Autumn 2021

**American University of Central Asia**

**Advanced Mineral Analysis and Mineral Processing (AGEO-306)**

Advanced Mineral Analysis and Mineral Processing (AGEO-306)

Autumn 2021 Syllabus

 **Lecturer:** Assistant Prof. Cholponbek Ormukov

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**Course schedule** Tuesday 14:10

 Thursday 14:10

**1 Course Description:**

This is an introductory course in advanced mineral analysis and mineral processing for students with no prior experience in the field. After completing the elective course, students are expected to have sufficient experience in the analysis, description and processing of minerals, as well as in the concepts and processes of the mining industry, which include mining and processing operations. This course itself will include such sections as introduction, optical, crystalline properties, description and processing of minerals.

**2. Course Aims:**

The purpose of studying the discipline " Advanced Mineral Analysis and Mineral Processing" is to provide students with skills when working with a polarizing microscope, as well as to study the theory and methods of analysis and processing of minerals.

**3 Course objectives:**

**The objectives of the course include theoretical consideration of the following issues:**

**Study** of the optical properties of minerals for the diagnosis of minerals.

**Get** skills in working with a polarizing microscope.

**Drilling** (and blasting) is the technology of achieving primary fragmentation of “in situ” minerals. This is the starting point for most mineral processes with the exception of natural minerals in the form of sand and gravel.

**Crushing** and screening is the first controlled size reduction stage in the process. This is the main process in aggregate production and a preparation process for further size reduction.

**Grinding** is the stage of size reduction (wet or dry) where the liberation size for individual minerals can be reached. By further size reduction filler (mineral powder) is produced.

**4. Course Textbook** :

**Book1:** Mineral Processing Technology An Introduction to the Practical Aspects of Ore Treatment and Mineral Recovery, by Barry A. Wills, Tim Napier-Munn 2006.

**Book 2:** Cornelis Klein & Anthony Philpotts, (2016) Earth Materials: Introduction to Mineralogy and Petrology (Second Edition), Cambridge University Press, UK, 594 pp. (the hard copy of this book is available at AUCA library) – this book will be used forlectures

**5. Lecture**: A typical class meeting will combine mini-lectures, discussions, group activities, multimedia presentations, and other demonstrations and activities to give you an opportunity to learn concepts in as active a manner as possible.

**6. General course rules:**

1. Students must attend all classes and participate in all activities. Absence is not an excuse for not completing homework and other tasks. Do not forget to complete each task before the start of the class and be prepared to classes.

2. All written assignments must be submitted to the course before the deadline. Tasks submitted after the deadline will not be accepted and evaluated. Late submission will be decreased by subtracting 50% of the grade received.

Absence does not relieve the student of the obligation to check the website and email in the assignment or correspond with the teacher to extend the deadline for completing the assignment.

3. Skip alerts: when a student skips classes due to illness or other valid reasons it is excused absence. If you miss the test / exam due to illness / emergency, please contact the lecturer before the test and present the medical certificate and authentication at the AUCA Medical Office. In this case, you will have the opportunity to test. In other cases, a missed test / exam will be counted as “zero”.

5. Review of work. Students who complete assignments on time are allowed to review them based on teacher feedback. The submitted documents and projects must comply with all the minimum requirements for assigning a rubric. If the assignment does not meet the minimum heading standards, it is considered incomplete work and must be completed by the student in order to be evaluated.

6. The class starts quickly at the appointed time. Being late for a lesson undermines the learning process and does not reflect superiority in the academic environment. Do not interfere with the class when leaving the room and returning back.

7. Laptops / tablets should not be used in the classroom without the approval of the instructor.

8. The use of a mobile phone is strictly prohibited. They should be silenced and removed throughout the lesson.

9. The presentation should be presented in class on the day they should. Late submission will be - 50% of the grade received;

10. Students are expected to follow university policies and student guidelines. All types of plagiarism are strictly prohibited.

**7. Assignments/Assessment**

Attendance - 10%

Attendance is required and is 10% of your final grade. To be successful in this course, you need to attend classes every time! Attendance sheets will be distributed in each lecture. Each unjustified absence will reduce your attendance score by 4%. If you become ill, you must notify the instructor and present an official document (certificate) from the doctor, especially if you are planning a presentation in the classroom or submit a written assignment. Four unjustified passes will result in an “F” for the entire course.

