



## Subject card

Subject name and code	, PG_00071093						
Field of study	Civil Engineering						
Date of commencement of studies	October 2022	Academic year of realisation of subject			2025/2026		
Education level	first-cycle studies	Subject group			Optional subject group		
Mode of study	Part-time studies	Mode of delivery			at the university		
Year of study	4	Language of instruction			Polish		
Semester of study	8	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 inż. Cezary Szydłowski					
	Teachers	dr inż. Cezary Szydłowski					
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	10.0	0.0	10.0	0.0	0.0	20
	E-learning hours included: 0.0						
eNauczanie source address: <a href="https://enauczanie.pg.edu.pl/2025/course/view.php?id=5214">https://enauczanie.pg.edu.pl/2025/course/view.php?id=5214</a>							
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	20		0.0		0.0	20
Subject objectives	The course aims to familiarize students with and understand the principles and methods of asphalt and concrete pavement diagnostics, to acquire analytical skills and the interpretation of diagnostic test results, and to make decisions regarding the selection of maintenance technologies. Furthermore, the course aims to familiarize students with various technologies for pavement reinforcement, reconstruction, and pavement recycling.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_K01] Is aware of the key aspects of professional, ethical and social responsibility related to management, business operation, decision making and opinion formulation in civil engineering.	Conducts research together with the group and performs team tasks.	[SK1] Assessment of group work skills [SK2] Assessment of progress of work [SK3] Assessment of ability to organize work [SK4] Assessment of communication skills, including language correctness [SK5] Assessment of ability to solve problems that arise in practice
	[K6_W03] Demonstrate knowledge and understanding of the processes, established standards and design methods in the civil engineering subject area and of their limitations.	Uses legal regulations and standards related to pavement diagnostics and maintenance. Applies standards for conducting field and laboratory tests.	[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation [SW3] Assessment of knowledge contained in written work and projects
	[K6_K04] Engages in independent lifelong learning and individually follows the development of science and technology in the field of civil engineering.	Participates in laboratory work. Attends lectures.	[SK1] Assessment of group work skills [SK3] Assessment of ability to organize work [SK4] Assessment of communication skills, including language correctness [SK5] Assessment of ability to solve problems that arise in practice
	[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.	Prepares reports on conducted laboratory and field tests. Works in a team.	[SK2] Assessment of progress of work [SK4] Assessment of communication skills, including language correctness [SK5] Assessment of ability to solve problems that arise in practice
	[K6_U05] Conducts research (obtaining information, simulations, experimental methods) in the field of construction in order to solve specific tasks and report research results.	Conducts research using specialized equipment for pavement diagnostics (e.g. FWD). Conducts laboratory tests of road materials.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task

