GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Musical Acoustics, PG_00048331		
Field of study	Electronics and Telecommunications		
Date of commencement of studies	February 2024	Academic year of realisation of subject	2024/2025
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	

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_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.	[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information
[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.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge

<table>
<tr><td>Subject contents</td><td><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</td></tr>
<tr><td>Prerequisites and co-requisites</td><td></td></tr>
<tr><td>Assessment methods and criteria</td><td>
<table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Practical exercise</td><td>50.0%</td><td>50.0%</td></tr>
<tr><td>Midterm colloquium</td><td>50.0%</td><td>50.0%</td></tr>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>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/</td></tr>
<tr><td>Supplementary literature</td><td>No requirements</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td></td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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