GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Analog Integrated Circuits, PG_00048108		
Field of study	Electronics and Telecommunications		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2025/2026
Education level	first-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	4	Language of instruction	Polish
Semester of study	7	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Microelectronic Systems -> Faculty of Electronics, Telecommunications and Informatics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Jacek Jakusz	
	Teachers	dr hab. inż. Jacek Jakusz	

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	2.0	18.0	50

Subject objectives

The aim of the course is to provide knowledge of design analog integrated circuits and gain practical skills in design and performance verification of analog circuits using CAD software.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W32] Knows the parameters, functions and methods of analysis, design and optimization of analogue and digital circuits and electronic systems	The student lists and classifies and describes the basic technologies of IC manufacturing. The student recognizes and describes basic functional blocks of analogue integrated circuits. The student recognizes and describes basic circuits: operating amplifiers, transconductance amplifiers and comparators. The student calculates basic parameters of analog amplifying circuits.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
[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	Student calculates parameters of simple analog circuits. Student designs topographies of simple analog circuits. The student simulates and evaluates parameters of analog circuits.	[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment

<table>
<tr><td>Subject contents</td><td>1. CMOS, BJT & BiCMOS analog integrated circuits introduction
2. Modeling of CMOS and BJT devices
3. Passive components in analog integrated circuits
4. Basic building blocks: MOS switches, MOS Current Sinks/Sources
5. Basic building blocks: current mirrors, MOS resistors, active loads
6. Basic building blocks: single stage amplifiers
7. Basic building blocks: output amplifiers/buffers
8. Voltage and current reference circuits
9. Operational amplifiers - design principles and compensation
10. Architecture of two-stage CMOS operational amplifier
11. Design procedure of two-stage CMOS operational amplifier
12. High-performance CMOS operational amplifiers - examples
13. Operational transconductance amplifiers OTA linearization methods
14. OTA realization - examples
15. Current conveyors and current amplifiers
16. CMOS comparators</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>No requirements</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>Midterm colloquium</td><td>50.0%</td><td>60.0%</td></tr>
<tr><td>Practical exercise</td><td>50.0%</td><td>40.0%</td></tr>
</table></td></tr>
<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>D. Johns, K. Martin: Analog Integrated Circuit Design, John Wiley & Sons, Inc. P.E. Allen, D.R. Holberg: CMOS Analog Circuit Design, Oxford University Press Jacek Izydorczyk: Pspice. Komputerowa symulacja układów elektronicznych, Helion</td></tr>
<tr><td>Supplementary literature</td><td>No requirements</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr>
</table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>Design of a two-stage CMOS operational amplifier.</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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