GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Power systems operation and control, PG_00064741		
Field of study	Power Engineering, Power Engineering		
Date of commencement of studies	February 2027	Academic year of realisation of subject	2026/2027
Education level	second-cycle studies	Subject group	Obligatory subject group in the field of study 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	1	Language of instruction	Polish
Semester of study	1	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Electrical Power Engineering -> Faculty of Electrical and Control Engineering -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Robert Kowalak	
	Teachers	dr hab. inż. Robert Kowalak	

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	0.0	15.0	0.0	0.0	45

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	45	10.0	45.0	100

Subject objectives

Familiarizing students with the work of the power system in established and unknown states. Understanding the principles of implementing voltage and reactive power regulation as well as active power regulation and frequency.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_K11] is aware of importance of professional acting, the need for critical verification of acquired knowledge and consulting experts opinion in case of facing difficulties with individual problem solving	has the ability to think critically and aware of the use of experts	[SK2] Assessment of progress of work
[K7_W03] demonstrates structured and theory supported knowledge encompassing key issues in the field of Power Engineering, enabling design of energy systems, machines and devices, transmission grids and internal installations	has knowledge of work with a system of operating states of the power system	[SW3] Assessment of knowledge contained in written work and projects
[K7_U01] utilizes acquired analytical, simulation, and experimental methods, as well as mathematical models for analysis and evaluation of energy systems, machines and devices, transmission grids and internal installations	has knowledge of the principles of work of basic devices and systems in the power system	[SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment

<table>
<tr><td>Subject contents</td><td>Course content – lecture

Generating active Power in the Power system. The sources of active power and their profiles. Turbine regulators. Generating and compensation of reactive Power in the Power system. The sources of reactive power and their profiles. Synchronous generators as a regulated source of reactive power. Induction systems of synchronous generators. Regulators of the generator. Capacitors and chokes as a static source of reactive power. Regulators of condensers baterries. The principles of reactive power compensation in transmission and distributive grids. Automatic regulation of tension and frequency in the power system. Frequency regulation in the power system. Primary and secondary regulation. ARCM grids. Frequency regulation of the Power system. Integrated control of ARNE and ARST.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td></td></tr>
<tr><td>Assessment methods and criteria</td><td><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Midterm colloquium</td><td>60.0%</td><td>100.0%</td></tr>
</table></td></tr>
<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>1. Zajczyk R.: Regulacja częstotliwości i mocy w systemie elektroenergetycznym. Wer_2014. Wydanie elektroniczne (pdf).
2. Zajczyk R.: Regulacja napięcia i mocy biernej w systemie elektroenergetycznym. Wer_2014. Wydanie elektroniczne (pdf).
3. Machowski J..: Regulacja i stabilność systemu elektroenergetycznego, Oficyna wydawnicza Politechniki Warszawskiej., Warszawa 2007.
4. Machowski J, Białek J.W., Bumby J.,R..: Power system dynamics and stability. John Wiley & Sons New York1997.
5. Kundur P.: Power System Stability and Control. McGraw-Hill, Inc. 1994.
6. Anderson P.M., Fouad A.A.: Power system control and stability IEEE Press Power Engineering Series and John Wiley & Sons, New York 2003.</td></tr>
<tr><td>Supplementary literature</td><td>1. Hellmann W., Szczerba Z.: Regulacja częstotliwości i napięcia w systemie elektroenergetycznym. Warszawa: WNT, 1978.
2. Machowski J., Bernas S.: Stany nieustalone i stabilność systemu elektroenergetycznego. Warszawa WNT 1989.
3. Saccommanno F.: Electric Power Systems Analysis and Control IEEE Press Series on Power Engineering, New York, 2003.
4. Wood A.J., Wollenberg B.F.: Power generation, operation & control John Wiley & Sons, New York 1984.
5. Weedy B.M.: Electric power systems John Wiley & Sons, Chichester 1987</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
</table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>Discuss the process of adjusting the frequency and active power in the power system.

Discuss the process of voltage and reactive power in the power system.</td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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