Department of Geoengineering

GEOMECHANICAL PROCESSES IN ROCK MASSIF

Work program of the discipline (Syllabus)

Details of the Disciplines	
Level of higher education	***Third (Educational and scientific)***
Branch of knowledge	*18. Production and technology*
Specialty	*184 Mining*
Educational program	*Geoengineering*
Discipline status	*Normative*
Form of study	*Full-time)/ (evening form)/external/ distance learning /mixed form*
Year of study, semester	*IIyear ,1-st semester*
Discipline scope	*6 credits/180 h (lections -8. Practice– 10,Iindividual tasks 47, Independent work 115)*
Semester control / control measures	*Εκsamination*
Lessons schedule	*According to the training schedule (two weeks)*
Language of Lecture	*Ukraine/Englich/*
Information about course leader / lehrer	*Supervisor of the graduate student prof. Kravets VG*
Course placement	

Program of the discspline

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

The curriculum "Geomechanical processes in rock massifs" is made in accordance with the educational and scientific program of the third level of higher education "Geoengineering" (PhD degree) specialty 184 "Mining" The discipline belongs to the cycle of professional and practical training

The subject of the discipline is scientific knowledge of the nature of geodynamic phenomena caused by man-made influences, knowledge of features and possibilities of their use in mining, construction and mining, taking into account known scientific achievements and own scientific approaches to the problems of applied geodynamics of explosion. During the teaching of theoretical material the methods of problem-search, research method of educational projects are used, aimed at revealing the system of evidence, comparing points of view, different approaches. There are also practical classes, consultations, independent training in the library and on the basis of Internet resources, independent individual work.

Program competencies:

FC01. Ability to perform original research, achieve scientific results that create new knowledge in mining and related interdisciplinary areas and can be published in leading scientific publications on production and technology and related fields.

FC03. Ability to identify, pose and solve research problems in the field of mining, evaluate and ensure the quality of research.

Program learning outcomes:

PRN03. Plan and perform experimental and / or theoretical research in mining and related interdisciplinary areas using modern tools, critically analyze the results of their own research and the results of other researchers in the context of the whole set of modern knowledge on the research problem.

PRN04. Develop and implement scientific and / or innovative engineering projects that provide an opportunity to rethink existing and create new holistic knowledge and / or professional practice and solve significant scientific and technological problems of mining in compliance with academic ethics and social, economic, environmental and legal aspects.

PRN06. Apply modern tools and technologies for information retrieval, processing and analysis, geomonitoring information systems and research of array properties.Prerequisites and postrequisites of the discipline (place in the structural and logical scheme of education according to the relevant educational program)

The discipline is taught in the second year of preparation of the doctor of philosophy, is a compulsory subject and requires basic training of students in natural and technical sciences (geoengineering disciplines.

The basis for studying the discipline are such subjects as "Rock Destruction and Industrial Seismics"). “Geomechanics”, “Fundamentals of Scientific Research”, “Explosive Design”, “Construction of Underground Structures.” The course will be especially useful for PhD students whose dissertation work is related to the formation of engineering properties of igneous soils and massifs, development of advanced technologies conducting mining operations, especially in difficult mining and geological conditions.

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

The discipline is taught in the second year of preparation of the doctor of philosophy, is a normative discipline and requires forms the necessary program learning outcomes for further research.

3. Course content

Topic 1 Theoretical foundations of explosion geodynamics (4 hours)

Topic 2. Elements of technological processes based on geodynamics (4 hours).

4Training materials and resources

Basic literature

1.Kravets VG Geomechanical processes in the rock mass. Applied geodynamics of the explosion. Textbook / VG Kravets, OO Vovk, OM Terentyev (electronic resource). K .: KPI them. Igor Sikorsky, 2021.- 247p. Material in the archive of electronic resources of NTUU KPI. Igor Sikorsky.