Subject contents	Course content – lecture		
	<p><b>Lecture 1.</b> Introduction to lectures, operational properties, and introduction to diagnostics.  <b>Lecture 2.</b> Pavement Management System. Pavement Diagnostics: Deflection Measurement, Benkelman Beam, FWD, TSD, Deflection Normalization.  <b>Lecture 3.</b> Pavement Diagnostics: Anti-skid Properties of Pavements.  <b>Lecture 4.</b> Pavement Diagnostics: Deflection Measurement, Benkelman Beam, FWD, TSD, Deflection Normalization.  <b>Lecture 5.</b> Pavement Diagnostics: Surface Condition Assessment, Visual Assessment, Score Marking, and Damage Normalization.  <b>Lecture 6.</b> Pavement Thickness Assessment with GPR, Destructive Testing, and Laboratory Assessment of Drilled Samples.  <b>Lecture 7.</b> Technologies and Materials in the Maintenance of Flexible and Semi-Rigid Pavements.  <b>Lecture 8.</b> Technologies and Materials in the Maintenance of Rigid Pavements.  <b>Lecture 9.</b> Design of pavement strengthening using the deflection method and the mechanistic method.  <b>Lecture 10.</b> Summer and winter maintenance.</p>		
	Course content – laboratory		
	<p><b>Laboratory 1.</b> Introduction to laboratories, pavement diagnostics, anti-skid properties of pavements: macrotexture testing using the profilometric method, testing the pavement coefficient of friction using an English pendulum.  <b>Laboratory 2.</b> Pavement diagnostics, pavement load-bearing capacity measurement: measuring the load-bearing capacity of aggregate pavements using a lightweight dynamic plate, measuring flexible pavements using a dynamic deflectometer (FWD), assessing the interaction of concrete slabs.  <b>Laboratory 3.</b> Pavement diagnostics, pavement load-bearing capacity measurement: analysis of flexible pavement deflections, deflection normalization, analysis of structural layer parameters based on back-calculations.  <b>Laboratory 4.</b> Pavement diagnostics, surface condition assessment, visual assessment.  <b>Laboratory 5.</b> Pavement diagnostics, surface condition assessment, automatic assessment using an LCMS-2 vehicle. Transverse and longitudinal pavement roughness, IRI, and rut depth.  <b>Laboratory 6.</b> Pavement Maintenance: Hot recycling of asphalt pavement, asphalt granulate testing (determining the black curve, determining the white grading curve, determining the bitumen content in the granulate), designing asphalt mixes with granulate.  <b>Laboratory 7.</b> Pavement Maintenance: Hot recycling of asphalt pavement. Preparation of asphalt mixes with asphalt granulate.  <b>Laboratory 8.</b> Pavement Maintenance: Hot recycling of asphalt pavement. Laboratory testing of asphalt mixes with granulate (void content, stiffness modulus, indirect tensile strength).  <b>Laboratory 9.</b> Pavement Maintenance: Cold recycling of asphalt pavement, mineral-cement-emulsion mix design, preparation of MCE mixes.  <b>Laboratory 10.</b> Pavement Maintenance: Cold recycling of asphalt pavement, MCE mix testing (void content, stiffness modulus, indirect tensile strength).</p>		
Prerequisites and co-requisites	Knowledge from previous semesters in the field of Road Construction Technology, Geometrical Road Planning, Road Surface Construction, Road Materials is necessary.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
		60.0%	60.0%
		100.0%	40.0%

Recommended reading	Basic literature	<p>1. Diagnostyka stanu nawierzchni i wybranych elementów korpusu drogi - wytyczne stosowania, GDDKiA, 2019</p> <p>2. Zofka A., Proaktywna strategia zarządzania elementami infrastruktury drogowej, IBDiM, zeszyt 82</p> <p>3. Piłat J., Radziszewski P., Nawierzchnie Asfaltowe, WKŁ 2007</p> <p>4. Szydło A., Nawierzchnie drogowe z betonu cementowego, Polski Cement 2004</p> <p>5. Glinicki M., Inżynieria betonowych nawierzchni drogowych, PWN 2024</p> <p>6. Thom N., Principles of pavement engineering, Thomas Telford Publishing Ltd, 2008</p>
	Supplementary literature	Cudworth D., Rahman M., Deterioration and Maintenance of Pavements, Thomas Telford Publishing Ltd, 2023
	eResources addresses	<p>Basic</p> <p><a href="https://www.gov.pl/web/infrastruktura/ptb">https://www.gov.pl/web/infrastruktura/ptb</a> - Technical and Construction Regulations</p> <p><a href="https://www.gov.pl/web/gddkia/diagnostyka-stanu-nawierzchni">https://www.gov.pl/web/gddkia/diagnostyka-stanu-nawierzchni</a> - Road Surface Condition Diagnostics - GDDKiA</p>
Example issues/ example questions/ tasks being completed	<p>1. Discuss the types of diagnostic tests for asphalt pavements.</p> <p>2. Discuss the method for testing the anti-skid properties of pavements.</p> <p>3. Explain the limitations of using cold asphalt pavement recycling technology.</p> <p>4. Indicate the correct answer regarding the IRI (Impact Surface Roughness Index): A) IRI is the longitudinal profile of the pavement. B) IRI is expressed in mm/m. C) IRI as a profile is expressed in deviations (mm) from the roadway centerline. D) IRI can only be measured with a dedicated device equipped with an accelerometer.</p>	
Practical activities within the subject	Field exercises	

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