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 Measurement Techniques (PhD) • Fluid Mechanics Measurement Techniques (PhD)

1.2. Neptun code

BMEGEÁT4A16

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	-	-

1.5. Type of assessments (quality evaluation)

exam

1.6. ECTS

3

1.7. Subject coordinator

name:	Dr. Vad János Gábor
post:	university professor
contact:	vad.janos@gpk.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/BMEGEAT4A16/

1.10. Course language

hungarian

1.11. Primary curriculum type

komplex vizsga tárgycsoport PhD tárgy

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

The aim of the course: to acquire measurement knowledge and skills based on basic flow and measurement studies in basic and master's programs, to apply flow measurement knowledge in a way that is customized to the doctoral program, to further develop it in a creative and practical way, taking into account research aspects, especially short-, medium- and long-term engineering and industrial applicability and utilization of research results.

2.2. Learning outcomes

Competences that can be acquired by completing the course:

A. Knowledge

- The student identifies the motives and basic knowledge included in his / her own doctoral research program: measurement theory, flow measurement techniques.
- The student knows the connection points of the research aspects of flow measurement measurement technology with other disciplines related to doctoral research (eg mathematical statistics).
- The student, starting from his engineering approach, identifies the practical aspects of the expected results of the doctoral research, its applicability in flow measurement technology.
- Based on his engineering approach, the student knows the engineering and industrial applications of the expected results of doctoral research.
- The student is basically informed about the measurement motives and flow engineering aspects of other doctoral programs cared for within the Doctoral School, based on the information provided by his / her peers.
- The student is informed about the current state of the field of fluid metrology ("State of the Art").
- The student is in possession of the basic criteria for the presentation of research results related to flow measurement.
- The student is aware of the basic connections of mathematical measurement techniques, mathematical descriptive equations, with special regard to error estimation.
- The student is aware of the basic principles of flow measurement technology introduced in research.
- The student is aware of the basic principles of mathematical modeling (eg CFD validation) related to fluid dynamics measurement research.

B. Ability

- Use the concepts of subject and research topic area.
- Analyzes the available domestic and international literature sources in the field.
- It interprets the characteristics of the flow processes characteristic of the research topic area and the factors influencing them.
- Is able to derive and calculate the quantities related to the subject and the research topic, typical for the field of flow measurement technology.
- It identifies the parameters related to the subject and the research topic, characteristic of the field of measurement technology, their theoretical and practical modification possibilities.

- Apply physical modeling knowledge related to the subject and its research topic, which is important in the field of measurement technology.
- Apply flow mathematical modeling knowledge important in the field of measurement technology related to the subject and its research topic.
- Is able to formulate key questions related to the subject and his / her research topic, related to important factors, parameters, physical characteristics in the field of measurement technology, important for modeling.
- Selects the appropriate methods for the specific measurement problem.
- Outlines the current engineering solutions, key theoretical issues and state-of-the-art practical solutions of the subject and the research topic area.

C. Attitude

- He constantly monitors his work, results and conclusions.
- It expands your knowledge of measurement technology through continuous acquisition of knowledge.
- Open to the use of information technology tools.
- It seeks to learn about and routinely use the tools needed to solve measurement problems.
- It develops your ability to provide accurate and error-free problem solving, engineering precision and accuracy.
- It strives for demanding engineering work and makes a decision based on careful consideration.
- It monitors changes in the social, economic and political system.
- He publishes his results in accordance with his professional rules.
- It publishes its opinions and views without offending others.

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 a responsibility for the sustainable use of the environment and for present and future generations.
- He is committed to the principles and methods of systematic thinking and problem solving.

2.3. Teaching methodology

A) In the lectures of the subject held at a given time on a weekly basis, the student gives a summary lecture related to the individual research topic of the student. B) The lecturer, in cooperation with the fellow students, raises critical questions, by answering and elaborating in detail the student can deepen the flow measurement and practical implications of the doctoral research. C) The student conducts a detailed literature search based on the critical questions and develops answers to the critical questions. D) Based on the elaborated answers, the student further develops the previous presentation and presents the improved presentation in dance. E) Based on the improved presentation, the student develops a short essay that - even as an appendix to the future PhD dissertation - strengthens the dissertation from a measurement point of view. During the solution of individual tasks, within the framework of the lectures or beyond that, consultation is possible.

