BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS
FACULTY OF MECHANICAL ENGINEERING

SUBJECT DATASHEET

I. SUBJECT DESCRIPTION

1. GENERAL DATA

1.1. Subject name (in Hungarian, in English)

Air Pollution Control, Wastewater and Solid Wastes Management • Air Pollution Control, Wastewater and Solid Wastes Management

1.2. Neptun code

BMEGEÁTBG04

1.3. Type

study unit with contact hours

1.4. Course types and number of hours (weekly / semester)

course type	number of hours (weekly)	nature (connected / stand-alone)
lecture (theory)	3	-
exercise	-	-
laboratory exercise	-	-

1.5. Type of assessments (quality evaluation)

mid-term grade

1.6. ECTS

3

1.7. Subject coordinator

name:	Dr. Suda Jenő Miklós (71958230447)
post:	adjunct
contact:	suda@ara.bme.hu

1.8. Host organization

Department of Fluid Mechanics (http://www.ara.bme.hu)

1.9. Course homepage

http://www.ara.bme.hu/oktatas/tantargy/NEPTUN/BMEGEATBG04/

1.10. Course language

hungarian, english

1.11. Primary curriculum type

mandatory

1.12. Direct prerequisites

Strong prerequisite:	BMEGEÉEBG61
Weak prerequisite:	-
Parallel prerequisite:	-
Milestone prerequisite:	-
Excluding condition:	-

(the subject cannot be taken if you have previously completed any of the following subjects or groups of subjects)

2. AIMS AND ACHIEVEMENTS

2.1. Aim

The aim of the course is to provide theoretical background and practical knowledge in air pollution control, wastewater treatment, and solid wastes management for mechanical engineers. Theoretical background, measurement principles, application areas, advantages and limitations of various environmental protection techniques applied in industrial practice are covered by the lectures. Main topics: physical, chemical and biological methods of separation, recovery and deformation of both gaseous, solid and liquid phase pollutants; typical tasks of wastewater treatment methods & technologies, basic processes and engineering equipment of the technology; characteristics of solid wastes, collection and treatment, theoretical basics of burning solid wastes, solid waste disposal and recycling. This course helps to recognize & evaluate the environmental protection problems and to solve the most typical engineering problems.

2.2. Learning outcomes

Competences that can be acquired by completing the course:

A. Knowledge

- The student is familiar with solid wastes management processes and equipment.
- The student is familiar with the wastewater management processes and equipment.
- The student is familiar with the air pollution control processes and equipment.
- The student has a thorough knowledge of the differences between solid wastes technologies and their main advantages/drawbacks.
- The student has a thorough knowledge of the differences between wastewater treatment technologies and their main advantages/drawbacks.
- The student has a thorough knowledge of the differences between air pollution control technologies and their main advantages/drawbacks.
- The student is aware of the types, sources, properties, quantities, and qualities of solid wastes.
- The student is aware of the types, sources, properties, quantities, and qualities of wastewater treatment.
- The student is aware of the types, sources, properties, quantities, and qualities of air pollution control.
- The student is aware of the types, sources, properties, quantities, and characteristics of the treatment of gaseous components.
- The student is aware of the types, sources, properties, quantities, and characteristics of the separation of solid/liquid particles from gases.
- The student has a thorough knowledge of environmental protection legislation and regulation.
- The student has a thorough knowledge of the engineering design's responsibility for the future generation.

B. Ability

- The student can describe the types, sources, properties, quantities, and qualities of solid wastes.
- The student can describe the on-site handling, storage, processing of solid wastes.

- The student can assess biological, chemical, and energetic resource recovery processes and the ultimate disposal.
- The student can identify wastewater characteristics, pre-treatment (primary, secondary, tertiary treatment), primary separation, or clarification wastewater treatment techniques.
- The student can analyze the physical-chemical wastewater treatment techniques and the biological treatment of biodegradable waste water.
- The student can evaluate sludge treatment techniques, sludge disposal.
- The student can assess the material balance, minimum liquid-gas ratio, flowsheet for absorption of sulphur dioxide.
- The student can describe notations in adsorption, equilibrium, adsorbents, adsorption plant, packed beds, regeneration of adsorbents.
- The student can analyze the application of adsorption (organic gases and vapours, sulphur dioxide), chemical waste gas treatment, explosion range, material and heat balance, heat recovery based on advantages and disadvantages.
- The student can describe the main characteristics of aerosols, the equation of motion for particle-laden flows, basic parameters of two-phase flows.
- The student can identify the main forces and effects in particle dynamics, the main differences of ideal and real separation processes.
- The student can analyze the mass balance of a separator, and the overall/fractional efficiency, and its link to particle concentration measurement, especially in case of isokinetic sampling method.
- The student can describe the main types of particle separator equipment: settling chambers, pre-separator louvers, Venturi-scrubbers, cyclones, surface & depth filters, electrostatic precipitators.

