



SZKOŁA GŁÓWNA  
GOSPODARSTWA  
WIEJSKIEGO

## Ground Improvement

### Educational subject description sheet

#### Basic information

<b>Field of study</b> Course Offer for exchange students - second cycle studies, including uniform master studies (MA programmes)		<b>Didactic cycle</b> 2024/25	
<b>Speciality</b> -		<b>Subject code</b> PWMPWM2S_D.B100000P.06306.24	
<b>Organizational unit</b> Course Offer for exchange students		<b>Lecture languages</b> english	
<b>Study level</b> second cycle studies, including uniform master studies (MA programmes)		<b>Mandatory</b> Elective subjects	
<b>Study form</b> full-time studies		<b>Block</b> Basic subjects	
<b>Education profile</b> General academic		<b>Disciplines</b>	
<b>Coordinator</b>	Andrzej Głuchowski		
<b>Teacher</b>	Andrzej Głuchowski		
<b>Period</b> Winter semester	<b>Examination</b> Exam	<b>Number of ECTS points</b> 2	
	<b>Activities and hours</b> Lecture: 15 Auditorium exercises: 30		

## Goals

Code	Goal
C1	Analyze the soft soil properties and apply the proper ground improvement technique
C2	Apply mechanical modification, using Deep Compaction Techniques, Blasting, Vibrocompaction. Stone Columns, Dynamic and Compaction Piles, and Vertical Drains
C3	Adapt physical and chemical ground improvement techniques using thermal modification, like Grouting, Deep Soil Mixing technology, Ground Replacement, Geosynthetics

## Subject's learning outcomes

Code	Outcomes in terms of	Effects	Examination methods
<b>Knowledge - Student knows and understands:</b>			
W1	Knows and understands information about ground improvement techniques		Oral exam
W2	Knows and understand how to design an earth construction or foundation on the soft or problematic soils subgrade		Oral exam
<b>Skills - Student can:</b>			
U1	Ability to recognition and determination of problems and solutions to geotechnical design of structures		Project
U2	Ability to use a few ground improvement methods to optimize the design solution		Project
<b>Social competences - Student is ready to:</b>			
K1	Is ready to act consciously and understands design and technical aspects of ground improvement in geotechnical engineering		Oral exam, Project

## Study content

No.	Course content	Subject's learning outcomes	Activities
1.	Design limit states and slope stability.	W1, W2, U1, U2, K1	Lecture, Auditorium exercises
2.	Stone columns design and introduction to Vibroreplacement technique.	W1, W2, U1, U2, K1	Lecture, Auditorium exercises
3.	Design of deep soil mixing (DSM) ground improvement.	W1, W2, U1, U2, K1	Lecture, Auditorium exercises
4.	Ground improvement using geosynthetics.	W1, W2, K1	Lecture
5.	Ground replacement technique and limit states analysis	W1, W2, K1	Lecture

No.	Course content	Subject's learning outcomes	Activities
6.	Preloading and vertical drains design.	W1, W2, U1, U2, K1	Lecture, Auditorium exercises
7.	Numerical analysis using FEM software.	U1, U2	Auditorium exercises

### Course advanced

Activities	Methods of conducting classes
Lecture	Lecture
Auditorium exercises	Case study, Design method

Activities	Examination method	Percentage
Lecture	Oral exam	50%
Auditorium exercises	Project	50%

Activities	Credit conditions
Lecture	The student will be asked 3 questions from a pool of 15 questions previously presented
Auditorium exercises	Completion of the exercises consists of completing two design exercises

### Literature

#### Obligatory

1. Han J. Ground Improvement. Principles and practice. Wiley; 1st Edition (May 26, 2015)
2. Koerner R.M. Designing with Geosynthetics Xlibris US; 6th ed. Edition (January 16, 2012)
3. Huat B.K.H., Prasad, A., Kazemian S., Anggraini V. Ground Improvement Techniques CRC Press; 1st Edition (November 6, 2019)

#### Optional

1. Almeida M., Riccio M., Hosseinpour I., Alexiew D. Geosynthetic Encased Columns for Soft Soil Improvement CRC Press; 1st Edition (October 10, 2018)
2. Kirsh K., Bell A. Ground Improvement CRC Press; 3rd Edition (November 26, 2012)
3. Das B.M. Advanced Soil Mechanics CRC Press; 5th Edition (April 15, 2019)
4. <http://www.geowizard.org/index.html> - ADONIS 3.0 Documentation
5. Szymański, A. (2007). Mechanika gruntów. Wydawnictwo SGGW, Warszawa.

### Calculation of ECTS points

Activity form	Activity hours*
Lecture	15
Auditorium exercises	30
Preparing the project	7

Preparation for the exam	8
<b>Student workload</b>	<b>Hours</b> 60
<b>Number of ECTS points</b>	<b>ECTS</b> 2

\* hour means 45 minutes