Lectures activities – 15%

Participation means more than good attendance. Reading has a significant role in the development of students' analytical and critical thinking. You should be prepared to discuss readings during each workshop, as indicated in the schedule. Most of the materials that I give in my lectures can also be found in books, so if you systematically read the literature, you will have a good chance of writing tests successfully. The book is difficult in places, so I would suggest the following strategy:

1. Read the assigned text before each lecture.

2. Take notes during the lecture, referring to my PowerPoint lecture slides.

Labs – 25%

The lab is an important part of this class and makes up 36% of your total class score. There will be 8 labs, the duration of each is one week. Most of the work will be done in groups, but apart from that there will be more individual work that you will have to complete yourself. If you fail to make a labs on time, you will lose 25% assigned for the labs.

Term tests – 25%

During the semester there will be 2 tests. These tests will be consisting of questions from past lectures and laboratory exercises. These tests can be considered as preparatory processes for the final exam. I will announce the specific coverage of each test one week before the tests, and the announcement will be posted on the classroom site. Testing will cover laboratory exercises as well as lecture material. Tests should be completed in the allotted time.

Final exam – 25%

The final exam is a multi-choice test based on the lecture book Structural geology. In case of academic dishonesty, you will receive zero for the job. The test and exam will cover laboratory exercises as well as lecture material. Testing should be completed at the scheduled time. Students should have colored pencils, an eraser, and a calculator with them.

**8. EVALUATION SCHEME**

Attendance - 10%

Lectures activities - 15%

Labs - 25%

Term tests – 25%

Final exam – 25%

**9. Grading system**

Your final grade will be determined as follows:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| A | A- | B+ | B | B- | C+ | C | C- | D+ | D | D- | F |
| >90 | 86-89 | 82-85 | 78-81 | 74-77 | 70-73 | 66-69 | 62-65 | 58-61 | 54-57 | 50-53 | <50 |

 **10.**  **2021 Autumn Course Calendar – Lecture Sessions (subject to change)**

**Schedule of lecture and laboratory topics: subject to change with notice:**

**8. EVALUATION SCHEME**

Attendance - 10%

Lectures activities - 15%

Labs - 25%

Term tests – 25%

Final exam – 25%

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 **10.**  **2021 Autumn Course Calendar – Lecture Sessions (subject to change)**

**Schedule of lecture and laboratory topics: subject to change with notice:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Week** | **Day** | **Lecture titles** | **Lab titles** |
| September | **02/07** | **Introduction to course:**Basic definitions; Minerals by value; The process frame of minerals; Size and hardness. | Basic provisions of crystal optics |
| September | **09/14** | **Crystallography:**Translational symmetry; Point symmetry; Point groups; Space groups etc. | Introduction to Polarizing microscope (Microscope device). |
| September | **16/21** |  **Optical mineralogy:**Light; Interaction light and matter; Mineral color etc. | Introduction to Polarizing microscope (Technical data) |
| September | **23/28** | **Optical mineralogy:** continue | Mmethod of working with a polarizing microscope |
| September/October | **30/05** | **Mineral properties:**Introduction; Hardness; Color and Luster; Magnetism etc. | Physical and optical properties of minerals in microsection |
| October | **07/12** |  **Mineral descriptions:**Igneous rocks; Magmatic process; Igneous environments. | Work with polarizing microscope (microsection) |
|  |  | **Exam** |  |
| October | **14/19** | **Mineral descriptions:**Igneous rocks; Classification  | Work with polarizing microscope (microsection) |
| October | **21/26** | **Mineral descriptions:**Sedimentary rocks; Sedimentary process, Sedimentary environments | Work with polarizing microscope (microsection) |
| October/November | **28/02** |  **Sedimentary rocks;**continuation | Work with polarizing microscope (microsection) |
| November | **04/09** | **Mineral descriptions:**Metamorphic rocks; Metamorphic variables; Metamorphic process.  | Work with polarizing microscope (microsection) |
| November | **16/18** | **Metamorphic rocks:** continuation | Work with polarizing microscope (microsection) |
|  |  | **Midterm exam** |  |
| November | **23/25** | **Mineral separation**  | Presentation of students  |
| November/December | **30/02** | **Native elements:**Metals; Semimetals; Non-metals. | Presentation of students |
| December | **07/09** | **Ore and mineral processing** | Presentation of students |
| December | **14/16** | **Mineral analysis process** |  |
|  |  | **Final exam** |  |