GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Computing and Simulation Techniques, PG_00047685		
Field of study	Electronics and Telecommunications		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2022/2023
Education level	first-cycle studies	Subject group	Obligatory subject group 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	4.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Marine Electronic Systems -> Faculty of Electronics, Telecommunications and Informatics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Jan Schmidt	
	Teachers	dr inż. Jan Schmidt dr inż. Barbara Stawarz-Graczyk dr inż. Piotr Grall mgr inż. Mariusz Rudnicki	

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	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_U05] can plan and conduct experiments related to the field of study, including computer simulations and measurements; interpret obtained results and draw conclusions	Student is capable of implementing simulations in DC, transient and frequency analysis. Has the qualities for making simulation measurements and elementary signal analysis.	[SU1] Assessment of task fulfilment
[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 PSPICE 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.	[SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge
[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_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.	[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment

Subject contents

1. Numerical methods in analysis of circuits and systems.
2. Solving systems of linear equations. Method LU and iteration methods.
3. Solving nonlinear equations. Methods of bisections, falsi, secants, Newton.
4. Interpolation and approximation. Interpolation with Lagrange polyno-mials. Least squares approximation.
5. Description of interactive MATLAB environment.
6. Fundamentals of MATLAB programming.
7. Selected examples of MATLAB scripts in application to numerical analysis methods.
8. Description of SPICE program application.
9. Models of active and passive electronic elements in the SPICE bank of elements.
10. Models of exciting signals. Time and frequency domain signal representation.
11. Principles of creating schemes representing simulated objects.
12. Characteristics of selected methods of analysis.
13. Methodology of carrying out measurements in the simulator environment.

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
Project	50.0%	28.0%
Laboratory	50.0%	28.0%
Midterm colloquium	50.0%	44.0%

Recommended reading	Basic literature	1. Z. Fortuna, B. Macukow, J. Wąsowski: Metody numeryczne. Wyd. IV, WNT Warszawa 1998 2. Micro-Cap 12 Electronic Circuit Analysis Program Use"s Guide 2019 by Spectrum Software. 3. A. Szatkowski, J. Cichosz: Metody numerycze. Podstawy Teoretyczne. Skrypt. Wyd. Politechniki Gdańskiej, wyd. III 2010 4. M.S. Makowski: Wprowadzenie do SPICE"a (Micro-Cap"a). SPICE jako podstawowe narzędzie obliczeń inżynierskich. Przykłady typowych zastosowań i podstawy obsługi programu. https://enauczanie.pg.edu.pl/moodle/enrol/index.php?id=640 5. A. Zalewski, R. Cegieła: MATLAB - obliczenia numeryczne i ich zastosowania. Nakom, Poznań 1996 6. R. Salamon, M.S. Makowski: MATLAB - podstawy i zastosowania. Skrypt w wersji elektronicznej. https://eti.pg.edu.pl/katedra-systemow-sonarowych/tois
	Supplementary literature	No requirements
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	See corresponding links	
Work placement	Not applicable	