2.4. Support materials

a) Textbooks

Tamás Lajos: Fundamentals of Fluid Mechanics. (Tamás Lajos, 2015.) ISBN 978 963 12 2885 4.

b) Lecture notes

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c) Online materials

http://www.ara.bme.hu/oktatas/tantargy/NEPTUN/BMEGEAT4A16/

2.5. Validity of the course description

Start of validity:	2025. January 1.
End of validity:	2029. July 15.

II. SUBJECT REQUIREMENT

3. ACHIEVEMENT CONTROL AND EVALUATION

3.1 General rules

INTERIM PERFORMANCE EVALUATION: a) Presentation 1: summary presentation related to the student's individual research topic. Possible score: max. 20%. b) Presentation 2: an improved summary presentation related to the student's individual research topic, further developed based on the critical questions defined by the instructor. Possible score: max. 30%. EXAMINATION: c) Essay: a 1 ... 5 page written summary essay to be prepared outside the contact hours, which can be mapped in both format and content to the appendix of the future PhD dissertation, according to the needs of the research program. Possible score: max. 50%. At the end of the semester, the result of the exam consists of 2 presentation elements of the mid-year performance evaluation and 1 exam paper.

3.2 Assessment methods

A. Detailed description of mid-term assessments

1. Mid-term assessment

type: formative assessment, point-in-time personal act

count: 1

purpose, description: A presentation lecture to be developed during the semester, linked to the PhD research, which helps to critically raise issues related to the doctoral topic, through theoretical and practical considerations. The aim of the partial achievement is to examine the existence of knowledge, ability, attitude, and learning outcomes belonging to the autonomy and responsibility competence group. Upon successful completion of the task, the student stabilizes and further develops the knowledge acquired before the start of the doctoral program in the field of flow measurement technology.

2. Mid-term assessment

type: formative assessment, point-in-time personal act

count: 1

purpose, description: A presentation lecture to be developed during the semester, linked to the PhD research, which helps to critically raise issues related to the doctoral topic, through theoretical and practical considerations. The aim of the partial achievement is to examine the existence of knowledge, ability, attitude, and learning outcomes belonging to the autonomy and responsibility competence group. Upon successful completion of the task, the student stabilizes and further develops the knowledge acquired before the start of the doctoral program in the field of flow measurement technology. Particular attention should be paid to the development compared to the previous performance appraisal in the presentation, which should answer the critical questions.

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

Elements of the exam:

1. written partial exam

obligation: mandatory (partial) exam unit, failing the unit results in fail (1) exam result

Essay: a 1 ... 5 page written summary essay to be prepared outside the contact hours, which can be mapped in both format and content as an appendix to the future PhD dissertation, according to the

description: needs of the research program. The content and form requirements of the essay must meet the quality of a dissertation, which greatly improves the students' ability to formulate their research results accurately in writing.

2. oral partial exam

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3. practical partial exam

-

4. inclusion of mid-term results

obligation: mandatory (partial) exam unit, failing the unit results in fail (1) exam result

description: The score for the so-called Presentation 1 computer-assisted oral summary presentation: up to 20%, the score for the so-called Presentation 2 computer-aided oral summary presentation: maximum 30%. The score obtained on these is 50% of the exam ticket. There is no other special way or rule for crediting the results of presentations than the results of mid-year work.

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

identifier	**weight**
1 . Mid-term assessment	40 %
2 . Mid-term assessment	60 %

The condition for signing is that the score obtained in the mid-year assessments is at least **40%**.

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

type	**weight**
written partial exam	50 %
oral partial exam	0 %
practical partial exam	0 %
inclusion of mid-term results	50 %

3.5 Determination of the grade

grade ● [ECTS]	**the grade expressed in percents**
very good(5) ● Excellent [A]	above 95%
very good(5) ● Very Good [B]	85% .. 95%
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).

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	28
exam preparation	21
additional time required to complete the subject	41
summary	**90**

3.9. Validity of subject requirements

Start of validity:	2025. January 1.
End of validity:	2029. July 15.

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 sciences PhD programme

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

b) ability

c) attitude

d) independence and responsibility

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)	BSc and MSc level flow theory and flow engineering theory; knowledge of physical and numerical modeling of flows; comprehensive knowledge of the design, performance and evaluation of flow simulation studies.

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)	Independent, creative engineering problem-solving ability, the ability to recognize and analyze the essential connections between complex flow phenomena and flow engineering processes.