



## Subject card

Subject name and code	Analog-to-Digital Circuits, PG_00064020						
Field of study	Electronics and Telecommunications						
Date of commencement of studies	February 2025	Academic year of realisation of subject			2024/2025		
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	1	Language of instruction			Polish		
Semester of study	1	ECTS credits			2.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Department of Microelectronic Systems -> Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Grzegorz Blakiewicz					
	Teachers	dr hab. inż. Grzegorz Blakiewicz					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0	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	3.0		17.0		50
Subject objectives	Gain knowledge of design and principle of operation of analog-digital integrated circuits. Gain skills in the design, analysis and computer simulation of selected functional blocks that are part of integrated analog-digital 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	The student has gained knowledge of type and design of basic analog-digital functional blocks.			[SW3] Assessment of knowledge contained in written work and projects		
	[K7_U08] while identifying and formulating engineering tasks specifications and solving these tasks, can: - apply analytical, simulation and experimental methods, - notice their systemic and non-technical aspects, - make a preliminary economic assessment of suggested solutions and engineering work	The student has gained knowledge of properties of selected functional blocks of analog-digital systems, which allows him to select the appropriate solution for the assumed requirements.			[SU3] Assessment of ability to use knowledge gained from the subject		
[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	The student can design and perform simulations for verification of basic functional blocks in analog-digital systems.			[SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment			

Subject contents	<ol style="list-style-type: none"> <li>1. Characteristics of analog-digital integrated systems</li> <li>2. Components of analog-digital systems and their parameters</li> <li>3. Band-limiting and smoothing filters</li> <li>4. Sample and hold circuits</li> <li>5. Characteristics of analog-to-digital and digital-to-analog converters</li> <li>6. Parallel digital-to-analog converters</li> <li>7. Serial digital-to-analog converters</li> <li>8. Parallel analog-to-digital converters</li> <li>9. Serial analog-to-digital converters</li> <li>10. Higher accuracy analog-to-digital and digital-to-analog converters</li> <li>11. High-speed analog-to-digital and digital-to-analog converters</li> <li>12. Converters based on sigma-delta modulator</li> <li>13. Digital-to-analog converter with sigma-delta modulator</li> <li>14. Analog-to-digital converter with sigma-delta modulator</li> <li>15. Measurements of parameters of analog-to-digital and digital-to-analog converters</li> </ol>											
Prerequisites and co-requisites	Knowledge of basic signal and circuit theory and the ability to analyze analog circuits.											
Assessment methods and criteria	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 40%;">Subject passing criteria</th> <th style="width: 30%;">Passing threshold</th> <th style="width: 30%;">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td>End-of-semester colloquium</td> <td>50.0%</td> <td>70.0%</td> </tr> <tr> <td>Laboratory exercises</td> <td>50.0%</td> <td>30.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	End-of-semester colloquium	50.0%	70.0%	Laboratory exercises	50.0%	30.0%
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End-of-semester colloquium	50.0%	70.0%										
Laboratory exercises	50.0%	30.0%										
Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. P. E. Allen, D. R. Holberg, CMOS Analog Circuit Design, Oxford University Press, New York 2002.</li> <li>2. R. van de Plassche, Scalone przetworniki analogowo-cyfrowe i cyfrowo-analogowe WKŁ, Warszawa 2001.</li> </ol>										
	Supplementary literature	<ol style="list-style-type: none"> <li>1. J. J. Mulawka, Układy mikroelektroniczne z przełączanymi pojemnościami, WKŁ, Warszawa 1987.</li> <li>2. P. E. Allen, E. Sanchez-Sinencio, Switched Capacitor Circuits, VNR, New York 1984.</li> <li>3. M. Nadachowski, Z. Kulka, Analogowe układy scalone, WKŁ, Warszawa 1983.</li> </ol>										
	eResources addresses	Adresy na platformie eNauczanie:										
Example issues/ example questions/ tasks being completed												

Work placement	Not applicable
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