



Subject card

Subject name and code	, PG_00069235						
Field of study	Konstrukcje nawierzchni						
Date of commencement of studies	October 2022		Academic year of realisation of subject		2025/2026		
Education level	first-cycle studies		Subject group				
Mode of study	Full-time studies		Mode of delivery		at the university		
Year of study	4		Language of instruction		Polish		
Semester of study	7		ECTS credits		2.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Department of Transportation Engineering -> Faculty of Civil and Environmental Engineering -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Dawid Ryś				
	Teachers		dr hab. inż. Dawid Ryś				
			dr hab. inż. Piotr Chrostowski				
			dr inż. Kamila Szwaczekiewicz				
			dr inż. Sławomir Grulkowski				
			dr inż. Jacek Szmagliński				
		dr inż. Mariusz Jaczewski					
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	15.0	0.0	30
	E-learning hours included: 0.0						
	eNauczanie source address: https://enauczanie.pg.edu.pl/2025/course/view.php?id=2430						
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		3.0		17.0	50
Subject objectives	• Deepening knowledge of pavement design methods based on the catalogues of typical pavement structures, including expanding understanding of the catalogue of rigid pavements as well as the catalogue of light and special pavements • Deepening knowledge of the fundamental material parameters that influence pavement design and understanding their impact on pavement durability • Expanding knowledge of mechanistic methods that form the basis for the development of the catalogue of flexible and semi-rigid pavements • Broadening understanding of the fundamentals of pavement structure theory • Understanding the concept of pavement durability and the process of its degradation • Expansion of knowledge in the field of railway track structures: ballastless track systems, track structures for high-speed railways, and track structures in urban rail transport.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_K04] Engages in independent lifelong learning and individually follows the development of science and technology in the field of civil engineering.	Participation in the lecture component and independent study of relevant literature. Work during the practical (design exercise) component of the course and presentation of the results of this work.	[SK4] Ocena umiejętności komunikacji, w tym poprawności językowej [SK5] Ocena umiejętności rozwiązywania problemów występujących w praktyce
	[K6_U04] Reads and prepares construction documentation (including drawings, graphic documentation in the CAD environment), efficiently uses maps as well as architectural, construction and geodetic drawings.	Preparation of pavement structure designs based on given input data and presentation of results within the project group.	[SU4] Ocena umiejętności korzystania z metod i narzędzi [SU1] Ocena realizacji zadania
	[K6_W03] Demonstrate knowledge and understanding of the processes, established standards and design methods in the civil engineering subject area and of their limitations.	Participation in the lecture component and independent study of relevant literature. Work during the practical (design exercise) component of the course and presentation of the results of this work.	[SW3] Ocena wiedzy zawartej w opracowaniu tekstowym i projektowym [SW1] Ocena wiedzy faktograficznej [SW2] Ocena wiedzy zawartej w prezentacji
	[K6_U03] Design engineering objects and details, processes and engineering systems by applying appropriate standards and methods of design.	Preparation of pavement structure designs based on given input data and presentation of results within the project group.	[SU1] Ocena realizacji zadania [SU2] Ocena umiejętności analizy informacji [SU3] Ocena umiejętności wykorzystania wiedzy uzyskanej w ramach przedmiotu [SU4] Ocena umiejętności korzystania z metod i narzędzi [SU5] Ocena umiejętności zaprezentowania wyników realizacji zadania
Subject contents	[K6_U07] Design and build engineering structures in a sustainable manner, with care for the natural environment and a minimum carbon footprint	Preparation of pavement structure designs based on given input data	[SU1] Ocena realizacji zadania [SU4] Ocena umiejętności korzystania z metod i narzędzi [SU3] Ocena umiejętności wykorzystania wiedzy uzyskanej w ramach przedmiotu
	Course content – lecture 1. Introduction, pavement classification, terminology, and the significance of individual pavement layers 2. Material constants adopted for design: subgrade, base courses, asphalt mixtures 3. Theory of pavement structures in an elastic multilayer system, bearing capacity, stresses, and strains in the pavement 4. Analysis of concrete pavement structures 5. Fatigue durability of asphalt mixtures, fatigue life of pavements, fatigue cracking and permanent deformations, low-temperature cracking and reflective cracking 6. ballastless track systems, track structures for high-speed railways, and track structures in urban rail transport Course content – project 1. Design of flexible pavement structures based on the Catalogue of Typical Flexible and Semi-Rigid Pavement Structures 2. Design of flexible pavement structures based on the empirical CBR method 3. Design of rigid pavement structures based on the Catalogue of Typical Rigid Pavement Structures 4. Design of rigid pavement structures based on the empirical Westergaard method 5. Design of light pavement structures based on the Catalogue of Light Pavements 6. Railway-road crossing		
Prerequisites and co-requisites	Knowledge of pavement design according to the 2014 Catalogue of Typical Flexible and Semi-Rigid Pavement Structures (KTKNPiP), as well as knowledge from lectures and design projects within the Road and Highway Construction course from semesters V and VI. Knowledge in the field of geotechnics, including concepts related to soil classification, the oedometric modulus of soil compressibility, soil compaction, and the bearing capacity of soil layers. Knowledge of general mechanics and strength of materials, particularly regarding basic concepts such as stress, strain, force, displacement, modulus of elasticity, shear modulus, tensile strength, flexural tensile strength, compressive strength, and other fundamental mechanical concepts. Knowledge of technical drawing and descriptive geometry, especially the ability to produce precise technical drawings. Proficiency in drafting and familiarity with CAD software. Ability to perform calculations using a spreadsheet and to prepare well-organized technical documentation using office software packages.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Practical part	60.0%	40.0%
	Exam from lectures part	60.0%	60.0%
Recommended reading	Basic literature	Yoder E.J., Witczak M.W., Principles of Pavement Design, Willey & Sons, 1975, Huang Y., Pavement Analysis and Design, NYC, 1993	

	Supplementary literature	Malick R.B., El-Korchi., Pavement Engineering, Principles and Practice, CEC Press, 2013
	eResources addresses	
Example issues/ example questions/ tasks being completed	Topics covered during design exercises: 1. Design of flexible pavement structures based on the Catalogue of Typical Flexible and Semi-Rigid Pavement Structures 2. Design of flexible pavement structures based on the empirical CBR method 3. Design of rigid pavement structures based on the Catalogue of Typical Rigid Pavement Structures 4. Design of rigid pavement structures based on the empirical Westergaard method 5. Design of light pavement structures based on the Catalogue of Light Pavements Sample exam questions: 1. Which materials are used for the upper base course in flexible pavement? 2. The deflections measured under a vehicle wheel are lower for rigid pavements than for flexible pavements. Why? 3. What does the term fatigue life of an asphalt mixture mean?	
Practical activities within the subject	Not applicable	

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