



## Subject card

Subject name and code	Computer-aided Simulation of Systems, PG_00048384						
Field of study	Electronics and Telecommunications						
Date of commencement of studies	February 2023	Academic year of realisation of subject			2023/2024		
Education level	second-cycle studies	Subject group			Optional 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	1	Language of instruction			Polish		
Semester of study	2	ECTS credits			2.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Marine Electronic Systems -> Faculty of Electronics, Telecommunications and Informatics						
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		4.0		16.0	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 telecommunication and echolocation systems.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[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.	Student describes methodology of computer simulation of systems. He examines functional schemes of systems and extracts their essential elements. He translates analogue mathematical description of system components into numerical algorithms.	[SW1] Assessment of factual knowledge
	[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	Is able to write a program in MATLAB environment performing simulates of the basic elements of the telecommunications system	[SU4] Assessment of ability to use methods and tools
	[K7_U06] can analyse the operation of components, circuits and systems related to the field of study; measure their parameters; examine technical specifications; interpret obtained results and draw conclusions	He uses computer simulations to determine the parameters and technical characteristics of systems. It studies the influence of noise on the functioning of systems.	[SU4] Assessment of ability to use methods and tools
	[K7_W04] Knows and understands, to an advanced extent, the principles, methods and techniques of programming and the principles of computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study, and organisation of systems using computers or such devices	He aggravates his programming skills in MATLAB environment performing simulation of the operation of selected telecommunications and echolocation systems, and examines their properties. He compares results of numerical calculations and theoretical predictions.	[SW1] Assessment of factual knowledge
	[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 the system on its operational parameters.	[SU1] Assessment of task fulfilment
Subject contents	<ol style="list-style-type: none"> <li>1. Introduction.</li> <li>2. Goals and techniques of CASS.</li> <li>3. MATLAB environment as a tool of systems simulation.</li> <li>4. Computer simulation methodology.</li> <li>5. System functional model.</li> <li>6. Algorithmization of system functions.</li> <li>7. Presentation techniques of simulation results.</li> <li>8. Generation of analog and digital signals.</li> <li>9. Generation of noise.</li> <li>10. Digital modeling of transmission losses in the channel.</li> <li>11. Numeric determination of wave propagation trajectories.</li> <li>12. Simulation of reverberation.</li> <li>13. Numerical simulation of analog filters.</li> <li>14. Sampling and a/d conversion.</li> <li>15. Quadrature sampling of narrowband signals.</li> <li>16. Digital filters design.</li> <li>17. Filtration of signals used in real-time systems.</li> <li>18. Simulation of detection in echolocation systems; correlation reception</li> <li>19. Matched filtration in frequency domain.</li> <li>20. Envelope detection.</li> <li>21. Detection of sinusoidal signals with unknown frequency.</li> <li>22. Demodulation of digital signals.</li> <li>23. Demodulation of AM, FM, SSB and QAM signals</li> </ol>		
Prerequisites and co-requisites			

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Midterm colloquium	60.0%	40.0%
	Project	60.0%	60.0%
Recommended reading	Basic literature	1. Haykin S. Systemy telekomunikacyjne, WKŁ Warszawa 1998 2. Skolnik M. Radar Handbook, McGraw-Hill, New York 1990 3. Salamon R. Systemy hydrolokacyjne, GTN Gdańsk 2006	
	Supplementary literature	1. Oppenheim A.V., Schaffer R.W. Digital Signal Processing, Prentice Hall, Englewood Cliffs 1975 2. Szabatin J. Podstawy teorii sygnałów, WKŁ Warszawa 1982	
	eResources addresses	Adresy na platformie eNauczanie: Symulacja Komputerowa Systemów 2023 - Moodle ID: 34471 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=34471">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=34471</a>	
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		