Національний технічний університет України
«КИЇВСЬКИЙ ПОЛІТЕХНІЧНИЙ ІНСТИТУТ
імені ІГОРЯ СІКОРСЬКОГО»

Department of Geoengineering

STRENGTHENING OF SOILS AND TECTONICALLY DISTURBED ROCKS IN MINING AND CONSTRUCTION ENGINEERING

Work program of the discipline (Syllabus)

Details of the discipline

Level of higher education	***Third (educational and scientific)***
Branch of knowledge	*18 Production and technology*
Specialty	*184 Mining*
Educational program	*Geoengineering*
Discipline status	*Selective*
Form of study	*full-time / full-time / distance / mixed*
Year of preparation, semester	*2nd year, spring semester*
The scope of discipline	*5 credits / 150 hours (lectures - 9 hours, practical - 5 hours, individual lessons - 40 hours, independent work - 96 hours)*
Semester control / control measures	*Credit, modular test*
Timetable	rozklad.kpi.ua/
Language of instruction	*Ukrainian*
Information about course leader / teachers	Lecturer: *Prof., Zuievska Natalia Valerievna, (+38) 0509821770, zuevska@i.ua* Practical:*Prof., Zuievska Natalia Valerievna, (+38) 0509821770, zuevska@i.ua*
Course placement	

Curriculum of the discipline

1. Description of the discipline, its purpose, subject of study and learning outcomes

The purpose of teaching discipline is the formation of students' abilities:

- Ability to choose the construction scheme taking into account the presence of karst, the technology of construction work and the organization of special events;
- Ability to choose the scheme of construction in landslide areas, the technology of construction work and choose ways to secure the slopes;

The main tasks of the discipline.

According to the requirements of the educational-professional program, students after mastering the discipline must demonstrate the following learning outcomes: knowledge:

- to choose the construction scheme taking into account the presence of karsts, the technology of construction works and the organization of special events;
- to choose the scheme of construction in landslide areas, the technology of construction works and to choose the ways of fixing the slopes;

skill:

- to choose the construction scheme taking into account the presence of karsts, the technology of construction works and the organization of special events;

- to choose the scheme of construction in landslide areas, the technology of construction works and to choose the ways of fixing the slopes;

have experience:

- Apply the acquired knowledge and skills for the construction of underground structures in complex engineering and geological conditions, taking into account the geotechnical characteristics of construction areas.

2. Prerequisites and postrequisites of the discipline (place in the structural and logical scheme of education according to the relevant educational program)

Prerequisites*:* Geomechanical processes in rock massifs, Mathematical modeling of geomechanical processes

Postrequisites: formation of additional competencies on soil strengthening and tectonically disturbed rocks in mining and civil engineering.

3. The content of the discipline

Topic 1. Features of construction in counterfeit areas.
Topic 2. Features of construction on subsidence soils.
Topic 3. Features of construction of structures in landslide-prone areas.
Topic 4. Construction of buildings and structures in earthquake-prone areas.
Topic 5. Features of construction of buildings and structures in a dense urban development.

4. Training materials and resources

Basic literature:

1. DBN B.1.1-5-2000. Buildings and structures in forged areas and subsiding soils. Part 1. State Construction Committee of Ukraine dated 30.12.1999.

2. Housing construction in earthquake-prone places: Perspectives, priorities and projections for development , James Lewis. The Australian Journal of Emergency Management, Vol. 18 No 2. May 2003 https://www.humanitarianlibrary.org/sites/default/files/2014/02/EJEM_HousingConstructionInEarthquakeProne Places.pdf

3. Yamada Norio, Ota Yoshikazu. Safety measures for Trans Tokyo Bay Highway (T.T.B.) tunnel project. //Underground Construction in Modern Infrastructure. Rotterdam, Balkema, ISBN 90 5410 964 5 - 1998. - pp.25 - 31.

4. INNOVATION IN THE JAPANESE CONSTRUCTION INDUSTRY U.S. Government Printing For sale by the Superintendent Office of Documents Washington: 1996 https://www.govinfo.gov/content/pkg/GOVPUB-C13-e73b47cde82a933b4fdbf01d04f51f8b/pdf/GOVPUB-C13-e73b47cde82a933b4fdbf01d04f51f8b.pdf

4. Brodin Arne. Risk analysis and safety concept, Norra and Sodra Lanken (Northern and Southern Link). //Underground Construction in Modern Infrastructure. Rotterdam, Balkema, ISBN 90 5410 964 5 - 1998. - pp. 49-53.

