


**KAPITAŁ LUDZKI**  
 NARODOWA STRATEGIA SPÓJNOŚCI

 Projekt współfinansowany przez  
 Unię Europejską w ramach  
 Europejskiego Funduszu  
 Społecznego

**UNIA EUROPEJSKA**  
 EUROPEJSKI  
 FUNDUSZ SPOŁECZNY


<b>Course title</b>		<b>ECTS code</b>	
Repetitory in mathematics		13.3.1286	
<b>Name of unit administrating study</b>			
Faculty of Mathematics, Physics and Informatics			
<b>Studies</b>			
<b>faculty</b>	<b>field of study</b>	<b>type</b>	second tier studies (MA)
Faculty of Chemistry	Chemistry	<b>form</b>	full-time
		<b>specialty</b>	all
		<b>specialization</b>	all
<b>Teaching staff</b>			
dr Adrian Kołodziejcki			
<b>Forms of classes, the realization and number of hours</b>		<b>ECTS credits</b>	
<b>Forms of classes</b>		3	
Auditorium classes		classes - 30 h	
<b>The realization of activities</b>		student's own work – 30 h	
classroom instruction		tutorial classes – 15 h	
<b>Number of hours</b>		Total: 75 h – 3 ECTS	
Auditorium classes: 30 hours			
<b>The academic cycle</b>			
2022/2023 winter semester			
<b>Type of course</b>		<b>Language of instruction</b>	
obligatory		english	
<b>Teaching methods</b>		<b>Form and method of assessment and basic criteria for evaluation or examination requirements</b>	
Classes – multimedia presentation, in-class examples, exercises, solving problems.		<b>Final evaluation</b>	
		Graded credit	
		<b>Assessment methods</b>	
		Classes – the final grade is based on partial grades received during the semester for written reports and/or presentation of assignments.	
		<b>The basic criteria for evaluation</b>	
		Assessment criteria in accordance with the University of Gdańsk Study Regulations Classes: the arithmetic mean of partial grades received during the semester for written reports on exercises and presentation of the final assignment; the main criteria for evaluation of reports are the correct answers to the questions in the exercise instructions.	
<b>Method of verifying required learning outcomes</b>			
<b>Required courses and introductory requirements</b>			
<b>A. Formal requirements</b>			
none			
<b>B. Prerequisites</b>			
basic knowledge in mathematics			
<b>Aims of education</b>			
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			
<b>Course contents</b>			
Vector spaces (with vector addition and scalar multiplication operations); 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.

**Bibliography of literature**

Literature required to pass the course

Lectures on linear algebra, I. M. Gelfand, Wiley & Sons, Inc., 2007 (ISBN 10: 0470296011, ISBN 13: 9780470296011)

Extracurricular readings

Linear Algebra: Gateway to Mathematics, R. Messer, Pearson, 1997 (ISBN 10: 0065017285, ISBN 13: 9780065017281)

**The learning outcomes (for the field of study and specialization)**

K\_W05: has extended knowledge in the field of the linear algebra

K\_W07: selects suitable mathematical tools to the extent necessary to understand the formulation of quantum mechanics

K\_W08: demonstrates in-depth knowledge of linear functionals and operators used to solve problems in chemistry

K\_U02: critically assesses the results of performed observations and theoretical calculations and discusses errors in the context of precise mathematical terms

K\_U04: applies acquired knowledge of mathematics, chemistry and related scientific disciplines

K\_U11: communicates in a foreign language in accordance with the requirements specified for level B2 of the Common European Framework of Reference for Languages and can use specialist terminology

K\_K01: knows the limitations of her/his own knowledge; understands the need for further education

**Knowledge**

Student defines and describes basic terms of linear algebra. Recognizes a given vectors space, distinguishes between functionals and operators, recognizes and uses Hermitian operators.

**Skills**

Student solves eigenproblems (matrix formulation), finds eigenvalues and eigenvectors, 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.

**Social competence**

Student develops the skills of accurate and logical thinking and inference. Learns the principles of working safely, responsibly, and efficiently. Develops the ability to work in a team.

**Contact**

adrian.kolodziejski@gmail.com