

**ABDULLAH GÜL UNIVERSITY  
GRADUATE SCHOOL OF ENGINEERING & SCIENCE  
ELECTRIC AND COMPUTER ENGINEERING PROGRAM  
COURSE DESCRIPTION AND SYLLABUS**

Course Title	Code	Semester	T+L Hours	Credit	ECTS
Electric Power Distribution System Engineering	ECE-553	FALL-SPRING	3 + 0	3	10

**Prerequisite Courses** None

<b>Type</b>	Selective
<b>Language</b>	English
<b>Coordinator</b>	Assist. Prof Dr. Ahmet Onen
<b>Instructor</b>	Assist. Prof Dr. Ahmet Onen
<b>Adjunt</b>	none
<b>Aim</b>	Power distribution system modelling, primary and secondary system, voltage control and capacitor control and usage of a programming language during the course of these analysis.
<b>Learning Outcomes</b>	<ul style="list-style-type: none"> <li>• learn the operating principles of distribution systems</li> <li>• learn the the operating principles of distribution transformers</li> <li>• learn the techniques of designing distribution substation</li> <li>• learn the the operating principles of primary systems</li> <li>• learn how to calculate of power losses and voltage drop</li> <li>• learn application of capacitors in distribution systems</li> <li>• learn how to mitigate harmonic into distribution system and designing harmonic filters</li> </ul>
<b>Course Content</b>	<ul style="list-style-type: none"> <li>• Introduction to Distribution Systems</li> <li>• Load Characteristics and Nature of Loads</li> <li>• Application of Distribution Transformers</li> <li>• Design of Subtransmission Lines and Distribution Substation</li> <li>• Design Considerations of Primary Systems</li> <li>• Design Considerations of Secondary Systems</li> <li>• Voltage Drop and Power Loss Calculations</li> <li>• Application of Capacitors to Distribution Systems</li> <li>• Distribution System Voltage Regulation</li> <li>• Power System Harmonics</li> <li>• Distributed generators (if time allowed)</li> </ul>

**WEEKLY TOPICS AND PRELIMINARY STUDY**

Week	Topic	Preliminary Study
1	Introduction to Distribution systems: Demand, Demand factor, Diversity factor, Plant factor, utilization factor, loss factor, annual peak	
2	Load Characteristics: Customer class type load, residential, commercial load, constant current, constant power and constant impedance loads	
3	Distribution Transformer design: learning type of distribution transformer and their characteristics	
4	Distribution Transformer applications: Operating principles of distribution transformer	
5	Design of distribution substation: Operating principles, analysis and design criterias	
6	MIDTERM EXAM 1	
7	Primary distribution Systems: Operation principle of primary distribution system and their differences from secondary systems	
8	Secondary distribution Systems: Operation principle of secondary distribution system and their differences from primary systems	
9	Voltage Drop and Power Loss Calculations: Voltage drops and transient effects on voltage and calculation of losses with voltage drops	
10	Application of Capacitors: compensation of reactive power by using capacitors, capacitor calculation and usage in distribution systems	
11	MIDTERM EXAM 2- or review of presentation	
12	Distribution System Voltage Regulation: importance of voltage regulation, how to regulate voltage by using voltage regulator or oher control devices	

13	Power System Harmonics: what makes harmonic, total distortion calculation of current and voltage with respect to harmonic	
14	Power distribution system power quality: power quality problem with harmonic and elimination of harmonics, voltage flicker and arc flash study	
15	Distributed generators: Usage of controlled distributed generation and their entegration into the systems.	
16	Final Exam	

#### SOURCES

<b>Lecture Notes</b>	Lecture slides
<b>Other Sources</b>	1. "Electric Power Distribution Engineering", Turan Gonen, 3rd Edition, 2014, CRC Press. RECOMMENDED BOOKS: 1. Class Notes from AGU

#### COURSE MATERIALS SHARING

<b>Documents</b>	Lecture notes, slides
<b>Homeworks</b>	Students will be given one homework each week
<b>Exams</b>	1 Midterm and 1 Final Exam

#### EVALUATION SYSTEM

SEMESTER STUDY	NUMBER	CONTRIBUTION
Midterm	1	20
Homework	14	25
Quiz	14	25
<b>SUB-TOTAL</b>		70
<b>Contribution of Semester Study</b>		70
<b>Contribution of Final Exam</b>	1	30
<b>TOTAL</b>		100

#### Course Category

Sciences and Mathematics	30%
Engineering	70%
Social Sciences	0%

#### RELATIONSHIPS BETWEEN LEARNING OUTCOMES AND PROGRAM QUALIFICATIONS

No Program Qualifications		Contribution Level				
		1	2	3	4	5
1	The skills of using mathematics, science and engineering information in advanced research,					<b>X</b>
2	The skills of analyzing, designing and/or implementing an original system that will be able to solve an engineering problem,					<b>X</b>
3	The skills of using the required software, hardware and modern measurement equipments in their field of research,					<b>X</b>
4	The skills of planning independent research and implementing in detail,					<b>X</b>
5	The skills of following literature, listening to and making technical presentation, writing a paper in academic level,				<b>X</b>	
6	The skills of innovative and interrogative thinking and finding original solutions				<b>X</b>	

\*Increasing from 1 to 5.

#### ECTS / WORK LOAD TABLE

Activities	Number	Duration (Hours)	Total Work Load
Course Length (includes exam weeks: 16x total course hours)	16	3	48
Out-of-class Study Time (Pre-study, practice)	16	5	90
Internet search, library work, literature search	16	4	64

Presentation	7	3	21
Homework	16	4	64
Midterm	1	15	15
Final Exam	1	20	20
<b>Total Work Load</b>			322
<b>Total Work Load / 30</b>			322/30
<b>Course ECTS Credit</b>			10