GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Powertrain and Control Systems of Autonomous Vehicles, PG_00064539		
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 systemy of autonomous vehicles.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[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
[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_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

<table>
<tr><td>Subject contents</td><td>Course content – lecture
1. Introduction to the theory of autonomous vehicles, description of challenges and perspectives for development.

2. Components of the autonomous vehicles.

3. Fundamentals of dynamics of mechanical vehicles. Modelling of resistance forces.

4. Measures of driving performance.

5. Powertrain architecture.

6. Introduction to the problem of control of the powertrain.

7. Vehicle substitute models.

8. Models and control of subsystems of autonomous vehicles.

9. Batteries and their working principle.

10. Battery management system.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Advanced knowledge of math and physics, knowledge of electronics and basics of the control theory.</td></tr>
<tr><td>Assessment methods and criteria</td><td><table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>Written exam</td><td>55.0%</td><td>100.0%</td></tr></table></td></tr>
<tr><td>Recommended reading</td><td><table><tr><td>Basic literature</td><td>M. Meywerk, "Vehicle Dynamics", Wile, 2015.

F. Golnaraghi, B. C. Kuo "Automatic Control Systems", Willey, 2010.</td></tr><tr><td>Supplementary literature</td><td>L. Eriksson, L. Nielsen, "Modeling and Control of Engines and Drivelines", Wiley, 2014.

L. del Re et al. "Automotive Model Predictive Control", Springer-Verlag, 2010.</td></tr><tr><td>eResources addresses</td><td></td></tr></table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td></td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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