

<b>EEE3024</b>	<b>HIGH VOLTAGE TECHNIQUES</b>	<b>3+0+0</b>	<b>ECTS: 3</b>
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<b>Year / Semester</b>	Spring (Fall for 30% English Program)
<b>Course Level</b>	Undergraduate 3rd year
<b>Compulsory / Elective</b>	Compulsory
<b>Department</b>	Electrical and Electronics Engineering
<b>Prerequisite</b>	Power Systems
<b>Education system</b>	Face to face
<b>Course Duration</b>	14 weeks – 3 hours per week
<b>Faculty Member</b>	Prof. Dr. İsmail H. ALTAŞ
<b>Alternative Faculty Member</b>	None
<b>Language of Instruction</b>	English
<b>Internship</b>	Not applicable

### OBJECTIVES OF THE COURSE

The students are subject to learn general structure of HV power systems, main components in HV transmission such as towers, lines, cables, circuit breakers, sectionizers, switches, insulators, surge arresters, arc horns, corona rings, power transformers, measurement transformers, HV transmission line parameters, insulation materials, gasses in HV, electrical field in HV, HV generation and testing, electrical breakdown in gasses, breakdown in solid and liquid dielectrics.

<b>Learning Outcomes</b>	<b>CTPO</b>	<b>MEM</b>
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Upon successful completion of the course, the students will be able to :

LO - 1 : General structure of HV power systems	4	1
LO - 2 : Main components used in HV transmission	4,8	1
LO - 3 : Power transformers	3	1
LO - 4 : Measurement transformers	3,4	1
LO - 5 : Transmission line parameters	3,4	1
LO - 6 : Insulation materials and breakdown in solid and liquid dielectrics	2,3	1
LO - 7 : Gasses in HV and breakdown in gasses.	2,3	1

*CTPO: Contribution to department program outcomes, MEM: Measurement and evaluation method (1: Written Exam, 2: Oral Exam, 3: Homework, 4: Laboratory Study/Exam, 5: Seminar / Presentation, 6: Term Paper / Project), LO: Learning Outcome.*

### Contents of the Course

General structure of HV power systems, Main components in HV transmission, Towers, Lines and cables, Circuit breakers, sectionizers, switches, Insulators, Arc horns, corona rings, Power transformers, Measurement transformers, HV transmission Line parameters, Insulation materials, Gasses in HV, Electrical field in HV, HV generation and testing

## Teaching Plan

### Week Subject

Week 1	Electric power transmission and introduction to transmission networks
Week 2	General structure of HV power systems
Week 3	Major components in HV transmission
Week 4	Power towers, Lines, cables, and Insulators
Week 5	Circuit breakers, disconnectors, Surge arresters, Arc horns, corona rings
Week 6	Power transformers
Week 7	Instrument transformers, short exam
Week 8	HV transmission Line parameters
Week 9	Midterm
Week 10	HV transmission Line parameters
Week 11	Solid and liquid Insulation materials and break down of insulation materials
Week 12	Gases, corona and discharge events in HV, short exam
Week 13	Electric field effect in HV
Week 14	HV production and testing
Week 15	Evaluation of studies during the term
Week 16	Final exam

## Text Book / Course material

- İsmail H. Altaş, unpublished lecture notes

## Additional resources

- E. Kuffel, W. S. Zaengl and J. Kuffel, *High Voltage Engineering: Fundamentals*, 2<sup>nd</sup> Edition by Butterworth-Heinemann, 2000.
- M. Abdel-Salam, *High-voltage Engineering: Theory and Practice*, CRC Pres, 2000.
- C. L. Wadhwa, *High Voltage Engineering*, New Age Publishers, 2007.
- M. Özkaya, *Yüksek Gerilim Tekniği Cilt I-II*, İTÜ yayını. Daha sonra: Birsen yayınevinde de basıldılar.
- M. Özkaya, *Yüksek Gerilim Tekniğinde Ölçme*, İTÜ yayını.

## Evaluation Method

Method	Week	Date	Duration (Hour)	Contribution (%)
Midterm	9		2	30
Short Exam	7 and 12		0.5	20
Project	15		0	0
End of term exam	16		2	50

### Student Work Load and its Distribution

Type of work	Duration (hours pw)	Number of weeks
Lectures (face to face teaching)	3	14
extracurricular work	2	10
Preparation for the Midterm Exam	2	7
Midterm	2	1
Homework	1	10
Short Exam	1	2
End of term exam	1	1
Other 1	2	1
<b>Total Work Load</b>	<b>14</b>	<b>46</b>