



UNIVERSITY OF MISKOLC

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**FACULTY OF  
EARTH AND ENVIRONMENTAL  
SCIENCE AND ENGINEERING**

**Subject name: Basics of waste management**

**FACULTY OF EARTH AND ENVIRONMENTAL SCIENCES & ENGINEERING  
MSc education**

**Course communication dossier**

**UNIVERSITY OF MISKOLC  
FACULTY OF EARTH AND ENVIRONMENTAL SCIENCES & ENGINEERING  
Institute of Raw Materials Preparation and Environmental Technology**

**Recommended semester: 1.**

## **Contents**

1. Course description (Content, Lecturer, Number of classes, Credits)
2. Course schedule (Weekly content)
3. Example for written examination (Sample classroom test)
4. Exam questions
5. Other requirements

## 1. COURSE DESCRIPTION

<b>Course Title: Basics of waste management</b>		<b>Credits: 3</b>												
Type of course: compulsory	Neptun code: MFEET710010													
Type (lec. / sem. / lab. / consult.) and Number of Contact Hours per Week: <b>2 lec + 1 sem</b>														
<b>Type of Assessment</b> (exam. / pr. mark. / other): <b>exam</b>														
<p><b>Assessment and grading</b>  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:</p> <table> <thead> <tr> <th>% value</th> <th>Grade</th> </tr> </thead> <tbody> <tr> <td>90 -100%</td> <td>5 (excellent)</td> </tr> <tr> <td>80 – 89%</td> <td>4 (good)</td> </tr> <tr> <td>70 - 79%</td> <td>3 (satisfactory)</td> </tr> <tr> <td>60 - 69%</td> <td>2 (pass)</td> </tr> <tr> <td>0 - 59%</td> <td>1 (failed)</td> </tr> </tbody> </table>			% value	Grade	90 -100%	5 (excellent)	80 – 89%	4 (good)	70 - 79%	3 (satisfactory)	60 - 69%	2 (pass)	0 - 59%	1 (failed)
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0 - 59%	1 (failed)													
Position in Curriculum (which semester): <b>1<sup>st</sup></b>														
Pre-requisites ( <i>if any</i> ): -														
<p><b>Course Description:</b> Introduction. Requirement of the subject. Environmental protection-waste management: underlying principles, definitions. Definitions and properties of waste treatment – waste preparation, process engineering characterization of waste. Mechanical processes of waste recycling. Relevant material properties. Selective waste collection: material balance, processes, equipments and technology of selective collection. Treatment of Municipal Solid Waste – I.: technology of waste sorting plant. Treatment of Municipal Solid Waste – II.: treatment of residue: stabilization and technology for production of secondary fuel (RDF-Refuse-derived fuel ). Treatment of Municipal Solid Waste – III.: composting and biogas production</p>														
<p><b>Aim of the course:</b>  The aim of the subject for students is to learn knowledge about the waste management. History and development of waste management. Generation and types of industrial and municipal wastes. Introduction, position and aim of the subject in the course. Generation, types, composition, environmental effect of wastes. Definition and basics of sustainable development and sustainable raw material management. Determination of material characteristics (chemical and physical properties) and evaluation of the results. Material flow of production and consumption wastes. Relationship of waste management and environmental protection. Product and production integrated environmental protection. Treatment and preparation of wastes based on various utilization needs. Processes of mechanical waste preparation. General waste preparation technologies.</p>														
The 3-5 most important compulsory, or recommended <b>literature</b> (textbook, book) <b>resources:</b>														
<ul style="list-style-type: none"> <li>• Bernd Bilitewski: Waste management. 1997. Springer Science &amp; Business Media</li> <li>• Jacqueline Vaughn: Waste Management: A Reference Handbook. 2009</li> </ul>														

- Ramesha Chandrappa: Solid Waste Management: Principles and Practice. 2012. Springer
- Lecture PowerPoint
- A. D, Salman, M. Ghadiri, M. J. Hounslow: Handbook of Powder Technology: Particle Breakage. 2007. Elsevier
- Recently published Journal Papers, Journal of Cleaner Production, Waste management, ...

Competences:

**a) Knowledge**

Understands the processes described by the general and specific theories required for the practising of the fields of earth science engineering. Has a solid technical and scientific knowledge required for the high-level progress in earth sciences engineering disciplines, among others in numerical methods, technical physics and their contexts. Based on his/her knowledge, understands the structure of the raw material extraction sector, the technologies used for the extraction and preparation of mineral raw materials. Knows the problem-solving (research-planning and management) techniques of best available practices in earth sciences. Has a well-established knowledge of the legal, economic, administrative, safety, work and fire protection, information technology and environmental protection fields related to the fields of earth science engineering.

