



COURSE CARD

1. Basic information

Course name in English:	Control and Reliability of Electrical Power System	
Course name in Polish:	Zarządzanie i niezawodność systemu elektroenergetycznego	
Number of hours:	15	
Type of course:	Elective course	
Form of course:	mixed forms (combination of lecture, seminar and laboratory)	
Code of course:		
Course leader:	prof. Ing. Radomír Goňo, Ph.D.	
Faculty of the course leader:	W5 Faculty of Electrical Engineering	
Email address of the course leader:	radomir.gono@pwr.edu.pl	
Scientific discipline(s) assigned to the course (doctoral students representing the marked disciplines can participate in the course):	Architecture and urban planning	<input type="checkbox"/>
	Automation, electronic, electrical engineering and space technologies	<input checked="" type="checkbox"/>
	Information and communication technology	<input type="checkbox"/>
	Biomedical engineering	<input type="checkbox"/>
	Chemical engineering	<input type="checkbox"/>
	Civil engineering, geodesy and transport	<input type="checkbox"/>
	Materials engineering	<input type="checkbox"/>
	Mechanical engineering	<input type="checkbox"/>
	Environmental engineering, mining, and energy	<input type="checkbox"/>
	Mathematics	<input type="checkbox"/>
	Chemical sciences	<input type="checkbox"/>
	Physical sciences	<input type="checkbox"/>
Management and quality studies	<input type="checkbox"/>	

2. Objectives

The course objectives are expressed by student acquired skills and competences. They will be able to reproduce and apply theory of frequency control in transmission system, theory of voltage control in transmission and distribution networks, theory of transformer, compensator and generator function with view to voltage control. Students will be able to use reliability computations in relation to electric power system.

3. Content

Detailed information about the course content, including topics and form of classes.

No.	Topic	Number of hours	Form of classes
1	Frequency control	2	lecture



2	Voltage control	1	lecture
3	Ripple Control	1	lecture
4	Protections	2	lecture
5	Stability	1	lecture
6	Transformer, compensator and generator	1	lecture
7	Grid code	1	lecture
8	Reliability of electric power supply	2	lecture
9	Calculation of examples	4	seminar
10			Select form
11			Select form
12			Select form
13			Select form
14			Select form
15			Select form

4. Prerequisites

List of prerequisites relating to knowledge, skills and other competences for course participants.

Basic knowledge of electrical engineering

5. Learning outcomes

List of learning outcomes at level 8 of the Polish Qualifications Framework assigned to the course (mark the learning outcomes in the last column).

Symbol	Learning outcome	
	<i>KNOWLEDGE. Doctoral student knows and understands:</i>	
SzD_W3	the main trends in the development of the scientific or artistic disciplines covered in the curricula;	<input checked="" type="checkbox"/>
SzD_W4	research methodology;	<input checked="" type="checkbox"/>
SzD_W5	the rules for the dissemination of scientific results, including in open access mode;	<input type="checkbox"/>
SzD_W6	the fundamental dilemmas of modern civilization;	<input type="checkbox"/>
SzD_W7	the legal and ethical conditions of scientific activity;	<input type="checkbox"/>
SzD_W8	the economic and other relevant conditions of scientific activity;	<input type="checkbox"/>
SzD_W9	basic principles of knowledge transfer to the economic and social spheres and commercialisation of results of scientific activity and know-how related to these results.	<input checked="" type="checkbox"/>
	<i>SKILLS. Doctoral student is able to:</i>	
SzD_U2	use knowledge from different fields of science or art to creatively identify, formulate and innovatively solve complex problems or perform research tasks, in particular: - define the purpose and subject of scientific research, formulate a research hypothesis, - develop research methods, techniques and tools, and use them creatively,	<input checked="" type="checkbox"/>



	- draw conclusions on the basis of scientific research; critically analyse and evaluate the results of scientific research, expertise and other creative work and their contribution to knowledge development; transfer the results of scientific activities to the economic and social spheres;	
SzD_U3	communicate on specialised topics to the extent that they enable an active participation in the international scientific community;	<input checked="" type="checkbox"/>
SzD_U4	disseminate research results, including in popular forms;	<input checked="" type="checkbox"/>
SzD_U5	initiate debates and participate in a scientific discourse;	<input checked="" type="checkbox"/>
SzD_U6	be able to speak a foreign language at B2 level of the Common European Framework of Reference for Languages to a level that enables them to participate in the international scientific and professional environment;	<input checked="" type="checkbox"/>
SzD_U7	plan and implement an individual or collective research or creative activity, including in an international environment;	<input checked="" type="checkbox"/>
SzD_U8	independently plan and act for one's own development and inspire and organize the development of others;	<input type="checkbox"/>
SzD_U9	plan classes or groups of classes and implement them using modern methods and tools.	<input type="checkbox"/>
	<i>SOCIAL COMPETENCES. Doctoral student is ready to:</i>	
SzD_K3	fulfilling the social obligations of researchers and creators, initiate public interest activities, thinking and acting in an entrepreneurial way;	<input type="checkbox"/>
SzD_K4	maintaining and developing the ethos of research and creative environments, including: - carrying out scientific activities in an independent manner, - respecting the principle of public ownership of research results, taking into account the principles of intellectual property protection.	<input type="checkbox"/>

6. Evaluation

Short description of the method(s) used to evaluate the learning outcomes assigned to the course, e.g., exam, test, report, presentation, etc.

Report will be used to evaluate the learning outcomes.

7. Teaching methods

Short description of the teaching methods used during the course, e.g., multimedia presentation, discussion, literature studies, developing written documents, own work, etc.

Teaching methods will include presentation, calculation, discussion, literature studies and own work.

8. Literature

List of primary and secondary literature used to prepare the course and including additional knowledge for participants, e.g., books, textbooks, research papers, standards, web pages, etc.

Presentations from the course leader

Polskie Sieci Elektroenergetyczne (PSE) <https://www.pse.pl/>

Instruction of transmission system operation and maintenance - Terms of use, operation, maintenance and planning of the network development



Electric power generation, transmission, and distribution, edited by Leonard L. Grigsby, CRC Press, 2012, ISBN 978-1-4398-5628-4

Brown, Richard E. Electric power distribution reliability. New York: Marcel Dekker, 2002. ISBN 0-8247-0798-2

Probabilistic Transmission System Planning, Wenyan Li, Wiley-IEEE Press, 2011, ISBN: 978-0-470-63001-3,

Operation and Control of Electric Energy Processing Systems, James Momoh, Lamine Mili, Wiley-IEEE Press, 2010, ISBN: 978-0-470-47209-5

Direct Methods for Stability Analysis of Electric Power Systems: Theoretical Foundation, BCU Methodologies, and Applications, Hsiao-Dong Chiang, Wiley, 2010, ISBN: 978-0-470-48440-1

9. Other remarks

Additional remarks, comments, (e.g., language of the course)

Language of the course is English.