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)

Fluid Mechanics Measurements ● Fluid Mechanics Measurements

1.2. Neptun code

BMEGEÁTNG05

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)	1	-
exercise	-	-
laboratory exercise	2	coupled

1.5. Type of assessments (quality evaluation)

mid-term grade

1.6. ECTS

4

1.7. Subject coordinator

name:	Vad János Gábor (71958341366)
post:	university professor
contact:	vad@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/BMEGEATNG05

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

Introduce students to the following topics: Fluid dynamics measurements. Time averaged measurements: static, dynamic, total pressure. Pressure measuring devices: probes, methods. Manometers. Pressure-based measurement of velocity magnitude and direction. Anemometers, heat probes. Temperature measurement. Measurement of time-varying pressures. Mass flow measurement back to speed measurement and reducer; comparison. Special flow meters: ultrasonic, magneto-hydrodynamic, capacitive cross-correlation, Coriolis, vortex, rotameter, turbine, volumetric. Practical examples. Creative, interactive industry case studies. Laboratory group projects.

2.2. Learning outcomes

Competences that can be acquired by completing the course:

A. Knowledge

- Knows the theoretical foundations of flow measurement technology, especially for basic research, applied R & D & I, and industrial applications.
- He was informed about the measurement technical aspects and measurement needs of flow technology machines, equipment, systems, technological processes affected by flow technology, for both gaseous and liquid working media.
- He was informed about the applied measurement and evaluation procedures of flow technology machines, equipment, systems and technological processes involved in flow technology.
- He is aware of the basics of organizing flow measurement projects.
- Knows the basic instruments of flow measurement technology.
- He is aware of the principle of operation of special (non-differential pressure) flow meters.
- Knows the principle of operation of instruments for measuring rapidly changing pressures.
- He is aware of the principle of differential pressure speed measuring probes.
- Informed about the principle of total pressure, static pressure, dynamic pressure measuring probes.
- It recalls the types and operating principles of non-differential pressure measuring instruments.

B. Ability

- Able to select instruments for a given flow measurement task.
- Develops your flow engineering project organization skills through interactive industry case studies.
- He expresses his critical opinion, communicates with the instructor and his peers, makes a solution proposal, and presents solution variants.
- Able to critically evaluate, comparatively analyze and prepare decision-making technical data from flow measurement.
- It proposes to solve technical problems arising during practical projects with a standards-based approach.
- At a basic level, it operates the main flow measurement devices independently.
- Analyzes equipment data related to a specific industrial diagnostic task.

- Is able to master the approach of using measurement data for validation of modeling tools, including Computational Fluid Dynamics (CFD) tools.
- Prepares a quantified estimate of the measurement error in connection with industrial case field measurements, built-in instruments, laboratory experiments.
- It prepares the decision-making in connection with the purchases and investments of flow measurement technology.

C. Attitude

- He constantly monitors his work, results and conclusions.
- It expands your knowledge of energy management and sustainability through continuous learning.
- Open to the use of information technology tools.
- It strives to get to know and routinely use the tools needed for energy management and economic problem solving.
- It develops your ability to provide accurate and error-free problem solving, engineering precision and accuracy.
- It applies the principles of energy efficiency, sustainability and environmental awareness in solving energy management tasks.
- It monitors changes in the social, economic and political system.
- He publishes his results in accordance with his professional rules.
- It is in line with the expectations and requirements of engineering ethics. It publishes its opinions and views without offending others.
- He takes a critical and self-critical approach in his engineering work.

D. Independence and responsibility

- Collaborates with the instructor and fellow students to expand knowledge.
- Accepts well-founded professional and other critical remarks.
- In some situations, as part of a team, you work with your fellow students to solve tasks.
- With his knowledge, he makes a responsible, informed decision based on his analyzes.
- He feels responsible for energy, the problems of energy management and the sustainable use of the environment, as well as present and future generations.
- He is committed to the principles and methods of systematic thinking and problem solving.
- He feels a responsibility to pass on engineering knowledge to younger generations in terms of professional education.
- He defends his position in professional debates on the basis of rational arguments and counter-arguments.
- He feels responsible for the responsible execution of engineering tasks, occasionally for the creation of long-term engineering jobs.
- It is committed to an entrepreneurial approach that goes beyond task execution, adapting to the integration of engineering tasks into innovative R & D & I activities (basic research, applied research and development-innovation) and the competitive sector.

