



## Subject card

Subject name and code	Automatics of Transportation Systems, PG_00031756						
Field of study	Automation, Robotics and Control Systems						
Date of commencement of studies	February 2023	Academic year of realisation of subject			2023/2024		
Education level	second-cycle studies	Subject group					
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	2	Language of instruction			Polish		
Semester of study	3	ECTS credits			4.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Electrical Engineering of Transport -> Faculty of Electrical and Control Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Jacek Skibicki				
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	30.0	0.0	0.0	60
	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	60		15.0		25.0	100
Subject objectives	The aim of the subject is to master the knowledge of widely understood automation in transport systems. The student learns the rules, systems and devices for controlling the railway traffic, urban transport and road traffic, as well as the possibilities of their automation. In addition, basic issues related to the automation of electric vehicle operation will be presented.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K7_U07		The student is able to identify areas of automation in transport systems.		[SU3] Assessment of ability to use knowledge gained from the subject		
	K7_W06		The student is able to recognize areas of possible application of automation elements in transport.		[SW1] Assessment of factual knowledge		
	K7_W11		The student knows automatic driving systems for rail vehicles.		[SW1] Assessment of factual knowledge		
	K7_U03		The student is able to prepare a report on laboratory tests.		[SU5] Assessment of ability to present the results of task		
	K7_U04		Student is able to use bibliographic resources regarding the subject of the subject.		[SU2] Assessment of ability to analyse information		
Subject contents	Traffic and railway traffic control devices: railway signaling. Techniques of railway traffic protection, track occupation control systems. Railway traffic management, the concept of linear and semi-automatic interlocking, transmission of information between the track and the vehicle. European rail traffic control system ETCS, definition, standards, technical equipment. Railway radio systems. Composition continuity control systems. Methods of traffic control on low-loaded lines. Railway crossing protection systems, categories of railway line intersections with vehicular roads, automatic crossing signaling, computer control, methods of detecting the presence of vehicles at the crossing. Automation of marshalling yards, goals and rules of timing, track brakes, steering. Motion control in metro systems. Full automation of rail transport, unmanned and unmanned systems, automatic freight transport, Cargomover system. Automatic systems used in urban transport. Methods of controlling traffic lights. Variable traffic signs and signaling devices, traffic detectors. Methods of vehicle location, automatic reading of license plates, dynamic traffic control systems. Traffic control in large urban agglomerations. Control of pedestrians movements. Full automation of traffic. Control of power supply and vehicle operation. Controlling transport behaviors and habits. Unconventional transportations systems						
Prerequisites and co-requisites	Knowledge of the basics of electrical engineering and electronics.						
Assessment methods and criteria	Subject passing criteria		Passing threshold		Percentage of the final grade		
	Exam from the lecture		60.0%		60.0%		
	Reports from laboratory exercises		60.0%		40.0%		

Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. Vuhic V.: Urban transit, systems and technology. Wiley 2007.</li> <li>2. Rojek A.: Tabor i trakcja kolejowa. Warszawa: KOW 2010.</li> <li>3. Bergiel K., Karbowski H.: Automatykacja prowadzenia pociągu. Łódź, EMI-PRESS 2005.</li> <li>4. Dyduch J., Pawlik M.: Systemy automatycznej kontroli jazdy pociągu. Radom, Wyd. PR 2002.</li> <li>5. Dyduch J., Kornaszewski M.: Systemy sterowania ruchem kolejowym. Radom, Wyd. PR 2004.</li> <li>6. Dąbrowa-Bajon M.: Podstawy sterowania ruchem kolejowym. Warszawa, OWPW 2002.</li> <li>7. Leśło M., Guzik J.: Sterowanie ruchem drogowym cz. I i II. Gliwice, WPS 2000.</li> <li>8. Praca zbiorowa: Interoperacyjność systemu kolei Unii Europejskiej. Warszawa: KOW 2015.</li> <li>9. Pawlik M.: Europejski system zarządzania ruchem kolejowym. Warszawa: KOW 2015.</li> <li>10. Chromański W., Grabarek I., Kozłowski M., Czerepicki A., Marczuk K.: Pojazdy autonomiczne i systemy transportu autonomicznego. Warszawa: PWN 2020.</li> <li>11. Modelewski K.: Inteligentny transport. Brzezina Łąka: Poligraf 2018.</li> <li>12. Mężyk A., Zamkowska S.: Problemy transportowe miast, stan i kierunki rozwiązań. Warszawa: PWN 2019.</li> <li>13. Wesołowski J.: Miasto w ruchu, dobre praktyki w organizowaniu transportu miejskiego. Łódź: Instytut Spraw Obywatelskich 2008.</li> <li>14. Żurkowski A., Pawlik M.: Ruch i przewozy kolejowe, sterowanie ruchem. Warszawa: KOW 2010.</li> <li>15. Dyduch J., Kornaszewski M.: Komputerowe systemy sterowania ruchem kolejowym. Radom: UTH 2014.</li> <li>16. Barański S., Karbowski H.: Teoria i aplikacje systemów bezpiecznego prowadzenia pociągu. Łódź: WPŁ 2016.</li> </ol>
	Supplementary literature	Periodics: Technika Transportu Szynowego; Transport Miejski i Regionalny
	eResources addresses	Adresy na platformie eNauczenie:
Example issues/ example questions/ tasks being completed	Traffic control in cities; Control of traffic on railway lines; Work of an autonomous vehicle;	
Work placement	Not applicable	