

BASICS OF ACOUSTICS

Subject (module) title		Subject code	Study Programme (s)	
Basics of Acoustics		B001119	<i>Composition, Music Folklore, Film Art (Sound Design)</i>	
Lecturer (-s)		Department where the subject is delivered		
Coordinator: prof. Rytis Ambrazevičius, PhD		Department of Ethnomusicology		
Study cycle		Type of the subject (module)		
First (bachelor)		Optional		
Mode of delivery	Semester or period when the subject is delivered		Language (s) of instruction	
Classwork	Autumn / Spring semester / <i>Composition, Folk Music, Film Art (Sound Design)</i> All programs		English	
Prerequisites and co-requisites				
Preliminary requirements: Knowledge of theory of music compatible with the requirements of entrance exams			Neighbouring requirements (if any): None	
Number of ECTS Credits	Total Student's load	Contact hours	Self-study hours	
3	80	36	44	
Purpose of the subject (module)				
Delivering of basic knowledge about acoustics, its scope, phenomena, and methods of study; formation of basic skills of acoustical analysis.				
Short Abstract of the subject (module) (up to 500 characters)				
<i>Basics of acoustics</i> is a study subject of introductory character; it introduces the main concepts and terms of acoustics, sonic features, objective and subjective sonic phenomena, sound in rooms, general criteria for room acoustics and methods of their realization. Study methods: lectures, consultations, self-study. Assessment methods: test, exam.				

Programme competences to be delivered (numbers of programme (s) learning outcomes)	Learning outcomes of the subject (module)	Teaching and learning methods	Assessment methods
Ability to think analytically, analyze and systematize information, solve problems, and create new ideas.	A student will know and will be able to explain the main concepts of acoustics, characterize the object of acoustics, differentiate between the objective and subjective sonic phenomena, and evaluate sound parameters from the graph of the sound signal.	Interactive lecture consultation, analysis of text and acoustical analysis, self-study	<i>Summative assessment:</i> test, exam
Ability to analyze musical structures.	A student will be able to analyze the sound spectrum, evaluate the phenomena of sound propagation: reflections, refraction and diffraction		
Ability to choose the right instruments, measures, genre and musical context.	A student will know the acoustical fundamentals of perception of loudness, pitch, and timbre.		
Ability to think critically and self-critically	A student will be able to justify the phenomena of development of musical scales; differentiate between the parameters of tonal material and modal scale.		
Ability to choose appropriate instruments, measures, genre and musical context.	A student will be able to design mathematically Pythagorean scale, Just intonation, and versions of various temperaments; also to calculate their intervals and to evaluate suitability of the scales for certain music.		
Ability to choose appropriate instruments, measures, genre and musical context.	A student will be able to evaluate acoustics of a concert hall, to indicate its essential faults, and to suggest the ways of their removal.		

Topics	Time (hours) and assignments of contact and self-study hours								Assignments	
	Lectures in large groups	Individual lectures	Seminars	Practical training in small groups	Practical training in large groups	Preparation for the exam / Rehearsals / Consultations	Exam / Pass/Fail	Total contact work		Self-study hours
1. Introduction	2							2		
2. Sound. Origin of sound. Objective and subjective sound. Sound vibrations, their amplitude, form, and period. Sound waves, their wavelength and speed	4							4	4	Analysis of text and acoustical analysis
3. Sound. Sound pressure and level. Energy parameters of sound. Dynamical range. Sound envelope	2							2	4	
4. Sound. Sound frequency, relation between frequency and period. Relation between pitch and frequency. Pitch standard	2							2	4	
5. Sound spectrum. Kinds of sounds. Time and frequency images of a sound. Pure tone, its spectrum. Complex tone, its spectrum. Partial: fundamental, harmonics, overtones. Noises, mixed sounds, pulse sounds; their spectra	2							2	4	
6. Sound propagation. Spherical and plane waves. Change of intensity of a propagating sound wave. Sound reflections, echo, absorption, diffraction, refraction	2							2	4	Analysis of text
7. Physiological and psychological acoustics. Loudness. Loudness level. Fletcher-Munson diagram. Range of hearing. Masking. Compression of sound information	2							2	2	
8. Physiological and psychological acoustics. Pitch, timbre, subjective duration. Absolute pitch	2							2	2	
9. Natural scales. Origin of musical scale. Tonal material and modal scale. Pythagorean tuning. Just intonation	2							2	2	Analysis of text and mathematical analysis
10. Temperaments. Non-equal temperaments. Equal temperaments. Relation of musical scale and kind of music	2							2	2	
11. Sound phenomena in rooms. Direct sound. Early reflections. Reverberation, its formation.	2							2	2	Analysis of text and acoustical analysis
12. Criteria for good acoustics of a room and methods of their realization. Clarity. Uniformity. Envelopment. Freedom from echo. Optimal reverberation. "Warmth," "deepness." Performer satisfaction. Freedom from background noise. Precedence effect and its handling in sound reinforcement.	2							2	2	Analysis of text and acoustical analysis
13. Reverberation time. Dependence of reverberation time on room volume and surfaces (area and absorption). Evaluation of reverberation time. Optimal reverberation times for various types of music and room sizes.	4							4	4	Analysis of text, acoustical and mathematical analysis

Correction of room acoustics. Acoustics of typical concert halls in the world.										
14. Final lecture	2							4	8	Analysis of text
15. Exam						2	2	4		
Total:	32	0	0	0	0	2	2	36	44	

Assessment strategy	Weight in per cent	Deadline for completing the assignments	Assessment criteria
Test	50 per cent	Beginning of November	Written test. Evaluation based on the percentage of correct answers: 8,33% correct answers – 1 point; 16,67% correct answers – 2 points; 25% correct answers – 3 points; 33,33% correct answers – 4 points; 41,67% correct answers – 5 points; 50% correct answers – 6 points; 62,5% correct answers – 7 points; 75% correct answers – 8 points; 87,5% correct answers – 9 points; 100% correct answers – 10 points
Exam	50 per cent	During the exam session	Oral exam. Evaluation based on the percentage of correct answers: 8,33% correct answers – 1 point; 16,67% correct answers – 2 points; 25% correct answers – 3 points; 33,33% correct answers – 4 points; 41,67% correct answers – 5 points; 50% correct answers – 6 points; 62,5% correct answers – 7 points; 75% correct answers – 8 points; 87,5% correct answers – 9 points; 100% correct answers – 10 points

Author	Publication date (year)	Title	No. of periodical or volume	Publisher (place, publishing office) or Web link
Compulsory study material				
Rossing T. D., Moore R. F., Wheeler P. A.	2002	<i>The Science of Sound</i>	3rd edition	San Francisco: Addison Wesley
Hall D. E.	2002	<i>Musical Acoustics</i>	3rd edition	Pacific Grove, CA: Brooks/Cole
Howard D. M., Angus J. A. S.	2017	<i>Acoustics and psychoacoustics</i>	5th edition	New York, London: Routledge
Additional study material				
Everest F. A., Pohlmann K. C.	2009	<i>Master Handbook of Acoustics</i>	5th edition	New York: McGraw-Hill
Rossing T. D., ed.	2014	<i>Springer Handbook of Acoustics</i>	2nd edition	Berlin, Heidelberg: Springer-Verlag

Approved by Department of Ethnomusicology: date and No. of Department Report		
No. and date of registration in study subjects (modules) register		