Budapesti Műszaki és Gazdaságtudományi Egyetem
Gépészmérnöki Kar
Áramlástan Tanszék

Budapest University of Technology and Economics (BME)
Faculty of Mechanical Engineering
Department of Fluid Mechanics (DFM)

Gépészmérnöki alapszak BSc
Kötelező tantárgy

Bachelor of Science in Mechanical Engineering
Mandatory subject

SUBJECT DATA SHEET AND REQUIREMENTS
(TANTÁRGY ADATLAP ÉS TANTÁRGYKÖVETELMÉNYEK)

For Academic Year 2012/2013, Semester 6 (Spring), final modification: 2013.09.13.

TECHNICAL ACOUSTICS AND NOISE CONTROL (MŰSZAKI AKUSZTIKA ÉS ZAJCSÖKKENTÉS)

1.	Code (kód)	Semester (szemeszter)	Subject size (lect.+sem.+lab.) (kiméret, ea.+gyak.+lab.)	Requirements (követelmény)	Credit (kredit)	Language (nyelv)
	BMEGEÁTAG15	6. (spring)	2+0+l	e (v)	3	English (angol)

2. Responsible person and Department (a tantárgyfelelős személy és tanszék):

Name (név):	Status (beosztás):	Department (tanszék):
Dr. János VAD	Associate Professor, Head of the Department (egyetemi docens, tanszékvezető)	BME Department of Fluid Mechanics (BME Áramlástan Tanszék)

3. Lecturer (a tantárgy előadója):

Name (név):	Status (beosztás):	Department (tanszék):
Dr. Gábor KOSCSÓ	Titular Associate Professor (címzetes egyetemi docens)	BME Department of Fluid Mechanics (BME Áramlástan Tanszék)

4. The thematic background of the subject (tantárgy az alábbi témakörök ismeretére épít):

Mathematics, Mechanics, Fluid Mechanics.

5. Compulsory/ suggested pre-request (kötelező előtanulmányi rend):

Fluid Mechanics BMEGEÁTAG11 (4. semester)

6. Main objectives of the subject (a tantárgy célkitűzése):

The description of basic acoustic principles, application areas. The subject includes introductory courses on acoustic and noise control engineering design and measurement techniques used on mechanical and environmental engineering.

7. The education methodology of the Subject (A tantárgy oktatásának módja):

14x2 hour lecture presenting the theoretical parts and solved problems, and 14x1 hour (in 2+6+6 hour parts) laboratory preparation and individual measurement exercises.

8. The short thematic description of the subject (a tantárgy rövid tematikája):

1. Concept of acoustics, classification of the subject. The concept of sound, two-fold nature of sound. Sound in different mediums and sound classified as a function of frequency and effective sound pressure.
2. Linear acoustic model. The mathematic and physical consequence of the linearity and speed of sound. Homogeneous wave equation.
3. The general solution of the homogeneous wave equation. Harmonic waves, trigonometric and complex representation. The solution of the wave equation in a bounded space, organ pipe and room natural frequencies.
4. Model testing and similitude, Helmholtz-number. Characteristic composition of harmonic waves, standing wave and beat.
5. Acoustic resonators, the natural frequency of a Helmholtz-resonator and examples. Harmonic analysis, sound spectra, octave band. The pitch and colour of a sound, consonance and dissonance.
6. Energetic relations of acoustic waves. Kinetic and potential energy density, sound intensity, sound power, RMS value and levels. Calculation with levels. Transmission loss, insertion loss, noise reduction. Impedances.
7. Spherical waves, sound sources, monopole, dipole, longitudinal and lateral quadrupole radiators. The acoustic source model law.
8. Sound propagation in the atmosphere, far field approximation of point and line sources. Attenuation of sound waves in gases, liquids and porous solid mediums. The meteorological effects of the free field sound propagation.

9. Normal transmission of the sound from one medium to another, and transmission of obliquely incident sound waves. The transmission loss of the simple layer walls.
10. Sound propagation in duct and higher order modes. The transmission of sound at he end of a tube, exponential horns, expansion chamber and side branch resonators.
11. The energetical model of closed sound space. Direct and reverberant sound fields, equivalent absorbing area, room constant, reverberation time.
12. The subject of noise control. Physiological effects of noise. Subjective measurement units, phon, dB(A), equivalent sound pressure level. The general methodology of noise control.
13. Noise generated by mechanical, fluid mechanical and thermal processes and their reduction. Noise control in free and in bounded space. Personal noise protection.
14. Acoustic measurements, microphones, analysers, calibrators, anechoic and reverberating chambers

9. Requirements (követelmények):

To be present at the lectures and laboratory works. To hand in at least passing level laboratory measurement reports till the deadline. The maximum achievable score for 1 perfect laboratory report is 10 point. The laboratory work and the measurement report cannot be made up later. At least passing level examination, that contains written and, depending on the Department opinion, oral part. The maximum score at the written examination is 80 point, the result of the oral part is pass or fall and optionally maximum 15 extra point. The total examination result will be the sum of the measurement report points and the written and oral examination point. The maximum achievable examination score is 100 point. The final examination mark with the Hungarian (BME) and ECTS grading scale:

Points achieved	Hungarian grade	ECTS equivalent	Explanation for the Hungarian grade
85-100	5	A	Excellent
70-84	4	B	Good
55-69	3	C	Satisfactory
40-54	2	D	Pass
0-39	1	F	Fail
	Nem jelent meg	DNA	Did not attend (no credit)
	Nem vizsgázott	I	Incomplete (no credit)
	Aláírva	S	Signed (no credit)
	Megtagadva	R	Refused (no credit)

All important subjects will be discussed during the lectures and therefore your attendance is essential. The attendance of the course has certain rules, automatic assignment of Fail (1) grade in case of cheating during exams and/or plagiarism, no incompletes, and no make-up exams.

10. Consulting opportunities, availability (konzultációs lehetőség, elérhetőség):

At the Department in prearranged appointment.
(Availability: office phone number: 4633187, e-mail address: koscso@ara.bme.hu)

11. Recommended literature (javasolt irodalom):

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

12. Approximate time to pass the subject (a tantárgy elvégzéséhez szüséges becsült munkaidő):

Contact hours at the university: 14x2 hour lecture, and 14x1 hour (in 2+6+6 hour parts) laboratory work total 42hour per semesters.

Home study: ~1hours/week during the semester, plus ~30hour before the exam total ~44 hour.

13. The data sheet and the requirements are prepared by (a tantárgy tematikáját kidolgozta):

Name (név):	Status (beosztás):	Department (tanszék):
Dr. Gábor KOSCSÓ	Titular Associate Professor (címzetes egyetemi docens)	BME Department of Fluid Mechanics (BME Áramlástan Tanszék)