SOIL MECHANICS

Subject code: 06.4-WILŚ- BUD- MGRU- IB08

Subject type: Obligatory

Language of instruction: English

Responsible for the subject: Person currently conducting lectures

Providing education: Agnieszka Gontaszewska, Ph.D.
Waldemar Szajna, Ph.D. Eng.
Ewa Wojnicka-Janowska, Ph.D. Eng.

Type of class	Number of classes per semester	Number of classes per week	Semester	Type of credit	ECTS points
Full time studies					5
Lecture	15	1	III	exam	
Laboratory	30	2		credit with a grade	
Project	15	1		credit with a grade	
Part time studies					
Lecture	9	1	III	exam	
Laboratory	18	2		credit with a grade	
Project	9	1		credit with a grade	

SUBJECT OBJECTIVE:

Soil recognition and classification; examination of basic physical features. Mechanical characteristics of the soil centre. Slope stability.

INITIAL REQUIREMENTS:

Strength of materials, Geology.

SUBJECT SCOPE:

Lecture

Elements of soil science

Soil origin and basic division of building soil; Construction and physicochemical properties of clays; Physical features related to soil types; Physical characteristics related to the condition of soil; soil classification.

Mechanical characteristics of soils and laboratory methods for investigating them

Pore pressure, effective stress and drainage; Soil compressibility, testing postometric stiffness and pre-consolidation level; Shear stiffness of soil: testing methods, shear curves of soils; Soil durability: laboratory methods of strength testing, soil strength models - strength hypotheses, strength parameters; Groundwater and water flow in the ground; Consolidation.

Analysis and modelling of soil mass

Boundary equilibrium methods. Slope stability.

Project

Methods for determining the value of geotechnical parameters and methods for separating geotechnical layers. Project No. 1: Distribution of stresses in the substrate. Project No. 2: Analysis of slope stability.

Laboratory

Soil classification (according to PN-86/B 02480, PN-EN ISO 14688); Macroscopic examination; Grain size analysis; Bulk density and density of the soil skeleton; Consistency limits and condition of cohesive soils; Parameters of the condition of non-cohesive soils; Optimum humidity; Filtration coefficient; Compressibility modules; Shear strength; Triaxial research - demonstration

Educational methods:

Lecture	- conventional lecture,
Laboratory	- laboratory exercises in teams,
Project	- individual and team work on a project.

EDUCATION RESULTS:

Results after completion of the course	Symbol	Verification method	Type of class
Knowledge			
The student can define basic mechanical characteristics of soil. The student can explain the role of effective stresses in soil mechanics. The student can describe basic models and parameters of soil strength and stiffness, and can explain what factors affect their values. The student knows which tests can be used to determine values of these parameters. The student can recognize differences in the behaviour of loaded soil with and without drainage	**K_W12**	exam	L
Abilities			
The student can identify soil type and condition and knows how to designate and convert basic physical characteristics of fine-grained and coarse-grained soils	**K_U12**	test, a credit for projects	Lab
The student can solve simple geotechnical tasks: determine stresses in a soil mass, estimate slope stability with the simplified method	**K_U09, KU10**		Lab
The student can prepare documentation regarding engineering tasks	**K_U03**		P
Social competences			
The student is aware of responsibility for their own work, understands the need for teamwork and the need for cooperation of geologists, geotechnicians, designers and contractors	**K_K04**	conversation during lectures initiated by the teacher; checking competences during the introduction to classes	L, Lab

REQUIREMENTS TO OBTAIN A CREDIT:

Lecture	A written exam with points.
Laboratory	The condition for a credit is a positive grade for all laboratory exercises planned for the laboratory programme and for a written test.
Project	The condition for a credit is completion of previously consulted and approved projects (2 projects) and two written tests for each project.

Criteria for grades for the exam and written tests:

91-100% correct answers	grade 5.0
81-90 % correct answers	grade 4.5
71-80 % correct answers	grade 4.0

61-70 % correct answers	grade 3.5
51-60 % correct answers	grade 3.0
0-50 % correct answers	grade 2.0

STUDENT WORK:

Organize classes	15L + 30Lab + 15P =	60 h
Preparation for the exam		25 h
Laboratory exercises – individual work		30 h
Project – individual work	15 + 10 =	25 h
Total	60 + 25 + 30 + 25 =	140 h
ECTS for the subject	140 / 30 = 4,67	5 ECTS

BASIC LITERATURE:

1. Lambe T.W., Whitman R.: Mechanika gruntów, Arkady, Warsaw 1978.
2. Wiłun Z.: Zarys geotechniki, Wyd. KiŁ., Warsaw 2000.
3. Pisarczyk S.: Mechanika gruntów, Wyd. Politechniki Warszawskiej, Warsaw 1999.
4. Glazer Z.: Mechanika gruntów, Wyd. Geol., Warsaw 1985.

COMPLEMENTARY LITERATURE:

1. Das B.M.: Principles of geotechnical engineering, PWS Eng., Boston 1985.
2. Myślińska E.: Laboratoryjne badania gruntów, Warsaw, PWN 1992.Obrycki M., Pisarczyk S., Zbiór zadań z mechaniki gruntów, Oficyna Wyd. Polit. Warszawskiej, Warsaw 1999.
4. PN-EN 1997:2008 Eurokod 7. Projektowanie geotechniczne. PKN, Warsaw.
5. PN-EN ISO 14688:2006, Badania geotechniczne. Oznaczanie i klasyfikacja gruntów, PKN, Warsaw.
6. PN-81/B-03020, Grunty budowlane. Posadowienie budowli. Obliczenia statyczne i projektowanie. Wyd. Normalizacyjne, Warsaw.
7. PN-86/B-02480, Grunty budowlane. Określenia, symbole, podział i opis gruntów. Wyd. Normalizacyjne „Alfa”, Warsaw.

SYLLABUS PREPARED BY:

Waldemar Szajna Ph.D. Eng.