

Tadeusz Kosciuszko Cracow University of Technology

Course Card

Faculty of Civil Engineering

Field of study: Civil Engineering

Study profile: general academic

Study form: full-time

Field of study code: BUD

Study cycle: 1st

Specialty: no specialty

1 COURSE INFORMATION

Course name	Mechanika gruntów
Course name in English	Soil Mechanics
Course code	WIL BUD oIS C28 24/25
Course category	Basic
No. of ECTS points	3.00
Semester	4

2 CLASS TYPE, NUMBER OF HOURS ACCORDING TO THE STUDY PLAN

Semester	Lecture	Class exercise	Laboratory	Computer lab	Design exercise	Seminar
4	30	0	30	0	0	0

3 COURSE OBJECTIVES

Objective 1 Introduction into the soil mechanics, the classification of soils. Macroscopic analysis.

Objective 2 Determination of physical parameters of soils: density, water content, porosity. Granulometric analysis.

Objective 3 Cohesive soil analysis, Atterberg limits, the degree of plasticity.

Objective 4 Non-cohesive soils problems, soil compaction, optimal water content.

Objective 5 Standard constitutive models of soil, mechanical properties, shear strength, soil compressibility. New constitutive models.

Objective 6 The water in the soil, filtration, filtration rate.

Objective 7 Soil as a multiphase medium: skeleton, fluid, gas. Hypotheses of strength and mechanisms of soil destruction. Introduction into the soil mechanics research problems.

4 PREREQUISITES IN TERMS OF KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1 First semester of Strength of Materials

2 Completing the course of Theoretical Mechanics

5 LEARNING OUTCOMES

LO1 Knowledge Student gives the name of building soil with varying composition of the fractions, defines the physical characteristics of the soil and knows the granulometric analysis techniques.

LO2 Skills Student is able to give the name of building soil on the basis of macroscopic diagnosis, is able to define the physical characteristics of the soil, perform sieve analysis and aerometric analysis in the laboratory conditions.

LO3 Knowledge Student knows the Atterberg limits for cohesive soils, plasticity index and the density index for non-cohesion soils.

LO4 Skills Student is able to define in laboratories the Atterberg limits, and the optimal density of the soil in Proctor tests.

LO5 Skills Student knows fundamental constitutive models of soils.

LO6 Knowledge Student in the laboratory is able to find the cohesion and the internal friction angle in the direct shear test or in the triaxial compression test and compression modulus using oedometer.

LO7 Skills Student knows the hypothesis of soil strength.

LO8 Knowledge Student, using the knowledge of the strength of materials, can explain the mechanisms of destruction of soil, as the three-phase materials.

LO9 Knowledge Student is able to work individually and in a team, as well as report the results of work both for practical and scientific purposes.

6 COURSE CONTENT

Laboratory		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
L1	Classification of soils due to Polish and international standards. Basic concepts, symbols and description. Classes of soil samples and sampling methods.	4
L2	Granulometric analysis of the cohesive and non-cohesive soils.	4

Laboratory		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
L3	Determination of physical parameters of the soils. Determination of organic content.	4
L4	Atterberg limits.	4
L5	Soil compaction. Optimum moisture content and density index. Proctor method. Determination of hydraulic conductivity, Identification of passive capillary rise.	4
L6	Mechanical characteristics of the soil. Basic concepts. Compressibility and consolidation of soils, oedometer compressibility modules.	4
L7	The shear strength of a soil. Direct and residual shear tests. Determination of the internal friction angle and cohesion.	4
L8	Final approval of the reports. Final test.	2

Lecture		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
L1	Introduction into the soil mechanics. Soil classification of due to Polish and international standards. Documentary collection and geotechnical categories of subgrade.	4
L2	The physical characteristics of soil: water content, density, porosity, other parameters. Granulometric analysis according to different standards,	4
L3	Atterberg limits for cohesive soils, the definition of plasticity index. Degree of compaction of cohesionless soil, hydraulic conductivity and passive capillary rise problems.	4
L4	Mechanical characteristics of the soil: the primary and secondary compressibility oedometer modules, the sand equivalent index.	4
L5	The shear strength in the direct shear test and triaxial compression test.	4
L6	The water and water pressure in the soil, aeration and saturation zone. Determine: suffusion, colmatage, consolidation, irrigation and dehydrations.	4
L7	Models of soil: a) as a linear-elastic half space, Boussinesq problem, b) multi-phase models, the main hypotheses in the theory of plasticity. Strain and stress soil models. Soil stability.	6

7 TEACHING TOOLS

N1 Lectures

N2 Laboratories

N3 Group work

N4 Counseling

N5 Discussion

N6 Multimedia presentations

8 Student workload

Activity form	Number of hours of activity
Hours realized in contact with the teacher	
Hours resulting from the study plan	60
Consultation hours	3
Exams and tests during session	3
Hours of autonomous student work	
Preparing for classes, studying literature	8
Developing results	6
Preparing of reports, projects presentations, discussion	10
Total number of hours devoted to the subject	90
Total number of ECTS points	3.00

9 Methods of grading

Partial grades

F1 Individual laboratory reports

F2 Team work

F3 Final test

Summary grade

P1 Final exam

P2 Weighted average of the marks

Conditions for passing the course

L1 The exam may join students who passed individually the laboratory test

L2 The written examination may consists of theoretical test

L3 Evaluation of the effect of education is the average of P1 and P2

L4 Condition for completing the subject is to obtain a positive mark for each of P1 and P2