NJSC «ABYLKAS SAGINOV KARAGANDA TECHNICAL UNIVERSITY»

Scientific-methodological
council
minutes No 5
«18» 02 2026

PROGRAM
OF ENTRANCE EXAM
for admission to doctoral studies
Educational program 8D07206 – «Mine surveying»

Department: Mine surveying and geodesy

Developed by:
Khmyrova Ye.N., associated professor, Candidate of Engineering Sciences
Ozhigin S.G., associated professor, Doctor of Engineering Sciences

Karaganda 2026

Preface

The entrance exam program has been developed by:

Khmyrova Ye.N., associated professor, Candidate of Engineering Sciences
Ozhigin S.G., associated professor, Doctor of Engineering Sciences

Discussed at a meeting of MS&G department

Minutes № 14 «16» 02 2026

Head of MS&G department _____ Tutanova M.S.
(signature)

Introduction

The main objectives of training doctoral students in the 8D07206 "Mine Surveying" educational program are: to train postgraduate specialists with a high level of professionalism, professional communication skills, civic awareness, and the ability to formulate and practically solve modern practical problems in the field of mine surveying.

Database of examination materials for entrance examinations to doctoral programs in the educational program 8D07206 "Mine Surveying" for the 2025-2026 academic year:

Structure and content of the exam for the profile of educational programs group

1. The electronic exam paper consists of 3 questions:

Blocks	Nature of the question	Number of points
1st question	theoretical - determines the level and systematic nature of theoretical knowledge	10
2nd question	Practical - identifies the degree of development of functional competencies (the ability to apply methods, technologies, and techniques in a subject area)	15
3rd question	demonstrates a systematic understanding of the subject area being studied, specialized knowledge in the field of research methodology (systemic competencies)	25
TOTAL		50

Main topics covered in entrance exams

1. Mine surveying control of mining operations during deposit geometrization

1.1. List of topics:

- Geometrization of mineral deposits. Modern software tools
- Methods for processing mine surveying results
- Development systems, features of mine surveying work in open-pit and underground mining
- Classification of types of destruction
- Geometric parameters of slopes and their impact on stability
- Modern monitoring tools and technologies (total stations, GNSS, scanners, etc.).
- Regulatory requirements for slope stability.
- Processing and analysis of observation results.

1.2. Recommended reading:

1. Borshch-Komponiyets V.I., Navitny A.M., Knyzh G.M. Mine Surveying. Textbook — 3rd ed., revised and expanded. — Moscow: Nedra, 1992. — 447 p.
2. Beisenova A.S., Abdrasilov E.N. Mine Surveying (textbook). — Almaty: KazNITU, 2021.
3. Baimuratov B.Zh. Engineering Geodesy and Mine Surveying. — Karaganda: KarGTU, 2022.
4. Kurmashev K.S. Organization of Mine Surveying Services at Mining Enterprises. — Almaty: Kazakh School of Subsurface Use, 2020.
5. GOST R 52875-2007. Mine surveying support systems.
6. SN RK 1.02-03-2011. Rules for performing mine surveying work (Kazakhstan).
7. Ashikhmin A.A. Geomechanics in mining. – Moscow: Nedra, 2018.
8. Atamanov S.M. Monitoring of deformations in mine workings. – Almaty: KazNII, 2020.
9. Knyzh G.M. Mine surveying. – Moscow: Nedra, 2017.

2. Modern monitoring methods in the exploitation of mineral deposits

2.1. List of topics:

- Factors affecting the nature of the displacement process of rocks and the earth's surface
- Development of a project for observation stations
- Use of UAVs to build digital models of open-pit mines.
- Methods for conducting geomechanical monitoring.
- Design of observation stations
- Laser scanning: ground-based and aerial.
- Radar interferometry (InSAR) in deformation monitoring.
- Monitoring using remote sensing data.
- Point cloud processing and 3D model construction.
- Combining data from different sensors.
- Accuracy and comparability of different technologies.

2.2. Recommended reading:

1. Baimukhambetov E.K., Dzhumagulov M.Zh. Mine Surveying. Textbook. — Almaty: Satbayev University, 2020.
2. Boiko S.I. Mine Surveying. Textbook and Practical Guide. — St. Petersburg: Lan, 2021.

3. Sinanyan R.R. Mine Surveying. Textbook – 2nd ed., revised and expanded. — Moscow: Nedra, 1988. — 311 p.
4. Mine Surveying. Edited by Prof. V.N. Gusev/ St. Petersburg: National Mineral Resources University "Gorny", 2014– 402 p.
5. Zhanasova Zh.K. Laser Scanning in Mine Surveying. – Almaty: Tau-Ken, 2022.
6. Kasymov T.T. Application of GNSS and UAVs in geodesy and mine surveying. – Nur-Sultan: KazNITU, 2021.
7. Lato M., Diederichs M.S. Remote Sensing in Mining. – Springer, 2019.

3. Rock mass stability management

3.1. List of topics:

- Factors affecting the nature of the displacement process of rocks and the earth's surface
- Fundamentals of slope failure mechanics
- Hazardous geomechanical processes on open-pit slopes
- Limit equilibrium method
- Calculation of the stability factor
- Modeling in Rocscience (Swedge, Slide, RS2, etc.)
- Back-calculation based on observation data

3.2. Recommended reading:

1. Kasenov K.B., Aubakirov E.M. Fundamentals of Mine Surveying: Textbook. — Almaty: KazNITU, 2023. — 250 p.
2. Boiko S.I., Babenko L.I. Mine Surveying: Practical Guide. — St. Petersburg: Lan, 2020. — 248 p.
3. Smailova A.K., Tuleubaev T.A. Modern Surveying Measurements: Textbook. — Almaty: KazNITU, 2022. — 192 p.
4. Surovtsev A.F. Mine Surveying: Textbook. — Moscow: Nedra, 2010. — 495 p.
5. Operating instructions for devices (Leica, Trimble, Topcon, etc.)
6. Rocscience Inc. User manuals for Swedge, Slide, RS2. – Toronto, 2023.
7. Popov I.I. Geomechanics of open-pit slopes. – Almaty: Nauka, 2019.
8. Hoek E., Bray J.W. Rock Slope Engineering. – CRC Press, 2018.

Topics for essays

1. Geographic information systems (GIS) and their application in mine surveying.
2. Mine surveying support for underground mining operations: problems and solutions.
3. Mine surveying support for open-pit mining operations: innovations and process optimization.
4. Automation and robotization in mine surveying: present and future.
5. Analysis of the accuracy of mine surveying measurements and methods for improving it.
6. Application of unmanned aerial vehicles (UAVs) in mine surveying.
7. Methods for predicting earth surface deformations during mineral extraction.
8. Satellite technologies in mine surveying: opportunities and limitations.
9. Use of laser scanning in mine surveying.
10. Future development of mine surveying.