

Specification for the book of courses

Study program		Electrical Engineering and Computer Science		
Module		Electronics - Multimedia technologies		
Type and level of studies		Undergraduate Academic Studies		
The name of the course		Acoustics		
Lecturer (for lectures)		Ćirić G. Dejan		
Lecturer/associate (for exercises)		Panajotović S. Aleksandra		
Lecturer/associate (for OFE)		Ćirić G. Dejan		
Number of ECTS		6	Course status (obligatory/elective)	Obligatory
Prerequisites				
Mastering basic theoretical and practical knowledge about the nature of sound, generating and transmitting sound, sound perception, sound sources, transducers, room acoustics, sound recording and reproduction. Gaining knowledge about audio signals and systems, their characteristics and applications.				
Course objectives				
Theoretical knowledge about sound. Application of theoretical knowledge in order to acquire skills for the use of acoustic devices and audio equipment, studio space and related programs. Skills of sound recording and processing.				
Course outcomes				
Theoretical knowledge about sound. Application of theoretical knowledge in order to acquire skills for the use of acoustic devices and audio equipment, studio space and related programs. Skills of sound recording and processing.				
Course outline				
Physical characteristics of sound (generation and transmission of sound waves, quantification of the sound field). Electro-acoustical transducers: microphones, speakers, headphones (operating principles and characteristics). Standard microphones and special-purpose microphones (high directivity microphones and microphone arrays for 3D sound recording). Psycho-physiological acoustics: sound perception (intensity, pitch and timber); subjective perception of sound, equal loudness curves, binaural localization, effects of masking. Spatial dimensions of the sound image (stereo techniques for positioning of objects in the sound image, binaural technique, multi-channel formats). Room acoustics - sound in enclosed space. Acoustical design of rooms (acoustic quality of professional venues). Standards of sound recording and sound reproduction in analog and digital domain. Formats and compression of audio signals. Time and frequency analysis of audio signals. Speech intelligibility. Features of music signals (melody, rhythm, dynamics, interpretation, production). Features of ambient sounds.				
Theoretical teaching				
Problem solving in computational exercises (Sound transmission and sound sources. Electro-acoustical transducers. Input and output acoustical environment. Psychological acoustics. Sound recording and reproduction). Use of standard procedures and software tools for sound processing (Sound Forge, Praat, Adobe Audition, WaveLab). Computer simulations (Room acoustics). Practical lab and studio exercises (Characteristics of electro-acoustical transducers (speakers, cross-overs, and headphones). Room impulse response and objective parameters of room acoustics. Sound recording and reproduction. Microphone techniques).				
Practical teaching (exercises, OFE, study and research work)				
Problem solving in computational exercises (Sound transmission and sound sources. Electro-acoustical transducers. Input and output acoustical environment. Psychological acoustics. Sound recording and reproduction). Use of standard procedures and software tools for sound processing (Sound Forge, Praat, Adobe Audition, WaveLab). Computer simulations (Room acoustics). Practical lab and studio exercises (Characteristics of electro-acoustical transducers (speakers, cross-overs, and headphones). Room impulse response and objective parameters of room acoustics. Sound recording and reproduction. Microphone techniques).				
Textbooks/references				
1	T. D. Rossing: Springer handbook of acoustics, Springer, New York, 2007.			
2	G. Ballou: Handbook for sound engineers, 4th edition, Elsevier, Focal Press, Burlington, 2008.			
3	J. Blauert, N. Xiang: Acoustics for engineers - Troy lectures, 2nd edition, Springer, Berlin, 2009.			
4	D. R. Raichel: The science and applications of acoustics, 2nd edition, Springer, New York, 2006.			
5	L. E. Kinsler, A. R. Frey, A. B. Coppers, J. V. Sanders: Fundamentals of acoustics, 4th edition, John Wiley & Sons, New York, 2000.			
Number of classes of active education per week during semester/trimester/year				
Lectures	Exercises	OFE	Study and research work	Other classes
2	2	1	0	0
Teaching methods				
Lectures; Computational exercises; Laboratory sessions; Studio exercises; Consultations.				
Grade (maximum number of points 100)				
Pre-exam duties		Points	Final exam	Points
Activity during lectures		5	Written exam	25
Exercises		20	Oral exam	25
Colloquia		25		
Projects				