



Subject card

Subject name and code	Musical Acoustics, PG_00048331						
Field of study	Electronics and Telecommunications						
Date of commencement of studies	February 2023		Academic year of realisation of subject		2023/2024		
Education level	second-cycle studies		Subject group		Optional subject group Subject group related to scientific research in the field of study		
Mode of study	Full-time studies		Mode of delivery		at the university		
Year of study	2		Language of instruction		Polish		
Semester of study	3		ECTS credits		2.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Department of Multimedia Systems -> Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. inż. Bożena Kostek				
	Teachers		prof. dr hab. inż. Bożena Kostek dr inż. Karolina Marciniuk prof. dr hab. Mariusz Mróz mgr inż. Wanda Ludwikowska dr inż. Bartłomiej Mróz				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0	0.0	30
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	Number of study hours	30		2.0		18.0	50
Subject objectives	The aim of the course is to familiarize students with the issues underlying musical signal and musical data processing.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K7_W03] Knows and understands, to an increased extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum.		Student has got knowledge in the fields of musical acoustics and music informatics. Student has got knowledge in characteristics of musical instruments. Student has got knowledge in musical notation, analysis and parametrization of musical signals.		[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects		
	[K7_U04] can apply knowledge of programming methods and techniques as well as select and apply appropriate programming methods and tools in computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study, making assessment and critical analysis of the prepared software as well as a synthesis and creative interpretation of information presented with it		Student can use the knowledge in the field of musical acoustics in music informatics. The student is able to use musical notation, analysis and parameterization of musical signals in the music information retrieval.		[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools		

Subject contents	<u>Lecture</u> 1. Introduction. References 2. Musical Systems. Equal Tempered Scale 3. Musical Scales. Musical Notation 4. Musical Instruments Families and Types. Musical Instruments Characteristics. Musical Instruments Sound Generation 5. Pipe Organ Characteristics. Modeling of Pipe Organ Control System 6. Signal Processing Analysis of Musical Sounds. Sonograph Analysis 7. Time-Frequency Domain Analysis of Musical Instrument Sounds. Pitch Detection Algorithms 8. Musical Instrument Sound Parametrization. 9. Time Domain-Based Parameters. Frequency Domain-Based Parameters. Time-Frequency Domain-Based Parameters 10. MPEG-7 Standard Descriptors 11. Analysis of Singing. Singing Voice - Types 12. Vocal Tone Extraction. Formant Analysis of Singing 13. Musical Sound Separation. Blind Signal Separation Algorithms 14. Music Information Retrieval systems, Query-by Humming (QBH) and Query-by-Example (QBE) systems, multimedia music databases 15. Lecture summary 16. Exam <u>Laboratory</u> 1. Introduction, organizatory meeting. 2.Signal analysis of typical aerophones, chordophones and idiophones. 3. Wavelet analysis of musical instrument sounds. 4. Parameterization of musical instrument sounds in the Matlab system. 5. Fundamental frequency detection in the Matlab system. 6. Sound timbre recognition of musical instruments. 7. Parametrical analysis of the singing voice. 8. Laboratory evaluation and discussion		
	Prerequisites and co-requisites		
	Assessment methods and criteria	Subject passing criteria	Passing threshold
	Midterm colloquium	50.0%	50.0%
	Practical exercise	50.0%	50.0%
Recommended reading	Basic literature	J. C. Brown, Computer indentification of musical instruments using pattern recognition with cepstral coefficients as features, J. Acoust. Soc. Am., vol. 105, pp. 1933-1941, 1999. C. Djeraba, Multimedia Mining. A Highway to Intelligent Multimedia Documents, Kluwer Academic Publishers, 2003. M. Drobner, Akustyka muzyczna, PWM, 1972. Musical Instrument Sounds of the Symph. Orchestra, Multimedia Pr. Co.(CD-ROM) B. Kostek, and A. Czyzewski, Representing Musical Instrument Sounds for their Automatic Classification, J. Audio Eng. Soc., vol. 49, No. 9, pp. 768 785, 2001. M. Mayvbury, Intelligent Multimedia Information Retrieval, AAAI Press/The MIT Press, 1997. B. Kostek, Soft Computing in Acoustics, Applications of Neural Networks, Fuzzy Logic and Rough Sets to Musical Acoustics, Studies in Fuzziness and Soft Computing, Physica Verlag, Heidelberg, New York, 1999. C. Sachs, Historia instrumentów muzycznych, PWM, 1989. Musical Instruments (Chestnut New Media CD-ROM). Http://www.ismir.net/	
	Supplementary literature	No requirements	
	eResources addresses	Adresy na platformie eNauczanie: Akustyka muzyczna - 2024 - Moodle ID: 18344 https://enauczenie.pg.edu.pl/moodle/course/view.php?id=18344	
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		