



Subject card

Subject name and code	Renewable Energy Sources and Energy Storage, PG_00067971						
Field of study	Automatic Control, Cybernetics and Robotics						
Date of commencement of studies	October 2026	Academic year of realisation of subject			2027/2028		
Education level	first-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	2	Language of instruction			Polish		
Semester of study	4	ECTS credits			1.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Signals and Systems -> Faculty of Electronics Telecommunications and Informatics -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Piotr Kaczmarek					
	Teachers	dr inż. Piotr Kaczmarek					
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	0.0	0.0	15
	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	15	1.0		9.0		25
Subject objectives	The course aims to provide an understanding of the role of renewable energy sources and storage systems in modern energy sectors and their significance for sustainable development. It introduces fundamental concepts related to advanced technologies for energy generation and storage. Students will learn the operating principles and characteristics of renewable sources such as solar, wind, hydro, geothermal, and biomass energy. The course will also cover energy storage technologies, including lithium-ion batteries, supercapacitors, hydrogen storage, and mechanical storage systems such as compressed air. Lectures will include an analysis of the efficiency, environmental impact, and practical applications of individual solutions, as well as the risks associated with the "green revolution."						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_U03] can design, according to required specifications, and make a simple device, facility, system or carry out a process, specific to the field of study, using suitable methods, techniques, tools and materials, following engineering standards and norms, applying technologies specific to the field of study and experience gained in the professional engineering environment	The student can develop algorithms that optimize the use of renewable energy sources, working in cooperation with energy storage systems and the power grid.	[SU2] Assessment of ability to analyse information
	[K6_W11] knows and understands, to an advanced extent, the general principles of setting up and development of business entities, forms of individual entrepreneurship and running ventures and the fundamental dilemmas of modern civilization and basic economic, legal and other conditions of various types of activities related to the field of study, including the basic concepts and principles in the field of industrial property and copyright protection	The student can perform economic analysis and assess the risks associated with the implementation of systems based on renewable energy	[SW1] Assessment of factual knowledge
	[K6_W10] knows and understands, to an advanced extent, the parameters, functions, and methods of analysis, design, and optimization of electronic circuits and systems, the definitions of error and measurement uncertainty, measurement methods, including time, frequency, and phase measurements, the properties of converters, and methods of digital signal processing, as well as the basic processes occurring in the life cycle of technical devices, objects, and systems, and methods of supporting processes and functions, specific to the field of study	The student can design basic systems related to the utilization of renewable energy sources.	[SW1] Assessment of factual knowledge
	[K6_W02] knows and understands, to an advanced extent, selected laws of physics and physical phenomena as well as methods and theories explaining the complex relationships between them, constituting the basic general knowledge in the field of technical sciences related to the field of study	The student knows the laws of physics applied by renewable energy sources.	[SW1] Assessment of factual knowledge
Subject contents	Course content – lecture Introduction to renewable energy Solar energy fundamentals Photovoltaic (PV) technologies Solar thermal energy Wind energy fundamentals Wind turbine technologies Hydropower and biomass energy Geothermal and ocean energy Problems of excess renewables and energy system balancing The role of energy storage and demand flexibility Negative impacts of renewable energy deployment Electrical energy storage batteries Mechanical energy storage Chemical and thermal energy storage Economic aspects of renewable energy and storage Impact of renewable energy development on the economy and labor market		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written exam	60.0%	100.0%
Recommended reading	Basic literature	Godfrey Boyle <i>Renewable Energy: Power for a Sustainable Future</i>	

	Supplementary literature	Joe K. Kenn <i>Renewable Energy Engineering Handbook for Beginners: A Step-by-Step Guide and Practical Application to Solar, Wind, Hydro, and Other Green Power Systems</i>
	eResources addresses	
Example issues/ example questions/ tasks being completed		
Practical activities within the subject	Not applicable	

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