



Subject card

Subject name and code		Foundation Engineering II, PG_00042252						
Field of study		Civil Engineering						
Date of commencement of studies		February 2024		Academic year of realisation of subject		2024/2025		
Education level		second-cycle studies		Subject group		Optional subject group 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		exam		
Conducting unit		Department of Geotechnics, Geology and Marine Civil Engineering -> Faculty of Civil and Environmental Engineering						
Name and surname of lecturer (lecturers)		Subject supervisor		dr hab. inż. Marcin Cudny				
		Teachers						
Lesson types and methods of instruction		Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
		Number of study hours	30.0	0.0	0.0	15.0	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		Practical skills in design calculations and numerical simulations of soil - structure interaction in geotechnics.						
Learning outcomes		Course outcome	Subject outcome		Method of verification			
		[K7_W02] knows principles of analysis, design and dimensioning of complex constructions and its elements	Ability to build an FEM model for numerical simulations of various geotechnical problems. Ability to conduct various types of numerical analyses (drainage, consolidation, undrained, creep, dynamics).		[SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge			
		[K7_U14] is able to plan and to interpret the geotechnical investigations, to analyse the foundation stability; can design direct and deep foundations in complex soil conditions for complicated statical and dynamical loads	The ability to plan an optimal program of laboratory or field tests in order to determine parameters for advanced calculations of various geotechnical problems.		[SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information			
		[K7_W12] has deep and theoretically firm knowledge about geotechnical investigation, the rules of geotechnical design and engineering geology; knows the complicated processes in soil, techniques of foundations, draining systems, soil strengthening, geosynthetics applications, underground constructions and earthworks	Ability to validate the quality of geotechnical investigations carried out as part of the implementation of various geotechnical projects. The ability to evaluate the usefulness of the obtained test results for the estimation of parameters needed in advanced calculations.		[SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge			
		[K7_W14] knows and applies building codes and obeys the Construction Law; has knowledge on environmental impact of investment realisation	Knowledge of the selection of partial factors in numerical simulations of various geotechnical problems.		[SW1] Assessment of factual knowledge			
[K7_U15] has advanced skills in civil engineering within offered specialization/profile	Ability to analyze initial-boundary value problems in geotechnics using FEM numerical simulations.		[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information					

Subject contents	<ol style="list-style-type: none"> <li>1. Introduction - summary of the gained experience on foundation engineering to date.</li> <li>2. Review of computational methods used in geotechnical design and analysis.</li> <li>3. Finite Element Method (FEM) - presentation of the standard implementation in engineering programs (pre-processor, solver, post-processor).</li> <li>4. Presentation of FEM systems used in geotechnical practice: ZSoil, Plaxis, Tochnog.</li> <li>5. Practical classes - examples of simple boundary-initial problems solved in practice.</li> <li>6. 3D/2D transition for structural elements in a row (piles, columns, anchors).</li> <li>7. Project - design of excavation in organic compressible soils with calculations in two FE codes (ZSoil, Plaxis), with various material descriptions and different drainage conditions.</li> <li>8. Comparative analysis of the results obtained in project calculations.</li> </ol>											
Prerequisites and co-requisites	Basic knowledge of soil mechanics and foundation engineering.											
Assessment methods and criteria	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">Subject passing criteria</th> <th style="width: 33%;">Passing threshold</th> <th style="width: 34%;">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td>project</td> <td>50.0%</td> <td>70.0%</td> </tr> <tr> <td>exam</td> <td>50.0%</td> <td>30.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	project	50.0%	70.0%	exam	50.0%	30.0%
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project	50.0%	70.0%										
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Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. Helwany S., Applied Soil Mechanics with Abaqus Applications.</li> <li>2. User Manual Plaxis FEM code - current version.</li> <li>3. User Manual ZSoil FEM code - current version.</li> <li>4. Muir Wood D., Geotechnical Modelling.</li> <li>5. Kempfert H-G., Gebreselassie, B., Excavations and Foundations in Soft Soils.</li> <li>6. ICE manual of geotechnical engineering Volume 2. Geotechnical Design, Construction and Verification</li> <li>7. Eurocode, Geotechnical Design..</li> </ol>										
	Supplementary literature	Journals:  Géotechnique  ICE Geotechnical Engineering  Computers and Geotechnics										
	eResources addresses	Adresy na platformie eNauczenie:										
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> <li>1. Parameters of material models: Mohr-Coulomb, Cap-model, Soft Soil, Soft Soil Creep, Hardening Soil.</li> <li>2. Methods of numerical simulation of piles and anchors in a plane strain conditions.</li> <li>3. Methods of introducing initial conditions in the numerical calculations of geotechnical problems (K0, OCR, POP)</li> <li>4. Method B &amp; undrained conditions.</li> <li>5. Methods of introducing changes in the numerical model, e.g. construction of an embankment or excavation.</li> <li>6. Methods of planning the model geometry in the case of excavation analysis.</li> <li>7. Tunnel drilling simulation (TBM) - parameters and phases of calculations.</li> </ol>											
Work placement	Not applicable											

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