GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Mathematical Modelling Methods, PG_00047561		
Field of study	Automatic Control, Cybernetics and Robotics		
Date of commencement of studies	October 2020	Academic year of realisation of subject	2021/2022
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	2	Language of instruction	Polish
Semester of study	3	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Decision Systems and Robotics -> Faculty of Electronics, Telecommunications and Informatics		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Zdzisław Kowalczuk	
	Teachers	prof. dr hab. inż. Zdzisław Kowalczuk	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	0.0	0.0	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	4.0	66.0	100

Subject objectives

The aim of the course is to master the knowledge of methods of mathematical modeling of dynamic processes.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W01] Knows and understands, to an advanced extent, mathematics necessary to formulate and solve simple issues related to the field of study	The student gets acquainted with the basic problems and methods of mathematical modeling of dynamic processes.	[SW1] Assessment of factual knowledge
[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	The student understands the principles, methods and techniques of programming and the principles of creating computer software or programming microprocessor devices, as well as the organization of work of systems using computers	[SW1] Assessment of factual knowledge

Subject contents

1. Modeling and simulation 2. Methodology and models 3. Relations of modeling and simulation 4. Fidelity of modeling and coherence of simulation 5. Modeling: Real systems and basic models 6. Model reduction: integral models 7. Simulation: Rules of interaction 8. Prototype discrete procedure of simulation 9. Model structure and system reaction 10. State variables and state equations 11. Pseudo-random generators 12. Forming probability distributions 13. Analytical (physical) modeling 14. Types of variables; continuity and compatibility laws 15. Example (I) of analytical modeling 16. Example (II) of analytical modeling 17. Synthetic (mathematical) modeling 18. Examples of synthetic modeling 19. Integral modeling of systems 20. Structural modeling; hybrid (analogue and digital) modeling 21. Analogue (continuous-time) modeling and structural representations 22. Differential equations 23. Modeling example (I) of differential equations 24. Modeling example (II) of a set of differential equations 25. Value and time scaling 26. Examples of scaling procedures 27. Modeling and simulation of continuous-time systems 28. Modeling and simulation of control systems 29. Simulation programs; program structure 30. Languages for modeling; simulation systems.

Prerequisites and co-requisites

No requirements

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Written exam	50.0%	100.0%

Recommended reading	Basic literature	J. M. Smith: Mathematical modelling and digital simulation for scientists and engineers. Wiley, New York, 1977. H. Orłowski, J. Hawryluk: Modelowanie cyfrowe. WNT, Warszawa, 1971.
	Supplementary literature	Z. Kowalczuk: Discrete models in the design of control systems, Zesz. Nauk. PG, vol. 78, no. 493, 1992
	eResources addresses	
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	