GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Modelling and Simulation of Systems, PG_00055359		
Field of study	Informatics		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2023/2024
Education level	second-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	2	Language of instruction	English
Semester of study	3	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Algorithms and Systems Modelling -> Faculty of Electronics, Telecommunications and Informatics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Piotr Kowalczyk	
	Teachers	dr hab. inż. Piotr Kowalczyk dr hab. inż. Adam Lamęcki	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	0.0	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	10.0	20.0	75

Subject objectives	Students learned the puprose, the methods and techniques of mathematical modelling.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U01] can apply mathematical knowledge to formulate and solve complex and non-typical problems related to the field of study by:n- appropriate selection of source information and its critical analysis, synthesis, creative interpretation and presentation,n- application of appropriate methods and toolsn	Student selects and evaluates the effectiveness of the method of modeling and simulation of systems: - uses discrete methods for solving ordinary and partial differential equations (differences and finite elements) - solves and interprets the matrix eigenvalue problems - uses appropriate methods of function interpolation and approximation (including multi variables functions)	[SU1] Assessment of task fulfilment
[K7_W02] Knows and understands, to an increased extent, selected laws of physics and physical phenomena, as well as methods and theories explaining the complex relationships between them, constituting advanced general knowledge in the field of technical sciences related to the field of study	Student knows and understands the laws and physical phenomena in the field of kinematics, dynamics, mechanics, vibrations, waves and heat flow.	[SW1] Assessment of factual knowledge
[K7_U41] can select methods of modelling and analysis of information systems and applications using selected elements of theoretical computer science and modern programming tools	Student is able to choose or create an appropriate mathematical model of the problem under consideration and associate appropriate numerical tools with it.	[SU2] Assessment of ability to analyse information
[K7_U06] can analyse the operation of components, circuits and systems related to the field of study; measure their parameters; examine technical specifications; interpret obtained results and draw conclusions	Understands the principles of the model, can detect errors, analyse and interpret the results obtained.	[SU2] Assessment of ability to analyse information
[K7_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 advanced technical systems, devices and facilities typical for the field of studies, gained in the professional engineering environment	Student is able to determine the applicability conditions of various modeling techniques. In particular, the convergence conditions of the method and its accuracy.	[SU3] Assessment of ability to use knowledge gained from the subject

Subject contents

- differential equations as one of the basic tools of mathematical modeling- discrete methods of solving differential equations (Euler, finite differences, finite elements)- methods of function interpolation and approximation (including radial basis functions)- elements of stochastics- solving and interpreting of matrix eigenvalue problems

Prerequisites and co-requisites

- basic knowledge of the Matlab environment- basics of differential and integral calculus- elements of linear algebra- the basics of physics

Assessment methods and criteria

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

Recommended reading

Basic literature

1. R. Wieczorkowski, R. Zieliński: "Komputerowe generatory liczb losowych", WNT, Warszawa 1997.
2. D.E. Knuth: "Sztuka Programowania", t. 2: ,,Algorytmy seminumeryczne", WNT, Warszawa 2002.
3. P. Billingsley: "Prawdopodobieństwo i miara", PWN, Warszawa 1987.
4. J. Muszyński, A.D. Myszkis: "Równania różniczkowe zwyczajne", PWN, Warszawa 1984.
5. R.J. Wilson: "Wprowadzenie do teorii grafów", PWN, Warszawa 1998.

	Supplementary literature	McLaughlin, Michael P.: A Tutorial on Mathematical Modeling
	eResources addresses	Adresy na platformie eNauczanie: Modelowanie i Symulacja Systemów - 23/24 - Moodle ID: 32532 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=32532
Example issues/ example questions/ tasks being completed	The object moves along a straight line. Its speed is directly proportional to the square of the distance s (t) that it has already traveled. Which of the following equations describes this relationship?(a) s = k / s ^ 2. (b) ds / dt = k / t ^ 2. (c) ds / dt = kt ^ 2. (d) ds / dt = ks ^ 2.	
Work placement	Not applicable	