OSTİM TECHNICAL UNIVERSITY
INSTITUTE OF SCIENCES
ELECTRICAL & ELECTRONICS ENGINEERING
COURSE SYLLABUS
2022-2023 FALL

EEE403 Power Electronics							
Course Name	**Code**	**Semester**	**Theory (hour/week)**	**Application (hour/week)**	**Lab (hour/week)**	**Credits**	**ECTS**
Power Electronics	EEE403	Fall	3	0	0	3	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, Homeworks

Course Objectives

The objective of this course is to learn the operation principles of the line frequency power converters and power devices, and analysis and design of these converters.

Learning Outcomes

Having successfully completed this course, students will be able to:
LO-1: Understand the concept of power control through switching.
LO-2: Understand the basic operation principles of power semiconductors used in line frequency power conversion circuits and can perform basic calculations.
LO-3: Can identify the basic rectifier topologies used in line frequency converters and can analyze these converters.
LO-4: Can design rectifier circuits to meet certain requirements and can select power devices considering realistic conditions.
LO-5: Know the meaning and ideal values of certain parameters to evaluate the performance of converters.
LO-6: Can identify the basic dc-dc converter topologies used in converters and can analyze these converters.
LO-7: Can design dc-dc converter circuits to meet certain requirements and can select power devices considering realistic conditions.

Course Description

Basic characteristics and operation principles of thyristors and diodes. Single phase and three phase rectifiers. Uncontrolled, semi-controlled and controlled rectifiers. Non-idealities in rectifiers. Harmonics at the input and output of the converters. Input power factor. Transformer utilization and unbalances. AC voltage controllers. Line frequency rectifier applications. DC-DC converter topologies and working principles.

Subjects and Related Preparation Studies	
Week	**Subjects**
1	Application areas of power electronics and introduction basic principles
2	Review of basic techniques used in power electronics (Fourier analysis, transient circuit analysis)
3	Operation principles and characteristics of diodes and thyristors
4	Analysis of single phase diode rectifier topologies
5	Analysis of single phase thyristor rectifier topologies
6	Analysis of three phase rectifiers: Uncontrolled rectifiers
7	Analysis of three phase rectifiers: Controlled rectifiers
8	12-pulse and 18-pulse rectifiers
10	Analysis of resistive Op-Amp circuits
11	DC-DC conversion theory and circuits
12	Analysis of Buck type DC-DC converters
13	Analysis of Chopper circuits
14	Analysis of Boost type DC-DC converters
15	Example problems and solutions
16	Final Exam

Course Notes/Textbooks

1. Power Electronics: circuits, devices, and applications; M. Rashid, Prentice-Hall, 2013
2. Power Electronics: Converters, Applications, and Design; N. Mohan, Tore Undeland, William P. Robbins

Evaluation System		
Semester Activities	**Number**	**Weighting**
Participation		
Laboratory		
Application		
Field Work		
Portfolio		
Quizzes / Studio Critiques		
Homework / Assignments	1	20%
Presentation		
Project		
Report		
Seminar		
Midterm	1	40%
Final	1	40%
	Sum	**100 %**
Weighting of Semester Activities on the Final Grade		60 %
Weighting of End-of-Semester Activities on the Final Grade		40 %
	Sum	**100 %**

Course Category	
Core Courses	x
Major Area Courses	x
Supportive Courses	x
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			
Application			
Portfolio			
Field Work			
Study Hours Out of Class			
Presentation			
Project			
Reports			
Homework/Assignments	1	20	20
Quizzes / Studio Critiques			
Midterms	1	20	20
Final Exam	1	20	20
Total	**(ECTS 108/25 = 4.32)**		**108**