MINERAL PROCESSING II

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Work load: 45 h lectures and 30h assignments, lab classes, field trips
Number of credits: 7.5ECTS
Course code: M7003K
Source: http://www.emerald.ulg.ac.be/?q=mineral-processing-ii

► *Objectives and Intended learning outcomes:*

The course objective is to provide a possibility to understand mineral processes for ores, industrial minerals, recycling products and mineral fuels (coal and peat).
After completion the student should be able to:

- Calculate technical-economic conditions for winning of mineral resources,
- Describe and explain commonly occurring processes for mineral beneficiation,
- Analyze reasons for selection of processes based on raw material properties,
- Generalize the knowledge of process conditions to suggest process selections for hypothetical raw materials.

► *Contribution to EIT's Overarching Learning Outcomes*

Above listed ILOs cover the **EIT Overarching Learning Outcomes: 1, 5 and 6**.
Studying mineral beneficiation techniques and reviewing techniques used at Scandinavian mine sites, contributes to making value judgements and developing sustainability competencies. The use of models for ore recovery calculations and mass balances trains research skills and competencies, while exercises for assessment of process flow sheets address intellectual transforming skills and competencies.

► *Contents:*

Processing of ores.

- Magnetite and hematite ores. Processing of steel alloying ores. Theory of flotation. Autogenous grinding. Copper ores, lead and zinc ores and complex sulphide ores. Precious metal ores.
- Computer laboratory class: Mass balancing.
- Assignments: Product balance. Limiting grades and selectivity. Flotation. Mass and water balance. Particle technology.
- Comminution of minerals. Reactions with liquids and gases. Dissolution. Adsorption. Precipitation. Rheology of suspensions and particulate matter. Porosity, pore size distribution. Shear strength of particulate matter. Mechanical properties of mineral products. Handling of bulk materials. Ultra fine grinding. Industrial minerals and fuels.
- Aggregates for roads and concrete. Lime, cement and other binders. Masonry. Light weight concrete, aerated concrete, glass, insulators and other construction materials. Ceramics. Refractories. Pigments and fillers. Coal processing. Environmental issues.

- Handling of solid waste materials from mineral processing plants. Legislation. Process water. Recycling.
- Uses of mineral processing methods in the recycling of industrial and consumer products. Selected recycling processes. Management and mineral economy.
- Current issues.
- Assignments: Revenues. Cost analysis, Technical -economical calculations.

► *Realization:*

The teaching comprises lectures, assignments, computer laboratory class, lessons, and field trips. The lectures should provide the possibility for the students to be able to describe and explain the operating principles of the processes and to explain theoretical concepts.
The assignments, which are introduced during lessons, train the student to independently do calculations and technical compilations.
The computer laboratory class is done in groups. The students are trained to compile input data for evaluate and report on computer-assisted material balances.
The field trips provide the possibility for the students to learn to describe process technology.

► *Literature:*

Compendium from Division of Mineral Processing.

► *Prerequisites:*

Knowledge of minerals (mineralogy); their occurrence, built and identification.

- Completed basic course in mineral processing technology, or physical separation methods.
- Mastering of particle size distributions; mass, water and pulp flow calculations; product balances; grade-recovery diagrams and selectivity diagrams.

► *Assessment method:*

In the assessment of the student, three different methods are used: content based, competence based, and impact based. They corresponds to grades 3, 4 and 5 respectively as described under Exam.

► *Exam:*

After the first quarter, a written exam that is, and an oral examination after the course. The written exam has to be passed before the student is admitted to the oral examination. The theoretical understanding of the field of study is checked by written and oral exams, graded Fail, 3, 4, 5.

- For grade 3, the student must be able to describe and explain what is included in the field of study, and do routine calculations.
- For grade 4, the student must be able to analyse reasons for process selections based on the properties of the raw material.
- For grade 5, the student must be able to apply the acquired knowledge to partly new theoretical and practical problems.

► *Items/credits*

Number	Type	Credits	Grade
0001	Written exam Q1	2.4	U 3 4 5
0002	Oral exam, Q2	3.0	U 3 4 5
0003	Laboratory class and assignments	1.5	U G
0004	Field trip	0.6	U G