pages 123-134 of the course notes.	*Lectures, Problem Solving and Q&A	Ö.Ç.2 Ö.Ç.5
8.Week	*Midterm Exam					
9.Week	*Calculation of equivalent circuit parameters of asynchronous motors.	*Necessary experiments to obtain the equivalent circuit parameters of asynchronous motors	*Obtaining equivalent circuit parameters of asynchronous motors	*Study pages 135-146 of the course notes.	*Narration and problem solving	Ö.Ç.2
10.Week	*Power losses, efficiency and torque calculations in asynchronous motors.	*Finding power losses and efficiency in asynchronous motors by connecting to the grid	*Power losses in asynchronous motors and direct obtaining of efficiency	*Study pages 147-158 of the course notes.	*Explanation, application, problem solving	Ö.Ç.2 Ö.Ç.5
11.Week	*Explanation of the structure, types and working principle of direct current machines.	*Investigation of the structure and parts of a direct current machine	*Investigation of the structure and parts of a direct current machine	*Study pages 83-91 of the course notes.	*Lecture, question and answer, practice	Ö.Ç.4 Ö.Ç.5
12.Week	*No-load and load operating characteristics of DC motors	*DC motors idle and load operation tests	*Investigation of the idle and load operating characteristics of DC motors	*Ders notunun 92-101 sayfalarına çalışmak.	*Explanation, problem solving and application	Ö.Ç.4 Ö.Ç.5
13.Week	*Losses, Efficiency and Torque Calculations in Direct Current Machines.	*Connecting the direct current machine to the network	*Direct determination of efficiency in direct current machines	*Study pages 102-109 of the course notes.	*Explaining, problem solving and practicing	Ö.Ç.4
14.Week	*Structure, types and working principle of synchronous machines.	*Connecting the synchronous machine to the network	*Starting the synchronous machine	*Study pages 159-177 of the course notes.	*Explanation, question and answer, practice	Ö.Ç.3
15.Week	*Tests and specifications of alternators.	*Investigation of operating characteristics of the alternator	*Operating characteristics of the alternator	*Study pages 178-194 of the course notes.	*Explanation, problem solving, application	Ö.Ç.3 Ö.Ç.3

Assesment Methods %
1 Ara Sınav : 40.000
3 Final : 60.000

ECTS Workload			
Activities	Count	Time(Hour)	Sum of Workload
Vize	1	1.00	1.00
Ara Sınav Hazırlık	5	3.00	15.00
Final	1	1.00	1.00
Laboratuvar	2	1.00	2.00
Derse Katılım	3	1.00	3.00
Ders Öncesi Bireysel Çalışma	5	1.00	5.00
Alan Çalışması	5	2.00	10.00
Teorik Ders Anlatım	14	4.00	56.00
Uygulama / Pratik	3	2.00	6.00
Final Sınavı Hazırlık	7	3.00	21.00
Total :			120.00
Sum of Workload / 30 (Hour) :			4
ECTS :			4.00

Program And OutcomeRelation														
	P.O.1	P.O.2	P.O.3	P.O.4	P.O.5	P.O.6	P.O.7	P.O.8	P.O.9	P.O.10	P.O.11	P.O.12	P.O.13	P.O.14
	P.O. 1	P.O. 2	P.O. 3	P.O. 4	P.O. 5	P.O. 6	P.O. 7	P.O. 8	P.O. 9	P.O. 10	P.O. 11	P.O. 12	P.O. 13	P.O. 14
L.O. 1	5	1	2	1	3	1	1	1	0	0	2	3	5	2
L.O. 2	5	1	2	1	3	1	1	1	0	0	2	3	5	3
L.O. 3	5	1	2	1	3	1	1	1	0	0	2	2	5	2
L.O. 4	5	1	2	1	3	1	1	1	0	0	2	2	5	2
L.O. 5	4	1	2	1	5	2	2	2	0	0	3	4	4	5
Avarage	9.20	3.40	6.60	4.00	8.00	4.20	5.40	3.20	2.40	1.00	5.80	5.40	9.40	6.00

Ders/Program Çıktıları İlişkisi														
P.O. 1	P.O. 2	P.O. 3	P.O. 4	P.O. 5	P.O. 6	P.O. 7	P.O. 8	P.O. 9	P.O. 10	P.O. 11	P.O. 12	P.O. 13	P.O. 14	
22	12	23	15	23	15	21	10	12	5	18	13	23	16	

BEWARE OF PLAGIARISM! Please pay attention to proper academic citation rules and avoid plagiarism, an unethical and academically fraudulent behavior, when completing reports, assignments, or other academic works, and it is treated with the same disciplinary action as cheating in a classroom setting. It is imperative to refrain from presenting another person's ideas, language, expressions, or any other form of intellectual property as your own. Regardless of quality, your assignments/projects/research should reflect your original work. Perfection is not a requirement, and in case of any uncertainties regarding academic writing guidelines, you may seek clarification from your course instructor.

Engel Durumu/Uyarlama Talebi : Engel durumuna ilişkin herhangi bir uyarlama talebinde bulunmak isteyen öğrenciler, dersin öğretim elemanı ya da Nevşehir Engelli Öğrenci Birimi ile en kısa sürede iletişime geçmelidir.