

NATIONAL TECHNICAL UNIVERSITY OF UKRAINE
"Igor Sikorsky Kyiv Polytechnic Institute"

I approve



Chairman of the Admissions Committee

Rector

Anatolii MELNYCHENKO

28.03.2025

date

PROGRAM

Additional Entrance Test

for admission to the educational and scientific program for the preparation of Doctor of Philosophy
"Geoengineering"

in the specialty G16 Mining and Oil and Gas Technologies

The Program was adopted:

Scientific and Methodological Commission in the
specialty G16 Mining and Oil and Gas Technologies
Protocol No. 3 dated March 26, 2025

Head of the NMCU

Natalia ZUIEVSKA

ENTRY

The program determines the form of organization, content and features of conducting an additional entrance test for the educational and scientific program for the training of Doctors of Philosophy "Geoengineering" in the specialty G16 Mining and Oil and Gas Technologies for applicants who enter for a PhD degree in a field of knowledge (specialty) other than the one specified in their diploma, on the basis of which admission is made.

The purpose of the program is to check the acquisition of competencies and learning outcomes necessary for mastering the educational and scientific program for the training of Doctors of Philosophy "Geoengineering" in the specialty G16 Mining and Oil and Gas Technologies.

1. BASIC SUMMARY

1.1. List of topics that are submitted for the additional entrance test

1. Analyze the impact of mining and mineral resources on historical processes, technological progress, education and science.
2. Reveal the main stages of the history of mining and the development of mining technologies.
3. Analyze the development of mining in Ukraine.
4. Classify and reveal the properties of rocks. Systematize the categories of mineral reserves.
5. Give the characteristics of overburden mine workings, their functions and parameters.
6. Analyze the capital and preparatory workings of the coal mine.
7. Analyze the benefits of using geographic information systems for the current and long-term design of mining enterprises.
8. Analyze modern methods of computer-aided design for performing analysis by the method of finite elements of deformations and stability of soil and rocks, calculations of the interaction of the structure with the soil.
9. Analyze the application of engineering measures to stabilize the soil slope and the use of calculation programs to assess the stability of the slope by the finite element method.
10. Schematically depict the algorithm of the technology for the construction of vertical trunks.
11. Classify the types of fastening of mine workings.
12. Analyze the steel frame fasteners: structural elements, interaction with the rock massif, installation methods.
13. Analyze the anchor fastening: structural elements, interaction with the rock massif, installation methods.

14. Analyze reinforced concrete and sprayed concrete fasteners: structural elements, interaction with the rock massif, installation methods.
15. Analyze underground transport, lifting, drainage, ventilation.
16. Analyze the surface complex of the mining enterprise: surface structures, their design features, functions and technological processes on the surface.
17. Reveal the technological stages of mineral processing. Analyze the purpose of the department (buildings) of the enrichment plant.
18. Reveal the essence of open-pit mining and types of open-pit mining in accordance with the types of deposits. Contrast the advantages and disadvantages compared to underground mining.
19. Analyze the mining enterprise of the quarry, systematize its elements and mine workings.
20. Analyze the techniques and technologies of open pit mining. Make judgments about the reclamation of disturbed areas?
21. Compare the possibilities of oil and gas field development technology.
22. Reveal the issues of processing cartographic materials, arrays of text and numerical information using GIS technologies.
23. Analyze the use of GIS technologies as a way to acquire and process geographic information.
24. Computer-aided design systems in geoconstruction.
25. Weigh the possibilities, prospects and methods of developing marine gas hydrates.
26. Reveal the essence and general technological principles of borehole physicochemical geotechnology of mineral development (dissolution, leaching, smelting, gasification, etc.)
27. What fasteners are used in the hollow, trench and shield methods of construction of tunnels and metro stations?
28. How are pylon and column type metro stations built with precast concrete finishes?
29. How are single-vaulted metro stations built? Analyze the conditions for using the open method.
30. What underground (mining) methods of construction do you know? Analyze them. Give a classification of road and rail tunnels.
31. Justify the technological sequence of work in the pit method of construction of metro stations and tunnels.
32. Justify the technological sequence of work in the trench method of construction of metro stations and tunnels.

33. Justify the technological sequence of work with the shield method of construction of metro stations and tunnels.
34. Justify the technological sequence of work when applying the "Wall in the ground" method in the construction of metro stations and tunnels.
35. How does the environment affect the reliability of tunnel structures? What mining methods of tunnel construction do you know? Analyze them.
36. What mining methods of constructing tunnels with the construction of permanent processing at once do you know? Analyze them. Compare penetration with non-mechanized and mechanized shields.
37. What methods of constructing large-section underground tunnels do you know? Describe the New Austrian method of tunnel construction.
38. What non-traditional and promising ways of building tunnels do you know? Analyze them.

