Syllabuses

European Mineral Engineering Course

Courses instructed at the Universty of Miskolc as part of Process Engineering MSc, Raw materials processing module

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Economic Geology and Mineralogy

Course Title: Economic Geology and Mineralogy **Code: MFEMMEP_M/EG**	**Credits: 3**

Type (lec. / sem. / lab. / consult.) and Number of Contact Hours per Week: **2 + 1**

Type of Assessment (exam. / pr. mark. / other): **examination**
Students will be assessed with using the following elements.

Attendance:	5 %
Homework	10 %
Short quizzes	10 %
Midterm exam	40 %
Final exam	35 %
Total 100%	

Grading scale:

% value	Grade
80 -100%	5 (excellent)
70 – 79%	4 (good)
60 - 69%	3 (satisfactory)
50 - 59%	2 (pass)
0 - 59%	1 (failed)

Position in Curriculum (which semester): **1st**

Pre-requisites *(if any)*:

Course Description:

Main rock forming minerals and mineral groups of silicates, oxides, carbonates. Genetic groups and main petrographic characteristics of rocks. Plate tectonics and ore formation. Basics of ore mineralogy. Optical properties and processing-related characteristics of the main ore mineral types. Application of electron probe microanalysis in ore mineralogy. Major ore forming processes. Magma-related ore deposits. Sedimentary and metamorphic ore deposits. Globally important types of ore deposits in a genetic system. Industrial minerals and their application.

The 3-5 most important compulsory, or recommended **literature** (textbook, book) **resources**:

- The slides will be provided digitally.
- MacKenzie, W. S., Guilford C. (1980): Atlas of Rock-Forming Minerals in Thin Section. Halsted Press
- Evans, A.M. (1993): Ore Geology and Industrial Minerals. An Introduction (Third edition). Geoscience Texts Series, Blackwell Scientific Publications, Oxford, 1–389.
- Bernhard Pracejus (ed.) (2008): The Ore Minerals Under the Microscope. An Optical Guide. Elsevier.
- Dill, H.G. (2010): The „chessboard" classification scheme of mineral deposits: Mineralogy and geology from aluminium to zirconium. Earth-Science Reviews, 100, 1–420.

Responsible Instructor (*name, position, scientific degree):* **Dr. Norbert Zajzon assoc. prof.**

Other Faculty Member(s) Involved in Teaching, if any (*name, position, scientific degree*): -

Particulate processes

Course Title: Particulate processes **Code: MFEMMEP_M/PP**	**Credits: 5**
Type (lec. / sem. / lab. / consult.) and Number of Contact Hours per Week: **3 + 2**	
Type of Assessment (exam. / pr. mark. / other): **examination** Consultation at lectures, subjects chosen by students are selected according to the topic, student made an assignment and present it in front of the class. According to the presentation, student groups are selecting and dimensioning equipment Assesment according to a five grade scale: No knowledge on basic principles - **1** Knowledge on basic principles - **2** Knowledge on basic principles, ability to use them in practice - **3** Knowledge are complex - **4** Overall knowledge and the ability to overview it **5** **Assesment:** > 80%: 5; 79 – 70%: 4; 69 – 60%: 3 50 – 59%: 2; < 50%: 1.	
Position in Curriculum (which semester): **1st**	
Pre-requisites *(if any)*: **-**	
Course Description:	
Goals of the Course: The aim of the course is the introduction into mineral processing, especially into particles related processing from the point of view of the characterization of raw materials and processing. **Course Description:** **Part – Mineral Processing Basics** (Lj. Bokányi): Characterization of disperse systems. Particle size, shape, density and other physical parameters, their determination and mathematical distribution. Specific surface calculation and determination. Rheological properties of fluids and suspensions. Particle motion in fluids. Mineral intergrowth and liberation, determination of degree of liberation. Yield, assay and recovery. Washability curves. Separation efficiency and partition curve (Tromp-curve). Balance equations. Typical technological flow-sheets. **Part – Sampling** (J. Faitli): Basics of engineering applied statistics, estimation of the theoretical features of a population by the empirical parameters of samples. Criteria for the random uniform mixture. The averaged single samples concept. The Gy sampling theory, fundamental sampling error, sampling nomograms. Necessary minimal mass of samples. Typical sampling tasks (bulk at rest and during motion, belt conveyors, one phase liquids and gases, multi phases flow in ducts and pipes, isokinetic sampling). Processing of the average sample and the analysis. Data reconciliation techniques. Case studies. **Part – Powder Dynamics** (J. Faitli – Á. Rácz): General properties of bulk materials. Flow properties of powders. Comparison among viscous and powder flow. Measuring of powder flow functions, the Jenike type and the ring shear cells. Equipment of bulk storage, plug flow- and mass flow bins. Dischargers and feeders. Basics of pneumatic transport.	
The 3-5 most important compulsory, or recommended **literature** (textbook, book) **resources**:	
• Wills, B.A.: Mineral Processing Technology. Third Edition. Pergamon Press, Oxford. • Barry A. Wills, Tim Napier-Munn: Mineral Processing Technology. 2006 Elsevier Science & Technology • Fuerstenau and Han (ed).: Principles of Mineral Processing, SME, 2003. • Tarján, G. Mineral Processing, Volume I. Akadémiai Kiadó, Budapest, 1982. • Laurila, M.J. – Corriveau, M.P.: The Sampling of Coal. Intertec Publishing. • D. Schulze, Powders and Bulk solids – Behavior, characterization, storage and flow, 2008, Springer • Faitli, J.: Sampling in Mineral Processing Plants. Manuscript. • Periodicals	
Responsible Instructor (*name, position, scientific degree):* **József Fajtli, PhD**	
Other Faculty Member(s) Involved in Teaching, if any (*name, position, scientific degree*): Ljudmilla Bokányi, PhD; Ádám Rácz, PhD.	