3. Rolf Bielecki, Rolf Berger. Das Sicherheitskonzept fur den Bau der 4. Rohre desElbtunnels in Hamburg. //Tunnelbau. Berichte: 5 Internationales Tunnelbau-SymposiumMiinchen. Deutschland: Im Rahmen der Bauma, 1998, №1-2.-pp.27-32.

4. Eskesen S.D., Kampmann J. Risk reduction strategy in urban tunnelling: experiencefrom the Copenhagen Metro.// AITES-ITA World Tunnel Congress.-2000. pp. 161- 166.

2. DBN B.1.1-5-2000. Buildings and structures in forged areas and subsiding soils. Part 2. State Construction Committee of Ukraine dated 30.12.1999.

3. DBN B.1.1-3-97. Protection against dangerous geological processes. Engineering protection of territories, buildings and structures from landslides and landslides. Derzhkommiskbud of Ukraine dated February 28, 1997.

4. DBN B.1.1-12.2006. Construction in seismic areas of Ukraine.

5. Galstyan G.Sh. Seismic construction in Armenia // Building structures. Intern. scientific and technical zb. Construction in seismic areas of Ukraine. Vip. 64. - 2006

6. Rafidov TR, Mubarak YN Problems of seismic dynamics of underground structures // Foundations, foundations and mechanics of soils. - № 6. - 1992, p. 34-36.

7. Accumulation of NS Pile foundations in seismic construction // Foundations, foundations and soil mechanics. - № 5. - 2001, p. 14-16.

8. Eisenberg J.M. Seismic isolating adaptive systems // Foundations, foundations and soil mechanics. - № 6. - 1992, p. 22-25.

Educational content

5. Methods of mastering the discipline (educational component)

Names of lecture topics and a list of main issues

Topic 1. Construction of urban underground structures in counterfeit areas.

The problem of construction of new and protection of existing buildings and structures in counterfeit areas. Behavior of construction objects on an unevenly deformed basis. Constructive measures to protect buildings and structures erected in counterfeit areas. Structural schemes of buildings (rigid, pliable, combined). Features of the device of deformation seams of buildings.

Requirements for the foundations of buildings erected in forged areas. Foundations of buildings of flexible constructive scheme. Foundations of buildings made of cross strips on a flexible slab. Foundations of structures of rigid constructive scheme. Foundations in the form of monolithic cross strips. Prefabricated foundation with monolithic nodes. Box-shaped foundation, including the frame and floor of the first floor. Deep foundations in forged areas. Features of arrangement and protection of pile foundations in forged territories. Frame and frameless buildings erected in forged areas.

Topic 2. Construction of urban underground structures on subsiding soils.

The concept of subsidence soils, their characteristics and types. Methods of combating subsidence. Measures for the protection of structures erected on subsidence soils of type 1. Measures to protect buildings erected on subsidence soils of type 2. The method of compaction of loess soils with heavy rammers. Thermal fixation of loess soils. Method of consolidation of loess soils by silicateization. Constructive measures envisaged during construction on forest soils. Application of water protection measures during construction on subsidence soils. Frame and frameless buildings erected in areas composed of subsidence soils.

Topic 3. Features of construction of structures in landslide-prone areas.

The concept of "landslide zone". The problem of construction of buildings on slopes and landslide-prone areas. Landslide protection measures for buildings and structures erected on the slopes. Installation of landslide and landslide protection structures. Reinforcement of the foundations of buildings erected on landslide-prone areas.

Topic 4. Construction of buildings and structures in earthquake-prone areas.

General information about earthquake-prone areas. Features of construction of buildings and structures in earthquake-prone areas. Anti-seismic measures envisaged during the construction of buildings and structures in earthquake-prone areas. Determination of seismic intensity of the construction site. MSK-64 scale.

Features of constructions of buildings and constructions erected in seismically dangerous territories. Requirements for antiseismic, temperature and sedimentary joints of buildings and structures erected in seismically dangerous areas. Construction of retaining walls in earthquake-prone areas. Design and construction of tunnels in earthquake-prone areas. Seismic isolating adaptive foundation systems. Support type "pile in the ground". Pile foundations in earthquake-resistant construction. Application of kinematic supports and stiffness diaphragms in seismic construction.

