



## Subject card

Subject name and code	Electronic Circuit Design, PG_00048096						
Field of study	Electronics and Telecommunications						
Date of commencement of studies	October 2020	Academic year of realisation of subject			2023/2024		
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			4.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Metrology and Optoelectronics -> Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Paweł Wierzba				
	Teachers		dr hab. inż. Paweł Wierzba				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	15.0	0.0	45
	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	45		4.0		51.0	100
Subject objectives	Provision of knowledge and abilities in the fields of analysis and design of selected classes of analog circuits.						
Learning outcomes	Course outcome		Subject outcome			Method of verification	
	[K6_U06] can analyse the operation of components, circuits and systems related to the field of study, measure their parameters and examine technical specifications		performs analysis of analog circuits using SPICE simulation programs; performs analysis of analog circuits with operational amplifiers and filters;			[SU1] Assessment of task fulfilment	
	[K6_W32] Knows the parameters, functions and methods of analysis, design and optimization of analogue and digital circuits and electronic systems		knows operations performed by linear and nonlinear analog circuits; knows analysis methods of analog circuits using SPICE family programs; knows design methods for circuits using operational amplifiers; selects appropriate type and order of LC filters according to specifications;			[SW3] Assessment of knowledge contained in written work and projects	
Subject contents	<ol style="list-style-type: none"><li>1. Introduction to design of electronic circuits</li><li>2. Component characteristics important for the design process</li><li>3. Functions implemented with linear circuits</li><li>4. Operational amplifier in linear circuits</li><li>5. Design of selected linear circuits (instrumentation amplifier, control circuit )</li><li>6. Analog filter design</li><li>7. Design of selected non-linear circuits (amplitude demodulator, active rectifier, RMS measurement circuits)</li><li>8. Estimation of signal to noise ratio in designed circuits</li><li>9. Sensitivity of circuit to component parameters change. Introduction</li><li>10. Calculation of circuit sensitivity to component parameters change. Difference method</li><li>11. Calculation of circuit sensitivity to component parameters change. Monte-Carlo method</li><li>12. Calculation of circuit sensitivity to component parameters change. Worst case method</li><li>13. Selection of components tolerance</li><li>14. Design of low-power circuits</li><li>15. Assessment and improvement of designed circuits stability</li><li>16. Analysis of analog circuits</li><li>17. Analysis of digital and mixed signal circuits</li></ol>						

Prerequisites and co-requisites	No requirements		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Midterm colloquium	51.0%	30.0%
	Project	50.0%	30.0%
	Practical exercise	50.0%	40.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. Z. Bielecki, A. Rogalski, Detekcja sygnałów optycznych, WNT Warszawa 2001</li> <li>2. T. H. Wilmshurst, Signal recovery from noise in electronic instrumentation, Taylor and Francis, 1990</li> <li>3. G. W. Roberts, A. S. Sedra, SPICE, 2nd edition, Oxford University Press, Oxford 1997</li> <li>4. P. Horowitz, W. Hill, Sztuka elektroniki, WNT Warszawa 1992</li> <li>5. M. Niedźwiecki, M. Rsiukiewicz, Nieliniowe elektroniczne układy analogowe, WNT Warszawa 1991</li> <li>6. U. Tietze, Ch. Schenk, Układy półprzewodnikowe, WNT Warszawa 1996</li> </ol>	
	Supplementary literature	No requirements	
	eResources addresses	Adresy na platformie eNauczenie: Projektowanie układów elektronicznych - 2023 - Moodle ID: 31929 <a href="https://enauczenie.pg.edu.pl/moodle/course/view.php?id=31929">https://enauczenie.pg.edu.pl/moodle/course/view.php?id=31929</a>	
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		