Course/module description

Course provider (institution): Kyrgyz Mining-Metallurgical Institute named after acadenic U. Asanaliev
Course title: Digital technologies in mine surveying: movement and deformation of rocks due to mining
Target group: PhD Students (Mining Program)
Type (compulsory/optional): Compulsory
Number of ECTS credits allocated (if applicable); estimated workload: 10 ECTS (300 academic hours)
Mode of delivery (face-to-face/ distance learning etc.); number of contact hours: 90 hours (face-to-face hours)
Language of instruction: Kyrgyz/Russian/ English
Prerequisites and co-requisites (if applicable): Fundamentals of Geodesy, Aerial Photography and Remote Sensing, Spatial Data Science, Geoinformation systems, Knowledge of English for reading literature
Course aims: Creation of a database of deposits; 3-D modeling and design of mineral deposits using GIS technologies; mastering general theoretical knowledge about modern methods of remote sensing of the geological environment; ability to apply modern methods of remote sensing to solve a wide range of geological problems; mastering general principles of remote sensing data processing and generating products. Geoinformation dynamic modeling of landslides, which enables to monitor the process under study according to pre-identified features. Geoinformation modeling of landslide processes, which formalizes the experience and knowledge of specialists and forms new knowledge and skills to make decisions in this environment. Geoinformation monitoring and complex modeling of landslide processes.
Learning outcomes: LO1: Be able to: work with software products of general and special purpose for modeling deposits of solid minerals; use technologies for operational exploration, mining and processing of solid minerals, during the construction and operation of underground facilities; collect, analyze and use topographic, geodetic and cartographic materials, and GIS products; study the natural resource potential of the country for the purpose of rational environmental management; develop design innovative solutions. LO2: Be qualified to: develop models of rock displacement processes, and evaluate the reliability of the constructed models using modern methods and information analysis tools; LO3: Be able to: determine the spatial and geometric position of objects and carry out the necessary geodetic and mine surveying measurements, as well as process and interpret their results; LO4: Be qualified to: design enterprises for operational exploration, production and processing of solid minerals, as well as to construct underground facilities using modern computer-aided design systems; LO5: Be able to: prepare reports on research work independently or as part of creative teams, as well as to collect, systematize and analyze scientific and technical information on the assignment.
Course content: 1. Basic concepts, terminology, goals and objectives; the history of the development of GIS technologies in the study of the process of displacement of the earth's surface; 2. Remote sensing methods for observing and recording the processes of displacement of the earth's surface and rocks; 3. Deciphering materials from space and aerial photography for monitoring the Earth's surface; methods for processing data from remote sensing of the Earth;4. Complex interpretation of satellite, aerial and phototheodolite images of the surface;

5. use of RS methods and data to study the process of displacement of the earth's surface;
6. Algorithms for calculating the parameters of displacement and deformation of the earth's surface during underground mining of reservoir deposits and visualization of the results obtained by GIS technologies.

Recommended or required reading and other learning resources/tools:

1. Lecture Materials
2. The course materials will be available through ELMS
3. The Power Point lecture slides are available for download as PDF files at the course website.
4. Electronic resources on the lecture topics are available at the course website.
5. The class notes, latest journal articles and references related the course topics will be referred to and/or distributed during the lectures.
6. Text and Reference Books (below)

Planned learning activities and teaching methods:

1. Regular lectures and consultation ;
2. Labs and computing tasks;
3. Individual practical exercises with materials from mineral deposit sites;
4. Class discussions.

Assessment methods and criteria:

1. Mid-term exam (25%)
2. Labs and computing tasks (25%)
3. Class discussion/participation (10%)
4. Final exam 40%

Grades: A, B, C, D, E, Fx, F

Additional information: Course instructor – Associate Professor **Umarov T. S.**

1.Authors: Chymyrov A.U., Bekturov A.K., Vkylbek uulu Belek «Geoinformation systems», Tutorial for performing laboratory work using the Quantum GIS program, 2021.

2.Authors: Chunuev I.K., Umarov T.S., Emilbek kyzy Akshoola, Guidelines for practical exercises in the discipline "Computer modeling of mineral deposits"