GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Team Project, PG_00038467						
Field of study	Electrical Engineering						
Date of commencement of studies	February 2024		Academic year of realisation of subject	2024/2025			
Education level	second-cycle studies		Subject group	Optional subject group 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	2		ECTS credits	4.0			
Learning profile	general academic profile		Assessment form	assessment			
Conducting unit	Department of Electrical Engineering of Transport -> Faculty of Electrical and Control Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Dariusz Karkosiński				
	Teachers		dr hab. inż. Dariusz Karkosiński				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	15.0	0.0	15.0	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		11.0	44.0		100
Subject objectives	Strengthening the design skills on the power MV and LV switchgear network, and supply and control systems of industrial drives						

Learning outcomes

Course outcome	Subject outcome	Method of verification
K7_U09	Student discusses in detail the configuration and parameters of power generating units, substations, transmission and distribution networks. Using CAE programs, the student designs power, control and protection elements for medium voltage and medium voltage industrial electric drives	[SU1] Assessment of task fulfilment
K7_U13	Can choose the right software and use the software (CAD / CAE) supporting the work of a design engineer. He can select, configure and parameterize protection relays of various manufacturers	[SU4] Assessment of ability to use methods and tools
K7_K03	Student discusses in detail the configuration and parameters of power generating units, substations, transmission and distribution networks. Using CAE programs, the student designs power, control and protection elements for medium voltage and medium voltage industrial electric drives	[SK1] Assessment of group work skills
K7_W11	Characterizes the selection of medium voltage switchgear bays and their equipment.	[SW3] Assessment of knowledge contained in written work and projects
K7_K05	Explains the construction of devices and main circuits of power stations. Calculates the flow of currents and power as well as voltage losses and drops. Explains the functions of power protection automatics and classifies security according to the American ANSI standards applied in the EU. He explains the basics of creating systems and communication networks of power substations according to the PN-EN (IEC) 61850 standard. He specifies and uses the firmware to parameterize the protections in the medium voltage network.	[SK5] Assessment of ability to solve problems that arise in practice

Subject contents

LECTURE and EXERCICES: Power supply systems for industrial facilities. Devices and main circuits of MV power stations. Short-circuit calculation. Power protection automation. Security classification according to American ANSI standards used in the EU. Microprocessor protection relays. Drive systems for medium power and medium voltage pumps. Roving inverters.

PROJECT: Design of a MV switching station for a medium-power pumping station with smooth flow control and programming of security parameters.

Prerequisites and co-requisites

Power Electrical engineering, electrical instalation design.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Practical exercise	50.0%	20.0%
Midterm colloquium	50.0%	40.0%
Project	50.0%	40.0%

Recommended reading

Basic literature

1. S. Niestępski i in., Instalacje elektryczne - budowa, projektowanie i eksploatacja, Warszawa 2001.
2. Strojny J., Strzalka J.: Projektowanie urządzeń elektroenergetycznych. Uczelniane Wydawnictwo Naukowo-Dydaktyczne AGH, Kraków 2008.
3. Winkler W., Wiszniewski A.: Automatyka zabezpieczeniowa w systemach elektroenergetycznych. WNT, Warszawa 2004.
4. Praca zb. pod redakcja Kujszczyka S.: Elektroenergetyczne sieci rozdzielcze, Tom 1. I 2. Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2004.

	Supplementary literature	1. Kowalik R., Januszewski M., Smolarczyk A.:Cyfrowa elektroenergetyczna automatyka zabezpieczeniowa. Oficyna Wydawn. Politechniki Warszawskiej, Warszawa 2006. 2. PN-EN 61850 Systemy i sieci komunikacyjne w stacjach elektroenergetycznych. 3. Lakervi E., Holmes E.J.: Electricity Distribution Network Design. 2nd Edition. London 2007. 4. Z. Nartowski, Normalizacja w elektryce, INPE 2004, No 58, pp. 15-25.
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	1. How to apply withdrawable circuit breakers? 2. What is the basic advantage of the use of high-speed earthing switch in the MV substations? 3. Which system of rapid shutdown arc in the MV is better and why - based on the opening of the safety valves at the top of the switchgear or optoelectronic system? 4. In witch the range of arc-safety MV substation occurs mostly to the arc and why? 5. Describe the successive elements of the feeder bay of 110 kV overhead line, starting from the busbar. 6. Which are the most common technologies for MV Switchgears? 7. What are the tasks of preventive automation at MV substations? 8. What are the tasks of automation restitution at industrial MV substations? 9. What are the features to meet the protection system for the MV cable line to the medium power motor pump drive? Give code ANSI / IEEE Std C37.2. 10. What are the features to meet the protection system for the MV cable line to the medium power motor fan drive? Give code ANSI / IEEE Std C37.2. 11. What are the features to meet system protection in the MV cable line to the medium power motor drive of conveyor belt? Give code ANSI / IEEE Std C37.2. 12. Replace the methods used for grounding the neutral MV distribution networks. 13. Replace the methods used for grounding the neutral point of industrial networks SN. 14. What are the disadvantages of the MV network with isolated neutral? 15. What are the risks arising from a common ground for MV and LV station? 16. Draw a diagram of the measurement system to protect ANSI 51G MV for the 3-cables system with insulated neutral. 17. Draw a diagram of the measurement system to protect ANSI 51G for the MV 3-cables system with earthed neutral 18. Describe the function of the ANSI 50BF. 19. Discuss the effects of automation ANSI 25 for controlling the coupling circuit breaker. 20. Discuss the thresholds action for automation ANSI 27 and 27R when switching backup medium power MV motor. 21. What is a blocking system in the MV protection context? How does it work? 22. What is a intertripping system in the MV protection context? How does it work? 23. How to apply the control of negative sequence of voltage for medium power motor? 24. Which one of the switch in the MV is imaged using two auxiliary contacts and for what purpose? 25. For what purpose and in what power network the devices are used in accordance with IEC 61850? 26. What are the three logical levels of communication in the substation standard IEC 61850 defines? 27. What the messages in a substation communication network the standard IEC 61850 gives the two highest priorities and that allows the transmission delay for them? 28. Replace recommended by the IEC 61850 communication medium of communication and mechanisms for reconfiguration after a failure. 29. What devices substation may be the IED's? 30. Give examples of the requirements of IEC 61850 regarding the accuracy of IEDs clock synchronization.	
Work placement	Not applicable	