**b) Skills**

Able to apply general and specific basic and applied scientific theories within the technical earth sciences, able to systematize them, to solve independent engineering tasks (mainly complex prospecting, final report summarizing exploration results, geological-geophysical parts of environmental impact assessments). Able to convey knowledge authentically by preparing presentations and written documents in Hungarian or in a foreign language. Able to perform complex planning, construction, inspection and official licensing tasks with the innovative application of theories and terminology describing technical earth science knowledge. - Able to review legal and economic knowledge and activities related to technical earth science tasks, to optimize connections. Able to actively cooperate with, organize, manage, and supervise larger and more complex activities based on or incorporating technical earth science tasks (especially mining, environmental technology investments, operations). Able to solve technical problems requiring innovative skills in theory and practice (especially field, surface, underground data collection, measurements, and their processing and interpretation requiring innovative skills). Able to organize cooperation with related disciplines and manage the (working) group within the framework of larger and more complex activities based on or incorporating technical earth science tasks.

**c) Competence in terms of attitude**

Open and receptive to the knowledge and acceptance of professional and technological methodological developments in the fields of technical earth sciences, to the acquisition of their management, and to the participation in their development. Actively applies innovative skills and knowledge in solving professional problems. Commits and convincingly demonstrates to knowing and adhering to the professional and ethical values. Professionalism and professional solidarity have deepened. Respects and follows the ethical principles and written rules of work and professional culture in activities and is able to follow them even when managing small workgroups. In the course of professional work, observes and adheres to the requirements of safety, health, environmental protection and quality assurance and control (SHE and QA / QC). Has a sufficient motivation to carry out activities in often changing working, geographical and cultural circumstances.

**(d) Competence in terms of autonomy and responsibility**

With the in-depth knowledge of the received strategic guidelines and external environmental requirements, is able to plan the work independently, and is also suitable to lead workgroups. Takes responsibility and is accountable for the work processes carried out under his / her control, for the employees working in them. Makes decisions carefully, in consultation with representatives of other disciplines (primarily legal, economic, and environmental), independently, takes responsibility for decisions. In addition to constructive teamwork, is an autonomous specialist capable of making professional decisions in the field of operation entrusted to him/her. Committed to the practice of sustainable natural resource management, occupational health, and safety.

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

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

## 2. COURSE TOPICS

**Basics of waste management**  
**Tantárgytematika (ÜTEMTERV)**  
**Aktuális tanév őszi félév**  
**Környezetmérnök MSc, 1. félév, törzsanyag tárgya**

Hét	Előadás
1	Introduction. Requirement of the subject.
2	Environmental protection-waste management: underlying principles, definitions.
3	Definitions and properties of waste treatment – waste preparation, process engineering characterization of waste.
4	Mechanical processes of waste recycling.
5	Relevant material properties.
6	Selective waste collection: material balance, processes, equipments and technology of selective collection. Part 1
7	Selective waste collection: material balance, processes, equipments and technology of selective collection. Part 2.
8	Treatment of Municipal Solid Waste – I.: technology of waste sorting plant
9	Plant visit.
10	Treatment of Municipal Solid Waste – II.: treatment of residue: stabilization and technology for production of secondary fuel (RDF- <i>Refuse-derived fuel</i> )
11	Consultation.
12	Treatment of Municipal Solid Waste – III.: composting and biogas production
13	Collecting the project work in report format. Consultation.
14	Student project presentation.

<b>Hét</b>	<b>Gyakorlat</b>
1	Introduction of the practice. Topics of the semester.
2	Giving the project work to students.
3	Calculation of waste streams.
4	Calculation of sorting plant data.
5	Consultation.
6	Project work.
7	Project work.
8	Calculation of waste material balance.
9	Plant visit.
10	Project work.
11	Calculation of apparatus related issues.
12	Calculation of apparatus related issues.
13	Collecting the project work report format. Consultation.
14	Student project presentation.

### **3. SAMPLE Classroom test**

Classroom Test

#### **Basics of Waste Management**

Written Examination

1. Please write down the definition of waste management, waste preparation and sustainable development. 3 p

Waste management: every activity which aim at the avoidance of formation, the recycling or disposal of waste.

