GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00069222		
Field of study	Projektowanie nawierzchni drogowych		
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	5.0
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 inż. Mariusz Jaczewski dr hab. inż. Dawid Ryś	

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	30.0	0.0	0.0	0.0	45

E-learning hours included: 0.0

eNauczanie source address: https://enauczanie.pg.edu.pl/2025/course/view.php?id=2431

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	10.0	30.0	85

Subject objectives

The cognitive objectives, related to the expansion of students' specialized knowledge, include:

1. Understanding empirical methods of pavement design: CBR, AASHTO 1993
2. Understanding the principles of index-based evaluation of road materials and the application of these indices in pavement design
3. Understanding the concept of pavement durability and the process of its degradation
4. Understanding the impact of traffic, climatic conditions, and drainage on the durability and condition of road pavements

In addition, the following educational objectives:

1. Developing teamwork skills
2. Developing the ability to work with guidelines and methods, including those prepared in English
3. The ability to prepare technical and design documentation
4. The ability to carry out computational analyses based on specified data

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_K03] Can effectively, clearly and unambiguously convey information, describe activities and communicate their results/ outcomes to engineers or a wider audience using appropriate communication methods and tools.	Preparation of pavement structure designs based on given input data and presentation of results within the project group.	[SK2] Ocena postępów pracy [SK3] Ocena umiejętności organizacji pracy [SK4] Ocena umiejętności komunikacji, w tym poprawności językowej [SK1] Ocena umiejętności pracy w grupie
[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 part and independent study of subject-related literature. Work during the practical (exercise) part of the course and presentation of the results of this work.	[SK2] Ocena postępów pracy [SK5] Ocena umiejętności rozwiązywania problemów występujących w praktyce

Subject contents

Course content – lecture

The lecture part of the course consists of 5 sessions, each lasting 135 minutes, during which the following topics are covered:

1. Introduction, general information on pavement design methods, selected empirical methods: AASHTO 1993, CBR
2. Rigid pavement design using the Westergaard method
3. Traffic loading, climate and weather factors in pavement design
4. Overview of mechanistic-empirical methods
5. Full-scale testing, long-term test sections, pavement degradation processes and performance prediction

Course content – exercises

The practical and design component includes 10 sessions, each lasting 135 minutes. These sessions involve calculation examples based on the methods discussed in lectures, as well as construction detailing for various pavement types. Design topics cover the following issues:

1. Design of flexible pavement structure according to the AASHTO 1993 method. Determination of pavement structural number, PSI index, changes in PSI over time due to traffic loads and environmental factors
2. Design of rigid pavement using the Westergaard method, determination of the subgrade reaction modulus (k), calculation of critical stresses from vehicle wheel loads and temperature effects

Prerequisites and co-requisites

Knowledge of pavement design according to KTKNPiP 2014, as well as familiarity with lectures and project work from the Roads and Highways Construction course in semesters V and VI.

Knowledge in the field of geotechnics, including concepts related to soil classification, oedometer modulus of compressibility, soil layer compaction, and bearing capacity.

Knowledge of general mechanics and strength of materials, particularly in relation to basic concepts such as stress, strain, force, displacement, modulus of elasticity, shear modulus, tensile strength, bending tension, compression, and other terms within mechanics.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Exam from lectures	60.0%	60.0%
Projects	60.0%	40.0%

Recommended reading

Basic literature	Huang Y.H., Pavement Analysis and Design, NYC, 1993 E.J., Yoder, M.W., Witczak., Principles of Pavement Design, Willey's &Sons, 1975
Supplementary literature	Kim Y.R., Modeling of Asphalt Concrete, ASCE Press, 2009
eResources addresses	

Example issues/ example questions/ tasks being completed	Topics covered during design exercisess • Design of flexible pavement structures based on the AASHTO 93 method • Design of rigid pavement structures based on the AASHTO 97 method • Design of rigid pavement structures based on the Knapton method • Design of pavement structures made of unbound materials • Design of lower pavement layers according to the MechanisticEmpirical method Sample exam questions 1. What does the PSI number represent in the AASHTO 1993 method? 2. What types of distresses are typical for rigid pavements made of Portland cement concrete, and which of them result from service-related wear? 3. How can the load transfer across a crack or an expansion joint be evaluated? Draw an appropriate diagram and discuss it. 4. What is the effect of the initial elastic stiffness modulus of asphalt mixtures in controlled load and controlled strain tests? Draw the relevant graphs and explain them.
Practical activites within the subject	Not applicable

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