GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00065281					
Field of study	Modelowanie ruchu kolejowego					
Date of commencement of studies	February 2025		Academic year of realisation of subject	2025/2026		
Education level	second-cycle studies		Subject group			
Mode of study	Full-time studies		Mode of delivery	at the university		
Year of study	1		Language of instruction	Polish		
Semester of study	2		ECTS credits	3.0		
Learning profile	general academic profile		Assessment form	assessment		
Conducting unit	Department of Transportation Engineering -> Faculty of Civil and Environmental Engineering -> Wydziały Politechniki Gdańskiej					
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Michał Urbaniak			
	Teachers					

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	15.0	0.0	45
	E-learning hours included: 0.0						
	eNauczanie source addresses:						
	Moodle ID: 1557 Modelowanie Ruchu Kolejowego MRK_2T_II_25/26 https://enauczanie.pg.edu.pl/2025/course/view.php?id=1557						

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	45	0.0	0.0	45

Subject objectives	The aim of the subject is to familiarize students with the principles and processes related to railway traffic modeling and to present the possibilities of using specialized software in this area.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_K01] recognizes the importance of knowledge related to the field of study in solving cognitive and practical problems	The student is able to work effectively in a group while modeling the traffic situation of vehicles in a designated railway area. The student systematically completes tasks and can compile the collected data into a correctly edited and formatted report.	[SK1] Ocena umiejętności pracy w grupie [SK2] Ocena postępów pracy [SK4] Ocena umiejętności komunikacji, w tym poprawności językowej
	[K7_U05] cooperates with other people in the implementation of team work, both as a leader and a team member, effectively achieving set goals	The student has the ability to use selected specialized tools for railway traffic modeling.	[SU1] Ocena realizacji zadania [SU4] Ocena umiejętności korzystania z metod i narzędzi
	[K7_W01] identifies in an in-depth way phenomena related to the field of study as well as theories describing them and possible methods of analyzing processes occurring in the life cycle of technical systems	The student has advanced knowledge in the field of railway traffic modeling. The student has knowledge of specialized tools used for railway traffic modeling.	[SW1] Ocena wiedzy faktograficznej
	[K7_K02] makes competent and ethical decisions, caring for the public interest and maintaining economic, social and environmental values	The student is able to use the tools learned for railway traffic modeling to solve real-world problems, taking into account the principles of sustainable development.	[SK5] Ocena umiejętności rozwiązywania problemów występujących w praktyce
	[K7_U02] presents logical and solid arguments regarding the obtained results, through analysis, synthesis of information in various technical contexts, critically approaching their interpretation	The student understands the principle of operation of the created model, can discuss and present its operating principles, and critically analyze it.	[SU5] Ocena umiejętności zaprezentowania wyników realizacji zadania

Subject contents	**LECTURE**
	1. Introduction to railway traffic modeling and simulation.
	2. Parameters and factors determining railway traffic conditions.
	3. Concept of capacity.
	4. Data acquisition.
	5. Principles of building railway traffic simulation models.
	6. Modeling and simulation for railway infrastructure design.
	7. Modeling and simulation for train timetable planning.
	8. Simulation studies of railway line capacity.
	9. Models for railway traffic used in Poland.
	10. Scope of simulation and information obtained from simulation.
	11. Verification of infrastructure based on simulation results.
	PROJECT
	1. Data acquisition necessary for building a railway traffic model for a given area.
	2. Preparation of a report on the acquired data.
	LABORATORY
	1. Development of a simulation model for railway traffic for a given area using specialized software.

Prerequisites and co-requisites	The student possesses knowledge from previously completed courses, with particular emphasis on:
	1. Railway traffic engineering,
	2. Rail transport Infrastructure,
	3. Control in transport systems,
	4. Railway traffic management and organization,
	5. Transport process modeling.

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Laboratory	60.0%	30.0%
	Project	60.0%	30.0%
	Lecture test	60.0%	40.0%

Recommended reading	Basic literature	1. PKP PLK S.A., Wytyczne do budowy modeli mikrosymulacyjnych ruchu kolejowego, Warszawa 2015
		2. Mrówczyńska B., Cieśla M., Król A., Assessment of Polish Railway Infrastructure and the Use of Artificial Intelligence, w: Modernization Investments on Polish Railways, Springer, 2017
		3. Tian Y., Zhu W., Song F., Route Choice Modelling for an Urban Rail Transit Network: Past, Recent, and Future Trends, European Transport Research Review, 2024
		4. Dutkiewicz J., Okulewicz J., Modelowanie symulacyjne podmiejskiej linii kolejowej, Prace Naukowe Politechniki Warszawskiej, Transport, z. 119, Warszawa 2017
		5. Bester L., Jasiński S., Toruń A., Badania symulacyjne zdolności przepustowej linii kolejowej, Logistyka, nr 3, 2014
	Supplementary literature	1. Kosicki D., Uryga B., Jasiak M., Modele mikrosymulacyjne sieci kolejowej w studiach wykonalności realizowanych dla PKP Polskie Linie Kolejowe S.A., Przegląd Komunikacyjny, nr 9, 2015
		2. Bester L., Toruń A., Modeling of Reliability and Safety at Level Crossing Including in Polish Railway Conditions, w: Telematics - Support for Transport, Springer, 2014
		3. Phusakulkajorn W., Núñez A., Wang H., Jamshidi A., Zoeteman A., Ripke B., Dollevoet R., De Schutter B., Li Z., Artificial Intelligence in Railway Infrastructure: Current Research, ITI Journal, 2023
		4. Ma Y., Sallan J.M., Lordan O., Rail Transit Networks and Network Motifs: A Review and Research Agenda, Sustainability, 2024
		5. Dąbrowa-Bajon M., Podstawy sterowania ruchem kolejowym, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2002
	eResources addresses	

Example issues/ example questions/ tasks being completed	**LECTURE**
	1. Concept of capacity.
	2. Principles of building railway traffic models.
	3. Modeling and simulation for railway infrastructure design.
	4. Parameters and factors determining railway traffic conditions.
	PROJECT
	1. Data acquisition necessary for building a railway traffic model for a given area.
	2. Preparation of a report on the acquired data.
	LABORATORY
	1. Development of a simulation model for railway traffic for a given area using specialized software.

Practical activites within the subject	Not applicable

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