



Subject card

Subject name and code	Quality of Electric Energy , PG_00016901						
Field of study	Electrical Engineering						
Date of commencement of studies	February 2023		Academic year of realisation of subject		2023/2024		
Education level	second-cycle studies		Subject group				
Mode of study	Full-time studies		Mode of delivery		at the university		
Year of study	1		Language of instruction		Polish		
Semester of study	2		ECTS credits		3.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Department of Power Electronics and Electrical Machines -> Faculty of Electrical and Control Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Jarosław Łuszcz				
	Teachers		dr hab. inż. Jarosław Łuszcz				
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		4.0		41.0	75
Subject objectives	Power Quality assessment skills						
	Power quality measurements skills						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K7_U08		the the student has the ability to assess the power quality		[SU2] Assessment of ability to analyse information		
	K7_W02		the student has the systematized knowledge in the field of electricity quality issues		[SW3] Assessment of knowledge contained in written work and projects		
	K7_U05		the student has the ability to measure the power quality and evaluate the results		[SU1] Assessment of task fulfilment		
	K7_K02		the student is aware of the effects of poor energy quality		[SK5] Assessment of ability to solve problems that arise in practice		
Subject contents	Methods of power quality indices defining. Sources of harmonics and inter-harmonics in power system. Influence of power electronics converters on power quality. Methods of power quality improvement - passive and active filtering. Simulation analysis of non-linear load on voltage quality. Analysis of exemplary power quality long-term-recording data.						
Prerequisites and co-requisites							
Assessment methods and criteria	Subject passing criteria		Passing threshold		Percentage of the final grade		
	Analysis and test report		50.0%		25.0%		
	Midterm colloquium		50.0%		25.0%		
	Semester/diploma dissertation		50.0%		50.0%		

Recommended reading	Basic literature	<ol style="list-style-type: none"> 1. Kowalski Z.: Jakość energii elektrycznej. Wyd. Politechniki Łódzkiej 2007. 2. Strzelecki R., Benysek G.: Power Electronics in Smart Electrical Energy Networks. Springer 2008. 3. Strzelecki R., Supronowicz H.: Współczynnik mocy w systemach zasilania prądu przemiennego i metody jego poprawy. Wyd. Politechniki Warszawskiej 2007. 4. A. Kempki: Elektromagnetyczne zaburzenia przewodzone w układach napędów przekształtnikowych. Oficyna Wydawnicza Uniwersytetu Zielonogórskiego 2005. 5. R. Smoleński: Conducted Electromagnetic Interference (EMI) in Smart Grids. Springer 2012. 6. Gregorio Romero Rey and Luisa Martinez Muneta (Ed.) Power Quality Harmonics Analysis and Real Measurements Data . , Croatia : InTech, 2011. 7. Ahmed Zobaa, Mario Manana Canteli and Ramesh Bansal: Power Quality Monitoring, Analysis and Enhancement. InTech 2011.
	Supplementary literature	<ol style="list-style-type: none"> 1. Baggini A.: Handbook of Power Quality. John Wiley & Sons 2008. 2. Benysek G.: Improvement in the Quality of Delivery of Electrical Energy using Power Electronics Systems. Springer 2007. 3. Hanzelka Z., Bień A.: Power quality application guide : harmonics, interharmonics. European Copper Institute, Brussels 2004.
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	Analysis of long term record of power quality indices	
Work placement	Not applicable	