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)

Thermo Dynamics and Fluid Dynamics • Thermo Dynamics and Fluid Dynamics

1.2. Neptun code

BMEGEÁTNG01

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)	2	-
exercise	-	-
laboratory exercise	1	coupled

1.5. Type of assessments (quality evaluation)

mid-term grade

1.6. ECTS

4

1.7. Subject coordinator

name:	Dr. Bak Bendegúz Dezső (79513977519)
post:	adjunct
contact:	bak@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/BMEGEATNG01

1.10. Course language

hungarian

1.11. Primary curriculum type

mandatory

1.12. Direct prerequisites

Strong prerequisite: -

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

Recalling and, if necessary, leveling the basics of fluid dynamics and heat transfer through lecture and consultation with self-directed learning, and acquiring new knowledge that lays the foundation for effective learning in the subjects of the course. By completing the course, students will be able to describe and model a number of flow and thermodynamic systems important for technical practice. In addition to providing a solid theoretical foundation, the subject provides practical knowledge that can be used directly.

2.2. Learning outcomes

Competences that can be acquired by completing the course:

A. Knowledge

- The student is familiar with general concepts used in fluid dynamics and thermodynamics.
- The student systematizes the methods used in fluid science and thermology according to different aspects.
- The student is aware of the factors influencing the results of flow and thermodynamic tests.
- The student understands basic equations describing fluid dynamics and thermodynamic processes.
- The student has a comprehensive knowledge of the principles and applicability limits of flow and thermal calculations and tests.
- The student knows the structure and operating principle of simpler flow measurement devices.
- The student understands the principle of flow measurement methods, their advantages and disadvantages.
- The student knows how to implement simpler flow measurements.
- The student knows the purpose, methods, and limitations of flow and thermal modeling.
- The student knows the methods of evaluating the quantities measured during measurements.
- The student is aware of the primary heat transfer phenomena (spatial heat radiation, heat transport mechanisms, multidimensional heat conduction, moving heat sources, phase transition, heat transfer, heat exchangers).
- The student knows about state-of-the-art flow modeling (computational fluid dynamics, percolation).
- The student knows about the properties of fluids described by different rheology curves.

B. Ability

- The student is able to select test methods to determine specific quantities.
- The student is able to model specific flow and thermodynamic processes.
- The student interprets equations describing fluid dynamics and thermodynamic systems.
- The student is able to identify the factors that influence the course of a given process.
- The student is able to select the equipment and tools needed to determine the flow characteristic.
- The student is able to rank the measurement techniques depending on the measurement conditions.
- The student is able to prepare the measuring system required to perform the flow measurement.
- The student is able to solve the equations set up to describe simple fluid dynamics and thermodynamic systems.

- At a basic level, the student is able to individually operate simple flow measurement equipment and devices that were introduced to them.
- The student is able to evaluate measurement results and determine flow characteristics from them.
- The student is able to apply methods to study the primary heat transfer phenomena.
- The student is able to apply basic equations to describe the primary fluid dynamics phenomena.
- The student is able to select the rheology model that describes the behavior of a given liquid.

C. Attitude

- The student constantly monitors their work, results, and conclusions.
- The student expands their knowledge of energy management and sustainability through continuous learning.
- The student is open to the use of information technology tools.
- The student strives to get to know and routinely use the tools needed for energy management and economic problem-solving.
- The student develops the ability to provide accurate problem solving with engineering precision, accuracy, and free of errors.
- The student applies the principles of energy efficiency, sustainability, and environmental awareness in solving energy management tasks.
- The student monitors changes in the social, economic, and political system.
- The student publishes their results in accordance with the professional rules.
- The student publishes their opinions and views without offending others.

D. Independence and responsibility

- The student collaborates with the instructor and fellow students to expand knowledge.
- The student accepts reasonable professional and other critical remarks.
- In some situations, as part of a team, the student works with their fellow students to solve tasks.
- Using their knowledge, the student makes a responsible, reasonable decision based on their analyzes.
- The student feels responsible for the problems of energetics, and energy management, the sustainable use of the environment, as well as present and future generations.
- The student is committed to the principles and methods of systematic thinking and problem-solving.

2.3. Teaching methodology

The teaching of the subject takes place in the framework of lectures and laboratory practice. The lectures basically introduce the students to the information determined by the knowledge competence elements using the technique of frontal education. The application and skill-level acquisition of knowledge take place in laboratory exercises, where an issued project work has to be solved in groups, which also develops teamwork skills. The project work must be presented at the end of the semester, and a report must be prepared.

