



## Subject card

Subject name and code	Geotechnical structures in transport, PG_00045880						
Field of study	Civil Engineering						
Date of commencement of studies	February 2023	Academic year of realisation of subject			2023/2024		
Education level	second-cycle studies	Subject group			Optional subject group		
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			4.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Railway Engineering -> Faculty of Civil and Environmental Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Arkadiusz Sitarski					
	Teachers	dr inż. Arkadiusz Sitarski dr hab. inż. Adam Krasieński					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	40.0	0.0	0.0	20.0	0.0	60
	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	60	5.0		35.0		100
Subject objectives	<p>The aim of the course is to familiarize students with issues related to structures permanently connected with soil. Students completing the University and graduating in bridge engineering will have the right to design and build such structures in the future, after obtaining construction license.</p> <p>The structures permanently connected with soil include: * bridge abutments, bridge pillars, abutment wing walls, retaining walls. * shallow tunnels (road, pedestrian crossings), deep tunnels, culverts, soil-steel structures</p>						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K7_W02] knows principles of analysis, design and dimensioning of complex constructions and its elements				[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects		
	[K7_W04] has knowledge on advanced strength of materials, modeling and optimisation of materials and constructions; has knowledge of fundamentals of Finite Element Method and general nonlinear analysis of engineering constructions and systems				[SW1] Assessment of factual knowledge		
	[K7_W15] has deep and adequate knowledge of civil engineering, within offered specialization and profile				[SW1] Assessment of factual knowledge		
	[K7_U02] can design and dimension complex steel, concrete (including reinforced), wood and masonry constructions and its details				[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools		

Subject contents	<p>Information on underground constructions: application, types, constructions, examples of implementation in the country and abroad.</p> <p>Deep (bored) tunnels: drilling and construction techniques, structures and their shapes, the impact of the rock mass (soil and rock medium) on tunnels, methods for determining the volume of actions, calculation and design of structures.</p> <p>Shallow (cut-and-cover) tunnels: construction types and technologies, principles of calculation and design.</p> <p>Immersed (underwater) tunnels: methods and principles of construction, calculation and design of structures.</p> <p>FEM numerical analyzes of bored tunnels and shallow tunnels constructed with slurry walls.</p> <p>Drainage, ventilation, lighting and maintenance of tunnels. Impact of execution and operation of tunnels and other underground structures on the surroundings.</p> <p>Bridge supports: types and construction methods of abutments and bridge pillars, actions on pillars and abutments.</p> <p>Geotechnical retaining structures: prefabricated retaining wall systems for structures supporting embankments in transportation infrastructure and for bridge abutment casings; construction of retaining walls in the GEO-PASS system - principles of calculating and designing.</p>											
Prerequisites and co-requisites	<p>Passing subjects related to the basics of bridge engineering.</p> <p>Passing subjects related to design and dimensioning of reinforced concrete and steel structures.</p> <p>Passing subjects related to the analysis of geotechnical structures such as shallow foundations and deep foundations, retaining structures and sheet piling.</p>											
Assessment methods and criteria	<table border="1" data-bbox="451 611 1487 712"> <thead> <tr> <th data-bbox="451 611 794 645">Subject passing criteria</th> <th data-bbox="794 611 1137 645">Passing threshold</th> <th data-bbox="1137 611 1487 645">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="451 645 794 678"></td> <td data-bbox="794 645 1137 678">55.0%</td> <td data-bbox="1137 645 1487 678">45.0%</td> </tr> <tr> <td data-bbox="451 678 794 712"></td> <td data-bbox="794 678 1137 712">60.0%</td> <td data-bbox="1137 678 1487 712">55.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade		55.0%	45.0%		60.0%	55.0%
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Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. Glinicki St.(1994) Budowle podziemne. Wydawnictwo Politechniki Białostockiej, Białystok.</li> <li>2. Furtak. K. (2005) Podstawy budowy tuneli. Wydawnictwo Politechniki Krakowskiej, Kraków.</li> <li>3. Gałczyński St. (2001) Podstawy budownictwa podziemnego. Wydawnictwo Politechniki Wrocławskiej.</li> <li>4. Jarominiak A. (1999) "Lekkie konstrukcje oporowe", Wydawnictwo Komunikacji i Łączności</li> <li>5. Katalogi i prospekty firmy Polgravel dot. prefabrykowanych ścian oporowych systemu GEO-PASS.</li> </ol>										
	Supplementary literature	<ol style="list-style-type: none"> <li>1. Kuliczkowski A.(1996) Tunele wieloprzewodowe. Wydawnictwo Politechniki Świętokrzyskiej, Kielce.</li> <li>2. Praca zbiorowa (1988) The rock engineering alternative Wydawnictwo Finnish Tunnelling Association, Iyvaskyla, Finland.</li> <li>3. Praca zbiorowa (1996) Budowle podziemne Wydawnictwo Politechniki Śląskiej, Gliwice.</li> <li>4. Czasopisma n-t Inżynieria Morska i Geotechnika</li> <li>5. Czasopisma n-t Geoinżynieria i tunelowanie</li> <li>6. Czasopisma n-t Inżynieria i Budownictwo</li> </ol>										
	eResources addresses	Adresy na platformie eNauczanie:										

<p>Example issues/ example questions/ tasks being completed</p>	<ol style="list-style-type: none"> <li>1. Types of bored tunnel structures.</li> <li>2. Technologies for drilling deep tunnels.</li> <li>3. Stress and strain state in the rock mass around tunnel workings.</li> <li>4. Methods for determining rock mass impact on the bored tunnel lining.</li> <li>5. Static calculations of deep tunnel construction.</li> <li>6. Shallow tunnel constructions.</li> <li>7. Technologies for building shallow tunnels in slurry walls and backfilled tunnels.</li> <li>8. Static calculations of shallow tunnels in slurry walls by the analytical-numerical method.</li> <li>9. FEM numerical analyzes of deep tunnels and shallow tunnels.</li> <li>10. Principle of work and structural systems of prefabricated retaining walls of the GEO-PASS system.</li> <li>11. Static calculations and dimensioning of retaining walls of the GEO-PASS system.</li> <li>12. Project of a shallow tunnel in slurry walls.</li> <li>13. Identification and analysis of loads acting on bridge supports.</li> <li>14. Designing of bridge supports.</li> </ol>
<p>Work placement</p>	<p>Not applicable</p>