GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Design of ASIC, PG_00048109						
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		4.0		
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. Bogdan Pankiewicz				
	Teachers		dr hab. inż. Bogdan Pankiewicz				
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	knows programmable integrated microelectronic systems, can design digital integrated circuit using standard cells approach and specialized design tools						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W33] Knows programming languages and equipment description languages, as well as methods for the synthesis of combinational and sequential circuits and programmable systems	Student knows the DFT techniques (Design For Test). Student knows the methods of testing digital and analog circuits. Student knows the basic properties and principles of using serial interfaces used for integrated circuits and PCB assembly testing, including an interface in accordance with the IEEE 1149.1 standard.	[SW1] Assessment of factual knowledge
[K6_W32] Knows the parameters, functions and methods of analysis, design and optimization of analogue and digital circuits and electronic systems	Student knows the construction of integrated AC and CA converters, basic digital circuits, output and input buffer blocks.	[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	Student is able to estimate the delays of basic logic circuits as well as input-output blocks. Student is able to estimate the possible resolutions of AC and CA converters realized in CMOS technology.	[SU1] Assessment of task fulfilment
[K6_W03] knows and understands, to an advanced 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	Student classifies the production technology of ASICs, explains the problems associated with the design of ASICs and explains the methods for eliminating parasitics.	[SW1] Assessment of factual knowledge
[K6_U04] can apply knowledge of programming methods and techniques as well as select and apply appropriate programming methods and tools in computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study	Student is able to design a digital integrated circuit using HDL languages. Student is able to perform a description of the integrated circuit, then perform a simulation of the description, perform logical synthesis and implementation in the standard cells techniques.	[SU1] Assessment of task fulfilment

Subject contents

1. IC technologies, technological steps, design rules, IC devices and its drawbacks. 2. Relative and absolute mismatch and devices design for matching im-provement. 3. Classification and general information regarding integrated digital to analog converters. 4. IC realization of selected DA converters. 5. Classification and general information regarding integrated analog to digital converters. 6. Sample and hold circuits and IC realization of selected DA converters. 7. General digital cells: gates and flip flops. 8. Estimation of propagation times and optimal design of gates. 9. Clock tree topologies and synthesis of clock tree. 10. Automated design of digital circuits. Review of commercial EDA tools (Cadence). 11. Testability of ASICs. Design of IC for testability. 12. Interface IEEE 1149.1. 13. Application of interface IEE1149.1 for testing of ICs. 14. Design of mixed circuits and systems. 15. Future of ASICs and ICs.

Prerequisites and co-requisites

Knowledge of VHDL or Verilog.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Project	51.0%	25.0%
Written exam	51.0%	50.0%
Practical exercise	51.0%	25.0%

Recommended reading

Basic literature	Matching properties of MOS transistors, M. Pelgrom, A. Duinmaijer, A. Welbres, IEEE Journal of Solid-State Circuits, vol.. 24, no. 5, October 1989. K. P. Parker, The Boundary-Scan Handbook Second Edition Analog and Digital, Kluwer Academic Publishers, 1998. C. Wai-Kai (editor), The VLSI Handbook, Taylor & Francis Group, 2007.
Supplementary literature	No requirements
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed

Work placement

Not applicable