Basics of waste management

MŰSZAKI FÖLDTUDOMÁNYI KAR MSc KÉPZÉS
(nappali munkarendben)

TANTÁRGYI KOMMUNIKÁCIÓS DOSSZIÉ

MISKOLCI EGYETEM
MŰSZAKI FÖLDTUDOMÁNYI KAR
NYERSANYAGELŐKÉSZÍTÉSI ÉS KÖRNYEZETI ELJÁRÁSTECHNIKAI INTÉZET

Ajánlott félév:1. félév

Tartalomjegyzék

1. TANTÁRGYLEÍRÁS

Course Title: Basics of waste management	**Credits: 3**
Type of course: compulsory	Neptun code: MFETT710010
Type (lec. / sem. / lab. / consult.) and Number of Contact Hours per Week: **2 lec. + 1 lab.**	

Type of Assessment (exam. / pr. mark. / other): **exam.**
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
90 -100%	5 (excellent)
80 – 89%	4 (good)
70 - 79%	3 (satisfactory)
60 - 69%	2 (pass)
0 - 59%	1 (failed)

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

Pre-requisites *(if any)*: -

Course Description:

Acquired store of learning:
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.

Competences:
Students will know the fundamentals of waste management and the generation of wastes. Furthermore, they will be able to characterize – from process engineering and chemical point of view – and utilize the various wastes.

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

- Bernd Bilitewski: Waste management. 1997. Springer Science & Business Media
- Jacqueline Vaughn: Waste Management: A Reference Handbook. 2009
- 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 manegement, …

T1 – The environmental engineer knows, and apply the scientific and technical theory, and practice. K10 - The environmental engineer is able to apply integrated knowledge in aspects of environmental protection equipments, processes, technologies, and informatics. Active professional English language skills.
Responsible Instructor (*name, position, scientific degree):* **Gábor Mucsi Dr., associate professor, PhD**
Other Faculty Member(s) Involved in Teaching, if any (*name, position, scientific degree*):

2. TANTÁRGYTEMATIKA

Basics of waste management
Tantárgytematika (ÜTEMTERV)
Aktuális tanév őszi félév
Környezetmérnök MSc, 1. félév, törzsanyagos tárgy

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-*Refuse-derived fuel*)
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.

Hét	Gyakorlat
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. MINTA ZÁRTHELYI ÉS A MINTA ZH MEGOLDÁSA

