GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Mathematical modeling of power systems, PG_00062295		
Field of study	Power Engineering, Power Engineering, Power 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	4.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Electrical Power Engineering -> Faculty of Electrical and Control Engineering		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Ryszard Zajczyk	
	Teachers		

Lesson types and methods of instruction

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

Subject objectives

To familiarize students with the principles of modeling power facilities and methods of analyzing the operating states of complex power systems such as the power system.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U07] is able to use basic and advanced knowledge of power equipment operation to assess the technical condition of the power system	Is able to use his knowledge of the operation of power systems for the purposes of modeling and analyzing their operating states	[SU1] Assessment of task fulfilment
[K7_U02] is able to use known mathematical and numerical methods to analyze and design elements, systems and power transmission networks and internal installations	Ability to use numerical methods for the analysis of power systems	[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools
[K7_W04] has advanced, ordered and theoretically grounded knowledge in the field of operation and selection of electrical machines, power transmission systems and power electronic devices, classical and forward-looking power technologies and their receivers, knows the principles of selection of power equipment and installations and their receivers and their operation	Learning the principles of selecting basic parameters of objects for modeling purposes	[SW3] Assessment of knowledge contained in written work and projects
[K7_W03] knows advanced aspects of automation and automatic control of power systems or transmission networks and internal installations	Learning the principles of modeling control systems: synchronous generator and power transformer	[SW3] Assessment of knowledge contained in written work and projects

Subject contents	Mathematical models of synchronous generators, power turbines, power transformers, power lines.Modeling of active power generation processes in the power system. Models of turbine-generator units. Turbine controller models.Modeling of voltage generation and regulation processes in the power system. Models of excitation systems for synchronous generators and generator controllers. Models of transformers and their control systemsModeling of reactive power generation and compensation processes in the power system.Modeling of power system elements using the PLANS program
Prerequisites and co-requisites	

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Assessment of the report	60.0%	100.0%

Recommended reading

Basic literature	1. Zajczyk R.: Modele matematyczne systemu elektroenergetycznego do badania elektromechanicznych stanów nieustalonych i procesów regulacyjnych. Gdańsk, Wydawnictwo Politechniki Gdańskiej 2003 2. Zajczyk R.: Regulacja częstotliwości i mocy w systemie elektroenergetycznym. Wer_2014. Wydanie elektroniczne (pdf). 3. Zajczyk R.: Regulacja napięcia i mocy biernej w systemie elektroenergetycznym. Wer_2014. Wydanie elektroniczne (pdf). 4. Kacejko P., Machowski J.: Zwarcia w systemach elektroenergetycznych WNT Warszawa 2013. 5. Machowski J..: Regulacja i stabilność systemu elektroenergetycznego, Oficyna wydawnicza Politechniki Warszawskiej., Warszawa 2007. 6. Machowski J, Białek J.W., Bumby J.,R..: Power system dynamics and stability. John Wiley & Sons New York1997.
Supplementary literature	1. Kundur P.: Power System Stability and Control. McGraw-Hill, Inc. 1994. 2. Saccommanno F.: Electric Power Systems Analysis and Control IEEE Press Series on Power Engineering, New York, 2003 3. Wood A.J., Wollenberg B.F.: Power generation, operation & control John Wiley & Sons, New York 1984 4. Weedy B.M.: Electric power systems John Wiley & Sons, Chichester 1987
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed	1. Analysis of power flows in a fragment of the power system.2. Assessment of voltage variability in power system nodes.3. Analysis of the impact of changes in transformer ratio on voltage levels in power networks.
Work placement	Not applicable