GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Modelling and Simulation of Electromechatronic Systems, PG_00048273		
Field of study	Electrical Engineering		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2024/2025
Education level	first-cycle studies	Subject group	
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	3	Language of instruction	Polish
Semester of study	5	ECTS credits	6.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Power Electronics and Electrical Machines -> Faculty of Electrical and Control Engineering		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Krzysztof Iwan	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	0.0	30.0	0.0	0.0	60

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	60	5.0	85.0	150

Subject objectives

The aim of the course is for the student to acquire knowledge and skills related to computer analyzes of processes characteristic of electrical engineering. The student will find the use of numerical methods, learn about the types of numerical analyzes used in electrical engineering and learn the currently recognized as leading programs for simulating processes occurring in selected, currently used devices. In addition, the student will master the skills of independent simulation of the indicated (or selected by the student) circuit-oriented issue.

Learning outcomes

Course outcome	Subject outcome	Method of verification
K6_W10	selects parameters of models of transport system components	[SW3] Assessment of knowledge contained in written work and projects
K6_K01	determines the level of model simplification and selects a simulation program	[SK2] Assessment of progress of work
K6_U10	analyzes low voltage systems, selecting components taking into account current regulations and standards	[SU1] Assessment of task fulfilment
K6_U09	selects the components of the analyzed model taking into account the obtained long-term, transient and short-circuit loads	[SU1] Assessment of task fulfilment
K6_K05	carries out the laboratory exercise program in compliance with the regulations	[SK5] Assessment of ability to solve problems that arise in practice

Subject contents	LECTURE:Classification of modeling levels: components, behavioral, functional. Methods of numerical solution of dynamic systems. Simulation methods of converter systems. Review of sample circuit simulation programs: PLECS, PSIM, TCad. Specification of parameters of elements in circuit simulators, including: resistor, capacitor, coil, transformer, power electronic switches and electrical machines. Models of electrical machines, mechanical loads and control systems. Functional models of systems. Implementation of model components through your own user definitions.LAB:Modeling, simulation and results analysis (MSA) of selected passive filters. MSA of systems with nonlinear components on the example of active filters. MSA of the local LV power grid. MSA of a fragment of the power grid with LV, HV, MV and LV components. Synthesis of a nonlinear component circuit model based on a physical model. Simulation and analysis of model results of selected drive systems. MSA of selected converter systems. Development of control modules as DLL blocks.
Prerequisites and co-requisites	Knowledge and skills in the field of numerical methods and basics of electrical engineering. Additionally, knowledge about electrical apparatus and devices.
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
	50.0%	60.0%
	50.0%	40.0%

Recommended reading	Basic literature	Szczęsny R., Komputerowa symulacja układów energoelektronicznych, Wydawnictwo Politechniki Gdańskiej, Gdańsk1999, Osowski S., Modelowanie i symulacja układów i procesów dynamicznych, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2007, Praca zbiorowa, Wybrane metody modelowania i symulacji, red. Nita K., Instytut Elektrotechniki, Wydawnictwo Książkowe Instytutu Elektrotechniki, Warszawa 2013, Matyka M., Symulacje komputerowe w fizyce, . Helion, Gliwice 2021.

	Supplementary literature	Modelowanie i symulacja układów napędowych i energoelektronicznych, Polska Akademia Nauk. Komitet Elektrotechniki, Wydaw. Politechniki Lubelskiej, Lublin 2002 Cieślik S., Modelowanie matematyczne i symulacja układów elektroenergetycznych z generatorami indukcyjnymi, Wydawnictwa Uczelniane Uniwersytetu Technologiczno-Przyrodniczego, Bydgoszcz 2008, Judek S., Karwowski K., Lipiński Lech., Miszewski M., Modelowanie i symulacja napędów elektrycznych kolejowych pojazdów trakcyjnych z silnikami indukcyjnymi, Rail Vehicles, 2011-08 (3), p.25-29, Systemy elektroenergetyczne: modelowanie, symulacja i symulatory, eksploatacja i współpraca, Międzynarodowa Konferencja Naukowa APE9 , Jurata 1999, Nowak M., Roman Barlik R., Poradnik inżyniera energoelektronika. Wydawnictwa Naukowo-Techniczne, Warszawa 2014, Symulacja procesów dynamicznych : prace IX Sympozjum SPD-9, Polana Chochołowska 10-14 czerwca 1996, Warszawa : PTETiS. OW 1996, Szymański G., Symulacja cyfrowa niebezpiecznych oddziaływań stacji i linii wysokich napięć, Wydawnictwo Politechniki Poznańskiej, Poznań 1998, Demenko A., Symulacja dynamicznych stanów pracy maszyn elektrycznych w ujęciu polowym, Wydaw. Politechniki Poznańskiej, Poznań 1997, Sowa P., Modelowanie dynamiczne układów elektroenergetycznych : laboratorium modelowania cyfrowego : zastosowanie programu EMTP (ElectroMagnetical Transients Program), Wydaw. Politechniki Śląskiej, Gliwice 1992, Praca zbiorowa, Laboratorium modelowania układów elektromechanicznych i energoelektronicznych, red. Krykowski K., oprac. Grzesik B., Wydawnictwo Politechniki Śląskiej, Gliwice 1993, Matulewicz W., Modelowanie krwiobiegu za pomocą obwodu elektrycznego, Wydawnictwo Politechniki Gdańskiej, Gdańsk 2010, Szczeciński P., Zajczyk R., Modele matematyczne do badania bezpieczeństwa systemu elektroenergetycznego. ,Wydawnictwo Politechniki Gdańskiej, Gdańsk 2012.
	eResources addresses	Podstawowe https://mostwiedzy.pl/pl/tcad?_isAlias=tcad&id=0_120611444212428181_BPA - https://powersimtech.com/products/psim/capabilities-applications/ - https://www.plexim.com/products/plecs - Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	