

COURSE SYLLABUS

Course code	1080-BU400-ISA-0452
Course name	Soil Mechanics and Geotechnical Engineering I
Course version	2027L
Level of education	first cycle programme
Form and mode of study	full-time study
Study profile	general academic profile
Field of study	Civil Engineering
Specialisation	-
Organizational unit	The Faculty of Civil Engineering
Implementing unit	The Faculty of Civil Engineering
Course unit	n/a
Course groups	-
Course status	Obligatory
Language of the course	English
Study stage code	BU000-S4-ISA-1080
Number of ECTS credits	5

Part I**01. Learning outcomes and the method of conducting classes**

Learning outcomes	see table "Learning outcomes"
Forms of classes and the number of hours in the semester	
laboratory	40,00 h
lectures	20,00 h
tutorials	5,00 h

02. ECTS balance

Number of ECTS credits	5	
Course workload	Hours	ECTS
Total number of hours and ECTS credits for the course:		
Hours and ECTS credits for courses involving direct participation of academic teachers	67	2,68
Hours and ECTS credits involving student's independent work	58	2,32
Total	125	5,00
Number of hours involving direct participation of academic teachers:		
Hours connected with class participation	65	
Other synchronous hours	2	
Total	67	
Number of hours involving student's independent work:		
Hours for student's independent work	58	

03. Course content

Part I

Course content	Classification of soils with regard to their origin as well as physical and mechanical properties. Basic parameters of soil. Determination of soil type and state of subsoil layers. Field sampling of soils for laboratory tests - geotechnical categories and rules according to Eurocode 7. Types of water in a soil mass: adsorbed, capillary and free ground water. Darcy's law, laboratory and field methods of determination of the coefficient of permeability, seepage forces and pore-water pressure. Distribution of stresses in an elastic half-space: Boussinesq's problem solution and methods of estimation of vertical and horizontal stresses due to applied load. Analysis of stresses in subsequent stages of construction: overburden, secondary, additional and total with respect to the global and/or effective stress states. Shear strength of soils: internal friction angle (IFA) and cohesion (C) with their apparent and effective values. Stress path and basic laboratory tests: Direct Shear Apparatus (DSA), Triaxial Apparatus (TA). Determination of settlement in case of flexible plate and rigid foundation using modules of compressibility and/or modulus of deformation. Terzaghi's theory of one-dimensional consolidation.
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Table: Learning outcomes

Knowledge	
Outcomes code	W1
Description	Knows statistical methods of analysis of measurement results, approximation methods, physical and mechanical properties of soils. Knows the units of measurement of physical and mechanical properties and stress and strain states of the soil medium. Has a basic knowledge of the application of EUROKOD 7 European Standards for geotechnics. Has knowledge of the assessment of ultimate limit states, stability and deformability of the subsoil and the limit states of use of a building.
Related field-of-study learning outcomes	K1_W08
Skills	
Outcomes code	U1
Description	Be able to assess a building site, establish values for the geotechnical properties of the soil, determine the complexity of the geotechnical conditions and, on this basis, the geotechnical category. Be able to assess the ultimate limit states, stability and deformability of the foundation and the serviceability limit states of the load-bearing structure of a building.
Related field-of-study learning outcomes	K1_U14, K1_U18, K1_U21, K1_U24
Social competence	
Outcomes code	K1
Description	Be ready to: critically evaluate one's knowledge and perceived content; recognize the importance of knowledge in solving cognitive and practical problems, and consult experts when one has difficulty solving a problem on one's own;
Related field-of-study learning outcomes	K1_K01, K1_K03

Part II**04. Year and semester of studies**

Year	2027L
Semester	4

05. Course leader and course teachers

Course leader	Artur Zbiciak
lectures	Artur Zbiciak
tutorials	Rafał Kusztyk

Part II	
laboratory	Rafał Kuszyk
06. Course objective	
Course objective	The aim of the course is to introduce students to the fundamentals of soil mechanics and geotechnical engineering, including physical and mechanical properties of soils, methods of their determination, and basic principles of stress and strain analysis in soil media, forming the basis for geotechnical design.
07. Teaching methods and techniques	
laboratory	Methods: laboratory classes Techniques: geotechnical laboratory testing, use of testing equipment, data analysis, laboratory reports
lectures	Methods: informative lecture, problem-oriented lecture Techniques: multimedia presentation, board work, analysis of engineering examples, discussion
tutorials	Methods: problem-solving classes Techniques: numerical exercises, analysis of geotechnical cases, individual work
08. Methods of verifying learning outcomes	
Knowledge	
Outcomes code	W1
Description	Knows statistical methods of analysis of measurement results, approximation methods, physical and mechanical properties of soils. Knows the units of measurement of physical and mechanical properties and stress and strain states of the soil medium. Has a basic knowledge of the application of EUROKOD 7 European Standards for geotechnics. Has knowledge of the assessment of ultimate limit states, stability and deformability of the subsoil and the limit states of use of a building.
Verification methods	lectures: written examination
Skills	
Outcomes code	U1
Description	Be able to assess a building site, establish values for the geotechnical properties of the soil, determine the complexity of the geotechnical conditions and, on this basis, the geotechnical category. Be able to assess the ultimate limit states, stability and deformability of the foundation and the serviceability limit states of the load-bearing structure of a building.
Verification methods	laboratory: written test laboratory: written report
Social competence	
Outcomes code	K1
Description	Be ready to: critically evaluate one's knowledge and perceived content; recognize the importance of knowledge in solving cognitive and practical problems, and consult experts when one has difficulty solving a problem on one's own;
Verification methods	assessment of active class participation tutorials: credit
09. Required and recommended reading list	
Required reading	Braja M. Das: Advanced Soil Mechanics, 3rd ed. Taylor & Francis, New York 2008. Budhu M.: Soil Mechanics Fundamentals. Wiley-Blackwell, 2015. Verruijt A.: An Introduction to Soil Mechanics. Springer, 2018.
Recommended reading	Yu H-S.: Plasticity and Geotechnics. Springer, 2006. Pietruszczak S.: Fundamentals of Plasticity in Geomechanics. CRC Press, 2010.
10. Other information	

Part II	
Other information	In accordance with the Course Regulations.