Topic 5. Features of construction of buildings and structures in a dense urban development.

Requirements for fencing of ditches in the conditions of dense city building. Initial data for the design of sheet piling near existing buildings and structures. Requirements for the fastening elements of the pits.

Types of formation of sheet piling. Temporary sheet piling. Permanent sheet piling. Metal tongue and groove profiles. Features of erection of enclosing walls from profiles of a metal tongue. Technology of construction of a belt of a pile row. The construction of the enclosing wall, which is arranged with load-bearing elements with stitching between them and their advantages and disadvantages. Types of fencing structures of ditches with load-bearing elements and stitching. Formation of a pile filtration protection. Fence formed by piles arranged in 2 and 3 rows.

The name of the topic of practical classes and a list of key issues

Calculation of deformations of the earth's surface of forged territories. Construction of displacement troughs and plots of deformations of the earth's surface.

Investigation of the nature of the development of deformations of the earth's surface within the subsidence funnel.

Calculation of subsidence of the foundation under the foundation of the building.

Calculation of landslide-prone areas by the method of round-cylindrical surface.
Acquaintance with the SRF-2004 maps. MSK-64 scale.
Choosing the option of building a new foundation near the existing one. Calculation of the distance between the erected foundation and the existing one, based on the solution of problems by the method of boundary equilibrium.
Determination of maximum allowable additional deformations of existing structures during construction of new ones near them.

6. Independent work of a student / graduate student

The name of the topic for self-study
Foundations in the form of monolithic cross strips. Prefabricated foundation with monolithic nodes. Box-shaped foundation, including the frame and floor of the first floor. Deep foundations in forged areas. Features of arrangement and protection of pile foundations in forged territories. Frame and frameless buildings erected in forged areas. [1] p. 21-31, [6] p. 33-37 Frame and frameless buildings erected in areas composed of subsidence soils. [8] p. 20-31 Reinforcement of the foundations of buildings erected on landslide-prone areas. [18] p. 20-22, [19] p. 27-29 MSK-64 scale. Seismic isolating adaptive foundation systems. Support type "pile in the ground". Pile foundations in earthquake-resistant construction. Application of kinematic supports and stiffness diaphragms in seismic construction. [24] p. 22-25, [25] p. 14-16, [26] p. 38-39

Policy and control

7. Course policy (educational component)

The system of requirements for students:

- attending lectures and practical classes is a mandatory component of studying the material
- at the lecture the teacher uses his own presentation material; uses Google Class to teach current lecture material, additional resources, labs, and more; Teacher gives you access to a specific Google Class directory to download electronic lab reports and MCR responses
- modular tests are written in lectures without the use of aids (mobile phones, tablets, etc.); the result is sent in a file to the appropriate Google Class directory
- incentive points are awarded for: active participation in lectures ;, preparation of reviews of scientific papers; presentations on one of the topics of the VTS discipline, etc. Number of encouraged points by more than 10
- penalty points are set for: late delivery of laboratory work. The number of penalty points is not more than 10

8. Types of control and rating system for evaluation of learning outcomes (RSO)

Current control is carried out in the form of two modular tests (assessment of each 12-25 points), 5 practical works (assessment of each 4-7 points), individual work (8-15).

The sum of rating points received by the student during the semester is transferred to the final grade according to the table. If the sum of points is less than 60, the student performs a test. In this case, the sum of points for the performance of DCR and credit test is transferred to the final grade according to the table.

A student who received more than 60 points in the semester can take part in the test. In this case, the points obtained by him on the test are final.

Table of correspondence of rating points to grades on the university scale:

Scores	*Rating*
100-95	Perfectly
94-85	Very good
84-75	Fine
74-65	Satisfactorily
64-60	Enough
Less than 60	Unsatisfactorily
Admission conditions are not met	Not allowed

Work program of the discipline (syllabus):

Folded Professor of the Department of Geoengineering, Doctor of Technical Sciences, Zuevskaya NV

Approved department _____ (protocol № ___ from _____)

Agreed IEE Methodical Commission (protocol № __ from _____)