Waste preparation: the purposeful activity when the raw materials or wastes are prepared using mechanical (crushing, separation by physical properties – such as density, magnetic, electric, optical, thermal, surface, state of matter properties, agglomerating homogenisation) processes to be appropriate for further treatment or utilization.

Sustainable development: The sustainable - harmonic – development is such a form of development which beside the satisfaction of present demand, does not divest the future generation of the possibility of satisfaction of their demand. Beside ecological and economical mutual dependence, and the keeping of equilibrium, the ethical responsibility appear in the definition.

2. Please describe the integrated hierarchical waste management concept. 2 p

## **Integrated hierarchical waste management conception**

*To avoid the generation of waste*

- **behaviour of manufacturer: production-  
and product integrated environment  
protection**
- **behaviour of consumer**



*The reduction of amount of waste*

- selective collecting
- preparation
- recycling and utilization



*The treatment and elimination of waste*

- thermal, chemical or biological modification



*Organized deposit of residue*

3. What is the difference of Reuse and recycle? 2 p

**Reuse of waste:** If the waste is used again in the original function - mainly applied solution in the case of the package materials (bottle, flask, barrel, cans, box, the so called az un. multipath or recirculated package material).



**Recycling:** Among the waste treatment processes the **recycling** has a very important role which based on the selective waste collecting and it supports the repeated using of valuable materials directly or after a physical-mechanical preparation.

4. What is the typical material types and composition of municipal solid waste? 2 p

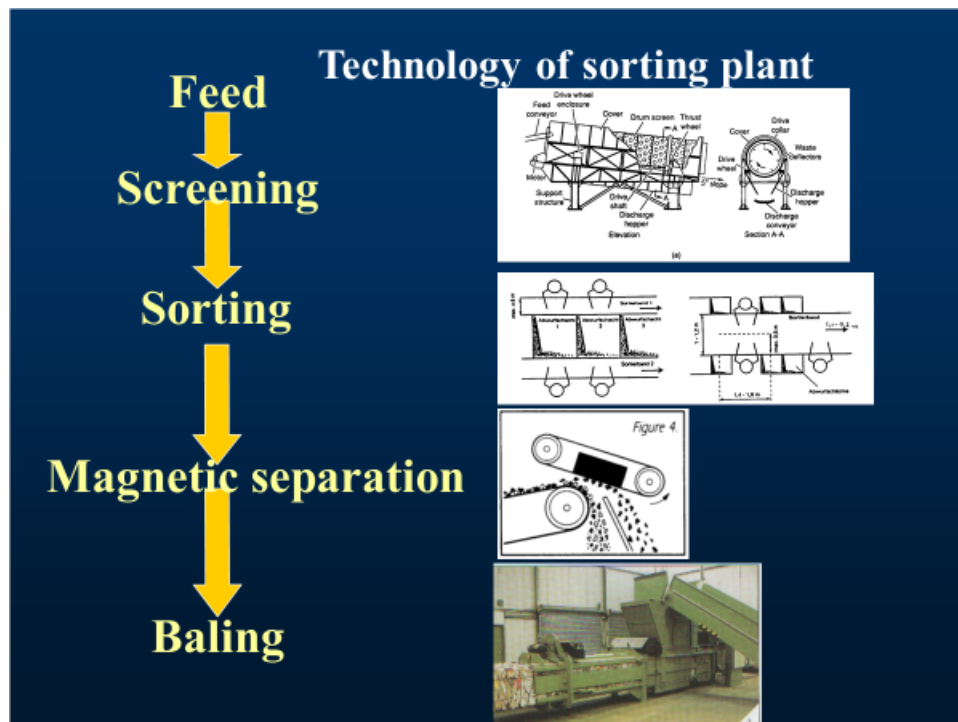
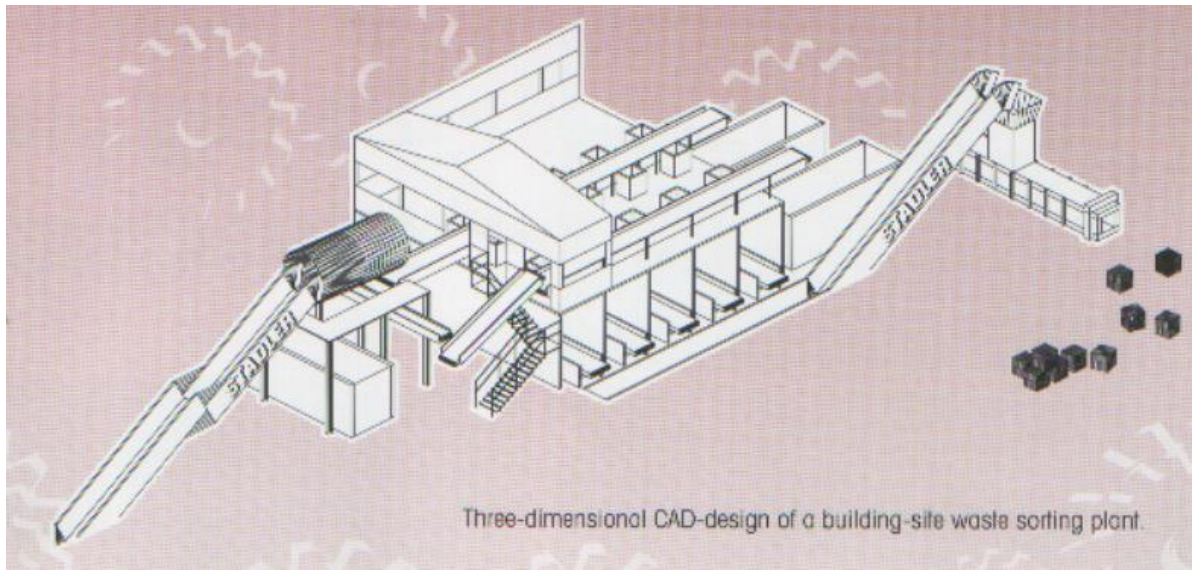
<b>Component</b>	<b>Weight fraction , %</b>
<b>Paper</b>	<b>21,9</b>
<b>Glass</b>	<b>10,4</b>
<b>Plastic</b>	<b>5,4</b>
<b>Metals (Al, Fe)</b>	<b>3,2</b>
<b>Degradable organic</b>	<b>26,5</b>
<b>Garden waste</b>	<b>14,5</b>
<b>Other</b>	<b>2,6</b>
<b>Sum</b>	<b>100,0</b>

