GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Modelling and Simulation of Electronic Systems, PG_00048098		
Field of study	Electronics and Telecommunications		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2026/2027
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 Metrology and Optoelectronics -> Faculty of Electronics, Telecommunications and Informatics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Michał Kowalewski	
	Teachers	dr inż. Michał Kowalewski	

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

A course teaches students model building skills, that is representing some aspects of the real world by numbers or symbols which may be easily manipulated to facilitate the study of the dynamics of existing or hypothesized systems at a reduced cost.

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	Classifies methods of modeling electronic systems. Knows the rules of modeling in Simulink. Appreciates the importance of modeling and simulation as a tool in the design and analysis of electronic systems.	[SW1] Assessment of factual knowledge
[K6_U09] can carry out a critical analysis of the functioning of existing technical solutions and assess these solutions, as well as apply experience related to the maintenance of technical systems, devices and facilities typical for the field of studies, gained in the professional engineering environment	In Matlab and Simulink, student constructs and researches models of analogue-to-digital converters: successive approximation, integration, sigma-delta modulator. Investigates model of generator with automatic amplitude control loop, model of van der pole oscillator. Models nonlinear systems using piecewise-linear approximation.	[SU4] Assessment of ability to use methods and tools

Subject contents

1. Introduction 2. Modelling of linear continuous circuits, topological formulation of algebraic network equations 3. Modeling of linear continuous systems: transfer function models and state-space approach 4. Modelling discrete time systems 5. Block diagram reduction and manipulation rules 6. Behavioural modelling in Matlab environment 7. Modelling of non-linear circuits by piecewise-linear method 8. Creation of hierarchical models, using the debugger and accelerator, creating masked blocks, interactive simulation, running a batch of simulations in Simulink 9. Libraries of standard Simulink blocks: linear, non-linear, discrete, sources, sinks 10. Libraries: mathematical operations, function and tables, signals and systems 11. Variable-step and fixed-step solvers of sets of ordinary differential equations 12. Practical examples: model of succesive approximation ADC 13. Model of dual-slope integration ADC 14. Model of sigma-delta converter 15. Colloquium

Prerequisites and co-requisites

No requirements

<table>
<tr><td>Assessment methods and criteria</td><td colspan="2"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Laboratory</td><td>50.0%</td><td>40.0%</td></tr>
<tr><td>Midterm colloquiums</td><td>50.0%</td><td>60.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>1. Vlach J., Singhal K.: Computer methods for circuit analysis and design. New York, Van Nostrand Reinhold, 1994 2. Osowski S.: Modelowanie i symulacja układów i procesów dynamicznych. OWPW, 2007 3. Klee H.: Simulation of Dynamic Systems with MATLAB and Simulink. CRC Press, Boca Raton 2007. 4. Esfandiari R.S., Lu B.: Modeling and analysis of dynamic systems, CRC Press, Boca Raton 2010</td></tr>
<tr><td>Supplementary literature</td><td>No requirements</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">1. 7th order elliptical filter models. 2. Formulation of state equations for electronic systems. 3. Model building and dynamic system simulation in Matlab-Simulink environment 4. Examination of the analog-to-digital converter model. 5. Examination of numerical integration algorithms. 6. Selected models of electronic systems: a generator with automatic amplitude control, a / c converter with double integration, a sigma-delta modulator.</td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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