C. Attitude

- The student is constantly developing professional knowledge, theoretical and practical knowledge.
- The student is open to integrating the latest experimental and numerical tools into their workflow.
- The student seeks to deepen and improve the techniques available to solve technical problems in the subject of the lecture.
- The student develops accurate and effective problem-solving skills.
- The student creates opportunities for the exploitation of energy-efficient and sustainable technologies.

D. Independence and responsibility

- The student feels responsible for finding, understanding, and embracing the techniques and ideas found in the relevant literature.
- The student takes responsibility for his actions and decisions, for his professional solutions.
- The student makes a decision to solve engineering problems as part of a group.
- The student supports problem-solving approaches to integrating a system-wide approach.
- The student defends its position on the responsibilities of engineers and their impact on society and the environment.

2.3. Teaching methodology

The course includes frontal lectures that include “chalk and talk” type instruction as well as electronic lectures. The lectures are divided into four main parts: 1) the basics of environmental protection and the separation of gaseous components, 2) the separation of particles from gases, 3) the treatment of solid waste, and 4) the treatment of wastewater. The presented materials can be downloaded from the subject website. Lecture notes and additional online materials cover all the topics presented and may include additional slides to improve and verify knowledge of the

topics presented.

2.4. Support materials

a) Textbooks

Bothné Fehér K, Láng P, Parti M, Suda JM: Air Pollution Control, Wastewater and Solid Wastes Management (electronic lecture notes) 2021, ISBN 963x

b) Lecture notes

Parti M: Basics of Environmental Protection (electronic lecture notes), 2021, ISBN 963x

Suda JM: Particle Separation form Gases (electronic lecture notes), 2021, ISBN 963x

Bothné Fehér K: Wastewater treatment (electronic lecture notes), 2021, ISBN 963x

c) Online materials

http://www.ara.bme.hu/oktatas/tantargy/NEPTUN/BMEGEATBG04/

2.5. Validity of the course description

Start of validity:	2020. February 14.
End of validity:	2024. December 31.

II. SUBJECT REQUIREMENT

3. ACHIEVEMENT CONTROL AND EVALUATION

3.1 General rules

The requirement for successful completion is the attendance on the lectures and four written, individually successful (min. 30%) mid-term tests. The final rating is calculated based on the weighted average of the four mid-terms. In the case when 3 of the 4 mid-terms are rated 65% of higher and the mid-terms are completed without retakes, the term-end mark will increase by one mark. The minimum requirement for each mid-term is 30% individually, but a total of 40% is the minimum requirement.

3.2 Assessment methods

A. Detailed description of mid-term assessments

1. Mid-term assessment

type: formative assessment, simple

count: 1

purpose, description: The topic of the written 1st mid-term is the material of the lectures presented in Part 1 of the lectures. The mid-term is 45 minutes long and includes both theoretical and practical questions. The requirement for successful completion is the attendance of the lecture and the min. 30% result of the mid-term. The final grade is calculated on the basis of the weighted average of the four mid-terms. In the case of three of the 4 mid-terms' result in 65% or higher and the student has not used a retake, the final term-end mark will be increased by one mark. The minimum requirement for the mid-term is 30% each, separately, but minimum 40% is needed in total average.

2. Mid-term assessment

type: formative assessment, simple

count: 1

purpose, description: The topic of the written 2nd mid-term is the material of the lectures presented in Part 2 of the lectures. The mid-term is 45 minutes long and includes both theoretical and practical questions. The requirement for successful completion is the attendance of the lecture and the min. 30% result of the mid-term. The final grade is calculated on the basis of the weighted average of the four mid-terms. In the case of three of the 4 mid-terms' result in 65% or higher and the student has not used a retake, the final term-end mark will be increased by one mark. The minimum requirement for the mid-term is 30% each, separately, but minimum 40% is needed in total average.