5. What is the selective waste collection system? 3 p

Selective waste collection system consists of collection from inhabitants, enterprises, companies and institutes as well as sorting in the sorting plant in order to generate a clean product. For example: DSD (Duales System Deutschland) treating system for packaging materials. The waste types (treating aspect) and their amount collected yearly is specified (this number id changing year

by year). Technical realization of collecting and utilization is provided. Appropriate product fee is specified.

- 6. Please describe the technological flowsheet of waste sorting plant with giving the main parts, machines! 10 p



Screening by trommel screen in order to remove the fine size fraction from the material stream.

Sorting in climatized sorting cabin in one or multiple line.

Magnetic separation in order to remove magnetic particles, mainly iron.

Baling for compacting the product in order to minimize its volume.

**Operating modes are:**

Negative sorting: the sorting is not aimed at the full sorting of components but at the sorting of one material or a contamination.

Positive sorting: this solution is used if all parts of the fed material is sorted manually from the material flow and it is got the dropping cellar.

Maximum points: 22 p

#### 4. EXAM QUESTIONS

Vizsgatételek **Basics of Waste Management** c. tantárgyból

1	Please write down the definition of waste management, waste preparation and sustainable development.
2	Please describe the integrated hierarchical waste management concept.
3	What is the difference of Reuse and recycle?
4	What is the typical material types and composition of municipal solid waste?
5	What is the selective waste collection system?
6	Please describe the technological flowsheet of waste sorting plant!
7	How to calculate the waste mass flow rate and the sorting capacity?
8	What is product- and production integrated environmental protection?
9	What are the consequences of waste formation?
10	What is the aim of environmental protection?
11	What are the most common waste types?
12	What is the production-consumption loop?
13	What is the production waste and consumption waste?
14	How to realize a complex utilization of Municipal Solid Waste (MSW)?
15.	What is mechanical-biological treatment of MSW? Advantages?
16	Please describe the generation, main characteristics and utilization possibilities of red mud.
17	Please describe the generation, main characteristics and utilization possibilities of electric arc furnace dust.
18	Please describe the generation, main characteristics and utilization possibilities of coal mining gangue and power station fly ash.

## **5. OTHER REQUIREMENTS**

A vizsga zárthelyi dolgozat írása közben a mobiltelefon használata tilos!

Miskolc, 2022. június.10.

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Dr. Nagy Sándor  
Intézetigazgató egyetemi docens

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Dr. Mucsi Gábor  
egyetemi tanár