



SZKOŁA GŁÓWNA
GOSPODARSTWA
WIEJSKIEGO

Ground Improvement

Educational subject description sheet

Basic information

Field of study Course Offer for exchange students - second cycle studies, including uniform master studies (MA programmes)		Didactic cycle 2024/25	
Speciality -		Subject code PWMPWM2S_D.B100000P.06306.24	
Organizational unit Course Offer for exchange students		Lecture languages english	
Study level second cycle studies, including uniform master studies (MA programmes)		Mandatory Elective subjects	
Study form full-time studies		Block Basic subjects	
Education profile General academic		Disciplines	
Coordinator	Andrzej Głuchowski		
Teacher	Andrzej Głuchowski		
Period Winter semester	Examination Exam	Number of ECTS points 2	
	Activities and hours 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
Knowledge - Student knows and understands:			
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
Skills - Student can:			
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
Social competences - Student is ready to:			
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
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

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

Optional

- Almeida M., Riccio M., Hosseinpour I., Alexiew D. Geosynthetic Encased Columns for Soft Soil Improvement CRC Press; 1st Edition (October 10, 2018)
- Kirsh K., Bell A. Ground Improvement CRC Press; 3rd Edition (November 26, 2012)
- Das B.M. Advanced Soil Mechanics CRC Press; 5th Edition (April 15, 2019)
- <http://www.geowizard.org/index.html> - ADONIS 3.0 Documentation
- 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
Student workload	Hours 60
Number of ECTS points	ECTS 2

* hour means 45 minutes