Identifier: https://ela.kpi.ua/handle/123456789/43941

2.Kravets VG Design of blasting works. Teaching. manual / VG Kravets, NV Zuevskaya (electronic resource). K .: KPI them. Igor Sikorsky, 2021.- 212p. Material in the archive of electronic resources of NTUU KPI. Igor Sikorsky.

Identifier: https://ela.kpi.ua/handle/123456789/43513Additional literature

1. Optional

3.. Applied geodynamics of explosion in mining and geotechnical construction / Kravets VG, Vovk OO, Kotenko VV, Terentyev OM. Zhytomyr: ZhSTU, 2012.- 156p

4. Boyko V .IN. Problems of seismic safety of blasting in the quarries of Ukraine / Monograph / VV Boyko, K .: Ltd. "Steel Publishing House", 2012.-184p.

5.Technological applications of border effects by hole charges system explosion / Viktor Kravets, Azer Shukurov, Roman Zakusylo, Andrij Kovtun / Materialy Wysokoenergetyczne. 2019.11 (2) -S.21-30

6.. Kravets VG Boundary effects of explosion of charges of complex shape / VG Kravets, AM Shukyurov, PV Gontar, AL .Han, VV Korobiychuk // Bulletin of ZhSTU .Ser.Technical Sciences.-Zhytomyr: 2018-№2 (82) .- P.240-247;

7.Zakusylo R. Innovative technologies for gentle destruction of rocks by dynamic methods / .Zakusylo, V.Kravets, A.Shukurov // Innovative development of resource-saving technologies for mining. Multi-authored monograph.-Sofia: Publishing House «St.Ivan Rilski», 2018.- 439p.

8.Regularities of Energy Field Formation in the Explosion of a Conical Charge / Viktor Kravets, Roman Zakusylo, Yuri Sydorenko , Azer Shukurov, Tomasz Salacinski, Daryna Zakusylo / Central European Journal of Energetic Materials / 2019,16, (4): P.533-546

9. Korobiichuk V. Weakening of rock strength under the action of cyclic dynamic loads / V. Korobiichuk, V.Kravets, R.Sobolevskyi, A.Han, V.Vapnichna.- Eastern-European Journal of Enterprice Technologies, 2018- 2/5 (92) .— P.20-25.

10.Explosive wave propagation in the presence of antiseismic protective curtain / Viktor Kravets, Natalia Remez, Andrii Kovtun, Azer Shukiurov / Ukrainian School of Mining Engineering XII International Scientific and Practical Conference, E3S Web of Conferences, Berdiansk: Ukraine , 4 - 8 September 2018 / Vol / 60, 2018.-8p.

11. Application of explosion energy during special mining and construction works / VG Kravets, VV Boyko, AL Gan, OV Gan / Modern special equipment, №2 (61), 2020.- C .135-150**Educational content**

5. Methods of mastering the discipline (educational component)

The general methodical approach to teaching the discipline is defined as a problem-searching, research method.

As well as practical classes, consultations, independent training in the library and on the basis of Internet resources, independent individual work.

Topic 1. Theoretical foundations of explosion geodynamics (4 hours)

General provisions and theoretical foundations of explosion geodynamics. Development of ideas about the elastic-deformed state of the rock mass during the explosion Mathematical models of compressible soils and rocks

Topic 2. Elements of technological processes based on geodynamics (4 hours)

Formation of engineering properties of compressible soils by explosion. Formation of camouflage cavities in compressible soils. Influence of geometry and final dimensions of charge on mechanical effect of explosion. Mechanical effect of explosion of vertical extended charge on contact with a free surface. Influence of the length of the vertical charge in the system on the parameters of the ejection recess

The mechanism of filling the explosive cavity with thixotropic material

Technological elements of the anti-filtration screen

Recommended topics of practical classes

The main tasks of the series of practical classes:

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- consolidation of lecture material on the theory and practice of applied geodynamics,

- the formation of the necessary knowledge of the basic principles of modeling environments exposed to intense dynamic influences,

- training in practical methods for predicting the mechanical effect of the explosion; -

- skills of making various technological decisions on the use of explosion energy in mining, geotechnical construction and special works.

