



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Processing and compression of audiovisual signals [S2EiT2E-TIT>PiKSA]

Course

Field of study

Electronics and Telecommunications

Year/Semester

1/1

Area of study (specialization)

Information and Communication Technologies

Profile of study

general academic

Level of study

second-cycle

Course offered in

English

Form of study

full-time

Requirements

elective

Number of hours

Lecture

30

Laboratory classes

30

Other

0

Tutorials

0

Projects/seminars

0

Number of credit points

5,00

Coordinators

dr inż. Sławomir Maćkowiak

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Lecturers

Prerequisites

Has a structured and theoretically underpinned knowledge on one-dimensional signal theory which is necessary for understanding the representations of signals in time domain and frequency domain. Has a structured and theoretically underpinned knowledge on basic methods of digital signal processing. Can solve typical problems related to signal analysis in time and frequency domains. Is able to obtain information from literature and databases as well as other sources in English; is able to integrate obtained information, interpret it, draw conclusions and justify opinions. Knows the limits of his own knowledge and abilities, understands the need for ongoing education.

Course objective

The goal is to teach the fundamentals of representation, processing and compression of audiovisual signals. The course is particularly advisable for students who did not attend multimedia course before or the course was limited.

Course-related learning outcomes

Knowledge:

Have a structured and mathematically underpinned knowledge on acquisition, human perception,

quality assessment, processing, digital representations, compression and transmission of video, speech and audio signals for use in multimedia systems.

Skills:

Understanding of the technical conditions for transmission, storage and presentation of multimedia data. Can formulate appropriate basic requirements for technical systems implementing multimedia services.

Social competences:

Knowing the limits of own knowledge and skills, understanding the need for ongoing education. Have awareness of the necessity of professional approach to solving technical problems and take responsibility for the proposed technical solutions.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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The knowledge acquired in the lecture is verified on the written and / or oral exam. The exam consists of several open questions with different levels of difficulty with the assigned number of points. The questions relate to the content presented during the lectures. Credit threshold: 50% of points.

Laboratory - the knowledge of students is verified through the ongoing assesment of student activity during laboratories and/or through the reports of tasks performed during the laboratories. Performed tasks are related to the processing and encoding of audiovisual data. Credit threshold: 50% of points.

Programme content

Lecture and laboratory topics:

Human visual system (the structure of the eye, limitations of perception). Perception and representations of colors. Visual data represtations.

Digital image processing and compression (lossless and lossy).

Fundamentals of video compression. Video compression standards.

Human auditory perception (the structure of the organ of hearing, the physical characteristics of the wave vs perceptual attributes of a sound, limitations of perception, masking - simultaneous and temporal).

Speech coding (lossy compression techniques: ADPCM, LPC, CELP, ACELP, sinusoidal coding, ITU-T standards and recommendations).

Perceptual coding of wideband audio (the peculiarities of subband and transform coding, fundamentals of perceptual coding, compression schemes of MPEG-1 and 2 layer 1, 2, and 3, MPEG-2 AAC, SBR bandwidth extension, parametric stereo coding, MPEG-4 AAC-HE technique, MPEG-USAC).

Course topics

none

Teaching methods

Lecture - multimedia presentation, illustrated with examples on the board. Slides available to students after the lecture.

Laboratory - computer classes using software that allows advanced simulation and analysis of audiovisual signals and systems. Solving problems given by the teacher and / or specified in the laboratory instruction. Interpretation of the received solution and drawing conclusions.

Bibliography

Basic

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

J-R. Ohm, Multimedia Communication Technology: Representation, Transmission and Identification of Multimedia Signals (Signals and Communication Technology), Springer, 2004

E. Carne, Connections for the Digital Age: Multimedia Communications for Mobile, Wiley, 2011

Additional

D. Karwowski, T. Grajek, et al., 20 Years of Progress in Video Compression - from MPEG-1 to MPEG-H HEVC. General View on the Path of Video Coding Development, Image Processing and Communications Challenges 8, Springer International, 2016, pp. 3-15

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,00
Classes requiring direct contact with the teacher	70	3,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	55	2,00