



Subject card

Subject name and code	Mathematical Methods in Transporation. , PG_00040999						
Field of study	Transport						
Date of commencement of studies	February 2023		Academic year of realisation of subject		2023/2024		
Education level	second-cycle studies		Subject group		Obligatory subject group in the field of study 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	2		ECTS credits		3.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Faculty of Civil and Environmental Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor		dr Anita Milewska				
	Teachers		dr Anita Milewska dr inż. Kamila Szwaczkiewicz mgr inż. Natalia Karkosińska-Brzozowska				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	15.0	15.0	0.0	0.0	45
	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	45		5.0		25.0	75
Subject objectives	Ability to describe the motion of an object in time and space by vectors and issues related to this motion. Analysis of harmonic signals and vibrating systems occurring in issues related to transport. The ability to analyze measurement data and inference in various aspects of transport.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K7_W01] has broad and advanced knowledge of some of the branches of mathematics including calculus of probability, mathematical statistics and numerical methods used to formulate, solve and verify complex transport problems		The student knows the methods used to solve optimization problems, can formulate a mathematical model describing issues related to transport.		[SW3] Assessment of knowledge contained in written work and projects [SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge		
	[K7_U04] able to speak the science and technology language as customary in the transport community and in other related fields		The student knows the mathematical tools and its use in transport issues, knows the proper mathematical and technical nomenclature.		[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment		
Subject contents	Motion of point in space - vector description, velocity vector, acceleration vector, curvature of the trajectory of motion, curvature circle, Frenet trihedral, Frenet formulas. Approximation of measurement data and inference regarding issues occurring in transport. Weibull distribution in transport problems and determination of its parameters from the sample. Moving average and weighted moving average. Multiple regression, linear regression, stepwise regression analysis. Correlation matrix, coefficient of determination, correlation and consistency. Fourier transform and its application to problems related to transport. Signals, signal filtering, harmonic signals and their application in vibrating systems occurring in issues related to transport.						
Prerequisites and co-requisites	Knowledge of vector calculus, mathematical analysis, differential equations, probability and mathematical statistics.						

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	passing the laboratory	60.0%	34.0%
	passing the exercises and lectures (colloquium)	55.0%	66.0%
Recommended reading	Basic literature	Szabatin J., "Podstawy teorii sygnałów", WKŁ (different editions) Mieloszyk E., "Nieklasyczny rachunek operatorów w zastosowaniu do uogólnionych układów dynamicznych", Wyd. IMP PAN, Gdańsk 2008 Trajdos T., "Matematyka, cz. 3", WNT (different editions)	
	Supplementary literature	Milewska A., Żukowska J., "Testing the Weibull distribution in road traffic losses analysis", Journal of KONBiN, 2008	
	eResources addresses	Adresy na platformie eNauczanie:	
	Example issues/ example questions/ tasks being completed	1. Approximate the parabola measuring data - take into account different cases of the parabola equation. 2. Present and justify the example of the system generating harmonic signals, occurring in transport.	
Work placement	Not applicable		