



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 2026	Academic year of realisation of subject				2029/2030	
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	Metrology and Electronic Systems Department -> Faculty of Electronics Telecommunications and Informatics -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Michał Kowalewski				
	Teachers		dr inż. Michał Kowalewski				
Lesson types	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_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	Course content – lecture 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 successive approximation ADC 13. Model of dual-slope integration ADC 14. Model of sigma-delta converter 15. Colloquium						
Prerequisites and co-requisites	No requirements						
Assessment methods and criteria	Subject passing criteria		Passing threshold			Percentage of the final grade	
	Midterm colloquiums		50.0%			60.0%	
	Laboratory		50.0%			40.0%	

Recommended reading	Basic literature	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
	Supplementary literature	No requirements
	eResources addresses	
Example issues/ example questions/ tasks being completed	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.	
Practical activities within the subject	Not applicable	

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