

RTU Course "Electroacoustics"

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General data

Code	RRI405
Course title	Electroacoustics
Course status in the programme	Compulsory/Courses of Limited Choice
Responsible instructor	Dmitrijs Pikuļins
Academic staff	Vitālijs Aišpurs Ruslans Babajans
Volume of the course: parts and credits points	1 part, 3.0 credits
Language of instruction	LV, EN
Annotation	Electroacoustics is a physical phenomenon, is a part of modern civilization and cultural factors. Students are introduced to the acoustic field during the study course, subjective properties of sound in speech and music perception, sound signal distortion, room acoustics, and electromechanical transformation. Students are introduced to microphones, sound emission, speakers and acoustic structures. The acquisition of the study course is facilitated by laboratories and practical work for measuring and evaluating the acoustic properties of microphones, speakers, acoustic units and rooms.
Goals and objectives of the course in terms of competences and skills	The goal of the study course is to provide students with knowledge in electroacoustic. The tasks of the study course are to provide in-depth knowledge of processes in radio and TV broadcasting systems, electromechanical converters, dynamic analogy methods for calculating microphones and speakers, thus creating a special physical view that allows solving mechanical, acoustic and other problems conveniently.
Structure and tasks of independent studies	Independent survey of literature. Analysis of laboratory works and evaluation of the methodology used. Development of potential optimization options.
Recommended literature	Obligātā/Obligatory: 1. Barenek L.L. and Mellow T.J., Acoustics: Sound Fields and Transducers, Academic Press is an imprint Elsevier, MA USA, 2012, ISBN:978-0-12-391421-7, 704 pp. 2. Kleiner M., Electroacoustics, CRC Press, FL USA, 2013, ISBN: 978-1-4398-3618-7, 596 pp. 3. Everest F.A. and Pohlmann K.C., Master Handbook of Acoustics, 6-th edition, Mc Graw Hill Education, USA, 2015, ISBN 978-0-07-184104-7, 622pp. 4. Steven L. Garrett. Understanding Acoustics: An Experimentalist's View of Sound and Vibration (Graduate Texts in Physics). Springer; 2nd edition 2020. (1619 p.) Papildu/Additional: 5. K.Tomariņš. Radio elektroakustika. Rīga: Zvaigzne, 1978. 6. K.Tomariņš, E. Zablovskis. Radio elektronika. Rīga: Zvaigzne, 1985. 7. H.Hellmann. Technisch-praktische Akustik. Fachbuchhochschule für Technik. Lübrck, 1983. 8. K.Tomariņš. Elektroakustika. Lekciju piezīmes. Rīga: Rīgas Tehniskā universitāte, 2003.
Course prerequisites	Knowledge in general physics, higher mathematics, linear electrical circuits.

Course contents

Content	Full- and part-time intramural studies		Part time extramural studies	
	Contact Hours	Indep. work	Contact Hours	Indep. work
Acoustic field. Subjective characterization of sound. Sound signal parameters. Room acoustics. Reverberation.	5	5	0	0
Acoustic isolation. Sound workshop. Theory of electromechanic conversation. Inversion of converters.	5	5	0	0
Dynamic electromechanical analogy. Electroacoustic analogy. Types and characteristics of microphones.	5	5	0	0
Design of microphones. Theory of sound radiation. Loudspeakers. Acoustic systems.	5	5	0	0
Laboratory work: measurement of damping factor, measurement of non-linear distortions.	5	5	0	0
Laboratory work: measurement of loudspeaker impedance, evaluation of acoustic system directional diagram.	5	5	0	0
Practice: absolute calibration of microphone, measurement of reverberation time.	5	5	0	0
Practice: analysis of loudspeaker amplitude-frequency curve, analysis of microphone directional characteristics.	5	5	0	0
Total:	40	40	0	0

Learning outcomes and assessment

Learning outcomes	Assessment methods
Orients in the theoretical knowledge of study course topics.	Tests during lectures and in the virtual space. Part of exam.

Knows the subjective properties of hearing and according to them is able to calculate and design microphones, speakers and their systems.	Ability to apply skills in practical work, in the analysis of laboratory work results. Part of the exam.
Is able to use an electroacoustic analogy for simulation and designing electromagnetic converters.	Ability to apply skills in practical work, in the analysis of laboratory work results. Part of the exam.
Is able to install and use audio systems indoors and outdoors	Ability to apply skills in practical work, in the analysis of laboratory work results. Part of the exam.

Evaluation criteria of study results

Criterion	%
Tests and discussions	40
Laboratory works	40
Exam	20
Total:	100

Study subject structure

Part	CP	Hours			Tests		
		Lectures	Practical	Lab.	Test	Exam	Work
1.	3.0	1.0	0.5	0.5		*	