3. Mid-term assessment

type: formative assessment, simple

count: 1

purpose, description: The topic of the written 3rd mid-term is the material of the lectures presented in Part 3 of the lectures. The mid-term is 45 minutes long and includes both theoretical and practical questions. The requirement for successful completion is the attendance of the lecture and the min. 30% result of the mid-term. The final grade is calculated on the basis of the weighted average of the four mid-terms. In the case of three of the 4 mid-terms' result in 65% or higher and the student has not used a retake, the final term-end mark will be increased by one mark. The minimum requirement for the mid-term is 30% each, separately, but minimum 40% is needed in total average.

4. Mid-term assessment

type: formative assessment, simple

count: 1

purpose, description: The topic of the written 4th mid-term is the material of the lectures presented in Part 4 of the lectures. The mid-term is 45 minutes long and includes both theoretical and practical questions. The requirement for successful completion is the attendance of the lecture and the min. 30% result of the mid-term. The final grade is calculated on the basis of the weighted average of the four mid-terms. In the case of three of the 4 mid-terms' result in 65% or higher and the student has not used a retake, the final term-end mark will be increased by one mark. The minimum requirement for the mid-term is 30% each, separately, but minimum 40% is needed in total average.

B. Detailed description of assessments performed during the examination period (if relevant)

Elements of the exam:

1. written partial exam
   -
2. oral partial exam
   -
3. practical partial exam
   -
4. inclusion of mid-term results
   -

3.3 The weight of mid-term assessments in signing or in final grading

identifier	**weight**
1 . Mid-term assessment	25 %
2 . Mid-term assessment	25 %
3 . Mid-term assessment	25 %
4 . Mid-term assessment	25 %

3.4 The weight of partial exams in grade (if relevant)

type	**weight**
written partial exam	0 %
oral partial exam	0 %
practical partial exam	0 %
inclusion of mid-term results	0 %

3.5 Determination of the grade

grade ● [ECTS]	**the grade expressed in percents**
very good(5) ● Excellent [A]	above 90%
very good(5) ● Very Good [B]	85% .. 90%
good(4) ● Good [C]	70% .. 85%
satisfactory(3) ● Satisfactory [D]	55% .. 70%

sufficient(2) ● Pass [E]	40% .. 55%
insufficient(1) ● Fail [F]	below 40%

The lower limit specified for each grade already belongs to that grade.

3.6 Attendance and participation requirements

Must be present at at least **70%** (rounded down) of lectures.

3.7 Special rules for improving, retaken and replacement

The special rules for improving, retaken and replacement shall be interpreted and applied in conjunction with the general rules of the CoS (TVSZ).

Can the submitted and accepted partial performance assessments be resubmitted until the end of the replacement period in order to achieve better results?

yes

Taking into account the previous result in case of improvement, retaken-improvement:

new result overrides previous result

The way of retaking or improving a partial assessment for the first time:

partial assesment(s) in this group can be improved or repeated once up to the end of the repeat period

3.8 Study work required to complete the course

Activity	**hours / semester**
participation in contact classes	42
elaboration of a partial assessment task	16
additional time required to complete the subject	32
summary	**90**

3.9. Validity of subject requirements

Start of validity:	2020. February 14.
End of validity:	2024. December 31.

4. ADDITIONAL INFORMATION

4.1 Primary course

The primary (main) course of the subject in which it is advertised and to which the competencies are related:

mechanical engineering

4.2 Link to the purpose and (special) compensations of the Regulation KKK

This course aims to improve the following competencies defined in the Regulation KKK>

a) knowledge

- Student has the knowledge of the theories and contexts of fundamental importance in the field of engineering and of the terminology which underpins them.

b) ability

- Student has the ability to apply the theories and related terminology in an innovative way when solving problems in a given field of engineering.

c) attitude

- Student is open and receptive to learning, embracing and authentically communicating professional, technological development and innovation in engineering.

d) independence and responsibility

- Student shares her acquired knowledge and experience through formal, non-formal and informal information transfer with those in her field.

4.3 Prerequisites for completing the course

Knowledge type competencies	
(a set of prior knowledge, the existence of which is not obligatory, but greatly facilitates the successful completion of the subject)	-
Ability type competencies	
(a set of prior abilities and skills, the existence of which is not obligatory, but greatly contributes to the successful completion of the subject)	-