



## Subject card

Subject name and code	Modelling and Identification, PG_00057474						
Field of study	Automation, Robotics and Control Systems						
Date of commencement of studies	February 2023	Academic year of realisation of subject			2022/2023		
Education level	second-cycle studies	Subject group					
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	1	Language of instruction			Polish		
Semester of study	1	ECTS credits			3.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Control Engineering -> Faculty of Electrical and Control Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Michał Grochowski					
	Teachers	dr hab. inż. Michał Grochowski dr inż. Bartosz Puchalski					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	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	10.0		20.0		75
Subject objectives	Presentation of advanced modern methods of systems modeling and estimation of their parameters. Analytical, fuzzy and neural technology will be presented.						
Learning outcomes	Course outcome		Subject outcome			Method of verification	
	K7_W01		Student is able to model complex objects and control systems; - Student selects the appropriate method for the identification and validation of complex control plants.			[SW3] Assessment of knowledge contained in written work and projects	
	K7_U06		Student examines the behaviour of dynamic objects by simulation and experiment; - Student selects the appropriate analytical and simulation methods to solve tasks in the field of control engineering and robotics; - Student formulate and solve optimization problems with the limits			[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools	
Subject contents	LECTURE Repetitorium basis of modeling and identification, range of degree studies. Fundamentals of probabilistic methods. Elements of the theory of estimation: confidence intervals, the concepts of relevance and power of the tests. Basics of mathematical modeling of real objects (statics and dynamics of processes). Elements of the verification models. Problems of optimal planning of experiments. Identification of the parameters on the basis of models (size and immeasurable nieobserwowalne). Identification of transmittance of complex systems and multi-dimensional. Identification of state equations. Tuning models. Fuzzy logic and identification of structures. Controls and issues of error correction methods follow-up control. Techniques in cases of stationary and nonstationary processes. LABORATORY Methodology of experimentation, passive and active. Comparison and application of both techniques. Identification of the characteristics of real objects statycznth lumped. Identification of object with distributed constants. Identification of complex objects. Identification of structures. Identification of static characteristics of simple technical processes. Identification of the object distributed constant						
Prerequisites and co-requisites	Skills mathematical description of physical phenomena and complex technical processes. Knowledge of the subject Mathematics (0411200001, 0411200002), Numerical Methods (0411200009), optimization and decision making (0411200030) and the methods and basis of identification (0411210003)						
Assessment methods and criteria	Subject passing criteria		Passing threshold			Percentage of the final grade	
	Practical exercise		60.0%			25.0%	
	Midterm colloquium		50.0%			75.0%	

Recommended reading	Basic literature	<p>1. Stolc L.: Wstęp do metod optymalizacji i identyfikacji: ćwiczenia i laboratorium, Wyd. PG, Gdańsk 1985.</p> <p>2. Piegat A.: Modelowanie i sterowanie rozmyte, Exit, Warszawa 1999</p> <p>3. Gajek L., Kałużka M.: Wnioskowanie statystyczne, WNT, Warszawa 1994</p> <p>4. Mańczak K.: Metody identyfikacji wielowymiarowych obiektów sterowania, WNT, Warszawa 1971.</p>
	Supplementary literature	<p>1. Lindgren B.: Elementy teorii decyzji, WNT, Warszawa 1977</p> <p>2. Volk W.: Statystyka stosowana dla inżynierów, WNT, Warszawa 1973</p> <p>3. Stoderstrom T., Stoica P.: Identyfikacja systemów, PWN 1997</p>
	eResources addresses	Adresy na platformie eNauczenie:
Example issues/ example questions/ tasks being completed	<ul style="list-style-type: none"> <li>• identification of dynamic object model parameters using the least squares method;</li> <li>• designing of fuzzy reasoning system for control purposes;</li> <li>• designing of the neural network model for control purposes on the basis on measured data.</li> </ul>	
Work placement	Not applicable	