

NAO " KARAGANDA TECHNICAL UNIVERSITY  
NAMED AFTER ABYLKAS SAGINOV"

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**THE PROGRAM  
OF ENTRANCE EXAM**  
for admission to doctoral studies  
Educational program 8D07208 – “Mine surveying” (specialized)

Department: Mine surveying and geodesy

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## **Preface**

The entrance exam program was developed by: Doctor of Technical Sciences. Ozhigin S.G., Ph.D. Khmyrova E.N.

Discussed at a meeting of the Department of MS&G

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Head Department of MS&G \_\_\_\_\_ Khmyrova E.N. " \_\_\_\_ " \_\_\_\_\_ 2025  
(signature)

## Introduction

The main tasks of training doctoral students in the educational program 8D07208 "Mine surveying" (specialized) are: training of specialists of postgraduate education with a high level of professionalism, culture of professional communication, having a civil position, able to formulate and practically solve modern practical problems in the field of surveying.

Database of examination materials for entrance exams to doctoral studies in the educational program 8D07208 " Mine surveying" (specialized) for the 2025-2026 academic year:

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

1. The electronic exam card consists of 3 questions:

<b>Blocks</b>	<b>Type of question</b>	<b>Number of points</b>
1st question	theoretical- determines the level and consistency of theoretical knowledge	10
2nd question	practical-reveals the degree of formation of functional competencies (ability to apply methods, technologies and techniques in the subject area)	15
3rd question	reveals a systematic understanding of the subject area being studied, specialized knowledge in the field of research methodology (system competencies)	25
<b>TOTAL</b>		<b>50</b>

## **Main topics for entrance exams**

### **11. Geomechanical monitoring of the stability of quarry slopes**

#### **1.1. List of topics:**

- Introduction to the geomechanics of open pit mining.
- Dangerous geomechanical processes on the sides of quarries.
- Methodology of geomechanical monitoring.
- Design of observation stations.
- Modern monitoring tools and technologies (total stations, GNSS, scanners, etc.).
- Regulatory requirements for slope stability.
- Processing and analysis of observation results.

#### **1.2. Recommended literature:**

1. Borsch-Komponiets V. I., Navitny A.M., Knysh G. M. *Mine surveying*. Textbook-3rd ed., reprint. Moscow: Nedra Publ., 1992, 447 p. (in Russian)Beisenova A. S., Abdrasilov E. N. *Mine surveying* (textbook). Almaty: KazNITU Publ., 2021.
2. Baimuratov B. Zh. *Engineering geodesy and surveying*. - Karaganda: KSTU, 2022.
3. Kurmashev K. S. *Organization of surveying service at mining enterprises*. - Almaty: Kazakh School of Subsoil Use, 2020.
4. GOST R 52875-2007. Survey support systems.
5. SN RK 1.02-03-2011. Rules for performing surveying operations (Kazakhstan).
6. Ashikhmin A. A. *Geomechanics in Mining*, Moscow: Nedra Publ., 2018.
7. Atamanov S. M. *Monitoring of deformations in mine workings*. Almaty: KazNII Publ., 2020.
8. Knysh G. M. *Marksheyderskoe delo [Mine Surveying]*, Moscow: Nedra Publ., 2017.

### **2. Modern methods of remote monitoring**

#### **2.1. List of topics:**

- Using UAVs to build digital models of quarries.
- Laser scanning: ground and aerial.
- Radar interferometry (InSAR) in strain monitoring.
- Monitoring using remote sensing data.
- Processing point clouds and building 3D models.
- Combining data from different sensors.
- Accuracy and comparability of different technologies.

#### **2.2. Recommended literature:**

1. Baymukhambetov E. K., Dzhumagulov M. J. *Mine surveying. Training manual*. - Almaty: Satbayev University, 2020.
2. Boyko S. I. *Mine surveying. Textbook and workshop*. St. Petersburg: Lan Publ., 2021.
3. Sinanyan R. R. *Mine surveying*. Textbook-2nd ed., reprint. Moscow: Nedra Publ., 1988, 311 p.
4. *Surveying business*. Edited by prof. V. N. Gusev / St. Petersburg: Federal Mineral and Raw Materials 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 surveying*. - Nur-Sultan: KazNITU, 2021.
7. □Lato M., Diederichs M.S. *Remote Sensing in Mining*. – Springer, 2019.

### **3. Calculation of slope stability using software products**

#### **3.1. List of topics:**

- Fundamentals of slope collapse mechanics
- Classification of destruction types
- Geometric parameters of slopes and their impact on stability
- Limit equilibrium method
- Calculation of the stability margin coefficient
- Modeling in Rocscience (Edge, Slide, RS2, etc.)
- Reverse calculation based on observational data

#### **3.2. Recommended literature:**

1. Kasenov K. B., Aubakirov E. M. *Osnovy marksheyderskogo dela: uchebnoe posobie [Fundamentals of mine surveying]*. - Almaty: KazNITU, 2023. - 250 p.
2. Boyko S. I., Babenko L. I. *Mine surveying: a practical course*. St. Petersburg: Lan Publ., 2020, 248 p.
3. Smailova A. K., Tuleubaev T. A. *Modern surveying measurements: a textbook*. - Almaty: KazNITU, 2022. - 192 p.
4. Surovtsev A. F. *Mine surveying: textbook*, Moscow: Nedra Publ., 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 quarry slopes*. Almaty: Nauka Publ., 2019.
8. Hoek E., Bray J.W. *Rock Slope Engineering*. – CRC Press, 2018.

