STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Stenghtening of the substrate**		Code **1010102121010126029**
Field of study **Civil Engineering Second-cycle Studies**	Profile of study (general academic, practical) **general academic**	Year /Semester **1 / 2**
Elective path/specialty **Railways**	Subject offered in: **Polish**	Course (compulsory, elective) **obligatory**
Cycle of study: **Second-cycle studies**	Form of study (full-time,part-time) **full-time**	
No. of hours Lecture: **15** Classes: **-** Laboratory: **15** Project/seminars: **-**		No. of credits **2**
Status of the course in the study program (Basic, major, other) **major**	(university-wide, from another field) **from field**	
Education areas and fields of science and art **technical sciences** **Technical sciences**		ECTS distribution (number and %) **2 100%** **2 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basic theoretical mechanics. Engineering geology. Basic physics and mathematics. Soil mechanics I degree.
2	**Skills**	Basic mathematical calculations. Basic structiural design. Stress analysis in different soil conditions. Settlement and consolidation analysis.
3	**Social competencies**	The need to constantly update and supplement knowledge and skills.

Assumptions and objectives of the course:

The course aims to familiarize students with modern foundation methods applied in civil and structural engineering. Students learns about specific application of different foundation and soil improvement techniques. Design of deep pile foundations is executed individually by students, in order to acquire practical skills.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Knowledge on soil- bearing capacity for direct and deep foundations. - [-K W 01-03]
2. Knowledge on stress, compressibility, shear strength, lateral earth pressure in soil. - [-K W 01-03]
3. Knowledge on special foundation techniques and methods. - [-K W 01-03]
4. Konwledge on soil improvement techniques and methods. - [-K W 01-03]

Skills:

1. Calculation of stresses and deformations in soil mass. - [-K U 01 03]
2. Calculation of bearing capacity of direct and deep foundations. - [-K U 01 03]
3. Calculations of soil improvement. - [-K U 01 03]
4. Design of soilo improvement. - [-K U 01 03]

Social competencies:

1. Student understands the need of lifelong learning, is able to organize the learning process of others. - [[K 2 W02, K 2 W03]
2. Student correctly identifies and resolves problems associated with his profession. - [K 2 W07]
3. Student is able to cooperate and work in teams and groups. - [[K 2 W01, K 2 W06]

Assessment methods of study outcomes

-Deep foundation exercise: design and calculations of a pile foundation.
-Direct shear laboratory test Report.
-Final evaluation of tutorials and lectures - test in week 14.
Evaluation of the course:

[%]	(grade)
100- 91	A excellent
90- 75	B very good
74- 65	C good
64- 51	D sufficient
< 50	E failed

Course description

-1.Definition of geotechnics.
Geotechnical engineering vs. soil mechanics.
General information on the subject of geotechnical engineering.
Presentation of the engineering application of geotechnics.
2.Fundamentals of soil mechanics.
Basic soil properties.
Shear strength of soils.
Compression and consolidation.
3.Foundation engineering.
Bearing capacity.
Settlement analysis.
4.Direct/shallow and deep foundations.
5.Soil improvement techniques and design.
6.Case studies I.

Basic bibliography:

1. Ground Improvement. Sven Hansbo. Geoforum, 2004.
2. Ground Improvement. Third edition. Klaus Kirsh and Alan Bell. CRS Press 2013.

Additional bibliography:

Result of average student's workload

Activity	Time (working hours)
1. Participation in lectures	15
2. Participation in tutorials	15
3. Individual work at home	15

Student's workload

Source of workload	hours	ECTS
Total workload	50	2
Contact hours	30	1
Practical activities	10	1