2.3. Teaching methodology

The subject is taught in an interactive lecture and laboratory practice. The lectures basically introduce students to the information defined by the knowledge competence elements, as well as the skill level elements, using the technique of frontal education, including interactive industrial problem-solving case studies. The application and skill-level acquisition of knowledge takes 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 substantiated in the framework of a mid-term essay

(price offer) and documented in the form of a technical report at the end of the semester, and then presented in the form of a presentation.

2.4. Support materials

a) Textbooks

Tamás Lajos: The basics of fluid dynamics. Vareg Hungary Kft. 2015. ISBN 978 963 12 2885 4.

b) Lecture notes

Vad, J., Advanced flow measurements. Technical University Publisher, 2008. Reference: 45085. ISBN 978 963 420 951 5.

c) Online materials

http://www.ara.bme.hu/oktatas/tantargy/NEPTUN/BMEGEATNG05

2.5. Validity of the course description

Start of validity:	2020. March 3.
End of validity:	2024. August 31.

II. SUBJECT REQUIREMENT

3. ACHIEVEMENT CONTROL AND EVALUATION

3.1 General rules

The evaluation of the study results is based on the following: 1) Interactive industrial problem-solving case studies, developed on questionnaires. 2) Closed dissertation. 3) Mid-term essay (price offer). 4) Technical report prepared on a project-type group mid-term task involved in flow measurement. 5) Presentation of the project task. The minimum requirement, for ALL performance CANDIDATES [1), 2), 3), 4), 5)] above, is to meet 40% of the maximum sub-score that can be awarded.

3.2 Assessment methods

A. Detailed description of mid-term assessments

1. Mid-term assessment

type: summative assessment

count: 1

purpose, description: Summative assessments collectively examine and assess students 'learning outcomes 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. Within this subject: Theoretical and application in-house dissertation, also referring to the jointly processed industrial case studies. Maximum score: 25.

2. Mid-term assessment

type: formative assessment, simple

count: 3

purpose, description: The basic aim of the partial performance assessment is to examine the existence of attitudes and learning outcomes belonging to the autonomy and responsibility competence group. The way to do this is to create a project task that can only be done in groups, and then to present it to the practical group. Within this subject: A) The price offer to be developed for the issued group project task as a mid-term essay. Maximum score: 20. B) Elaboration of the mid-term project task to be prepared in groups, documentation in the form of a technical report. Maximum score: 20. C) A series of creative problem-solving industry case studies developed in a small group in collaboration with the instructor, and a series of questionnaires documenting it. By doing so, it examines the existence of learning outcomes belonging to the competence group of skill, attitude, autonomy and responsibility. Rapid decision making, development of a critical practical approach. Maximum score: 15.

3. Mid-term assessment

type: formative assessment, project-based, complex

count: 1

purpose, description: Aim: An oral, slide-based summary presentation of the metrology project and its discussion, to practice and develop the student's presentation skills, discussion skills, critical approach, also for other groups. Asking critical questions as well as answering questions between each group of students is mandatory. The guidelines for the preparation of the presentation and the evaluation aspects are given to the students in advance. Maximum score: 20.

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	55 %
3 . 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 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.

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	16
elaboration of a partial assessment task	42
additional time required to complete the subject	6
summary	**120**

3.9. Validity of subject requirements

Start of validity:	2020. March 3.
End of validity:	2024. August 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 the theories and contexts of fundamental importance in the field of engineering and of the terminology which underpins them.

- Student has the knowledge of metrology and measurement theory in the field of mechanical engineering.

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 contribute original ideas to the knowledge base in the field of mechanical engineering.
- Student has the ability to apply and develop procedures, models and information technologies used in the design, organisation and operation of engineering systems and processes.

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

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)	-