GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Material degradation, PG_00066103		
Field of study	Chemistry		
Date of commencement of studies	February 2026	Academic year of realisation of subject	2026/2027
Education level	second-cycle studies	Subject group	Specialty subject group
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	2	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Corrosion and Electrochemistry -> Faculty of Chemistry -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Juliusz Orlikowski	
	Teachers		

Lesson types

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

Subject objectives

The aim of this course is to provide students with knowledge about the degradation of structural materials associated with operation in high-temperature conditions and the presence of aggressive chemical media. The knowledge gained will enable them to implement appropriate diagnostic methods to detect structural damage to materials and take steps to minimize the risk of future failures.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W01] recognizes problems of modern chemistry, including properties and obtaining chemical compounds, necessary for making calculations, including the dependence of the compound's structure and its reactivity	has knowledge of the main chemical factors causing degradation of construction materials	[SW1] Assessment of factual knowledge
[K7_U01] integrates and interprets information from literature, databases and other sources	is able to apply standards to determine the degradation mechanism	[SU1] Assessment of task fulfilment
[K7_K02] is able to cooperate and work in a group, taking on different roles	is ready to work on a team responsible for conducting a degradation risk analysis	[SK1] Assessment of group work skills

Subject contents

Course content – lecture

High-temperature metal degradation mechanisms based on structural change. Corrosion cracking processes based on chloride cracking, caustic embrittlement, polythionic acid interaction, the presence of wet H2Su, ammonia, and ethyl alcohol. Hydrogen embrittlement and high-temperature hydrogen attack mechanisms.

Course content – project

Analysis of degradation mechanisms of construction materials based on API571 and API581 standards for a specific practical case of a chemical installation

Prerequisites and co-requisites

Basics of inorganic chemistry

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Passing the lecture	60.0%	50.0%
Project execution	60.0%	50.0%

Recommended reading	Basic literature	Standards: API571 API581 API 934 A-E API 939 C-E
	Supplementary literature	Not applicable
	eResources addresses	
Example issues/ example questions/ tasks being completed	Degradation Mechanisms of High-Temperature Unalloyed Steels Conditions for the Occurrence of Hydrogen Embrittlement Causes of Sigma-Phase Embrittlement in High-Alloy Steels Critical Temperature and Hydrogen Content Conditions for High-Temperature Hydrogen Attack (HTHA)	
Practical activites within the subject	Not applicable	

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