



Subject card

Subject name and code	Analog Electronic Circuits, PG_00047538						
Field of study	Electronics and Telecommunications						
Date of commencement of studies	October 2022		Academic year of realisation of subject		2023/2024		
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	2		Language of instruction		Polish		
Semester of study	4		ECTS credits		3.0		
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		prof. dr hab. inż. Stanisław Szczepański				
	Teachers		prof. dr hab. inż. Stanisław Szczepański dr hab. inż. Bogdan Pankiewicz				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	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		42.0	75
Subject objectives	Knowledge of methods of analysis and design of analog electronic circuits structures based on the MOSFET, JFET and bipolar transistors.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_W05] Knows and understands, to an advanced extent, methods of supporting processes and functions, specific to the field of study	The student describes and classifies the methods of supporting the design and optimization of basic analog structures and digital electronic circuits.	[SW1] Assessment of factual knowledge
	[K6_W06] Knows and understands the basic processes occurring in the life cycle of devices, facilities and systems specific to a given field of study.	The student describes the basic processes in the life cycle of devices using analog and digital electronic circuits.	[SW1] Assessment of factual knowledge
	[K6_U06] can analyse the operation of components, circuits and systems related to the field of study, measure their parameters and examine technical specifications	The student classifies and describes basic structures of analog and digital electronic circuits. The student defines and explains the technical parameters of analog and digital electronic circuits. The student indicates and explains the applications of analog and digital electronic circuits.	[SU4] Assessment of ability to use methods and tools
	[K6_W32] Knows the parameters, functions and methods of analysis, design and optimization of analogue and digital circuits and electronic systems	Student defines and explains technical parameters and functions of analog and digital electronic circuits.	[SW3] Assessment of knowledge contained in written work and projects
	[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	The student defines and explains performance parameters of analog and digital electronic circuits. The student indicates and explains applications of analog and digital electronic circuits.	[SU4] Assessment of ability to use methods and tools
Subject contents	1. Introduction, categories of the electronic circuits 2. Power supply and biasing techniques for bipolar and MOS transistors 3. Models, DC and AC analysis of bipolar and MOS amplifiers 4. Frequency-domain analysis of bipolar and MOS amplifiers 5. Bipolar and CMOS differential amplifiers - properties and integrated circuit (IC) realizations 6. Functional blocks for linear ICs realized in bipolar and CMOS technologies 7. Operational amplifiers and their applications 8. Analytical models and analysis of IC amplifiers (bipolar and CMOS) 9. IC wideband amplifiers (bipolar and CMOS) 10. CMOS operational transconductance and transresistance amplifiers. 11. IC bandpass amplifiers 12. IC power amplifiers 13. Amplifiers with negative feedback loop. 14. Design of bipolar and CMOS amplifiers with negative feedback 15. Noise properties of active circuits 16. Synthesis methods for continuous-time active filters 17. Switched capacitor and switched current filters 18. CMOS programmable analog arrays - properties and applications 19. Analog Application Specific Integrated Circuit (ASIC) design 20. IC layout and design verification tools 21. Analog multiplier and its applications 22. Amplitude , frequency and phase detectors 23. Oscillations in the lossy resonance circuit. Negative resistance . Feedback-type oscillator structure. 24. Well-known feedback-oscillator structures 25. Relaxation-mode oscillators 26. Oscillators based on a high-Q resonator . Crystal-oscillator. 27. Signal generation in the phase-locked loop 28. Power supply rectifiers and filters. 29. Analog voltage regulators 30. Switching DC/DC and AC/DC converters.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written exam	50.0%	100.0%
Recommended reading	Basic literature	Guziński A: "Liniowe elektroniczne układy analogowe", WNT, 1994 Tietze U., Schenk Ch.: "Układy półprzewodnikowe", WNT2009 Sedra A.S., Smith K.C.: "Microelectronic circuits", Oxford University Press, New York, Oxford, 2004	
	Supplementary literature	No requirements	
	eResources addresses	Adresy na platformie eNauczanie: Liniowe i nieliniowe układy elektroniczne (podstawy) - 2023/24(lato) - Moodle ID: 36308 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=36308	
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		