Mechanical processes

Course Title: Mechanical Processes **Code: MFEMMEP_M/MP**	**Credits: 7**

Type (lec. / sem. / lab. / consult.) and Number of Contact Hours per Week: **4 + 3**

Type of Assessment (exam. / pr. mark. / other): **examination**
Students will be assessed with using the following elements.

Attendance:	5 %
Homework	10 %
Short quizzes	10 %
Midterm exam	40 %
Final exam	35 %
Total	100%

Grading scale:

% value	Grade
80 -100%	5 (excellent)
70 – 79%	4 (good)
60 – 69%	3 (satisfactory)
50 – 59%	2 (pass)
0 – 50%	1 (failed)

Position in Curriculum (which semester): **1st**

Pre-requisites *(if any)*:

Course Description:

The course consists of the theory and practice of mechanical processes applied in mineral processing subdivided into the following parts:

Part – Crushing and Grinding (G. Mucsi): Characterization of the comminution process. Aim of comminution, evaluation of its result. Fundamentals of particle breakage. Fracture mechanics: deformation and fracture, formation and spreading of fracture. Comminution theories (Rittinger, Kick-Kirpicev, Bond). Comminution equipments: operating principle, technical parameters, fields of application (jaw crusher, gyratory crusher, cone crusher, impact crusher, hammer crusher, rolls crusher, tumbling mills, high pressure grinding rolls, ring mill, vibrating mill, stirred media mill, air jet mill).
Part – Classification (I. Gombkötő): Aim of physical separation processes, principles of screening and classification (screen performance, screen types, hydraulic classifiers, horizontal current classifiers, hydrocyclone), gravity concentration methods, operational parameters (principles, HMS, jigs, spirals, film concentrators and shaking tables, centrifugal concentrators).
Part – Gravity and Magnetic Separation (I. Gombkötő): Mechanisms and equipment for magnetic and electric separation techniques, operational parameters (principles, low-intensity magnetic separators, high-intensity separators, high-gradient magnetic separators, superconducting separators, high tension electrostatic and electro dynamic separators, eddy current separators).
Part – Sorting (S. Nagy): Miscellaneous separation methods (sorting, selective comminution).
Part – Agglomeration (S. Nagy): Aim of agglomeration, bonding forces, bonding mechanisms. Processes, characterization of products. Equipments of agglomaeration, granulation, pelletization, sintering and roll pressing.
Part – Dewatering (J. Faitli): Sedimentation. Coagulation and flocculation. The batch settling test and its evaluation. Equipment of solid – liquid phase separation, thickeners, filtration, dryers. Basics of process engineering design of dewatering technologies.

The 3-5 most important compulsory, or recommended **literature** (textbook, book) **resources**:

- Handouts.
- List of recommended literature:
  - Agba D. Salman, Mojtaba Ghadiri, Michael J. Hounslow: HANDBOOK OF POWDER TECHNOLOGY. Volume 12. Particle Breakage. 2007. ISBN: 978-0-444-53080-6
  - A.D. Salmon, M. J. Hounslow, J.P.K. Seville: HANDBOOK OF POWDER TECHNOLOGY. Volume 11. Granulation. 2007. ISBN: 978-0-444-53080-6

- Barry A. Wills, Tim Napier-Munn: Mineral Processing Technology. 2006 Elsevier Science & Technology Books ISBN: 0750644508
- S. Komar Kawatra: Advances in Comminution. 2006. Society for Mining, Metallurgy, and Exploration, Inc. (SME) ISBN-13: 978-0-87335-246-8
- Gusztáv Tarján: Mineral Processing I-II., Tankönyvkiadó Budapest, 1974
- Wolfgang Pietsch: Size Enlargement by Agglomeration. 1991. JOHN WILEY & SONS ISBN 0 471 92991 3
- Wolfgang Pietsch: Agglomeration in Industry: Occurrence and Applications. 2005 WILEY-VCH Verlag GmbH & Co. KGaA ISBN 3-527-30582-3
- Errol G. Kelly, David J. Spottiswood Introduction to mineral processing Wiley, 1982

- Periodicals
- Description on case studies

Responsible Instructor (*name, position, scientific degree):* **Gábor Mucsi PhD**

Other Faculty Member(s) Involved in Teaching, if any (*name, position, scientific degree*): Imre Gombkötő, PhD, József Fajtli PhD, Sándor Nagy PhD