



Subject card

Subject name and code	Powertrain and Control Systems of Autonomous Vehicles, PG_00064520						
Field of study	Automatic Control, Cybernetics and Robotics						
Date of commencement of studies	February 2027	Academic year of realisation of subject			2026/2027		
Education level	second-cycle studies	Subject group			Optional subject group Specialty subject group 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	1	Language of instruction			Polish		
Semester of study	1	ECTS credits			2.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Signals and Systems -> Faculty of Electronics Telecommunications and Informatics -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Artur Gańcza					
	Teachers	dr inż. Artur Gańcza mgr inż. Aleksander Schmidt					
Lesson types	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		16.0	50	
Subject objectives	Introducing students to basic modeling methods for autonomous vehicle components and fundamental control algorithms for basic system of autonomous vehicles.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K7_U07] can apply advanced methods of process and function support, specific to the field of study	The student can apply established control methods to control problems of a basic components of autonomous vehicles.			[SU3] Assessment of ability to use knowledge gained from the subject		
	[K7_W10] knows and understands, to an increased extent, the basic processes occurring in the life cycle of equipment, objects and technical systems, as well as methods of supporting processes and functions, specific to the field of study	The student knows and understands the processes occurring in the powertrains of autonomous vehicles and recognizes their impact on vehicle control. The student knows the basics of design of the most important systems of autonomous vehicles.			[SW1] Assessment of factual knowledge		
	[K7_W01] knows and understands, to an increased extent, mathematics to the extent necessary to formulate and solve complex issues related to the field of study	Students are familiar with the mathematical techniques required for modeling and synthesizing control systems for components of autonomous vehicles.			[SW1] Assessment of factual knowledge		
	[K7_U02] can perform tasks related to the field of study as well as formulate and solve problems applying recent knowledge of physics and other areas of science	Students can apply their knowledge of mathematics and physics to model specific components of autonomous vehicles and synthesize a control algorithm for specific system of an autonomous vehicle.			[SU3] Assessment of ability to use knowledge gained from the subject		

Subject contents	<p>Course content – lecture</p> <ol style="list-style-type: none"> <li>1. Introduction to the theory of autonomous vehicles, description of challenges and perspectives for development.</li> <li>2. Components of the autonomous vehicles.</li> <li>3. Fundamentals of dynamics of mechanical vehicles. Modelling of resistance forces.</li> <li>4. Measures of driving performance.</li> <li>5. Powertrain architecture.</li> <li>6. Introduction to the problem of control of the powertrain.</li> <li>7. Vehicle substitute models.</li> <li>8. Models and control of subsystems of autonomous vehicles.</li> <li>9. Batteries and their working principle.</li> <li>10. Battery management system.</li> </ol>		
Prerequisites and co-requisites	Advanced knowledge of math and physics, knowledge of electronics and basics of the control theory.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written exam	55.0%	100.0%
Recommended reading	Basic literature	<p>M. Meywerk, "Vehicle Dynamics", Wile, 2015.</p> <p>F. Golnaraghi, B. C. Kuo "Automatic Control Systems", Willey, 2010.</p>	
	Supplementary literature	<p>L. Eriksson, L. Nielsen, "Modeling and Control of Engines and Drivelines", Wiley, 2014.</p> <p>L. del Re et al. "Automotive Model Predictive Control", Springer-Verlag, 2010.</p>	
	eResources addresses		
Example issues/ example questions/ tasks being completed			
Practical activites within the subject	Not applicable		

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