Basics of Waste Management

Written Examination

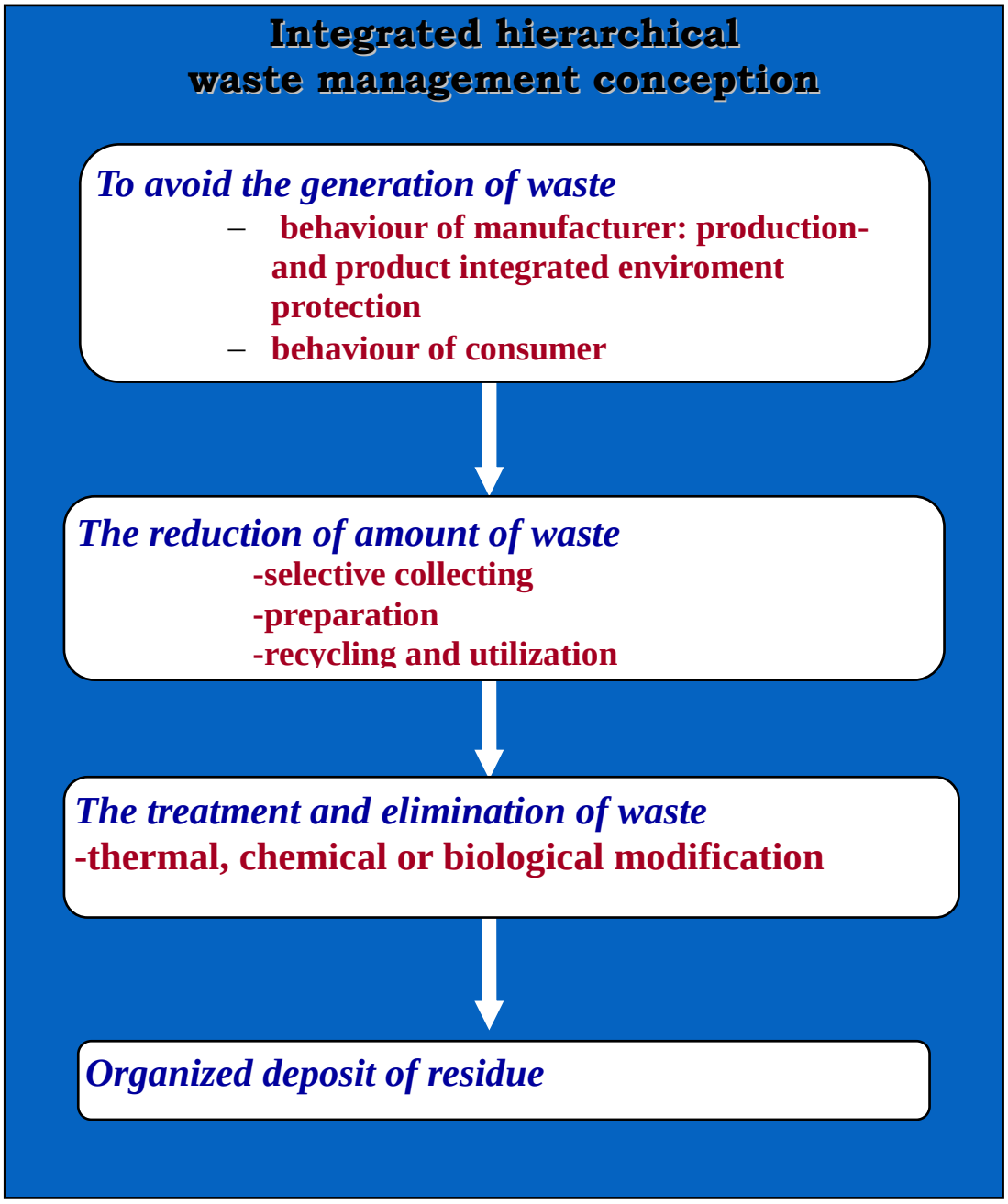
1. Please write down the definition of waste management, waste preparation and sustainable development. 3 p

   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



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

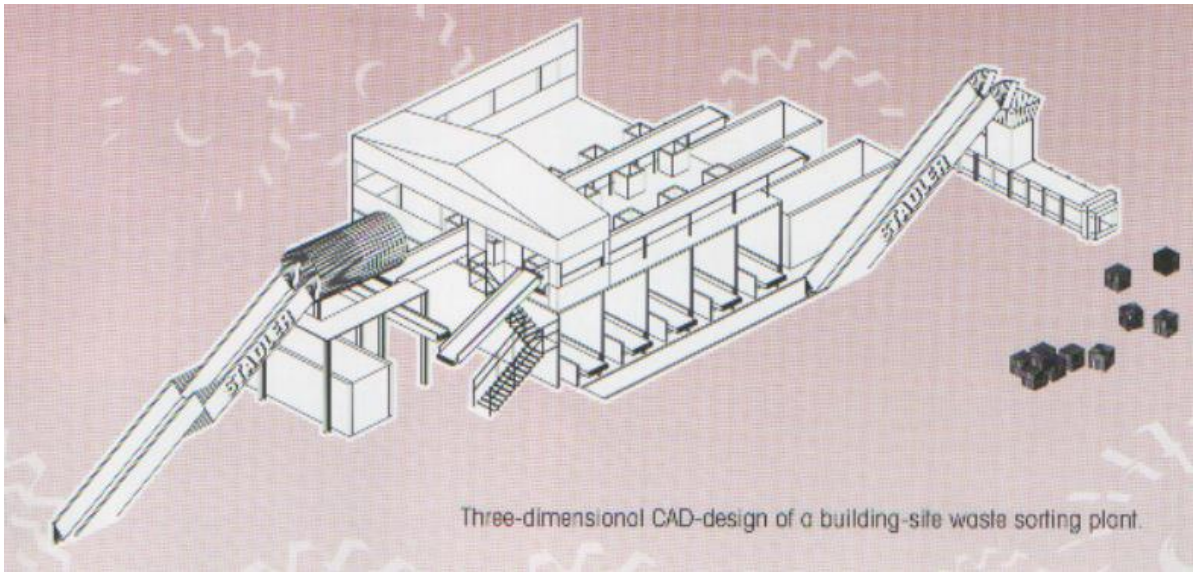
Component	**Weight fraction , %**
Paper	**21,9**
Glass	**10,4**
Plastic	**5,4**
Metals (Al, Fe)	**3,2**
Degradable organic	**26,5**
Garden waste	**14,5**
Other	**2,6**
Sum	**100,0**

