

COURSE DESCRIPTION CARD

Course name	Introduction to control systems of fractional order				
Course type	optional	Course code	SDPB0066	ECTS credits	2
Forms and number of hours	lecture: 20h	Scientific discipline	mechanical engineering; automatics, electronics and electrical engineering		
Course objectives	Scientific discipline: Mechanical engineering; Automatics, electronics and electrical engineering. Objectives of the course: Acquainting with the basics ideas of fractional calculus and its application to analyze the properties of control systems.				
Course content	1. Differential and differential operators of the fractional order 2. Description of a fractional order control system 3. Controllability and observability of fractional order control systems 4. Stability of fractional order control systems 5. Selected applications of fractional order calculus in automatics and mechanics				
Teaching methods	Lecture enriched with short presentations of the students				
Assessment method	Writing exam				
Symbol of learning outcome	Learning outcomes			Reference to the learning outcomes for the field of study for the 8 th level of Polish Qualification Framework (PRK)	Methods of assessing the learning outcomes
LO1	PhD student: knows methods of describing a control system of a fractional order			SD_W1	egzam
LO2	knows the basics of fractional order calculus			SD_W1, SD_U1	egzam
LO3	knows methods of studying the basic properties of fractional order control systems			SD_W1, SD_U1	egzam
LO4	can independently educate himself/herself and look for the necessary information in available sources			SD_W5, SD_U9, SD_K1	egzam

Student workload (in hours)	
Lecture	20
Consultations	2
The unassisted student work	15
Implementation of project tasks and preparation for and participation in exams/tests	10
Total	47
ECTS credits	2

Basic references	1. Das S., <i>Functional Fractional Calculus for System Identification and Controls</i>, Springer 2008 2. I. Petras, <i>Fractional Order Nonlinear System, Modeling, Analysis and Simulation</i>, Springer, 2011. 3. A. Teplajkov, <i>Fractional order Modelling and Control of Dynamic systems</i>, Springer, 2017
Supplementary references	1. T. Kaczorek, <i>Selected problems of fractional systems theory</i>, Springer, 2011. 2. P. Ostalczyk, <i>Discrete fractional calculus: applications in control and image processing</i>, World Scientific, 2016.
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