GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Low-energy Buildings Automation, PG_00067970						
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		5.0		
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						
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		7.0	58.0		125
Subject objectives	The course aims to provide knowledge and practical skills in designing and implementing modern energy management systems in buildings, in accordance with the principles of sustainable development. The subject covers issues related to intelligent control of building systems to minimize energy consumption. Lectures will address the integration of HVAC (heating, ventilation, and air conditioning) systems, lighting management, automated shading control, and energy consumption monitoring systems. During laboratories, students will program building automation controllers, analyze measurement data, and implement control algorithms for heat recovery systems.						

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 building automation systems that optimize energy consumption.	[SW3] Assessment of knowledge contained in written work and projects
	[K6_W21] knows and understands the basic methods of decision making as well as methods and techniques of design and operation of automatic regulation and control systems, computer applications for controlling and monitoring dynamic systems.	The student can use computer tools for designing and programming building automation systems.	[SW3] Assessment of knowledge contained in written work and projects
	[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 design automation systems based on popular building-dedicated controllers.	[SU3] Assessment of ability to use knowledge gained from the subject

<table>
<tr><td>Subject contents</td><td>Introduction to Energy Management in Buildings

Energy Performance of Buildings

Basics of HVAC Systems Heating and Cooling

Mechanical and Natural Ventilation Fundamentals

Heat Recovery from Ventilation Technologies and Efficiency

Heat Sources in Buildings Condensing Boilers

Heat Pumps Operating Principle and Applications

Domestic Hot Water Systems (DHW)

Intelligent Control of HVAC Systems Communication Protocols and Technologies

Lighting and Shading Automation Control

Energy Monitoring Systems and Consumption Analysis

Control and Optimization Algorithms in Energy Management Systems

Integration of Automation Systems Architecture and Security

Programming Building Automation Controllers

Practical Applications and Case Studies

Trends, Regulations, and the Future of Energy Management in Buildings</td></tr>
<tr><td>Prerequisites and co-requisites</td><td></td></tr>
<tr><td>Assessment methods and criteria</td><td><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Written exam</td><td>60.0%</td><td>34.0%</td></tr>
<tr><td>Lab</td><td>60.0%</td><td>33.0%</td></tr>
<tr><td>Project</td><td>60.0%</td><td>33.0%</td></tr>
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<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>Frank Kreith, D. Yogi Goswami Energy Management and Conservation Handbook</td></tr>
<tr><td>Supplementary literature</td><td>Roger W. Haines, Michael E. Myers HVAC Systems Design Handbook</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td></td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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