



## Subject card

Subject name and code	Power Converters, PG_00053923						
Field of study	Electronics and Telecommunications						
Date of commencement of studies	October 2022	Academic year of realisation of subject			2024/2025		
Education level	first-cycle studies	Subject group			Optional subject group Subject group related to scientific research in the field of study		
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	3	Language of instruction			Polish		
Semester of study	6	ECTS credits			2.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Microelectronic Systems -> Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Grzegorz Blakiewicz				
	Teachers		dr hab. inż. Grzegorz Blakiewicz				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0	0.0	30
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	Number of study hours	30		3.0		17.0	50
Subject objectives	Provide knowledge of design and optimization of basic switching converter configurations. Practical learning of principles of operation of switching converters and verification of parameters using computer simulators.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_W32] Knows the parameters, functions and methods of analysis, design and optimization of analogue and digital circuits and electronic systems		Student learnt theory and design of basic switching converters. He learned the way of selecting components for converters and measurement techniques.		[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge		
	[K6_U03] can design, according to required specifications, and make a simple device, facility, system or carry out a process, specific to the field of study, using suitable methods, techniques, tools and materials, following engineering standards and norms, applying technologies specific to the field of study and experience gained in the professional engineering environment		Student is familiar with the methods of selection of components for different switching converter configurations. In the laboratory he verified the correctness of the choice of the elements and their parameters, performed simulations to verify the correctness of the operation of the converters.		[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment		

Subject contents	<ol style="list-style-type: none"> <li>1. General characteristics of power converters</li> <li>2. Introduction to analysis of power converters</li> <li>3. Principles of operation and analysis of buck converter</li> <li>4. Principles of operation and analysis of boost converter</li> <li>5. Principles of operation and analysis of buck-boost converter</li> <li>6. Analysis of converters in discontinuous current mode</li> <li>7. Modeling of power loss in power converters</li> <li>8. Introduction to analysis of transformer power converters</li> <li>9. Principles of operation and analysis of forward converter.</li> <li>10. Principles of operation and analysis of flyback converter</li> <li>11. Principles of magnetism theory</li> <li>12. Magnetic materials and their models</li> <li>13. Inductors design methods</li> <li>14. Test</li> <li>15. Examples of inductors design</li> <li>16. Power semiconductor devices in switching power converters</li> <li>17. Small signal models of power converters</li> <li>18. Transfer functions of power converters</li> <li>19. Design of controllers for power converters</li> <li>20. Examples of controllers design for power converters</li> <li>21. Power converters electromagnetic compatibility</li> <li>22. Survey of commercial voltage regulators</li> <li>23. Final classification</li> </ol>											
Prerequisites and co-requisites	No requirements											
Assessment methods and criteria	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 40%;">Subject passing criteria</th> <th style="width: 30%;">Passing threshold</th> <th style="width: 30%;">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td>Practical exercise</td> <td>50.0%</td> <td>20.0%</td> </tr> <tr> <td>Midterm colloquium</td> <td>50.0%</td> <td>80.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Practical exercise	50.0%	20.0%	Midterm colloquium	50.0%	80.0%
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Example issues/ example questions/ tasks being completed												
Work placement	Not applicable											