



## Subject card

Subject name and code	Computing and Simulation Techniques, PG_00067032						
Field of study	Electronics and Telecommunications						
Date of commencement of studies	October 2026	Academic year of realisation of subject			2026/2027		
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	1	Language of instruction			Polish		
Semester of study	2	ECTS credits			3.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Signals and Systems -> Faculty of Electronics Telecommunications and Informatics -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Jan Schmidt					
	Teachers	dr hab. inż. Iwona Kočańska dr inż. Barbara Stawarz-Graczyk dr inż. Jan Schmidt dr inż. Arkadiusz Szewczyk mgr inż. Aleksander Schmidt					
Lesson types	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		3.0		27.0	75
Subject objectives	The aim of the course is to acquire by students the skills in basic programming, with the use of MATLAB, open-source MATLAB-like, and SPICE environments, in numerical calculations, digital signal processing and simulation studies of simple circuits and electronic systems.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_U01] can apply mathematical knowledge to formulate and solve complex and non-typical problems related to the field of study and perform tasks, in an innovative way, in not entirely predictable conditions, by:n- appropriate selection of sources and information obtained from them, assessment, critical analysis and synthesis of this information,n- selection and application of appropriate methods and toolsn	Student has the qualities for providing numerical and simulation experiments in DC, transient and frequency circuit and signal analysis. Diligent students are capable to state, discuss, and solve advanced problems like: ill-conditioned problems. I certain cases, they can use the Analysis and Synrhesis method.	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools
	[K6_W01] knows and understands, to an advanced extent, mathematics necessary to formulate and solve simple issues related to the field of study	Student is familiar with Analysis Methods for linear and elementary nonlinear circuits. He/she knows methods of solving sets of linear equations (LU method and iterative), nonlinear equations (bisection, falsi, secants, and Newton's), and interpolation and approximation rules/methods.	[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 capable of providing numerical experiments in DC, transient and frequency circuit and signal analysis. Has the qualities for making presentation in graphic form.	[SU1] Assessment of task fulfilment
	[K6_W04] knows and understands, to an advanced extent, the principles, methods and techniques of programming and the principles of computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study, and organisation of systems using computers or such devices	Student knows the programming rules in numerical calculations, electrical circuit simulations and signal processing. Student gets familiar with such well-adopted tools as MATLAB and SPICE and basics of their programming languages. He knows the principles of interpolation and approximation of functions, knows well-adopted simulation/ calculation tools and basics of their programming languages and enviroments.	[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation
Subject contents	<p>Course content – lecture</p> <ol style="list-style-type: none"> <li>Numerical methods in analysis of circuits and systems.</li> <li>Solving systems of linear equations. Method LU and iteration methods.</li> <li>Solving nonlinear equations. Methods of bisections, falsi, secants, Newton.</li> <li>Interpolation and approximation. Interpolation with Lagrange polyno-mials. Least squares approximation.</li> <li>Description of interactive MATLAB environment.</li> <li>Fundamentals of MATLAB programming.</li> <li>Selected examples of MATLAB scripts in application to numerical analysis methods.</li> <li>Description of SPICE program application.</li> <li>Models of active and passive electronic elements in the SPICE bank of elements.</li> <li>Models of exciting signals. Time and frequency domain signal representation.</li> <li>Principles of creating schemes representing simulated objects.</li> <li>Characteristics of selected methods of analysis.</li> <li>Methodology of carrying out measurements in the simulator environment.</li> </ol> <p>Course content – laboratory</p> <ol style="list-style-type: none"> <li>Introduction to the SPICE / MICRO-CAP program.</li> <li>MATLAB and SPICE as tools for calculating currents, voltages, and power in an electrical circuit mesh analysis. Numerical solution of linear equations.</li> <li>MATLAB and SPICE as tools for calculating currents, voltages, and power in an electrical circuit nodal analysis. Numerical solution of linear equations.</li> <li>MATLAB and SPICE as tools for calculating currents, voltages, power, and equivalent elements in an electrical circuit. Automatic formulation of linear equations describing the circuit and their numerical solution.</li> <li>MATLAB and SPICE as tools for DC analysis and simulation of circuits with nonlinear two-terminal components. Approximate solution of nonlinear equations.</li> <li>MATLAB and SPICE as tools for DC analysis and simulation of circuits with a bipolar transistor. Approximate solution of nonlinear equations.</li> <li>MATLAB and SPICE as tools for calculating currents, voltages, and power in sinusoidal (AC) electrical circuits. Numerical solution of linear equations.</li> </ol> <p>Course content – project</p> <p>As part of the project, student must complete three design tasks using numerical methods learned in the lecture. These tasks must be completed in the Matlab environment. Students will conduct, for example, a comparative analysis of the speed and accuracy of various methods within a single mathematical problem.</p>		
Prerequisites and co-requisites	Passing the courses: Linear Algebra, sem. 1 and Mathematical Analysis, sem.1 - required by students applying for individual study organization.		

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Midterm colloquium	50.0%	44.0%
	Laboratory	50.0%	28.0%
	Project	50.0%	28.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. Z. Fortuna, B. Macukow, J. Wąsowski: Metody numeryczne. Wyd. IV, WNT Warszawa 1998.</li> <li>2. Micro-Cap 12 Electronic Circuit Analysis Program Use's Guide 2019 by Spectrum Software.</li> <li>3. A. Szatkowski, J. Cichosz: Metody numeryczne. Podstawy Teoretyczne. Skrypt. Wyd. Politechniki Gdańskiej, wyd. III 2010.</li> <li>4. A. Zalewski, R. Cegiela: MATLAB - obliczenia numeryczne i ich zastosowania. Nakom, Poznań 1996.</li> <li>5. B. Mrozek, Z. Mrozek: MATLAB i Simulink. Poradnik użytkownika. Wydanie IV, Helion Gliwice 2018.</li> <li>6. W. Sradomski: MATLAB. Praktyczny podręcznik modelowania. Helion Gliwice 2015.</li> </ol>	
	Supplementary literature	No requirements	
	eResources addresses		
Example issues/ example questions/ tasks being completed	See corresponding links		
Practical activities within the subject	Not applicable		

Document generated electronically. Does not require a seal or signature.