ELEC4102 COURSE CATALOG INFO

Course Code : ELEC4102				**Course Name :** High Voltage Techniques			
Semester	**Lecture (Le+T+L)**	**Local Credit**	**ECTS**	**Language**	**Category**	**Instructional Methods**	**Prerequisites**
7 or 8	(3+0+0)	3	5	English	Core	Lecture	ELEC2202
Course Content	Review of electromagnetic theory. Breakdown in capacitors. Breakdown in gases and liquids. Townsend's ionization. Suspended particle theory. Bubble and cavitation theory. Breakdown in solid dielectrics. Half-wave and full-wave rectifiers. Voltage doublers and multipliers. Tesla transformers. Resonant transformers. Impulse voltage generators and lightning generators. Spice simulations and Matlab for HV circuits.						
Course Outcomes	**CO 1.** Analyze and solve certain kind of problems in Electric field theory related to HV engineering. **CO 2.** Solve breakdown problems in planar, cylindrical and spherical coordinate multi-dielectric capacitors. **CO 3.** Analyze the conduction and breakdown phenomenon in gaseous dielectrics, derive the breakdown criteria for primary, secondary and electronegativity types of ionization in gaseous insulators. **CO 4.** Analyze the conduction and breakdown phenomenon in liquid dielectrics, derive the breakdown criteria using suspended particle theory, bubble and cavitation theory in liquid insulators. **CO 5.** Analyze the conduction and breakdown phenomenon in solid dielectrics, derive the breakdown criteria due to cavities in solids. **CO 6.** Analyze and design of HV DC half-wave/full-wave rectifiers, voltage doublers/multipliers, Van De Graff generators. **CO 7.** Analyze and design of HV AC generators made of cascade transformer, tesla transformers, resonant transformers, impulse voltage generators.						

COURSE PLAN	
W1	Introduction to high voltage techniques
W2	Chapter 1 – Introduction, Basics Of Electric Field Theory
W3	Chapter 1 – Introduction, Basics Of Electric Field Theory
W4	Chapter 2 – Conduction and breakdown in gases
W5	Chapter 2 – Conduction and breakdown in gases
W6	Chapter 3 – Conduction and breakdown in liquid dielectrics
W7	Chapter 3 – Conduction and breakdown in liquid dielectrics
W8	Chapter 4 – Conduction and breakdown in solid dielectrics

W9	Chapter 4 – Conduction and breakdown in solid dielectrics
W10	Chapter 6 – Generation of high voltages and currents
W11	Chapter 6 – Generation of high voltages and currents
W12	Chapter 6 – Generation of high voltages and currents
W13	Chapter 6 – Generation of high voltages and currents
W14	Chapter 6 – Generation of high voltages and currents

COURSE ASSESMENT AND ECTS WORK LOAD			
Type of Work	**Count**	**ECTS WORK LOAD**	
		Time (Hour)(Including prep. time)	**Work Load**
Attendance	14	3	42
Final Exam	1	17	17
Quizzes			0
Term project			0
Reports			0
Final Project			0
Seminar			0
Assignments	5	2	10
Presentation			0
Midterms	2	7	14
Project			0
Laboratory		0	0
Tutorial		0	0
Other(Self study, Paper reviews)	14	3	42
		Total work load	125

	Total work load/25	5
	ECTS Credit	5

PROGRAM OUTCOMES - COURSE OUTCOMES RELATIONS		
PO	**Program Outcomes**	**CO**
1	**1.1.** Adequate knowledge in fundamentals of mathematics (algebra, differential equations, integrals, probability etc), science (physics, chemistry, biology etc.) and computer science (programming and simulation);	
	1.2. ability to use theoretical and applied knowledge in these areas in complex engineering problems.	
2	**2.1.** Ability to identify, formulate, and solve complex engineering problems;	1,..,7
	2.2. ability to select and apply proper analysis and modeling methods for this purpose.	1,..,7
3	**3.1.** Ability to design and integrate components of a complex system or process, as they relate to Electrical and Electronics Engineering discipline, under realistic constraints and conditions, in such a way as to meet desired requirements;	
	3.2. ability to apply modern design methods.	
4	**4.1.** Ability to devise, select, and use techniques and tools needed for analyzing and solving complex problems encountered in engineering practice;	
	4.2. ability to employ information technologies effectively.	
5	**5.1.** Ability to design experiments,	
	5.2. ability to conduct experiments, gather, analyze and interpret data.	
6	**6.1.** Ability to work in intra-disciplinary teams;	
	6.2. ability to work in multi-disciplinary teams;	
	6.3. ability to take individual responsibilities.	
7	**7.1.** Ability to effectively communicate via written and oral means;	
	7.2. knowledge of at least one foreign language;	
	7.3. ability to write effective reports and comprehend written reports;	
	7.4. ability to write design and manufacturing reports	

	7.5. ability to present effectively,	
	7.6. ability to give and follow clear instructions.	
8	**8.1.** Recognition of the need for lifelong learning;	
	8.2. ability to access information, to follow developments in science and technology, and to continue to educate him/herself.	
9	**9.1.** Consciousness to behave according to ethical principles, and about professional and ethical responsibility;	
	9.2. knowledge on standards used in engineering practice.	
10	**10.1.** Knowledge about business life practices such as project management, risk management, and change management;	
	10.2. awareness in entrepreneurship, innovation;	
	10.3. knowledge about sustainable development.	
11	**11.1.** Knowledge about the global and social effects of engineering practices on health, environment, and safety, and contemporary issues of the century reflected into the field of engineering;	
	11.2. awareness of the legal consequences of engineering solutions.	

Revison Date	**Prepared by**	**Approved by**
1.9.2019 1.6.2021	Doç. Dr. Ramazan Köprü	Prof.Dr. Ahmet Aksen