



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Digital image and sound [N1EiT1>OiDC]

Course

Field of study

Electronics and Telecommunications

Year/Semester

4/8

Area of study (specialization)

–

Profile of study

general academic

Level of study

first-cycle

Course offered in

polish

Form of study

part-time

Requirements

elective

Number of hours

Lecture

20

Laboratory classes

20

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

Number of credit points

4,00

Coordinators

dr inż. Damian Karwowski

damian.karwowski@put.poznan.pl

Lecturers

Prerequisites

1. The student has a systematic knowledge of mathematical analysis, algebra and statistical methods. 2. Has a structured and mathematically based knowledge of signal theory necessary to understand the representation and analysis of signals in the time and domain frequency. 3. Knows the principles of designing computer programs, has knowledge in the field of computer science and knows syntax of high-level software languages, e.g. C, C++, C#, MatLab. 4. Can obtain information from literature and databases and other sources in Polish or English; can integrate the obtained information, interpret it, draw conclusions and justify opinions. 5. Can solve typical tasks related to the analysis of signals in the time and frequency domain. 6. Can do implementation of basic algorithms using popular ones programming languages (e.g. Matlab, C).

Course objective

Familiarize students with the state of the art multimedia techniques, with methods of image and video analysis, with techniques of image, video, audio and speech compression, and with image and video presentation solutions.

Course-related learning outcomes

Knowledge:

1. The student has knowledge related to the state of the art methods of analysis and basic technical solutions in the field of acquisition, processing, transmission, compression and presentation of a video and still image. He has knowledge in the field of audio processing and compression techniques (audio and speech).

Skills:

1. The student is able to solve basic problems related to processing and compression of image and video.
2. Can solve technical problems related to the processing and compression of sound and speech.

Social competence:

1. The student is open-minded and understands the need for continuous training in order to improve qualifications.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:

1. Lecture

Written and / or oral exam. The exam consists of a few to over a dozen questions (depending on the assumed nature of the questions) and concerns the content presented during the lectures. The exact nature of the exam questions will be presented to students during one of the last lectures. Pass threshold: 50% of points.

2. Laboratory

Test at the end of the semester. The test consists of several questions checking skills in the area of data compression and processing. Passing threshold: 50% of points.

Programme content

1. Lecture

Representation of a digital image. Basics of image processing. Point operations. Linear and non-linear image filtering.

Still image compression techniques. Lossy and lossless coding algorithms.

Compression techniques of digital video . Hybrid video compression technique.

Digital audio and speech compression techniques.

2. Laboratories

Digital representation of images. Fundamentals of image processing techniques.

Spectral properties of images. Basics of image filtering.

Lossless and lossy image compression techniques. Fundamentals of video compression techniques.

Psychoacoustic modeling in audio coding. Audio compression.

Teaching methods

1. Lecture

Classes with clear elements of a traditional lecture, problem lecture (discussion with students of a specific problem) and a seminar lecture (mobilizing students to discussion on a specific topic), depending on the content of the presented material. Selected content of the lecture are

presented with a multimedia projector or on board. The discussion of the issues is accompanied by information about their practical application.

2. Laboratories

Computer classes with the use of software that enables advanced analysis, image and sound processing and compression. Solving problems given by the teacher and/or defined in the laboratory manual. Interpretation of the obtained solution and formulation of conclusions. Discussion of the possibilities of practical application of the issues being laboratory subject.

Bibliography

Primary:

1. Damian Karwowski, Zrozumieć Kompresję Obrazu, ISBN: 978-83-953420-0-4, Poznań 2019, Wydanie pierwsze (www.zrozumieckompresje.pl).
2. Marek Domański, Obraz cyfrowy, Wydawnictwa Komunikacji i Łączności, 2011.
3. D. Salomon, G. Motta, Handbook of Data Compression, Springer-Verlag, 2010.
4. K. Sayood, Introduction to Data Compression, Morgan Kaufmann, 2012.

Complementary:

1. A. Czyżewski, Dźwięk cyfrowy, Akademicka Oficyna Wydawnicza Exit Andrzej Lang, 1998.

Breakdown of average student's workload

| | Hours | ECTS |
|---|-------|------|
| Total workload | 110 | 4,00 |
| Classes requiring direct contact with the teacher | 50 | 2,00 |
| Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation) | 60 | 2,00 |