



**Tantárgy neve:
MECHANICAL AND BIOLOGICAL TREATMENT OF MUNICIPAL SOLID WASTE**

**MŰSZAKI FÖLDTUDOMÁNYI KAR BSc KÉPZÉS
(nappali munkarendben)**

TANTÁRGYI KOMMUNIKÁCIÓS DOSSZIÉ

**MISKOLCI EGYETEM
MŰSZAKI FÖLDTUDOMÁNYI KAR
NYERSANYAGELŐKÉSZÍTÉSI ÉS KÖRNYEZETI ELJÁRÁSTECHNIKAI INTÉZET**

Ajánlott félév: 2. félév

Tartalomjegyzék

1. Tantárgyleírás, tárgyjegyző, óraszám, kreditérték
2. Tantárgytematika (óraóra lebontva)
3. Minta zárthelyi
4. Vizsgakérdések
5. Egyéb követelmények

1. TANTÁRGYLEÍRÁS - DESCRIPTION

Course Title: Mechanical and Biological Treatment of Municipal Solid Waste	
Type of course: compulsory	Neptun code: MFEET720015
Type (lec. / sem. / lab. / consult.) and Number of Contact Hours per Week: 1 lec. + 2 sem.	
Type of Assessment (exam. / pr. mark. / other): exam. During the semester the following tasks should be completed: laboratory work and report.	
Grading Limits: > 80%: excellent, 70-79%: good, 60-69%: medium, 50-59%: satisfactory, < 50%: unsatisfactory.	
Position in Curriculum (which semester): 2nd	
Pre-requisites (<i>if any</i>): -	
Course Description:	
<u>Study goals:</u> To introduce the concept of waste sorting facilities and the necessity of treatment of the residual fraction of municipal solid waste (MSW) to recover valuable materials (metals) and energy (refuse derived fuel (RDF) and biogas) for the creating of circular economy.	
<u>Course content:</u> Circular economy and separative waste collection. Sorting plants: technology and machinery. Quality and quantity of MSW and its residual fraction. Biostabilisation of degradables. Recovery of metals. Recovery and separation of plastics. RDF separation and further operations. Evaluation of technologies meeting different processing goals. Machinery and economics, their design. Environmental impacts. Advanced technologies to achieve the highest energy recovera rate.	
<u>Education method:</u> Lectures and seminars	
The 3-5 most important compulsory, or recommended literature (textbook, book) resources:	
<ul style="list-style-type: none">• Lecture notes• Paul T. Williams. Waste Treatment and Disposal John Wiley & Sons, 2013• Thomas H. Solid Waste Technology & Management, 1 & 2. 2010. Online ISBN:9780470666883• McKinnon D, Fazakerley J, Hultermans R (2017). Waste sorting plants. Extracting value from waste. ISWA	
Competencies to evolve:	
T4 - The environmental engineer knows the operation, and the equipments of environmental protection facilities (water, and waste water treatment plants, hazardous, and non-hazardous landfill, waste incineration plant), and the ability of their innovation.	
K1 – The environmental engineer is able to apply the acquired general, specific rules, contexts, processes, and principles of mathematical-, natural-, and social sciences.	
K2 – The environmental engineer is able to publish, and negotiate in his/her specialization, using his/her mother language, and at least one foreign language.	
Active professional English language skills. Active professional English language skills.	

Responsible Instructor (*name, position, scientific degree*):

Ljudmilla Bokányi Dr., Associate Professor, PhD, CSc

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

2. TANTÁRGYI TEMATIKA – SCHEDULE OF LECTURES

1.	Municipal Solid Waste collection approaches. Importance of education of population.
2.	Sorting plants 1: processing aims. Technology
3.	Sorting plants 2: Machinery.
4.	Sorting of special plastics.
5.	Characterisation of the residual fraction of MSW.
6.	Concept of MBT (mechanical-biological treatment). Operations and machinery.
7.	MBT to bio-stabilise the greatest possible proportion of the residual solid waste to meet landfilling requirements 1
8.	MBT to bio-stabilise the greatest possible proportion of the residual solid waste to meet landfilling requirements 2
9.	MBT to recover high calorific value components at high yield 1
10.	MBT to recover high calorific value components at high yield 1
11.	Dry stabilisation and 3A technology
12.	Case studies
13.	Field trip to Győrszol
14.	Advanced techniques to recover maximum energy

Seminar work schedule

<i>Date</i>	<i>Description of tasks</i>
<i>Week 1.</i>	<i>Schedule of practice lessons, subject requirements</i>
<i>Week 2.</i>	<i>Introduction (Selective waste sorting plant)</i>
<i>Week 3.</i>	<i>Calculations for Selective waste sorting plant</i>
<i>Week 4.</i>	<i>Calculations for Selective waste sorting plant</i>
<i>Week 5.</i>	<i>Deadline of Complex planning task I. (Selective waste sorting plant)</i>
<i>Week 6.</i>	<i>National Holiday</i>
<i>Week 7.</i>	<i>Introduction (Mechanical-biological waste treatment technologies)</i>
<i>Week 8.</i>	<i>Calculations for Mechanical-biological waste treatment technologies</i>
<i>Week 9.</i>	<i>Calculations for Mechanical-biological waste treatment technologies</i>
<i>Week 10.</i>	<i>Calculations for Mechanical-biological waste treatment technologies</i>
<i>Week 11.</i>	<i>Consulting</i>
<i>Week 12.</i>	<i>Consulting</i>
<i>Week 13.</i>	<i>Deadline of complex planning II. (Mechanical-biological waste treatment plant)</i>
<i>Week 14.</i>	<i>Test</i>

3. Félévközi feladat – Seminar tasks

Task 1

Design a complex technology based on *selective (separative) collected waste sorting!*

The following parameters are known:

- The number of inhabitants (N): 220 000.
- The specific quantity of the generated waste (q): 0.31 tonnes/capita/year.

Choose the appropriate technology and prepare the technological flowchart.

Prepare a literature overview, detailing:

- Selective waste collection types, trends.
- Applied equipment (working principle, etc.)

Task 2

Design a complex technology based on *mechanical-biological waste treatment!*

The following parameters and information are known:

- Quantity of feed material (F): 195 000 tonnes/year,
- The fine fraction of municipal solid waste (<30..50) contains a relatively high quantity of biodegradable materials (65%),
- The coarse fraction of municipal solid waste (>80..100) contains a relatively high quantity of combustible materials,
- The intermediate fraction has a low combustible material content; the quantity of biodegradable materials within the fraction is 20%.

Choose the appropriate technology and prepare the technological flowchart!

4.VIZSGAKÉRDÉSEK - EXAM QUESTIONS

Municipal Solid Waste collection approaches.

Importance of education of population.

Sorting plants: processing aims. Technology

Sorting plants, machinery.

Sorting of special plastics.

Characterisation of the residual fraction of MSW.

Concept of MBT (mechanical-biological treatment). Operations and machinery.

MBT to bio-stabilise the greatest possible proportion of the residual solid waste to meet landfilling requirements

MBT to recover high calorific value components at high yield

Dry stabilisation and 3A technology

Case studies

Advanced techniques to recover maximum energy

4. EGYÉB KÖVETELMÉNYEK - others

Planning tasks, report of the field trip

Using mobile phones during the test is forbidden.

Miskolc, 2018. június.10.

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mb. intézetigazgató egyetemi docens

Dr. Bokányi Ljudmilla
egyetemi docens