



Subject card

Subject name and code	Functional analysis II, PG_00061292						
Field of study	Mathematics						
Date of commencement of studies	October 2026	Academic year of realisation of subject				2026/2027	
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 -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Maciej Starostka					
	Teachers						
Lesson types	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_W01] has enhanced knowledge of basic branches of mathematics, demonstrates knowledge theorem and hypotheses, has understanding of the role and importance of mathematical reasoning structure.				[SW1] Assessment of factual knowledge		
	[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	Course content – lecture Introduction to notation, 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	<p>W.Rudin, Analiza funkcjonalna, PWN, 2001.</p> <p>J.Musielak, Wstęp do analizy funkcjonalnej, PWN, 1989.</p> <p>J.Górnaiak, T.Pytlik, Analiza funkcjonalna w zadaniach, Wyd. PWr, 1992.</p> <p>K.Zhu, An Introduction to Operator Algebras, CRC Press, 2000.</p>	
	Supplementary literature	<p>R.V.Kadison, J.R.Ringrose, Fundamentals of the Theory of Operator Algebras, vol. I, III, AMS, 1997.</p> <p>F.Albiac, N.J.Kalton, Topics in Banach Space Theory, Springer, 2006.</p> <p>S.Prus, A.Stachura, Analiza funkcjonalna w zadaniach, PWN, 2007.</p>	
	eResources addresses		
Example issues/ example questions/ tasks being completed	<p>Identify dual spaces. Investigate compactness of subsets of continuous functions on compact spaces. Find closures of specific subsets of Banach spaces. Investigate metrizable of weak and *weak topologies. Investigate whether specific algebras are Banach algebras, C*-algebras. Compare different operator topologies.</p>		
Practical activities within the subject	Not applicable		

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