



## Subject card

Subject name and code	Smart electrical installations, PG_00065890						
Field of study	Hydrogen Technologies and Electromobility						
Date of commencement of studies	October 2022	Academic year of realisation of subject			2024/2025		
Education level	first-cycle studies	Subject group					
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	3	Language of instruction			Polish		
Semester of study	6	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	dr inż. Krzysztof Dobrzyński					
	Teachers	dr inż. Krzysztof Dobrzyński prof. dr hab. inż. Stanisław Czapp dr inż. Tomasz Minkiewicz					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	15.0	0.0	60
	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	60	6.0		34.0	100	
Subject objectives	The purpose of the course is to teach the student the principles of low-voltage electrical system design with energy storage, renewable energy sources and hydrogen systems. The student will learn how to select the cross-section of conductor and protection for supplying electrical equipment, including with the use of control by the actors of building automation systems.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_U12] can formulate a specification of simple engineering tasks of a practical nature related to the field of study	Performs the design process of power supply systems for electrical equipment.	[SU1] Assessment of task fulfilment
	[K6_U05] can use analytical and simulation methods, prepare and for the formulation and solution of tasks in the field of hydrogen technologies, automation and robotics, electrical engineering, use various techniques to carry out engineering tasks related to electrical devices, hydrogen installations, control and robotics systems	Designs power systems for electrical equipment. Develops operating diagrams of these systems and verifies their correctness.	[SU1] Assessment of task fulfilment
	[K6_W08] has knowledge in the field of energy storage systems: mechanical, thermal, electrical and others, knows the basics of thermodynamics and fluid mechanics, as well as the construction and operation of thermal energy equipment, hydrogen installations, process equipment, including renewable energy sources	Discusses the design and operation of selected energy storage systems, hydrogen systems and renewable energy sources (RES) used in buildings.	[SW1] Assessment of factual knowledge
	[K6_W18] knows the construction and operation of high-temperature fuel cells and electrolysers powered by hydrogen and other fuels and their practical application for energy generation and storage	He knows the principles of creating circuits to power hydrogen systems and energy storage.	[SW1] Assessment of factual knowledge
	[K6_W13] knows the properties of materials used in the field of hydrogen energy and electromobility	Discusses the properties of materials used in hydrogen technology and vehicle energy storage.	[SW1] Assessment of factual knowledge
	[K6_U08] can design and build systems and devices related to automation systems, mechatronics and robotics in energy storage devices and in hydrogen installations	Performs the necessary design calculations for power supply systems of energy storage and hydrogen systems. Makes the necessary schematics of power supply systems.	[SU1] Assessment of task fulfilment
	[K6_K02] can work in a group taking on different roles in it	He performs selected project tasks in groups.	[SK2] Assessment of progress of work
[K6_W17] knows the methods of researching engineering materials, has knowledge in the field of materials science and is able to relate the properties of materials with their structure and composition	Discusses the properties of materials used in energy storage technologies and hydrogen systems.	[SW1] Assessment of factual knowledge	
Subject contents	<p>LECTURE Tasks and structure of the installation supplying electrical equipment. Tasks and structure of the installation controlling electrical equipment. Main components and requirements. Arrangements of connections. Principles of cable laying. Selection of necessary components. Protection and control. Examples of power and control installation solutions. Selected energy storage technologies. Selected types of hydrogen systems. Selected technologies of renewable energy sources. Electrical safety in installations related to RES and energy storage.</p> <p>PROJECT Execution of the design of an installation supplying energy storage or hydrogen installation or renewable energy sources.</p> <p>LABORATORY Execution, programming and commissioning of a control system for an installation supplying electrical equipment.</p>		
Prerequisites and co-requisites	No requirements.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	LABORATORY	60.0%	30.0%
	PROJECT	60.0%	30.0%
	LECTURE	60.0%	40.0%

Recommended reading	Basic literature	<p>1. Markiewicz H.: Instalacje elektryczne. WNT, Warszawa, 2007</p> <p>2. Musiał E.: Instalacje i urządzenia elektroenergetyczne. WSiP, Warszawa, 2008.</p> <p>3. Petykiewicz P.: Nowoczesna instalacja elektryczna w inteligentnym budynku, COSiW, Warszawa 2001</p> <p>4. Wojciechowski H.: Technologie magazynowania energii. Cz. I, Czasopismo Instal numer 2/2017, Wydawnictwo INSTAL</p> <p>5. Wojciechowski H.: Technologie magazynowania energii. Cz. II, Czasopismo Instal numer 3/2017, Wydawnictwo INSTAL</p> <p>6. Szymański B., Instalacje fotowoltaiczne, GLOBEnergia, 2020</p> <p>7. Chmielniak T., Chmielniak T., Energetyka wodorowa, 2020, Wydawnictwo Naukowe PWN</p>
	Supplementary literature	<p>1. Lasseter R., Akhil A., Marnay Ch., Stephens J., Dagle J., Guttromson R., Meliopoulos A.S., Yinger R., Eto J.: White Paper on Integration of Distributed Energy Resources: The CERTS MicroGrid Concept, April 2002</p> <p>2. Lubośny Z.: Farmy wiatrowe w systemie elektroenergetycznym. Wydawnictwo WNT, 2012.</p> <p>3. Klugman-Radziemska E.: Praktyczne wykorzystanie energii słonecznej. Artykuł powstały w ramach projektu Odnawialne Źródła Energii Opolszczyzny nr 1/POKL/8.2.1/2008.</p>
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	In the laboratory, make, programming and start up the control installation of an electrical device.	
Work placement	Not applicable	

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