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)

Acoustics I. (PhD) ● Acoustics I. (PhD)

1.2. Neptun code

BMEGEÁT4A13

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. Horváth Csaba (71949162105)
post:	adjunct
contact:	horvath@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/BMEGEAT4A13/

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 subject is to fill the gaps in the acoustic knowledge of Ph.D. students by taking into account their earlier studies. A further aim of the course is to acquaint students with the conditions of sound generation, propagation and attenuation, as well as with important theoretical methods of acoustics (wave-, beam-, and energetic acoustics). During the semester, students must solve an individual assignment related to their doctoral topic and present results.

2.2. Learning outcomes

Competences that can be acquired by completing the course:

A. Knowledge

- The student knows the subject of acoustics, the concept of sound, and its dual nature.
- The student knows the homogeneous acoustic wave equation, its general solution, its solution in a closed space, the operation of an organ pipe, and the concept of room acoustics.
- The student can distinguish between plane, cylindrical, and spherical waves.
- The student knows the concept of the acoustic resonator, the mathematical model of the Helmholtz resonator, and the fields of application of acoustic resonators.
- The student is familiar with the description of the propagation of sound waves in pipes, the higher modes of sound propagation, the method for calculating sound propagation through a sudden cross-section change and a pipe termination.
- The student is knowledgeable in the design of a simple expansion drum and in the calculation of sound propagation through a channel that has a continuously changing cross-section.
- The student is aware of the energetic conditions that occur during sound propagation, the concepts of effective sound pressure, sound intensity, and sound power.
- The student is aware of the basic models for the calculation of acoustic radiation.
- The student can recall the basic calculation methods of room acoustics.
- Understands point-like monopole, dipole, and quadrupole sound source models and their modeling laws.
- The student is aware of flow-induced sound phenomena, the Lighthill acoustic analogy, and the inhomogeneous acoustic wave equation.
- The student is aware of the reason for the attenuation of sound waves and the basic mathematical models involved.

B. Ability

- Applies the concepts of the subject and the research topic area.
- Analyzes the available domestic and international literature sources in the field.
- Interprets the characteristics of the sound space characteristic of the topic area and the factors influencing them.
- The student can derive and calculate quantities related to the subject and research topic specific to the field of acoustics.

- The student can identify the parameters related to the subject and the research topic, which are characteristic of the field of acoustics, and the possibilities for their theoretical and practical modification.
- Apply knowledge of phonological modeling important in the field of acoustics related to the subject and its research topic.
- Apply knowledge of phonological numerical modeling important in the field of acoustics related to the subject and the research topic.
- Can identify key issues related to the subject and the research topic, related to important factors, parameters, and physical characteristics in the field of acoustics.
- Selects test and modeling methods applicable to a specific acoustic problem.
- Outlines the current engineering solutions, key theoretical issues, and state-of-the-art practical solutions of the subject and the research topic area.
- Able to make simple mathematical models related to sound generation, propagation, and attenuation phenomena.
- Performs simple experimental studies on the phenomena of sound generation, propagation, and attenuation.

C. Attitude

- The student constantly monitors their work, results, and conclusions.
- The student continuously expands their knowledge of acoustics through the continuous acquisition of knowledge.
- Open to the use of information technology tools.
- Seeks to learn about and routinely use the equipment needed to solve acoustic problems.
- The student develops their ability to provide accurate and error-free problem solving, engineering precision, and accuracy.
- The student strives to carry out engineering work of high quality and makes decisions based on careful consideration.
- The student monitors changes in the social, economic, and political systems.
- The student publishes their results following the rules of the profession.
- The student publishes 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, the student works with fellow students to solve tasks.
- With the student's own knowledge, makes responsible, informed decisions based on analyzes.
- The student feels responsible for the sustainable use of the environment, and toward present and future generations.
- The student is committed to the principles and methods of systematic thinking and problem-solving.

2.3. Teaching methodology

The subject is taught at weekly lectures and consultations which are held at pre-arranged times. Students are given an individual assignment related to their research topic during the semester, which they must solve during the semester and report on the outcomes. Consultations regarding the solution of the individual assignment are possible within the framework of the lectures and beyond at an agreed time.

2.4. Support materials

a) Textbooks

AP Dowling, JE Ffowcs Williams: Sound and Sources of Sound, Ellis Horwood Limited, 1990, ISBN 0853124000

b) Lecture notes

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c) Online materials

http://www.ara.bme.hu/oktatas/tantargy/NEPTUN/BMEGEATAG15/

2.5. Validity of the course description

Start of validity:	2021. May 31.
End of validity:	2024. December 31.

II. SUBJECT REQUIREMENT

3. ACHIEVEMENT CONTROL AND EVALUATION

3.1 General rules

During the semester, the student solves an individual assignment closely related to the student's own doctoral research topic. During the semester, the theoretical lectures give each student the theoretical knowledge and methodologies needed to solve the assignments. Students work independently on their own assignments, and the lecturer is regularly consulted as they progress. At the end of the semester, students present the results in front of each other and prepare documentation. The grade is determined at the end of the semester based on the results of the exam and the results of the individual assignment.

3.2 Assessment methods

A. Detailed description of mid-term assessments

Mid-term assessment

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

count: 1

purpose, description: During the semester, the individual assignment related to Ph.D. research helps deepen the curriculum's acquisition through theoretical and practical calculations and derivations. In addition, the assignment aims to examine the existence of knowledge, ability, attitude, and learning outcomes belonging to the autonomy and responsibility competence groups. Upon successful completion of the individual assignment, the student stabilizes the knowledge acquired in the lectures.

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

description: On the written exam, the lecturer assigns five short answer questions and two questions to be explained in detail, as well as two calculation tasks from the curriculum, which the students develop over a given period of 180 minutes. No aids may be used during the development of the written examination tasks, and the answers may be drawn up only on an official worksheet issued by the department. The written exam is evaluated before the oral exam of the day.

2. oral partial exam

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

description: During the oral exam, the speaker asks three questions from the syllabus, which the students answer in detail at the board after a few minutes of reflection. No aids may be used in answering the oral examination. The assessment of the oral exam is done immediately after the answer is provided. The results of the oral exam and the results of the written exam provide the basis of the exam grade obtained in the exam.

3. practical partial exam

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4. inclusion of mid-term results

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

identifier	weight
Mid-term assessment	100 %

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	60 %
oral partial exam	40 %
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 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:	2020. March 10.
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_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)	B.Sc. and M.Sc. level basics of acoustics and flow theory; knowledge of physical and numerical modeling of sound phenomena; comprehensive knowledge of the design, implementation, and evaluation of results for phonological 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 relationships of complex acoustic processes.