

Course/Module Description

Organization (institution): Kyrgyz Mining and Metallurgical Institute named after academician U. Asanaliev of the Kyrgyz State Technical University named after I. Razzakov (KSTU).
Course Name: Perspective Geotechnologies for Underground Mining of Mineral Deposits
Target group: PhD doctoral students (Mining Engineering Program).
Type (required/optional): Elective part.
Number of allocated credits ECTS (if applicable); Design load: 10 ECTS (300 academic hours)
Form of training (full-time/distance learning, etc.); Number of classroom hours: 90 hours (full-time hours)
Language of instruction: Kyrgyz/Russian/English
Prerequisites and related requirements (if applicable): Spatial Data Science, Introduction to Geospatial Programming, Movement and Deformation of Rocks Due to Mining Operations, Remote Sensing in Mining, Knowledge of English to Read Literature.
Course objectives: Formation and acquisition of scientific and technical knowledge of effective open geotechnologies and the creation of “smart mines”.
Learning outcomes: The student will be able to: LO1: carry out scientific and technical activities to achieve effective underground geotechnologies (low waste, resource conservation, resource reproduction, continuity of excavation, loading and transportation processes, etc.); LO2: scientifically substantiate and create models of the state of the subsoil (relief, climate, geology, hydrogeology, tectonics and other characteristics) for visualization in space and time, for the purpose of designing a “smart mine” and planning underground mining and operations, considering predicted negative natural factors Place of Birth; LO3: scientifically substantiate and create new schemes, methods and methods of conducting production processes of underground mining that ensure the complexity of deposit development, industrial and environmental safety; LO4: scientifically substantiate and develop new methods of geometrization of deposits for underground development, properties and conditions of rock masses as the basis for the geometry of subsoil qualimetry, optimization of operational exploration networks, calculation and adjustment of reserves, forecasting conditions for safe and rational development of subsoil, parameters of stable underground mine workings and voids, determination of losses and dilution of mineral resources; LO5: scientifically substantiate and develop new computer systems for geological and surveying support for managing the quality of minerals in mines.
Contents 1. Mineral resources mined underground, characteristics of rocks, determination of the main parameters of the mine (mine); 2. Review and analysis of new geotechnologies in open-pit mining in foreign countries, patent studies of scientific and technical achievements in underground geotechnologies, comparison of their applicability in domestic deposits; 3. Optimization of mine fields and their opening, underground mining systems, the structure of their complex mechanization and visualization of the results obtained in space and time, based on a preliminary assessment and forecasting of the natural geomechanical state of the deposit's rock mass with the construction of a financial model of the enterprise considering environmental and economic factors aspects and requirements of industrial safety, including: 3.1 Modeling of the geomechanical state of the mine rock mass (structural features; physical and mechanical properties of the rocks composing the rock mass; natural stress-strain state, etc.);

- 3.2 Modeling of methods for preparing rock mass for excavation in a mine (mechanical, hydraulic, physical, chemical, combined, explosive);
- 3.3 Modeling of excavation and loading of rocks in a mine (loader, scraper, gravity flow through bunkers), movement of mine cargo (automobile, conveyor, electric train with trolleys, combined), dumping (automobile, conveyor, scraper, combined, etc.);
4. Underground geotechnology in the development of coal deposits;
5. Modeling of an explosive method for preparing rock mass for excavation during underground development of complex structural deposits;
6. Underground geotechnology in the development of placer deposits.

Recommended or required literature and other learning resources/tools:

1. Lecture materials
2. Course materials will be available through ELMS.
3. Lecture slides Power Point available for download in the format. PDF on the course website.
4. Electronic resources on the topics of lectures are available on the course website.
5. Lesson notes, recent journal articles, and links related to course topics will be mentioned and/or distributed during lectures.
6. Texts and reference books on the discipline

Planned training activities and teaching methods:

1. Regular and lecture consultation;
2. Laboratory and computational tasks;
3. Individual practical exercises with materials of mineral deposits;
4. 8. Discussions in Audiences.

Evaluation methods and criteria:

1. Midterm exam (25%)
2. Laboratories and computational tasks (25%)
3. Discussion/participation in Audiences (10%)
4. Final exam 40%
5. Ratings: A, B, C, D, E, Fx, F

For more information: course teacher – Doctor of Technical Sciences, Professor Abdiev A.R.

Authors: Vokin V.N., Morozov V.N., Nazarova E.Yu., Kaderov M.Yu. Open geotechnology. Textbook, 2013

Authors: Mambetov Sh.A., Abdiev A.R., Mambetov A.Sh. Mining work in the Tien Shan. monograph, 2013.

Authors: Malofeev D.V. Macromine workbook using the example of a coal field, 2021.

Authors: Mambetov Sh.A., Abdiev A.R., Mambetova R.Sh. Fundamentals of geomechanics. Classic university textbook, 2020.