GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Challenge-based learning, PG_00060232		
Field of study	Technical Physics		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2025/2026
Education level	first-cycle studies	Subject group	Optional 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	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Division of Theoretical Physics and Quantum Informaton -> Institute of Physics and Applied Computer Science -> Faculty of Applied Physics and Mathematics -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Paweł Syty	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	0.0	0.0	0.0	15.0	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	5.0	30.0	50

Subject objectives

The aim of the course is to teach students the complete process of solving real-life, interdisciplinary design tasks from problem identification, through research, solution generation and prototyping, to testing and creating an implementation plan.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W01] Understands the importance of physics and its applications in connection to civilization.	The student understands the importance of physics and its applications in the context of the project being carried out.	[SW3] Assessment of knowledge contained in written work and projects [SW2] Assessment of knowledge contained in presentation
[K6_K05] Can present own work results, transfer information in a commonly understandable manner, communicate and self-evaluate, as well as constructively evaluate the effects of other persons' work.	The student is able to present the results obtained during the project and evaluate them.	[SK4] Assessment of communication skills, including language correctness [SK5] Assessment of ability to solve problems that arise in practice [SK1] Assessment of group work skills
[K6_U01] Can learn independently, obtain information from literature, databases and other properly selected sources.	The student is able to analyse a problem, examine the range of possible solutions and choose the right one.	[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject
[K6_U07] Can present basic facts within the scope of physics and other scientific disciplines in a clear manner.	The student is able to present the project's assumptions and implementation plan in a popular manner.	[SU5] Assessment of ability to present the results of task
[K6_U10] Can determine their own study field interests and develop them.	The student is able to identify their interests related to their field of study and the project being carried out.	[SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment

Subject contents	Course content – project 1. Introduction to the Challenge Based Learning methodology. Discussion of the CBL concept (Big Idea Essential Question Challenge). Examples of applications in IT education. Project work rules and assessment criteria. Division of students into teams. 2. Identification of challenges (Big Idea). Teams select a problem area (e.g. sustainable development, health, IT security, education, AI in everyday life). Formulation of a key question and a specific project challenge. 3. Research phase (Guiding Questions & Activities). Analysis of needs, stakeholders, market or technological research. Problem mapping. Selection of applicable information technologies (e.g. web application, IoT solution, AI, decision support system). 4. Solution design (Solution Concept). Brainstorming, preliminary prototyping. Development of a solution concept, system architecture, technology and implementation plan. Preparation of conceptual documentation. 5. Prototype implementation and testing. Building a minimum viable product (MVP). Examples: web application, dashboard, automation script, ML model. Limited testing. Preparation of results presentation. 6. Project presentation and evaluation. Public presentation of challenges, solutions and results. Discussion, reflection on the CBL process, conclusions and recommendations.
Prerequisites and co-requisites	
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
Activity in project work	50.0%	30.0%
Project documentation and solution prototype	50.0%	40.0%
Presentation and defence of the project	50.0%	30.0%

Recommended reading	Basic literature	A Practical Guide to Understanding and Implementing ChallengeBased Learning (Kenan Dikilitaş, Tim Marshall, Masoumeh Shahverdi; Palgrave Macmillan Cham, 2025) Challenge Based Learning: Engaging with Students Through Interactivity (Scott Beattie; Springer, 2024)
	Supplementary literature	ChallengeBased Learning, Research, and Innovation: Leveraging Industry, Government, and Society (Arturo Molina, Rajagopal; Palgrave Macmillan Cham, 2023)
	eResources addresses	
Example issues/ example questions/ tasks being completed	Examples of challenges: - How can we reduce energy waste in university buildings? - How can we improve the security of students' personal data?	
Practical activites within the subject	Not applicable	

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