1.2. The procedure for conducting an additional entrance test

An additional entrance test is carried out in the form of a written work. Each ticket contains four theoretical questions. For the test, 25 exam tickets are provided, formed from the above list of topics.

The deadline for completing the test is 3 academic hours without a break. After writing the work, the subject commission checks it and assigns a grade according to the evaluation criteria.

The methodology for conducting the entrance test is as follows. Members of the commission inform entrants about the procedure for conducting and executing papers on the additional entrance test, issue to entrants exam tickets with appropriate options and pre-printed signed letters for writing papers. In the future, in these letters, applicants write down written answers to the questions of the exam ticket and at the end indicate the date and put a personal signature.

For the organizational part of the test (explanations on conducting, design and evaluation criteria, issuance of tickets and letters for writing a paper) 10 minutes from the entire time of the exam is allotted, for answers to each of the three questions of the exam ticket, the applicant is given 30 minutes and for the final part (collection of tickets and written works from entrants by members of the commission) - 5 minutes.

At the end of the stage of writing the entrance test, the answers are checked and evaluated by all members of the commission. Members of the subject commission make a joint decision on assigning a grade for the answer to each of the questions of the exam ticket. These grades are placed on the student's answer sheet.

Summing up the results of the additional entrance test is carried out by entering points in the examination sheet. Familiarization of the student with the results of the additional entrance test is carried out in accordance with the rules of admission to the university.

1.3. Auxiliary materials for assembly

When passing the additional entrance test, it is prohibited to use auxiliary literature and other auxiliary materials and means.

1.4. Rating Evaluation System (RSO)

When passing the additional entrance test, entrants perform a written test. Each exam ticket contains four theoretical questions. All tasks are equivalent.

Depending on the completeness and correctness of the answer to the question, the applicant receives:

23... 25	points for	91... 100 %	correct answer
20... 22	points for	81... 90 %	correct answer
17... 19	points for	71... 80 %	correct answer
14... 16	points for	61... 70 %	correct answer
11... 13	points for	51... 60 %	correct answer
9... 10	points for	41... 50 %	correct answer
7... 8	points for	31... 40 %	correct answer
5... 6	points for	21... 30 %	correct answer
3... 4	points for	11... 20 %	correct answer
1... 2	points for	5... 10 %	correct answer
0	points for	0... 5 %	correct answer

The correct answer in this context is considered to be a complete and adequate coverage of the issue according to the program.

In the answers to the theoretical tasks of the exam ticket, the following are assessed:

- completeness of the disclosure of the issue;
- the ability to clearly formulate definitions of concepts/terms and explain them;
- the ability to argue the answer;
- analytical reasoning, comparison, formulation of conclusions;
- accuracy of the design of the written work.

The overall score for the entrance test is calculated as the arithmetic sum of the points for all four answers to the exam ticket questions. Thus, according to the rating system of assessment, according to the results of the entrance test, the applicant can score from 0 to 100 points.

Entrants, whose results of the additional entrance test on the RSO scale are from 60 to 100 points, receive a grade of "enrolled" and are allowed to take the entrance exam in the specialty.

Entrants, whose results of the additional entrance test on the RSO scale range from 0 to 59 points, receive a grade of "not enrolled" and are not allowed to participate in the next entrance tests and in the competitive selection.

1.5. Example of a typical task of an additional entrance test

NATIONAL TECHNICAL UNIVERSITY OF UKRAINE
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Educational degree	Doctor of Philosophy
Speciality	G16 Mining & Oil & Gas Technology
Educational program	Geoengineering
Exam	Additional entrance test

EXAM TICKET No. 1

1. Analyze the surface complex of the mining enterprise: surface structures, their design features, functions and technological processes on the surface.
2. Classify the technological stages of shale gas production.
3. Analyze underground transport, lifting, drainage, ventilation.
4. Analyze the development of mining in Ukraine

Approved at the meeting of the NMCU
Minutes No. 3 dated March 26, 2025

Guarantor of the educational program

Oksana VOVK

2. FINAL PROVISIONS

1. Persons who did not appear for the entrance examinations at the time specified in the schedule without valid reasons, persons whose knowledge was assessed by scores below the established level, shall not be allowed to participate in the next entrance exams and in the competitive selection.
2. Retaking entrance tests is not allowed.

LIST OF RECOMMENDED LITERATURE

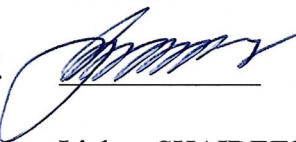
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