Course overview – full-time study

<table>
<thead>
<tr>
<th>Course title:</th>
<th>Mining Wastes and Raw Materials Processing</th>
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</thead>
<tbody>
<tr>
<td>Course number:</td>
<td>542</td>
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<tr>
<td>Supervising institute:</td>
<td>Institute of Mining Engineering and Safety</td>
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<tr>
<td>Course guarantee:</td>
<td>doc. Ing. Jiří Botula, Ph.D.</td>
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<tr>
<td>Credits:</td>
<td>5</td>
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<tr>
<td>Level of study:</td>
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<tr>
<td>Year:</td>
<td>2</td>
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<td>Link to website:</td>
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<tr>
<td>Intended for faculties:</td>
<td>HGF</td>
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<tr>
<td>Intended for the type of study:</td>
<td>consequential master</td>
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<tr>
<td>Way of completion:</td>
<td>credit and examination</td>
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<tr>
<td>Hours per week:</td>
<td>2 + 2</td>
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<tr>
<td>Prerequisites:</td>
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<tr>
<td>Co-requisites:</td>
<td>none</td>
</tr>
<tr>
<td>Appears in prerequisites:</td>
<td>no</td>
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**Learning outcomes**

- The student demonstrates knowledge:
  - in legislative regulations in the field of waste management of the Czech Republic with special focus on waste from mining and exploitation of mineral resources
  - in basic characteristics of selected types of waste including technologies for their potential use or disposal

- The student can:
  - evaluate the technological properties of selected types of waste
  - summarize the scheme of recycling or other use of selected types of waste

- The student is able to:
  - be acquainted with the issue of handling selected types of waste

**Teaching methods (representation of individual methods must be quantified in %)**

Lectures – 35 %
Exercises – 5 %
Experimental work – 30 %
Individual work – 30%

Annotation
The course introduces students to the waste legislation, interpretation of public administration in the field of waste management and the issue of handling industrial waste generated in the mining industry and related industries, including their assessment from an environmental perspective. Particular emphasis is placed on methods of waste recycling, whose objective is to transform waste into secondary raw materials. The methods used are illustrated on selected types of industrial waste, including waste water. Acquired knowledge is verified by solving computational tasks and laboratory experiments.

Compulsory literature
BOTULA, J. Odpady z těžby a zpracování surovin. Učební texty VŠB-TU Ostrava, being prepared

Recommended reading

Requirements for providing the education
Laboratory exercises are performed in technological laboratories equipped with the necessary treatment machinery and equipment. Results of laboratory work are evaluated by chemical analyses carried out in a chemical laboratory.

Methods of continuous checking knowledge during the semester
Knowledge is checked by written records from laboratory exercises and related discussions.

Outline of lectures
1. Basic concepts of waste management, waste management, waste recycling
2. Legislative framework for waste management
3. Waste recycling, recycling technologies, BAT technology
4. Waste disposal, waste solidification
5. Dumps and sludge beds
6. Thermal waste utilization
7. Wastes from coal mining and processing, characterization and utilization
8. Wastes from ore mining and processing, characterization and utilization
9. Waste from extraction and processing of building materials, characterization and utilization
10. Energy ashes and slags, characterization and utilization
11. Wastes from metallurgy of iron and non-ferrous metals, characterization and utilization
12. Industrial waste water, characteristics and methods for cleaning
13. Radioactive waste
14. Building waste
15. Environmental aspects of mining and processing of raw materials

Outline of exercises
1. Recycling technology, applications of treatment technologies for waste utilization
2. Calculation of sludge beds
3. The combustion of coal and waste, combustion process calculation
4. Evaluation of waste from mining and processing of raw materials, the determination of basic technological properties
5. Evaluation of waste from mining and processing of raw materials, evaluation of hazardous waste properties
6. The use of waste from coal mining and processing, acquiring coal fractions from waste materials using air separation. Experimental part.
7. The use of waste from coal mining and processing, acquiring coal fractions from waste materials using air separation. Evaluation of the experiment.
8. The use of waste from coal mining and processing, acquiring coal fractions from waste materials using flotation. Experimental part.
10. The use of energy ashes, magnetic separation. Experimental part.
12. Utilization of waste from iron metallurgy, decontamination of fine-grained metallurgical wastes using centrifugal separation. Experimental part.

Exam question topics
1. Basic concepts and definitions of waste management
2. Legislative regulations in the field of waste management
3. Waste disposal
4. Solidification of waste
5. Mechanical recycling technologies and their use in waste recycling
6. Chemical recycling technologies and their use in waste recycling
7. Thermal recycling technologies and their use in waste recycling
8. Biotechnologies and their use in waste recycling
9. Wastes from coal mining and preparation, characterization
10. Wastes from coal mining and processing, the possibilities of their recycling and usage
11. Wastes from ore mining and processing, the possibilities of their recycling and usage
12. Wastes from mining and processing of building materials, characteristics
13. Wastes from mining and processing of building materials, the possibilities of their recycling and usage
14. Energy ashes, properties and characteristics
15. Energy ashes, the possibilities of their usage
16. Slags from iron and steel production, characteristics, the possibilities of recycling and usage
17. Slags from the production of non-ferrous metals, characteristics, the possibilities of recycling and usage
18. Fined-grained waste from the manufacture of iron and steel, characteristics
19. Fined-grained waste from the manufacture of iron and steel, the possibilities of recycling and usage
20. Building waste, characteristics and possibilities of recycling
21. Radioactive waste, classification and characterization
22. Disposing of radioactive waste, storage of nuclear waste
23. Mining waste water, characterization and purification technologies
24. Waste water from heavy industry, characterization and purification technologies
25. The assessment of influence of mining technologies on the environment, basic concepts and procedures

Terms for completing the course

<table>
<thead>
<tr>
<th>Task name</th>
<th>Task type</th>
<th>Maximum number of points (credit for subtasks)</th>
<th>Minimum number of points</th>
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<tbody>
<tr>
<td>Credit and examination</td>
<td>Credit and examination</td>
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<td>51</td>
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<td>Credit</td>
<td>Credit</td>
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<td>Examination</td>
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<td>67</td>
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<tr>
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<td>Written exam</td>
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<td>Oral exam</td>
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