GDAŃSK UNIVERSITY OF TECHNOLOGY

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		