GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Hydrogen transport and storage, PG_00064573		
Field of study	Hydrogen Technologies and Electromobility		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2025/2026
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	5	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Control Engineering -> Faculty of Electrical and Control Engineering -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Adam Kielak	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	0.0	0.0	0.0	0.0	30

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	30	0.0	0.0	30

Subject objectives

Acquisition of knowledge concerning: methods of hydrogen transport and storage, thermodynamic phenomena related to these processes and technologies used in hydrogen storage in various states of matter, including liquid, gaseous and solid, as well as safety methods related to the handling and transport of hydrogen.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[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	It defines the elements of automation and robotics systems in the control and support systems for the operation of hydrogen installations and hydrogen-based fuels.	[SU2] Assessment of ability to analyse information
[K6_W13] knows the properties of materials used in the field of hydrogen energy and electromobility	It selects materials according to the requirments of the hydrogen transport or storage method used.	[SW1] Assessment of factual knowledge
[K6_K01] is aware of the need for continuous education and self-improvement in the field of the profession of an electrician and knows the possibilities of further education	Stay tuned for the latest information on hydrogen technologies. He selects the information found to the issues under consideration,	[SK4] Assessment of communication skills, including language correctness
[K6_U08] can design and build systems and devices related to automation systems, mechatronics and robotics in energy storage devices and in hydrogen installations	He designs simple automation systems in energy and hydrogen storage devices.	[SU3] Assessment of ability to use knowledge gained from the subject

Subject contents

Pipeline transport. Transport of a mixtureof hydrogen and methane. Storage. Technologies used in the storage of hydrogen in various states of matter: liquid, gas, and solid. Chemical compounds used to transport hydrogen. Thermodynamic aspects of hydrogen storage charging.Thermodynamic aspects of hydrogen storage discharge. Safety of transport and storage.

Prerequisites and co-requisites

Basic knowledge of thermodynamics, fluid mechanics and chemistry.

<table>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>Colloquium</td><td>60.0%</td><td>100.0%</td></tr></table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">1. Rahimpour, M. R., Makarem, M. A., & Kiani, P. (2024). Hydrogen Transportation and Storage. Routledge.

2. Turner, J. A., & Pivovar, B. (2022). Hydrogen Energy: Production, Safety, Storage, and Applications. Wiley.

3. Fennell, P. S., & Sherwood, J. (2023). Sustainable Hydrogen Energy: Production, Storage & Transportation. MIT Press.</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">1. Menon, E. S. (2005). Gas Pipeline Hydraulics. CRC Press.</td></tr>
<tr><td>eResources addresses</td><td colspan="2">Adresy na platformie eNauczanie:</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3">Pipeline transport of flammable gases.Pipeline transport of a mixture of methane and hydrogen.Negative Joule-Thomson effect when filling and emptying hydrogen tanks.Large-scale hydrogen storage in salt caverns.Chemical compounds that enable hydrogen storage.Hydrogen transport technologies depending on the distance between the place of production and the place of use.Cylinder bundles pressures, capacities, methods against excessive pressure increase and decrease.Hydrogen tanks used in road and rail transport.Seals used in hydrogen storage and transport technologies.</td></tr>
<tr><td>Work placement</td><td colspan="3">Not applicable</td></tr>
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