GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Functional analysis II, PG_00061292		
Field of study	Mathematics		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2024/2025
Education level	second-cycle studies	Subject group	Obligatory subject group in the field of study Subject group related to scientific research in the field of study
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	5.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Nonlinear Analysis and Statistics -> Faculty of Applied Physics and Mathematics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Maciej Starostka	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	30.0	0.0	0.0	0.0	60

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	60	5.0	60.0	125

Subject objectives

Introduction to advanced topics of functional analysis and noncommutative normed algebras.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U07] at an advanced level and covering modern mathematics, applies and presents in speech and in writing the content and methods of a selected branch of mathematics	Synthesis measure theory, functional analysis and noncommutative algebras.	[SU4] Assessment of ability to use methods and tools
[K7_U05] recognize topological structures in mathematical objects occurring, for example, in geometry or mathematical analysis; uses the basic topological properties of sets, functions and transformations, uses the language and methods of functional analysis	Has a profound knowledge of topological linear spaces.	[SU2] Assessment of ability to analyse information

Subject contents

Introduction to natation, basic definitions and revision of selected topics on set theory. Classical Banach spaces. The axiom of choice, Kuratowski - Zorn lemma, Hahn - Banach theorem. Characterization of compactness in specific Banach spaces. Stone - Weierstrass theorem. Dual operations. Weak and *weak topologies. Banach - Alaoglu theorem. Reflexivity. Banach algebras. Gelfand transform. C*-algebras. Spectral theorem and spectral measures. Strong and weak operator topologies. Basics of von Neumann algebras.

Prerequisites and co-requisites

Courses completed: Functional Analysis I (MAT1016)

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Activity	51.0%	10.0%
Exam	51.0%	50.0%
Projects	51.0%	40.0%

Recommended reading	Basic literature	W.Rudin, Analiza funkcjonalna, PWN, 2001. J.Musielak, Wstęp do analizy funkcjonalnej, PWN, 1989. J.Górniak, T.Pytlik, Analiza funkcjonalna w zadaniach, Wyd. PWr, 1992. K.Zhu, An Introduction to Operator Algebras, CRC Press, 2000.
	Supplementary literature	R.V.Kadison, J.R.Ringrose, Fundamentals of the Theory of Operator Algebras, vol. I, III, AMS, 1997. F.Albiac, N.J.Kalton, Topics in Banach Space Theory, Springer, 2006. S.Prus, A.Stachura, Analiza funkcjonalna w zadaniach, PWN, 2007.
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	Identify dual spaces. Investigate compactness of subsets of continuous functions on compact spaces. Find closures of specific subsets of Banach spaces. Investigate metrizibility of weak and *weak topologies. Investigate whether specific algebras are Banach algebras, C*-algebras. Compare different operator topologies.	
Work placement	Not applicable	

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