OSTİM TECHNICAL UNIVERSITY
INSTITUTE OF SCIENCES
ELECTRICAL AND ELECTRONICS ENGINEERING
COURSE SYLLABUS
2023-2024 SPRING

EEE304 ELECTRICAL MACHINES

Course Name	Code	Semester	Theory (hour/week)	Application (hour/week)	Lab (hour/week)	Credits	ECTS
Electrical Machines	EEE304	Spring	3	0	2	4	4

Course Language	English
Course Type	Compulsory
Course Level	Undergraduate
Mode of Delivery	In class lectures
Course Lecturer(s)	Dr. Hüseyin KÖSE
Teaching Methods and Techniques of the Course	Lectures, homework

Course Objectives

To learn the principles of electromechanical energy conversion and to use these principles to teach how electrical machines work; operation principles, applications and control methods of transformers, dc and ac machines; special electrical machines.

Learning Outcomes

Students who succeed this course:

1. Understand the basic concepts of electromechanical energy conversion and use these concepts in solving problems.
2. Understand the operation principles of single and three phase transformers and analyze their performance.
3. Understand the rotating field concept.
4. Understand the operation principles of alternating current and direct current machines, and are be able to conduct performance analysis of these machines by using these principles with the use of equivalent circuit.
5. Carry out simple electromechanical system designs

Course Description

Electromagnetic circuits. Electromechanical energy conversion. Single-phase and three-phase transformers. DC motors and generators: principles of operation, speed control. Rotating magnetic fields and three-phase windings. Induction machines: principles of operation, equivalent circuit, speed control. Synchronous machines: equivalent circuit, state characteristics, synchronization. Special electrical machines.

Subjects and Related Preparation Studies	
Week	**Subjects**
1	INTRODUCTION: Definition of electromechanical energy conversion. Review of basic laws. Basic methods and concepts that are necessary in the analysis of magnetic circuits. Magnetic analysis of Inductors and transformers.
2	TRANSFORMERS: Operation principles and applications of single-phase transformers. Ideal and non-ideal transformers. Three phase transformers. Autotransformers and Scot-type transformers.
3	TRANSFORMERS: Calculation of equivalent circuit parameters.
4	TRANSFORMERS: Power Losses, efficiency and regulation of transformers. Examples.
5	DC MACHINES: DC machine fundamentals. Induced voltage and torque equations. Equivalent circuit.
6	DC MACHINES: Separately excited, shunt, series and compound dc machines. Speed and voltage regulation and efficiency. Permanent magnet dc machines.
7	DC MACHINES: Example questions and solutions about DC machines.
8	**Midterm Exam**
10	AC MACHINES: AC machine fundamentals. Rotating fields and pole concept. MMK and flux distributions. Voltage and torque generation.
11	SYNCHRONOUS MACHINES: Principles and construction. Equivalent circuit and analysis. Phasor analysis. Power and torque relationship. Operation under load.
12	THREE PHASE INDUCTION MOTORS: Operation principles and structure. Types of IMs. Analysis through equivalent circuit. Calculation of equivalent circuit parameters. Speed control.
13	SINGLE PHASE INDUCTION MOTORS: Operation principles and types. Calculation of equivalent circuit parameters and analysis. Application areas.
14	INDUCTION MOTORS: Example questions and solutions about induction machines.
15	OTHER SPECIAL MOTORS: Operation principles of reluctance motors, universal motor, step motor, hysteresis motor and other special purpose motors.
16	**Project Exam, Presentations.**

Course Notes/Textbooks

1. Stephen J. Chapman.,4th ed, Electric Machinery Fundamentals, McGraw Hill
2. Lecturer notes in the lesson.

Evaluation System		
Semester Activities	**Number**	**Weighting**
Participation		
Laboratory	16	10%
Application		
Field Work		
Portfolio		
Quizzes / Studio Critiques		
Homework / Assignments		
Presentation		
Project		
Report		
Seminar		
Midterm	1	30%
Final	1	60%
	Sum	**100 %**
Weighting of Semester Activities on the Final Grade		40 %

Weighting of End-of-Semester Activities on the Final Grade		60 %
	Sum	**100 %**

Course Category	
Core Courses	x
Major Area Courses	x
Supportive Courses	
Media and Management Skills Courses	
Transferable Skill Courses	x

Course Learning Outcomes and Program Qualifications Relationship							
No	**Program Competencies/Outcomes**	**Contribution Level**					
		1	**2**	**3**	**4**	**5**
1	Ability to apply knowledge of mathematics, science, and engineering					x
2	Ability to design and conduct experiments and to analyze and interpret experimental results.				x	
3	Ability to design a system, component, and process according to specified requirements.					x
4	Ability to work in teams in interdisciplinary areas.			x		
5	Ability to identify, formulate and solve engineering problems.					x
6	Identifies, defines, formulates and solves complex network problems; chooses and applies analysis and modeling methods suitable for this purpose.				x	
7	Develops, selects and uses modern techniques and tools necessary for the analysis and solution of complex problems encountered in Electrical and Electronics Engineering applications; uses required technologies effectively.			x		

ECTS / Workload Table			
Semester Activities	**Number**	**Duration (Hours)**	**Workload**
Theoretical Course Hours (Including exam week: 16 x total hours)	16	3	48
Laboratory	16	2	32
Application			
Portfolio			
Field Work			
Study Hours Out of Class			
Presentation			
Project			
Reports			
Homework/Assignments			
Quizzes / Studio Critiques			
Midterms	1	20	20
Final Exam	1	20	20
Total	**(ECTS 120/25 = 4.8)**		**120**