**Course/module description**

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| **Course provider (institution):** Kyrgyz Mining-Metallurgical Institute named after acadenic U. Asanaliev |
| **Course title**: Modern methods and technologies of remote sensing |
| **Target group:** PhD Students (Applied Geology Program) |
| **Type (compulsory/optional):** Optional |
| **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:**<br>10 credits, Total -300 hours.<br>• Lectures - 30 hours.<br>• Lab - 60 hours.<br>• Independent work - 210 hours. |
| **Language of instruction:** Kyrgyz/Russian/ English |
| **Prerequisites and co-requisites (if applicable):** General Geology, Methodology of geological research, Geoinformation systems, Knowledge of English for reading literature |
| **Course aims:**<br>The purpose of studying the discipline is to obtain deep and comprehensive knowledge about remote sensing, its practical implementation and visual means. The program provides for the study of the properties of electromagnetic radiation of various parts of the spectrum, the resolution of various types of photographic, radiometric, scanning, geophysical and laser imaging equipment, the implementation of aviation, satellite and alternative transport platforms, and familiarization with methods of image processing and interpretation. Particular attention is paid to the practical implementation of skills in working with remote sensing data in geological mapping, work on the search and exploration of minerals. |
| **Learning outcomes:**<br>LO1: Formulate the basic concepts of remote sensing methods and technologies;<br>LO2: Prepare and process remote sensing data;<br>LO3: Apply modern remote sensing techniques for mapping and exploration of water, mineral and oil resources;<br>LO4: Use of photographic, optical-electronic, visual-instrumental sounding data;<br>LO5: Interpretation of remote sensing data;<br>LO6: Creation of various types of geological maps. |
| **Course content:**<br>Lecture 1. Objectives of the task. Basic terms, concepts and components of remote sensing.<br>Lecture 2. Physical foundations of remote sensing<br>Lecture 3. Technical implementation of the process of obtaining remote sensing data from an aviation transport platform.<br>Lecture 4. Technical implementation of the process of obtaining remote sensing data from a satellite transport platform<br>Lecture 5. Technologies for decoding remote sensing data. Basics of interpretation and interpretation of CS and APS<br>Lecture 6. Thematic interpretation and mapping<br>Lecture 7. Application of remote sensing in geological surveying.<br>Lecture 8. Technologies for deciphering remote sensing data and complex interpretation of its results using geological, geophysical, geochemical and landscape materials<br>Lecture 9. Construction of 3-dimensional models of objects and the basics of geovisualization |

Lecture 10. Integration of remote sensing and GIS.
Lecture 11. Remote sensing in the study of Quaternary deposits.
Lecture 12. Application of remote sensing in the study of geological structure
Lecture 13. Remote sensing in geoecological research.

**Recommended or required reading and other learning resources/tools:**

1. Lecture Materials
2. The course materials will be available through Electronic Learning Management Systems (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 listed below

**Planned learning activities and teaching methods:**

1. Regular and interactive lectures;
2. Labs and computing tasks;
3. Individual practical exercises with materials from mineral deposit sites;
4. Class discussions.
5. Work in groups and/or research projects

**Assessment methods and criteria:**

1. Mid-term exam (20%)
2. Labs and computing tasks (20%)
3. Class discussion/participation (10%)
4. Results of group project work, presentations (25%)
5. Final exam 25%

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

**Additional information:** Course instructor – Associate Professor **Kasymov M.A.**

**Main literature**

1. Remote Sensing and Geographic Information Systems, Chandra, A. M.; Ghosh, S. K., 2008.
2. Remote sensing. Models and methods of image processing, Schowengerdt, Robert A., 2010.
3. Remote sensing of the earth, Educational and methodological manual, Vorobyova A.A., St. Petersburg 2012
4. Aerospace methods of geological research / Ed. A.V. Pertsova. SPBU: VSEGEI, 2000. – 316 p.
5. Ryabukhin A.G., Makarov V.I., Makarova N.V. Space methods in geology. M.: Moscow State University. 1988. 145 p.
6. Remote methods in geology, Course of lectures, V. N. Gubin, Minsk BSU 2004

**Additional literature**

1. T. A. Trifonova, N. V. Mishchenko, A. N. Krasnoshchekov Geoinformation systems and remote sensing in environmental research: textbook. allowance. /. - M.: Academic. Project, 2005.
2. Korchuganova N.I., Korsakov A.K. Remote methods of geological mapping: Textbook. M.: KDU, 2009
3. Petrusevich M. N., Kazik L. I. Practical guide to aerial photogeology. M.: Moscow State University. 1976.
4. Petrusevich M. N. Aeromethods for geological research. M.: Moscow State University. 1962.
5. Petrusevich M. N. Airborne and ground-based stereo photography during geological research. M.: Moscow State University. 1976.

**Internet resources:**

1. www.kosmosnimki.ru
2. www.sovzond.ru
3. www.data
4. http://landsat.gsfc.nasa.gov

5. http://nasascience.nasa.gov
6. http://www2.jpl.nasa.gov/srtm
7. http://earth.esa.int
8. http://www.ccrs.nrcan.gc.ca