The graduate student must master the technique of experimental studies of dynamic characteristics of the environment, understand its capabilities, advantages and disadvantages in connection with engineering -geological conditions and methods of blasting. Practical work involves the acquisition of decision-making skills in the design of blasting works in conditions of incomplete certainty with the initial data, enrichment of practical experience in designing and conducting engineering work, including explosive methods.

6. Individual study

№	The name of the topic, which is submitted for individual study	Number of hours
1	Topic 1. Theoretical foundations of explosion geodynamics	20
2	Topic 2. Technological processes based on the geodynamics	27

Policy and control

7. Course policy (educational component)

in the classroom is welcome learning activity , prior knowledge of the topics of the lecture, the use of means of communication to search for information on the Internet, dialogic forms of communication; questions with the specifics of graduate dissertation research.

• rules of defense of individual assignments: deadline - two weeks before the end of the semester, defense of individual assignments takes the form of an interview;

• in case of skipping classes without good reason for the topic of the missed lecture is an abstract of 10-12 pages);

• at the end of the semester there is an additional opportunity to pass / retake test scores;

• policy on academic integrity - borrowing materials without reference to the author's work is not allowed , attempts at plagiarism are taken into account when passing the test.

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

1. The student's rating from the credit module is calculated from 100 points, of which 60 points is the starting scale. The starting rating (during the semester) consists of points that the student receives for:

- work in practical classes (5 classes);
- performance of modular work (1 work);

2 . Scoring criteria:

2.1. Work in practical classes:

- active creative work - 8 points;

- current work - 5 points;

2.2. Completion of modular work:

- perfect work - 20 points;

3. The condition of the first certification is to receive at least 15 points (at the time of certification). The condition of the second certification is to receive at least 30 points,

4. The condition for admission to the exam is a starting rating of at least 30 points.

5. At the exam, students perform a written test. Each task contains two theoretical questions (tasks) and one practical one. Each theoretical question (task) is evaluated with 15 points according to the following criteria:

- "excellent", complete answer, not less than 90% of the required information (complete, error-free solution of the problem) - 15-14 points; 1}} - "good", a sufficiently complete answer, at least 75% of the required information or minor inaccuracies (complete solution of the problem with minor inaccuracies) - 13-12 points,

- "satisfactory", incomplete answer, not less than 60% of the required information and some errors (the task is performed with certain shortcomings) - 11-10 points,

- "unsatisfactory", the answer does not meet the conditions for "satisfactory" - 0 points.

Each practical task - 10 points according to the following criteria:

- "excellent", complete answer, not less than 90% of the required information (complete, error-free solution of the problem) - 10-9 points; {1}} - "good", sufficiently complete answer, not less than 75% of the required information or minor inaccuracies (complete solution of the problem with minor inaccuracies) - 8-7 points,

- "satisfactory", incomplete answer , not less than 60% of the required information and some errors (the task is performed with certain shortcomings) - 6 points,

- "unsatisfactory", the answer does not meet the conditions for "satisfactory" - 0 points.

6. The sum of starting points and points for the examination test is transferred to the examination grade according to the table:

$R = R_C + R_E$	**Rating ECTS**	**Traditional rating**
95...100	A – perfectly	perfectly
85...94	B – very good	good
75...84	C – good	
65...74	D – satisfactorily	satisfactorily
60...64	E – enough (meets the minimum criteria)	
less than 60	Fx – unsatisfactorily	unsatisfactorily
less than 36	F – unsatisfactorily (additional work is required)	not allowed

.Syllabus compiled by: Professor of Geoengineering, DSc., prof. Kravets VG

Approved by the department (protocol № _15_23.06.2021_)

Approved by the Methodical Commission of the faculty [1] (protocol № 7_23.06.2021_)

[1] Methodical council of the university - for general university disciplines