

Subject card

Subject name and code	Repetitory in mathematics, PG_00054868						
Field of study	Chemistry						
Date of commencement of studies	October 2025		Academic year of realisation of subject		2025/2026		
Education level	Master's studies		Subject group		Obligatory subject group in the field of study		
Mode of study	full-time studies		Mode of delivery		at the university		
Year of study	1		Language of instruction		English		
Semester of study	1		ECTS credits		3.0		
Learning profile	academic		Assessment form		credit		
Conducting unit	Faculty of Mathematics, Physics and Informatics -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr Adrian Kołodziejewski				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	30.0	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		5.0		40.0	75
Subject objectives	Explaining the most important concepts of linear algebra to the students. Teaching students how to linear algebra concepts apply to theoretical chemistry and quantum mechanics in particular						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[CHEMMU2_U11] Communicates in English in accordance with the requirements specified for level B2 of the Common European Framework of Reference for Languages.	Student learns the principles of working safely, responsibly, and efficiently. Develops the ability to work in a team.	[SU6] demonstration of practical skills [SU8] observation of student's independent or team work
	[CHEMMU2_U04] Applies acquired knowledge of chemistry and related scientific disciplines.	Student defines and describes basic terms of linear algebra. Recognizes a given vectors space, distinguishes between functionals and operators, recognizes and uses Hermitian operators.	[SU4] test/exam - oral or written
	[CHEMMU2_W07] Selects experimental and theoretical techniques to the extent necessary to understand the description and modelling of medium complexity chemical processes.	The student is able to apply the tools learned to solve problems in quantum mechanics.	[SW4] test/exam - oral or written
	[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 is able to apply the theorems and proof methods learned during the lecture, use the ideas and techniques presented in the proofs of the theorems and examples given during the lecture, provide applications of the learned theorems, solve practical problems related to the lecture material.	[SK4] test/exam - oral or written
	[CHEMMU2_U02] Critically assesses the results of conducted, performed observations and theoretical calculations and discusses errors.	Student develops the skills of accurate and logical thinking and inference.	[SU5] implementation of a problem task
	[CHEMMU2_W05] Has extended knowledge in the field of the specialisation studied.	Student verifies the self-adjoint character of an operator (or lack thereof), performs the orthogonalization of a basis set, transform vectors to other basis sets, applies Riesz representation theorem.	[SW4] test/exam - oral or written
	[CHEMMU2_W08] Demonstrates knowledge of theoretical computational and IT methods used to solve problems in chemistry.	Student solves eigenproblems (matrix formulation), finds eigenvalues and eigenvectors,	[SW4] test/exam - oral or written
Subject contents	Vector spaces; subspaces; dimension, linear span and basis, real and complex spaces, spaces of functions, scalar product, norm, metric, functional, metric space, normed space, complete space, Hilbert space, dual space, linear form, antilinear form, bilinear form, Riesz representation theorem. Linear operator (linear transformation, linear mapping), matrix representation, eigenproblem (eigenvalues and eigenvectors), Hermitian operator (self-adjoint operator), spectrum of self-adjoint operators.		
Prerequisites and co-requisites	Basic knowledge in mathematics		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	test	50.0%	50.0%
	exam	50.0%	50.0%
Recommended reading	Basic literature	Lectures on linear algebra, I. M. Gelfand, Wiley & Sons, Inc., 2007 (ISBN 10: 0470296011, ISBN 13: 9780470296011)	
	Supplementary literature	Linear Algebra: Gateway to Mathematics, R. Messer, Pearson, 1997 (ISBN 10: 0065017285, ISBN 13: 9780065017281)	
	eResources addresses		
Example issues/ example questions/ tasks being completed	Not applicable		
Work placement	Not applicable		

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