SIMULATION OF MINERAL PROCESSING

Prof. B PÅLSSON

Work load: 40 h lectures and 35 h exercises, quizzes, assignments
Number of credits: 7.5ECTS
Course code: M7001K
Source: http://www.emerald.ulg.ac.be/?q=simulation-mineral-processing

► *Objectives and Intended learning outcomes:*

The course provides the possibility to acquire the knowledge to conduct simpler computer-assisted simulations of processes for particulate media. After completion the student should be able to:

- Identify situations when simulation techniques might provide a contribution to the understanding of the process,
- Establish the required input data for simulation of mineral processes,
- Construct and confine flowsheets for simulations,
- Report results from simulations,
- Judge if the simulation results are relevant,
- Interpret the result in process technology terms,
- Formulate hypothesis on changes to the process as a result of the simulation.

► *Contribution to EIT's Overarching Learning Outcomes*

Above listed ILOs cover the **EIT Overarching Learning Outcomes: 3, 5 and 6**.
Mineral beneficiation modelling using a combination of process mineralogical data and process flowsheet efficiency address creativity skills and competencies. Through flowsheet development using simulation software, the research skills and competencies are trained. Computer-assisted practical sessions for simulation and process analysis contribute to building intellectual transforming skills and competencies.

► *Contents:*

Dry processes

- Models for comminution of hard, crystalline materials
- Models for screening
- Simulation of crusher circuit

Wet comminution

- Models for comminution in mills with manufactured or autogenous grinding bodies
- Classification models
- Simulation of grinding circuit

Separation by density

- Models for density separation with manufactured or autogenous media
- Simulation of wet gravity circuit

Separation by surface properties (flotation)

- Simple and advanced models for flotation
- Simulation of flotation circuit

Separation processes based on other physical characteristics

- Simple models for magnetic separation
- Models for thickeners and filters
- Simulation of soil remediation plant

► *Realization:*

The entire course is conducted with IT support (LMS and/or static Web-pages) and a text book with attached simulation program. There is only one gathering in Luleå. The instruction consists of introductory lectures/reading notes, quizzes, exercises and assignments, all of them delivered by the LMS.
The reading notes aim to, for each part of the course, to get across the material in the text book with references to the program and to provide the possibility for the students to describe model structures and explain theoretical concepts. The quizzes are used to give the students a possibility to test their factual knowledge. The exercises are used to train the use of models and to introduce process technology concepts. The assignments are solved in groups with the help of the text book and its simulation program. They aim to train the students to work in groups to formulate the requirements for, conduct, evaluate, interpret, and report simulation results.

► *Literature:*

King, R. P.: Modelling and Simulation of Mineral Processing Systems. Butterworth-Heinemann, Oxford, UK, 2001. ISBN 0-7506-4884-8
Extra literature provided by Division of Mineral Processing.

► *Prerequisites:*

- Knowledge of minerals (mineralogy); their occurrence, built and identification.
- Knowledge of common unit operations in the minerals industry; crushing, grinding, screening, classification, sorting, gravity concentration, dense medium separation, magnetic and high-tension separation, flotation.
- Mastering of particle size distributions; mass, water and pulp flow calculations; product balances; grade-recovery diagrams and selectivity diagrams.
- Mastering of linear algebra

► *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:*

Control of acquired skill levels with quizzes and graded assignments for each part. These have to be submitted on time, or there will be an automatic deduction of attainable points for the part. The total points production determines the grand grade of the course, and it is given on the scale 3 4 5.

- For grade 3, the student must be able to list and produce input data, conduct a simulation and show the results.
- For grade 4, the student must be able to evaluate whether the result is relevant, to interpret it in process technology terms and report the results.
- For grade 5, the student must be able to formulate and motivate suggestions for change to processes and to report and present the results.

► *Items/credits*

Number	Type	Credits	Grade
0001	Assignment Reports	7.5	U 3 4 5