



## Subject card

Subject name and code	Time-Space Signal Processing, PG_00048386						
Field of study	Electronics and Telecommunications, Biomedical Engineering						
Date of commencement of studies	February 2026	Academic year of realisation of subject			2026/2027		
Education level	second-cycle studies	Subject group			Optional subject group Specialty subject group 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	2	Language of instruction			Polish		
Semester of study	3	ECTS credits			2.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department Of Signals And Systems -> Faculty Of Electronics Telecommunications And Informatics -> Wydział Politechniki Gdańskiej						
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Roman Salamon					
	Teachers	prof. dr hab. inż. Roman Salamon					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	15.0	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		2.0		18.0	50
Subject objectives	The aim of the course is to acquire by students the skills of computer simulation of the basic methods of signal processing in the time and space domain in echolocation systems.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_U09] can carry out a critical analysis of the functioning of existing technical solutions and assess these solutions, as well as apply experience related to the maintenance of advanced technical systems, devices and facilities typical for the field of studies, gained in the professional engineering environment	Using the written program that simulates the functioning of the system can interpret the impact of individual technical parameters of echolocation systems on its operational parameters.	[SU4] Assessment of ability to use methods and tools
	[K7_W04] knows and understands, to an increased extent, the principles, methods and techniques of programming and the principles of computer software development or programming devices or controllers using microprocessors or other elements or programmable devices specific to the field of study, and organization of work of systems using computers or such devices	He mastered algorithms of space-time signal processing in echolocation systems and the method of their implementation in the MATLAB environment.	[SW2] Assessment of knowledge contained in presentation
	[K7_U03] can design, according to required specifications, and make a complex device, facility, system or carry out a process, specific to the field of study, using suitable methods, techniques, tools and materials, following engineering standards and norms, applying technologies specific to the field of study and experience gained in the professional engineering environment	Student can write a program in MATLAB environment simulating the functioning of a selected hydro or radiolocation system. He is able to design and program the GUI graphical user interface of the selected echolocation system.	[SU4] Assessment of ability to use methods and tools
	[K7_W03] knows and understands, to an increased extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum	He knows the methods of space-time signals processing and can apply them to simulation of echolocation systems	[SW1] Assessment of factual knowledge
Subject contents	<ol style="list-style-type: none"> <li>1. Organization of the course conditions of passing</li> <li>2. Techniques of remote detection, localization and parameters of objects in the environment</li> <li>3. Problem of space search duration and techniques of its solutions</li> <li>4. General structure of multibeam space filters</li> <li>5. Multielement antennas, their structure</li> <li>6. Beam patterns and their parameters</li> <li>7. Basics of delay-and-sum multibeam space filters (DSMSF)</li> <li>8. Structure and techniques of realizing DSMSF</li> <li>9. Realization of filters in time domain</li> <li>10. Realization of narrow-band filters in frequency domain</li> <li>11. Realization of wide-band filters in frequency domain</li> <li>12. Methods and techniques of beam focusing</li> <li>13. Electronic steering of transmission beam</li> <li>14. Space spectrum and the direction of wave arrival</li> <li>15. Fourier method of space spectrum estimation</li> <li>16. High resolution techniques of space spectrum estimation: parametric methods of spectrum estimation</li> <li>17. Super resolution methods of spectrum estimation</li> <li>18. Adaptation methods</li> </ol>		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Midterm colloquium	60.0%	30.0%
	Project	60.0%	70.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. R. Salamon Systemy hydrolokacyjne. Wyd. Gdańskie Towarzystwo Naukowe, Gdańsk 2006</li> <li>2. A.V. Oppenheim, R.W. Schaffer Digital Signal Processing. Prentice-Hall, Englewood Cliffs 1975</li> </ol>	
	Supplementary literature	No requirements	
	eResources addresses	Adresy na platformie eNauczenie:	
Example issues/ example questions/ tasks being completed			

Work placement	Not applicable
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