

COURSE DESCRIPTION CARD

Course name	Nonlinear control systems				
Course type	optional	Course code	SDPB0056	ECTS credits	3
Forms and number of hours	lecture: 20h classes: 10h	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 principles of geometrical control methods and the way of using them to analyze the properties of nonlinear control systems.				
Course content	1. Fundamentals of differential geometry: vector field, Lie derivative, Lie brackets of the vector field associated with a given nonlinear control system, distributions. 2. Controllability of nonlinear control systems. 3. Observability of nonlinear control systems. 4. Stability and stabilization. 5. Lapunov control function.				
Teaching methods	Lecture enriched with short presentations of students; classes enriched by discussion with students				
Assessment method	Writing exam; classes: writing test				
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 and can use the tools of differential geometry to study the properties of control systems		SD_W1	egzam, classes	
LO2	knows and can use methods of testing the controllability and stability of a nonlinear control system in the state space		SD_W1, SD_U1	egzam, classes	
LO3	can study the observability of nonlinear control systems		SD_U1,	egzam, classes	
LO4	can independently educate himself/herself and look for the necessary information in available sources		SD_W5, SD_U9, SD_K1	egzam, classes	

Student workload (in hours)	
Lecture / classes	20 /10
Consultations	2
The unassisted student work	15
Implementation of project tasks and preparation for and participation in exams/tests	20
Total	67
ECTS credits	3

Basic references	1. W. Mitkowski, Zarys teorii sterowania, AGH 2019 2. A. Isidori: Nonlinear control systems. Springer 1998 3. H.Górecki: Optymalizacja i sterowanie systemów dynamicznych. AGH 2006
Supplementary references	1. T.Kaczorek, A.Dzieliński, W.Dąbrowski, R.Łopatka, Podstawy teorii sterowania. WNT 2016 2. 5. R.Marino, P.Tomei: Introduction to the Mathematical Theory of Control, AMS 2007
Author of the programme	dr hab. Ewa Pawłuszewicz, prof. PB
Date of issuing the programme	14.03.2021