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: Digital Technologies in Mine Surveying: Movement and Deformation of Rocks Due To Mining.

Target group: PhD Students (Mining Program))

Type (required/optional): Required 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): Fundamentals of Geodesy, Aerial Photography and Remote Sensing, Spatial Data Science, Geographic Information Systems, Knowledge of English for Reading Literature

Course objectives:

Formation and acquisition of scientific and technical knowledge of effective management of processes of movement of rocks and the earth's surface as a result of mining operations.

Learning outcomes:

The student will be able to:

LO1: carry out scientific and technical activities to achieve effective solutions to problems of managing the state of rock masses caused by negative geomechanical processes as a result of movement of rocks and the earth's surface due to the influence of mining operations;

LO2: scientifically substantiate and determine the dependence of deformation processes occurring in the rock mass and on the earth’s surface on the main influencing factors; methods for calculating the displacement of rocks and the earth's surface during various forms of subsoil development; conditions for the safe working of buildings, structures and natural objects; methods of protecting buildings, structures and natural objects from the harmful effects of mining;

LO3: carry out a scientifically and technically sound forecast of expected movements and deformations during mining, as well as during the construction and operation of underground structures; calculate safety and barrier pillars for the protection of buildings, structures, mine workings and natural objects;

LO4: scientifically substantiate and determine the parameters of displacement and deformation processes during mining, as well as during the construction and operation of underground structures;

LO5: develop models of rock displacement processes, evaluate the reliability of the constructed models using modern methods and information analysis tools.

Contents

1. 1. Basic concepts, terminology, goals and objectives, history of the development of research into the processes of movement of rocks and the earth’s surface;
2. Types, methods and methods of studying the processes of movement of rocks and the earth's surface using GIS technologies in the development of deposits by open-pit, underground, without mine (physical-chemical), combined methods, patent research of scientific and technical achievements of domestic and foreign researchers
3. 3. Interpretation of materials from space, aerial and phototheodeolite surveys for monitoring the Earth’s surface, methods of processing Earth remote sensing data;
4. Remote sensing to study the process of displacement of the earth's surface;
5. Use of remote sensing materials in monitoring the earth's surface;

6. Algorithms for calculating the expected parameters of displacement and deformation of the earth's surface during underground development of reservoir deposits and visualizing the results obtained using GIS technologies.

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 – Candidate of Technical Sciences, Associate Professor Umarov T.S., Kazatov U.T.

Authors: Chymyrov A.U., Bekturov A.K., Vkylbek uulu Belek «Geoinformation systems», Tutorial for performing laboratory work using the Quantum GIS program, 2021 year.
Authors: Chunuev I.K., Umarov T.S., Emilbek kyzy Akshoola, Guidelines for practical exercises in the discipline "Computerone modeling of mineral deposits"
Authors: Mambetov Sh.A., Abdiev A.R. Geomechanical processes in rock masses. Textbook, volume 2, 2013.