



**ESOGU ELECTRICAL - ELECTRONICS ENGINEERING DEPARTMENT  
COURSE INFORMATION FORM**

Course Title	Course Code
Power Electronics Applications	151228516

Semester in Program	Number of Course Hours per Week		ECTS
	Theory	Practice	
8	3	0	5

Course ECTS Credit Distribution				
Basic Sciences	Engineering Sciences	Design	General Education	Social
	5			

Language of Instruction	Course Level	Course Type
English	Undergraduate	Elective

<b>Prerequisite</b>	-
<b>Objectives of the Course</b>	Having taken this course, students will learn the need for electrical conversion, and learn the goal and methods of electrical conversion. At the end of the course, students become effective designers of useful power electronics converters.
<b>Brief Course Content</b>	Switching power supplies, zero-current and zero-voltage switching, resonance converters, gate drive circuits, snubber circuits, heat sink calculations, motor drives applications, uninterruptible power supplies, power electronics applications.

Learning Outcomes of the Course	Contributed POs	Teaching Methods *	Assessment Methods **
1 Learn about the topology and the operating principles of various DC/DC converters.	1, 2, 3	1, 5, 10, 11	A
2 Learn about the topology and the operating principles of DC power supplies.	1, 2, 3	1, 5, 10, 11	A
3 Learn about the topology and the operating principles of various DC/AC inverters and resonant converters.	1, 2, 3	1, 5, 10, 11	A
4 Learn about the topology and the operating principles of drive circuits, snubber circuits and heat sinks.	1, 2, 3	1, 5, 10, 11	A
5			
6			
7			

\*Teaching Methods 1:Lecture, 2:Discussion, 3:Experiment, 4:Simulation, 5:Question-Answer, 6:Tutorial, 7:Observation, 8:Case Study, 9:Technical Visit, 10:Problem Solving, 11:Individual Work, 12:Team/Group Work, 13:Brain Storm, 14:Project Design / Management, 15:Report Preparation and/or Presentation

\*\*Assessment Methods A:Exam, B:Quiz, C:Oral Exam, D:Homework, E:Report, F:Article Examination, G:Presentation, I:Experimental Skill, J:Project Observation, K:Class Attendance; L:Jury Exam

<b>Main Textbook</b>	D. W. Hart, Power Electronics. New York, NY: McGraw-Hill Professional, ISBN 978-0-07-338067-4, 2010.
<b>Supplementary Resources</b>	N. Mohan, W. Robbins, and T. Undeland, Power electronics: Converters, applications and design, 2nd ed. Brisbane, QLD, Australia: John Wiley and Sons (WIE), ISBN: 0471584088, 1995. P. T. Krein, Elements of Power Electronics. New York, NY: Oxford University Press, ISBN: 0195117018, 1997. J. G. Kassakian, M. F. Schlecht, and G. C. Verghese, Principles of power electronics. Upper Saddle River, NJ: Pearson, ISBN: 0201096897, 1991.
<b>Necessary Course Material</b>	-

Course Weekly Schedule	
1	Introduction to power electronics applications concepts
2	DC-DC converters – single ended primary inductance converter
3	DC-DC converters – interleaved converters, nonideal switches and converter performance, and discontinuous current operation
4	DC power supplies - flyback converter
5	DC power supplies - forward converter
6	DC power supplies - double ended (two switch) forward converter and push-pull converter
7	DC power supplies - full bridge and half bridge DC-DC converters, current fed converters, converter selection, power supply control, and complete DC Power supply
8	Mid-Term Exams
9	Inverters - full bridge converter and square wave inverter
10	Inverters - half bridge inverter and multilevel inverters
11	Inverters - pulse width modulation definition, three phase inverters, and induction motor speed control
12	Resonant converters - a resonant switch converter zero-current and zero-voltage switching, and series resonant inverter
13	Resonant converters – series, parallel, and series parallel resonant DC-DC converter
14	Drive circuits
15	Snubber circuits and heat sinks
16,17	Final Exams

Calculation of Course Workload			
Activities	Count	Time (Hour)	Total Workload (Hour)
Weekly classroom time	14	3	42
Weekly study time (review, reinforcing, preparation)	14	5	70
Homework			
Taking a quiz			
Studying for a quiz			
Oral exam			
Studying for an oral exam			
Report writing (Preparation and presentation time included)			
Project (Preparation and presentation time included)			
Presentation (Preparation time included)			
Mid-Term Exam	1	2	2
Studying for Mid-Term Exam	1	15	15
Final Exam	1	2	2
Studying for Final Exam	1	15	15
<b>Total workload</b>			<b>146</b>
<b>Total workload / 30</b>			<b>4.86</b>
<b>Course ECTS Credit</b>			<b>5</b>

Assessment	
<b>Activity Type</b>	%
Mid-term	50
<b>Final Exam</b>	50
<b>Total</b>	100

**COURSE CONTRIBUTION TO THE PROGRAM OUTCOMES**

(5: Very high, 4: High, 3: Middle, 2: Low, 1: Very low)

NO	PROGRAM OUTCOMES	Contribution
1	a. Sufficient knowledge of mathematics	5
	b. Sufficient knowledge of basic sciences	5
	c. Sufficient basic engineering and Electrical-Electronics engineering knowledge	5
	d. Skill of applying all these knowledge and experience to complicated Electrical-Electronics engineering problems	5
2	Skill of defining, identifying, formulating and solving the complicated problems in Electrical-Electronics engineering and related areas by applying appropriate analysis and modelling methods.	5
3	Skill of designing a complicated process, system, equipment or product by applying modern design methods under realistic constraints and conditions.	4
4	To analyze and solve the complicated engineering problems: a. skill of developing, selecting and applying the required techniques and devices	
	b. skill of using information technologies effectively	
5	To study the complicated on the complicated Electrical-Electronics engineering problems and research subjects: a. skill of experimental design	
	b. skill of performing the experiments, collecting the data and analyzing and interpreting the results	
6	a. Skill of performing individual studies	
	b. Skill of performing intra and interdisciplinary and multidisciplinary teamwork and studies	
7	a. Skill of effective oral and writing communication in Turkish	
	b. Skill of improving and using foreign language knowledge	
	c. Skill of effective reporting, understanding the reports and preparing the design and production reports	
	d. Skill of effective presentation and giving and getting clear and understandable instructions.	
8	Awareness of the necessity of life-long learning and skill of accessing to information and following the improvements in contemporary science and technology	
9	a. Awareness of necessity of behaving in accordance with the ethical principles and awareness of the importance of having professional ethical responsibilities	
	b. Knowledge about legal regulations and standards of engineering	
10	a. Knowledge about project management, risk management and change management	
	b. Awareness of the significance of entrepreneurship and innovation	
	c. Knowledge about sustainable development	
11	Knowledge about the effects of engineering applications and practices on the global and social health, ecology and safety, knowledge about the current problems in relation to the working areas of Electrical-Electronics engineering; and awareness of the legal issues resulting from engineering solutions	
12	Knowledge about modern problems in local and universal scale	

**LECTURER(S)**

Prepared by	Dr. İpek ÇETİNBAŞ			
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Date: 18.07.2024