GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Adaptive Filtration, PG_00068080		
Field of study	Automatic Control, Cybernetics and Robotics		
Date of commencement of studies	October 2025	Academic year of realisation of subject	2028/2029
Education level	first-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	4	Language of instruction	Polish
Semester of study	7	ECTS credits	1.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Signals and Systems -> Faculty of Electronics Telecommunications and Informatics -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Piotr Kaczmarek	
	Teachers	dr inż. Piotr Kaczmarek	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	0.0	15.0	0.0	15
	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	15	1.0	9.0	25

Subject objectives	The aim of the course is to develop practical skills in applying adaptive filtering to engineering problems. The course introduces fundamental concepts related to adaptive signal processing methods. Students will learn classical adaptive filtering algorithms such as LMS (Least Mean Squares) and RLS (Recursive Least Squares), along with their applications in noise reduction, system modeling, and signal detection. Projects include the implementation of adaptive filters, analysis of their performance, and basic engineering applications.

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<tr><td>Learning outcomes</td><td>
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<tr><th>Course outcome</th><th>Subject outcome</th><th>Method of verification</th></tr>
<tr><td>[K6_W21] knows and understands the basic methods of decision making as well as methods and techniques of design and operation of automatic regulation and control systems, computer applications for controlling and monitoring dynamic systems.</td><td>The student can use adaptive filtering to remove interference from measurement signals.</td><td>[SW3] Assessment of knowledge contained in written work and projects</td></tr>
<tr><td>[K6_U03] can design, according to required specifications, and make a simple 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</td><td>The student can implement advanced algorithms based on adaptive filtering for applications in medical, telecommunication, acoustic signals, and others.</td><td>[SU1] Assessment of task fulfilment</td></tr>
<tr><td>[K6_W01] knows and understands, to an advanced extent, mathematics necessary to formulate and solve simple issues related to the field of study</td><td>The student can apply statistical concepts to the design of adaptive filters.</td><td>[SW3] Assessment of knowledge contained in written work and projects</td></tr>
<tr><td>[K6_U01] can apply mathematical knowledge to formulate and solve complex and non-typical problems related to the field of study and perform tasks, in an innovative way, in not entirely predictable conditions, by:n- appropriate selection of sources and information obtained from them, assessment, critical analysis and synthesis of this information,n- selection and application of appropriate methods and toolsn</td><td>The student can extract information from noisy data.</td><td>[SU1] Assessment of task fulfilment</td></tr>
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<tr><td>Subject contents</td><td>As part of the course, the student will be required to complete three projects involving adaptive filtering. Example project tasks include:

1. Noise reduction in an audio signal using the LMS algorithm
2. Identification of an unknown dynamic system using the RLS method
3. Adaptive filtering of interference in EEG/ECG signals
4. Detection of useful signals in a noisy environment
5. Comparison of the performance of LMS and RLS algorithms in real time</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Lecture: Adaptive filtering</td></tr>
<tr><td>Assessment methods and criteria</td><td>
<table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Project evaluation</td><td>60.0%</td><td>100.0%</td></tr>
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<tr><td>Recommended reading</td><td>
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<tr><td>Basic literature</td><td>Haykin, S. Adaptive Filter Theory, 5th Edition</td></tr>
<tr><td>Supplementary literature</td><td>Paulo S.R. Diniz Adaptive Filtering: Algorithms and Practical Implementation</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td></td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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