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

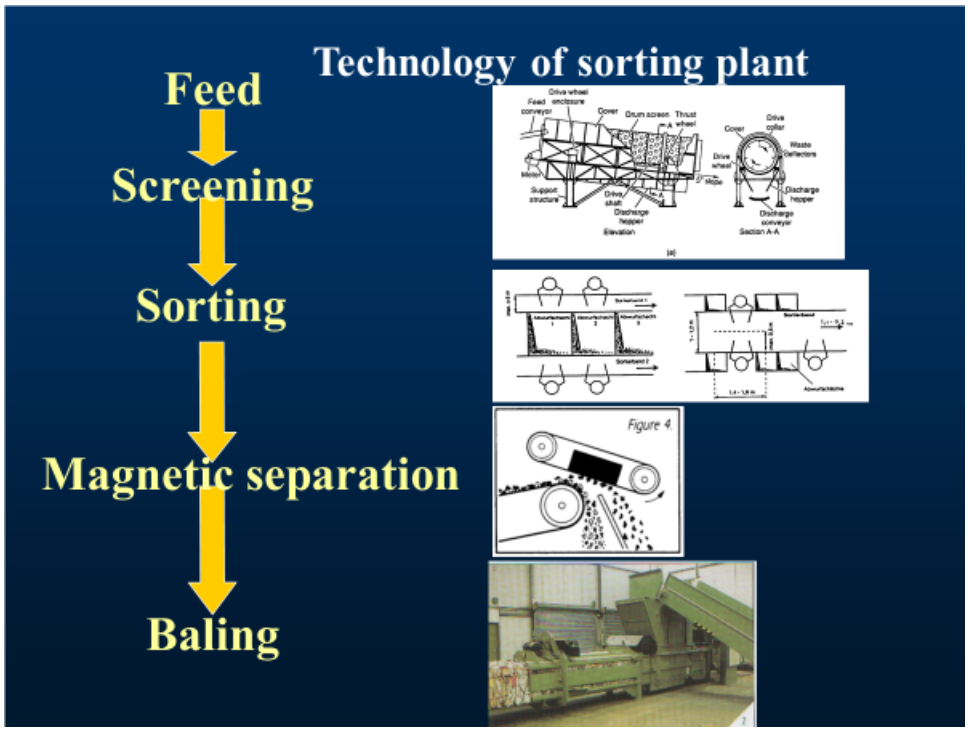
Selective waste collection system consists of collection from inhabitants, enterprises, companies and institutes as well as sorting in the sorting plant in order to generate a clean product. For example: DSD (Duales System Deutschland) treating system for packaging materials. The waste types (treating 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



Three-dimensional CAD-design of a building-site waste sorting plant.



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. VIZSGAKÉRDÉSEK

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?

5. EGYÉB KÖVETELMÉNYEK

A vizsga zárthelyi dolgozat írása közben a mobiltelefon használata tilos!

Miskolc, 2018. június.10.

Dr. Nagy Sándor	Dr. Mucsi Gábor
Intézetigazgató egyetemi docens	egyetemi docens