SUBJECT DATA SHEET AND REQUIREMENTS

last modified: 30th of August 2018

ADVANCED TECHNICAL ACOUSTICS AND MEASUREMENT TECHNIQUES

ALKALMAZOTT MŰSZAKI AKUSZTIKA ÉS MÉRÉSI MÓDSZEREK

1	Code	Semester Nr. or fall/spring	Contact hours/week (lect.+semin.+lab.)	Requirements p / e / s	Credit	Language
	BMEGEÁTMW10	**4.(3.*)fall**	**2+0+0**	**p**	**3**	**English**

*: in case of enrolment in fall

2. Subject's responsible:

Name:	Title:	Affiliation (Department):
Dr. János VAD	full professor	Dept. of Fluid Mechanics

3. Lecturer:

Name:	Title:	Affiliation (Department):
Dr. Csaba Horváth	assistant professor	Dept. of Fluid Mechanics

4. Thematic background of the subject: Mathematics, Mechanics, Fluid Mechanics

5. Compulsory / suggested prerequisites:
Compulsory: -
Suggested: Technical Acoustics and Noise Control (BSc level) BMEGEÁTAG05, -AG15

6. Main aims and objectives, learning outcomes of the subject:
Presentation of acoustic design and measurement methods, common in the engineering practise.

7. Method of education: lecture 2h/w, seminar 0h/w, laboratory 0h/w. The theory and solved problems will be presented at the lectures, extra visit to the acoustic laboratory.

8. Detailed thematic description of the subject:
Turbulence and Sound
- 1.1 Aeroacoustics of Low Mach Number Flows
- 1.2 Sound Waves and Turbulence
- 1.3 Quantifying Sound Levels and Annoyance

Linear Acoustics
- 3.1 The Acoustic Wave Equation
- 3.2 Plane waves and Spherical waves
- 3.3 Harmonic Time Dependence
- 3.4 Sound Generation by a Small Sphere
- 3.5 Sound Scattering by a Small Sphere
- 3.6 Superposition and Far Field Approximations
- 3.8 Acoustic Intensity and Sound Power Output

Lighthill's Acoustic Analogy

4.1 Lighthill's Analogy
4.3 Curle's theorem
4.4 Monopole, Dipole and Quadrupole Sources

Turbulence and Stochastic Processes
8.1 The Nature of Turbulence
8.2 Averaging and the Expected Value
8.3 Averaging of the Governing Equations and Computational Approaches
8.4 Description of Turbulence for Aeroacoustic Analysis

Aeroacoustic Testing and Instrumentation
10.1 Aeroacoustic Wind Tunnels
10.2 Wind Tunnel Acoustic Corrections
10.3 Sound Measurement
10.4 The Measurement of Turbulent Pressure Fluctuations
10.5 Velocity Measurement

Measurement, Signal Processing and Uncertainty
11.1 Limitations of Measured Data
11.2 Uncertainty
11.3 Averaging and Convergence
11.4 Numerically Estimating Fourier Transforms
11.5 Measurement as seen from the Frequency Domain
11.6 Calculating Time Spectra and Correlations
11.7 Wavenumber Spectra and Spatial Correlations

Phased Arrays
12.1 Basic Delay and Sum Processing
12.2 General approach to array processing
12.3 Deconvolution Methods
12.4 Correlated Sources and Directionality
12.5 Methods Based on Source Models

9. Requirements and grading

a) in term-period:

Attending the lectures, and acquiring at least a passing grade on the mid-term exam on the 14th week. The mid-term exam contains a written exam, and an oral exam. The maximum score on the mid-term exam is max. 100 points. The result of the oral part is "pass" or "fail", and optionally maximum 15 extra points. The total exam result will be the sum of the points of the mid-term exam and the oral examination points.
Totally maximum achievable 100 points equal to 100% as base of the final grading.
Grading: 0%-39%: fail(1); 40%-54% pass(2), 55%-69%: satisfactory (3), 70%-84%: good(4), 85%-100%: excellent (5)

b) in examination period: -

c) The students are subject to disciplinary measures against the application of unauthorized means at mid-terms, term-end exams and homework and the application of the 1/2013. (I.30.) Dean's Order must be followed.

10. Retake and repeat

In a case of a failed mid-term tests, the students can repeat the test on the 15th week (week for retakes). The retake test will contain a written exam (for max. 100 points), and an oral exam ("pass" with optional max. 15 extra points, or "fail").
Any further movements are due to the Code of Studies and Exams of BME.

11. Consulting opportunities:

Consultation hours: By email appointments and as it is indicated on the department's website.

12. Reference literature:

- Books:

THE COURSE FOLLOWS THE FOLLOWING BOOK:

S. Glegg and W. Devenport: Aeroacoustics of Low Mach Number Flows: Fundamentals, Analysis, and Measurements, Academic Press, 2017, ISBN 978-0-12-809651-2

ADDITIONAL READING MATERIAL:

A.P. Dowling, J.E.Foowcs Williams: Sound and Sources of Sound, Ellis Horwood Limited, 1983, ISBN 0-85312-400-0

Leo L. Beranek: Noise and Vibration Control, Institute of Noise Control Engineering, 1988, ISBN 0-9622072-0-9

- Downloadable materials: www.ara.bme.hu/oktatas/tantargy/NEPTUN/BMEGEATMW10

13. The approximate home study required to pass the subject:

Contact hours	28	h/semester
Home study for the courses	14	h/semester
Home study for the mid-semester checks	48	h/check
Preparation of mid-semester homework	-	h/homework
Home study of the allotted written notes	-	h/semester
Home study for the exam	-	h/semester
Totally:	**90**	**h/semester**

14. The data sheet and the requirements are prepared by:

Name:	Title:	Affiliation (Department):
Dr. Csaba HORVÁTH	assistant professor	Dept. of Fluid Mechanics

Hungary, 1111 Budapest, Bertalan L. u. 4-6.
Telefon: (36-1) 463-4072 Fax: (36-1) 463-3464
http://www.ara.bme.hu