2.4. Support materials

a) Textbooks

Tamás Lajos: Az áramlástan alapjai. Dr. Tamás Lajos, 2015, Budapest, ISBN 978 963 12 2885 4.

b) Lecture notes

T. Környey .: Hőátvitel, Műegyetemi Kiadó, 2019, Bp.

c) Online materials

http://www.ara.bme.hu/oktatas/tantargy/NEPTUN/BMEGEATNG01

2.5. Validity of the course description

Start of validity: 2022. January 1.

End of validity:	2024. December 31.

II. SUBJECT REQUIREMENT

3. ACHIEVEMENT CONTROL AND EVALUATION

3.1 General rules

The knowledge of students is evaluated on the basis of two written mid-terms as summary performance measurements, as well as a partial performance measurement. The summative assessment is a complex, written way of assessing the knowledge and ability type competence elements of the subject in the form of a written mid-term that requires the necessary lexical knowledge during the performance assessment. The working time is 60 minutes. Partial performance assessment (homework): a complex way of evaluating the knowledge, ability, attitude, and autonomy and responsibility type competence elements of the subject, the form of homework prepared in groups.

3.2 Assessment methods

A. Detailed description of mid-term assessments

1. Mid-term assessment

type: summative assessment

count: 2

purpose, description: Summative assessments collectively examine and assess the knowledge of students defined by knowledge and ability type competencies. Accordingly, each summative assessment assesses the acquisition of the designated theoretical knowledge as well as the existence of the knowledge and skills acquired in practice. Each summative assessment focuses 65% on theoretical knowledge and 35% on application skills. They will be completed on the date specified in the academic performance assessment plan, expected to be in the 7th and 14th weeks of education. 40 points can be obtained in each of the summative performance evaluations. A minimum of 40% is required for a pass.

2. Mid-term assessment

type: formative assessment, project-based, complex

count: 1

purpose, description: The basic aim of the partial performance assessment is to examine the existence of attitudes and knowledge belonging to the autonomy and responsibility competence group. The way to do this is to complete a project task that can only be done in groups and then present it in front of the members of the practice group. The assignments for groups of up to 4 people should be finalized by the 6th week of education. The content and format requirements and evaluation principles of the prepared project report are included in the task description. This task will be completed on the date specified in the study performance assessment plan, expected to be between the 7th and 14th week of education. The students can earn up to 20 points with this task.

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	80 %
2 . Mid-term assessment	20 %

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 85%
very good(5) ● Very Good [B]	85% .. 85%
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.

At least **70% of** laboratory practices (rounded down) must be actively attended.

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).

Need mid-term assessment to individually complete?

yes

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

NO

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

each summative assessment can be retaken or improved

Is the retaking-improving of a summary assessment allowed, and if so, than which form:

retake or grade-improving exam not possible

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 cannot be improved or repeated, the final result is assessed in accordance with Code of Studied 122. § (6)

Completion of unfinished laboratory exercises:

missed laboratory practices must be performed in the teaching term at pre-arranged appointment

Repetition of laboratory exercises that performed incorrectly (eg.: mistake in documentation):

incorrectly performed laboratory practice (e.g. Incomplete/incorrect report) can be corrected upon improved re-submission

3.8 Study work required to complete the course

Activity	**hours / semester**
participation in contact classes	42
preparation for laboratory practices	14
preparation for summary assessments	32
elaboration of a partial assessment task	30
additional time required to complete the subject	2
summary	**120**

3.9. Validity of subject requirements

Start of validity: 2022. January 1.

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 is familiar with the general and specific mathematical, scientific and social principles, rules, contexts and procedures needed to operate in the field of engineering.
- Student has the knowledge of metrology and measurement theory in the field of mechanical engineering.
- Student has the detailed knowledge of the rules for the preparation of technical documentation.

b) ability

- Student has the ability to apply the general and specific mathematical, scientific and social principles, rules, relationships and procedures acquired in solving problems in the field of engineering.
- Student has the ability to apply the theories and related terminology in an innovative way when solving problems in a given field of engineering.
- Student has the ability to deal with problems creatively, to solve complex problems in a flexible way, and to engage in lifelong learning and commitment to diversity and value-based approaches.

c) attitude

- Student strives to meet and enforce quality standards.

- Student strives to plan and carry out tasks to a high professional standard, either independently or in a team.
- Student is open and receptive to learning, embracing and authentically communicating professional, technological development and innovation in engineering.

d) independence and responsibility

- Student has the ability to work independently on engineering tasks.
- Student takes initiative in solving technical problems.
- Student takes responsibility for the sub-processes under student's management.

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)	Basic knowledge of fluid dynamics and thermodynamics. User-level informatics knowledge (MS Word, Excel).
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)	Previous experience in measurement tasks.