GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Advanced foundations, PG_00042226						
Field of study	Civil Engineering						
Date of commencement of studies	February 2024		Academic year of realisation of subject	2023/2024			
Education level	second-cycle studies		Subject group	Obligatory subject group in the field of study 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	English			
Semester of study	1		ECTS credits	2.0			
Learning profile	general academic profile		Assessment form	assessment			
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	15.0	0.0	0.0	15.0	0.0	30
	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	30		5.0	15.0		50
Subject objectives	Introduction to design an analysis of advanced geotechnical structures. Example engineering problem analysed in project classes is piled raft foundation. The foundation need to be designed with standard methods then it shoulld be analysed (soil-structure interaction, deformation analysis) with finite element method (FEM). Prefered tool is FE-system ZSoil (free student version).						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W12] has deep and theoreticaly firm knowledge about geotechnical investigation, the rules of geotechnical design and engineering geology; knows the complcated processes in soil, techniques of foundations, draining systems, soil strengthening, geosynthetics applications, underground constructions and earthworks	Ability to determine the scope of the necessary geotechnical parameters depending on the selected methods of designing and analysis of the geotechnical structure - soil ground interaction.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
[K7_U14] is able to plan and to interpret the geotechnical investigatons, to analyse the foundation stability; can design direct and deep foundations in complex soil conditions for complcated statical and dynamical loads	Ability to interpret in-situ and laboratory tests in order to perform advanced design calculations and numerical analyzes. It applies to different types of soil, load conditions and drainage conditions.	[SU5] Assessment of ability to present the results of task [SU2] Assessment of ability to analyse information
[K7_W07] has expanded knowledge of theory of road and airport pavements, pavement maintenence, advanced methods of material testing and contruction technologies	Knowledge of the basic methods of ground improvements under road embankments in difficult geotechnical conditions.	[SW1] Assessment of factual knowledge
[K7_W03] has knowledge of Continuum Mechanics, knows rules of static analysis, stability and dynamics of complex rod, shell and volume structures, both in linear and basic nonlinear regime	Knowledge of theoretical basis of advanced design calculations and analyses of soil-structure interaction. Knowledge of basic constitutive models of soils with their parameters. Ability to build a computational model of various geotechnical structures.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
[K7_W14] knows and applies building codes and obeys the Construction Law; has knowledge on environmetal impact of investment realisation	Knowledge of basic design recommendations in the Eurocode 7 standard - Geotechnical design.	[SW3] Assessment of knowledge contained in written work and projects

Subject contents

1. Introduction basic rules, methods and standards in designing geotechnical structures.
2. Shallow and raft foundations
3. Piled foundations
4. Piled raft foundations.
5. Ground improvement methods.
6. Basic rules on FEM in geotechnical applications.
7. Different design methods of piled raft foundations.
8. Modelling of piled raft foundation with FEM.
9. Influence of material model in analyses of soil-structure interaction.
10. Understending and estimation of material parameters of advanced soil constitutive models.

Prerequisites and co-requisites

Basic knowledge of soil mechanics, foundation engineering and structural mechanics.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
activity during project classes	10.0%	10.0%
correctness and quality of the project report	60.0%	90.0%

Recommended reading

Basic literature	1. ICE manual of geotechnical engineering, Volume 2. Geotechnical Design, Construction and Verification, 2. Eurocode 7 - Geotechnical Design, 3. Helwany S., Applied Soil Mechanics with Abaqus Applications.
Supplementary literature	1. Wood D.M., Geotechnical Modelling, 2. Terzaghi K., Peck R.B., Mesri G., Soil Mechanics in Engineering Practice.
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed

1. Analysis of calculation parameters and their variability with depth.
2. Calculation results of a piled raft foundation using traditional methods.
3. Calculation model made in the ZSoil system.
4. Comparative analysis of the obtained results in various calculation variants.
5. Graphical presentation of the results in the project.

Work placement

Not applicable

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