POZNAN UNIVERSITY OF TECHNOLOGY

EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)

COURSE DESCRIPTION CARD - SYLLABUS

Course name
Audio and Speech Processing [S2Teleinf2-ZTM>DM]

Course

Field of study Teleinformatics	**Year/Semester** 2/3
Area of study (specialization) Advanced multimedia techniques	**Profile of study** general academic
Level of study second-cycle	**Course offered in** Polish
Form of study full-time	**Requirements** compulsory

Number of hours

Lecture 14	**Laboratory classes** 24	**Other** 14
Tutorials 0	**Projects/seminars** 0	

Number of credit points

4,00

Coordinators

dr hab. inż. Dawid Mieloch prof. PP
dawid.mieloch@put.poznan.pl

Lecturers

Prerequisites

A student has basic knowledge of sound acquisition, processing, compression, transmission and presentation. A student has knowledge of programming and working in the Matlab environment.

Course objective

The course acquaints with the latest technologies in the field of sound processing, in particular with issues related to transmission (streaming) and data storage, presentation and processing. Gaining the knowledge and practical use cases of audio signal quality assessment methods and analysis of signal distortions introduced by compression techniques.

Course-related learning outcomes

Knowledge:
K2_W01 Has extensive knowledge in the area of specific branches of mathematics, including aspects of mathematical analysis, stochastic processes, optimisation strategies and numerical methods, necessary for:
modelling and research of advanced sound and speech processing devices and systems and related physical phenomena

description, analysis and synthesis of complex audio and speech systems
description, analysis and design of advanced sound and information processing algorithms in the context of sound and speech.
K2_W02 Has extensive knowledge of:
modern audio and speech transmission and processing technologies,
devices used in sound and speech processing systems
K2_W03 Has an in-depth, theoretically grounded knowledge of the theory of sound signals, including speech signals, and methods of their processing
K2_W05 Knows and understands the algorithms used in sound and speech processing systems from the chosen area of specialisation
K2_W11 Has advanced skills, techniques and tools used to solve complex engineering tasks and conduct scientific research in the area of sound and speech processing.

Skills:
K2_U01 Demonstrates the ability to acquire information from a variety of sources, including specialist literature, databases and other resources; is able to analyse and critically appraise gathered information and formulate accurate conclusions and reasoned opinions.
K2_U03 Is able to prepare detailed documentation of the results of conducted experiments, research projects and design tasks; is able to create reports containing a comprehensive discussion of the obtained results.
K2_U06 Applies the known mathematical models and methods, modifying them if necessary, to successfully carry out projects in the field of sound and speech processing.
K2_U13 Plans and carries out experiments, including measurements and computer simulations, interprets the obtained results, draws correct conclusions and formulates and tests hypotheses related to advanced engineering problems and research tasks.
K2_U16 Evaluates the usefulness and applicability of new developments (methods and tools) and innovative products in the field of sound and speech processing.

Social competences:
K2_K01 Demonstrates a willingness to recognise the role of knowledge in solving both theoretical and practical problems related to sound and speech processing and undertakes a critical analysis of the received content.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: written or oral exam with open questions requiring descriptive answers. Pass threshold: 50% of the total points available. Set of required topics is provided during the lectures.
Grading scale: <50% - 2.0 (ndst); 50% to 59% - 3.0 (dst); 60% to 69% - 3.5 (dst+) ; 70% to 79% - 4.0 (db); 80% to 89% - 4.5 (db+); 90% to 100% - 5.0 (bdb).
Laboratory: reports on laboratory exercises.
Grading scale: <50% - 2.0 (ndst); 50% to 59% - 3.0 (dst); 60% to 69% - 3.5 (dst+) ; 70% to 79% - 4.0 (db); 80% to 89% - 4.5 (db+); 90% to 100% - 5.0 (bdb).

Programme content

Lecture:
1. Sound and its perception.
2. Digital representations of the audio signal.
3. Modeling and statistical analysis of the audio signal.
4. Improving the quality of a noised and distorted signal.
5. Speech and broadband audio coding.
6. Synthesis of musical sounds and speech.
Laboratories:
1. The student designs, implements and tests programs implementing selected elements of digital audio systems related to the content presented during the lectures.
2. The student gets acquainted with the tools and devices enabling the acquisition and presentation of audio content.

Course topics

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Teaching methods

Lecture: a multimedia presentation conducted in a hybrid format. The possibility of guest lectures by external experts is assumed.
Laboratories: project implementation on computers (individually or in small groups), possible to be carried out remotely (excluding exercises involving sound acquisition and presentation devices).

Bibliography

Basic:
- A. Spanias, T. Painter, V. Atti, "Audio Signal Processing and Coding," Wiley, 2007

Additional:
- Madisetti V. (ed)," Video, Speech, and Audio Signal Processing and Associated Standards (The Digital Signal Processing Handbook, Second Edition)," CRC Press, 2009.

Breakdown of average student's workload

	Hours	ECTS
Total workload	103	4,00
Classes requiring direct contact with the teacher	38	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	65	2,50