University of Gdańsk

Subject card

Subject name and code	Symmetry in crystals, PG_00179528						
Field of study	Chemistry						
Date of commencement of studies	October 2026		Academic year of realisation of subject	2026/2027			
Education level	Master's studies		Subject group	Optional 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	1.0			
Learning profile	academic		Assessment form	credit			
Conducting unit	Laboratory of Crystallochemistry -> Department of Physical Chemistry -> Faculty of Chemistry -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor	dr Artur Mirocki					
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	15.0	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		3.0	12.0	30	
Subject objectives	The aim of the course is to familiarize students with point symmetry of finite objects, symmetry of infinite structures, experimental crystallography, and the physical properties of crystals in relation to their symmetry						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[CHEMMU2_K01] Knows the limitations of her/his own knowledge; understands the need for further education and can inspire other people to do so.	The student understands the necessity of continuous development of professional, personal, and social competencies as well as lifelong learning; demonstrates a critical attitude towards content obtained from the internet and other information sources; and complies with regulations regarding copyright and intellectual property protection	[SK1] oral statement/conversation/ discussion [SK5] implementation of a problem task [SK8] observation of student's independent or team work
[CHEMMU2_W02] Has extended and in-depth knowledge in the field of basic chemistry.	The student is able to assign point groups to objects, understands the stereographic projection of symmetry groups and diffraction methods, and can determine the relationship between crystal symmetry and the symmetry of physical properties	[SW1] oral statement/ conversation/discussion [SW5] implementation of a problem task
[CHEMMU2_W06] Applies mathematics to the extent necessary to understand, describe and model chemical processes of medium complexity.	The student is familiar with diffraction methods, Laue and Bragg diffraction conditions, the Ewald construction, and the concept of the reciprocal lattice; applies mathematical calculations to coordinate system transformations and to the identification of symmetry operations and elements	[SW1] oral statement/ conversation/discussion [SW5] implementation of a problem task
[CHEMMU2_W08] Demonstrates knowledge of theoretical computational and IT methods used to solve problems in chemistry.	The student is able to identify symmetry operations and elements, and assess the compatibility of symmetry with translational lattices; recognizes symmetry operations; knows symmetry groups; can assign point groups to objects; utilizes stereographic projection of symmetry groups; understands symmetry operations in infinite translational lattices; and describes the relationship between crystal symmetry and the symmetry of physical properties	[SW1] oral statement/ conversation/discussion [SW5] implementation of a problem task

Subject contents

Coordinate system transformations; compatibility of symmetry with translational lattices; isometry condition in an orthonormal coordinate system; symmetry operations and symmetry elements in three-dimensional and higher-dimensional spaces; invariants of symmetry operations; determination of the positions of symmetry elements; coexistence of symmetry axes; coexistence of mirror planes and symmetry axes; assignment of point groups to objects; stereographic projection of symmetry groups; diffraction methods; relationship between crystal symmetry and the symmetry of physical properties.

Prerequisites and co-requisites

General chemistry

Crystallography

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
test	51.0%	100.0%

Recommended reading

Basic literature	1. Bojarski Z., Gigla M., Stróż K., Surowiec M., Krystalografia, PWN, 2008. 2. Trzaska Durski Z., Trzaska Durska H., Podstawy krystalografii strukturalnej i rentgenografii, Oficyna Wydawnicza. Politechniki Warszawskiej, 2003.
Supplementary literature	1. Penkala, T., Zarys Krystalografii, PWN, 1983.
eResources addresses	

Example issues/ example questions/ tasks being completed

Work placement

Not applicable

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