GDAŃSK UNIVERSITY OF TECHNOLOGY

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 2025	Academic year of realisation of subject	2026/2027
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 -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Piotr Kaczmarek	
	Teachers	dr inż. Piotr Kaczmarek	

Lesson types and methods of instruction	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_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_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_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_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

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 *Renewable Energy: Power for a Sustainable Future*

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

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