GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Quality of Electric Energy, PG_00038377		
Field of study	Electrical Engineering		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2026/2027
Education level	second-cycle studies	Subject group	Specialty subject group Subject group related to scientific research in the field of study
Mode of study	Part-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 -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Jarosław Łuszcz	
	Teachers	dr hab. inż. Jarosław Łuszcz	

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	10.0	0.0	10.0	0.0	0.0	20

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	20	5.0	50.0	75

Subject objectives

The aim of the course is to provide knowledge on determining the state of power quality in the supply network, the causes of its degradation and methods of improvement.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W02] has an in-depth and structured knowledge of electrical measurements electrical measurements, the methods and equipment used for electrical measurements of non-electrical quantities, he/she knows the principles of testing operation tests of electrical equipment, has a structured knowledge of electricity quality issues	applies systematized knowledge in the field of electrical energy quality issues	[SW1] Assessment of factual knowledge
[K7_U08] be able to carry out tests on electrical power equipment, analyse disturbances in electrical power systems, record and assess the quality of electricity in the power network	assess power quality	[SU1] Assessment of task fulfilment
[K7_U05] is able to select equipment and carry out electrical measurements, design measuring systems for the determination of nonelectrical quantities, and analyse the results obtained	performs power quality measurements and evaluates measurement results	[SU1] Assessment of task fulfilment
[K7_K02] is aware of the impact of engineering activities on the environment, understands the the non-technical effects of those activities	assesses the impact of poor energy quality on the electromagnetic environment.	[SK5] Assessment of ability to solve problems that arise in practice

Subject contents	Course content – lecture LECTURE Methods of determining power quality parameters. Analysis of exemplary results of long-term recording of power quality. Sources of harmonic and inter-harmonic distortions in the power system. The impact of power electronic converter systems on the quality of power. Methods of improving power quality - passive and active filtration. Course content – laboratory LABORATORY Real-time measurements of power quality parameters. Analysis of recorded power quality parameters. Study of harmonic distortions generated by lighting devices. Study of harmonic distortions generated by AC/DC power supplies. Passive and active filtration of harmonic distortions. Study of harmonic distortions generated by adjustable speed drives.
Prerequisites and co-requisites	

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Midterm colloquium	50.0%	25.0%
Analysis and test report	50.0%	25.0%
Semester/diploma dissertation	50.0%	50.0%

Recommended reading

Basic literature

1. Hanzelka, Zbigniew, Jakość dostawy energii elektrycznej: zaburzenia wartości skutecznej napięcia. Komitet Elektrotechniki Polskiej Akademii Nauk. Kraków: Wydawnictwa AGH, 2013.
2. Kowalski, Zbigniew, Jakość energii elektrycznej. Łódź: Wydawnictwo Politechniki Łódzkiej, 2007.
3. R. C. Dugan, M. F. McGranaghan, S. Santoso, H. W. Beaty 2012: Electrical Power Systems Quality, 3th edition, The McGraw-Hill Companies, Inc., NY, USA, 2012, ISBN 978-0071761550.
4. Baggini, A.B. Handbook of Power Quality; Wiley Online Library: Hoboken, NJ, USA, 2008; ISBN 9780470065617.

Supplementary literature

1. Łuszcz, Jarosław, Ed., Power Quality Issues in Distributed Generation. InTech, Oct. 21, 2015. doi: 10.5772/59895.
2. G. Romero, Ed., Power Quality Harmonics Analysis and Real Measurements Data. InTech, Nov. 23, 2011. doi: 10.5772/699.
3. Łuszcz, Jarosław, Voltage Harmonics Measuring Issues in Medium Voltage Systems. Power Quality Harmonics Analysis and Real Measurements Data, InTech, 23 Nov. 2011. Crossref, doi: 10.5772/16411.
4. A. Zobaa, Ed., Power Quality Issues. InTech, Apr. 17, 2013. doi: 10.5772/3373.
5. Łuszcz, Jarosław, High Frequency Harmonics Emission in Smart Grids. Power Quality Issues, InTech, 17 Apr. 2013. Crossref, doi: 10.5772/52874.
6. Hanzelka, Zbigniew i in. Instalacje fotowoltaiczne w systemie elektroenergetycznym: jakość dostaw energii elektrycznej, warunki techniczne przyłączenia instalacji PV. Warszawa: PWN, 2024.
7. Wasiak, Irena. Sterowanie jakością energii elektrycznej w elektroenergetycznych sieciach rozdzielczych z wykorzystaniem półprzewodnikowych kompensatorów równoległych. Łódź: Wydawnictwo Politechniki Łódzkiej, 2006.
8. *Zbigniew Hanzelka i Andrzej Firlit Ed, Elektrownie ze źródłami odnawialnymi: zagadnienia wybrane.* Kraków: Redakcja Wydawnictw AGH, 2015.
9. Smolarczyk, Adam i in. *Harmoniczne w systemach elektroenergetycznych.* Wydanie I. Warszawa: Oficyna Wydawnicza Politechniki Warszawskiej, 2023.
10. Strzelecki, Ryszard, and Grzegorz Benysek Ed., Power Electronics in Smart Electrical Energy Networks. London: Springer, 2008.
11. Benysek, Grzegorz, and Marian Pasko Ed., *Power Theories for Improved Power Quality.* New York: Springer, 2012.
12. Bak-Jensen, Birgitte, and Birgitte Bak-Jensen. *Distribution Power Systems and Power Quality*. Basel, Switzerland: MDPI 2020.

eResources addresses

Example issues/ example questions/ tasks being completed	Analysis of long term record of power quality indices
Practical activites within the subject	Not applicable