STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Digital television**		Code **1010842131010840162**

Field of study **Electronics and Telecommunications**	Profile of study (general academic, practical) **general academic**	Year /Semester **2 / 3**

Elective path/specialty **Multimedia and Consumer Electronics**	Subject offered in: **Polish**	Course (compulsory, elective) **elective**

Cycle of study: **Second-cycle studies**	Form of study (full-time,part-time) **full-time**

No. of hours Lecture: **2**　Classes: **-**　Laboratory: **1**　Project/seminars: **-**	No. of credits **3**

Status of the course in the study program (Basic, major, other) **other**	(university-wide, from another field) **from field**

Education areas and fields of science and art **technical sciences**　**Technical sciences**	ECTS distribution (number and %**)** **3　100%**　**3　100%**

Responsible for subject / lecturer: prof. dr hab. inż. Marek Domański email: domanski@et.put.poznan.pl tel. +48 61 66 53 901 Faculty of Electronics and Telecommunications ul. Piotrowo 3A 60-965 Poznań	Responsible for subject / lecturer: dr inż. Sławomir Maćkowiak email: smack@multimedia.edu.pl tel. 061 665 3890 Faculty of Electronics and Telecommunications ul. Piotrowo 3A 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Has a detailed knowledge about modern telecommunication systems performing multimedia services, knows and understands the rules of operating multimedia systems in various networks, knows economical and legal issues necessary to provide multimedia services in those systems , knows development trends in electronics and telecommunication.
2	**Skills**	can describe potential development trends of multimedia services, is able to find information about using multimedia techniques in practise. Is able to recognize limitations of different solutions in multimedia systems, can diagnose problems and propose potential solutions. Is able to desing a system providing multimedia services within specified requirements. Knows the basics of DVB.
3	**Social competencies**	Demonstrates responsibility and professionalism in solving technical problems. Is able to participate in collaborative projects.
		Demonstrates responsibility for designed electronic and telecommunication systems. Is aware of the hazards they pose for individuals and communities if they are improperly designed or produced.

Assumptions and objectives of the course:

The aim of the subject is to present DVB television systems, compression standards MPEG-2, MPEG-4 part 10 (AVC), including new technologies (for example DVB-S2, 3D television, HEVC). The aim is to present sound coding systems and system data. A student has special knowledge of image and sound capturing, data processing and transmission.

The aim is to gain the knowledge in basic issues of image capture technologies, its compression and transmission. During practical classes a student learns to build/create compression and transmission algorithms.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Has a systematic, based on mathematics knowledge of: acquisition, human perception, quality assessment, processing, digital representations, compression and transferring of video, speech and sound signals in multimedia systems. - [K2_W01]

2. Has basic knowledge of development trends in electronics and telecommunications. - [K2_W01]

3. Has knowledge of DVB and DVB-S digital TV systems, including MPEG-2, MPEG-4 part 10 AVC standards. - [K2_W01]

4. Has systematic knowledge of modulation systems in terrestrial, digital and cable transmissions. - [K2_W13]

Skills:

Faculty of Electronics and Telecommunications

1. Understands technical conditions of transfer, storage and presentation of multimedia data and is able to form proper basic requirements for technical systems in multimedia. - [K2_U03 K2_U16]

2. Is able to define requirements for systems realizing basic multimedia tasks. - [K2_U08 K2_U16]

3. Understands basic regulations of international norms. - [K2_U08]

Social competencies:

1. Is aware of the limitations of his/her current knowledge and skills; is committed to lifelong learning. - [K2_K04]

Assessment methods of study outcomes

1. Written or oral exam or test.

2. Reports from laboratory classes.

3. Activity and preparation for the classes.

Course description

Lectures:

Television systems with analog image transmission. Digital television DVB. Image in DVB systems (image compression algorithm, video binary stream, MPEG-2 video codec characteristics, MPEG -2 controlling and steering, PMEG-2 chips). Sound in digital television: the sense of hearing, perceptual coding of sound signal, MPEG-1 standard in DVB, MUSICAM algorithm, acoustic data stream, multichannel sound in MPEG-2, overview of the most important sound compression techniques). Transport stream of MPEG-2. Program stream of MPEG-2. System information in MPEG-2. Conditional Access. Channel coding in DVB. The basic types of DVB system: satellite TV DVB-S, terrestrial TV DVB-T, cable TV DVB-C, DVB system versus Internet, DVB-H). Advanced video signal coding (AVC standard). Cameras. Monitors.

Exercises:

The layer of video stream compression: a compromise between the quality and the effectiveness of coding (DCT transform, quantization process, entropy coding, MPEG-2 standard), movement compensation (MPEG-2 standard), movement compensation (MPEG-2 standard), video stream analysis (MPEG-2 standard). The layer of audio stream: psychoacoustic model. The layer of transmission: data streams multiplexing, system layer MPEG-2, DVB-S transmitter simulation (Matlab), DVB-T transmitter simulation (Matlab). Multimedia Home Platform: creation of MHP application, user interaction management (MHP software simulator, MHP ADB receiver), user interface implementation (channel list, banner, guide), application for channel control with the use of created user interface (MHP software simulator, MHP ADB receiver), DVB SI channel control class implementation, parser implementation for event extended info downloading (MHP software simulator, MHP ADB receiver).

Basic bibliography:

1. Marek Domański, Zaawansowane techniki kompresji obrazów i sekwencji wizyjnych, Wydawnictwo Politechniki Poznańskiej, 2000

2. Domański M., Obraz cyfrowy, WKŁ, Warszawa 2010

3. ITU-R Rec., BT.500-11, Methodology for the subjective assessment of the quality of television pictures, 2002.

4. ITU-T Rec., H.264, Advenced video coding for generic audiovisual service, 2003

5. ISO/IEC IS 13818 / ITU-T Rec. H.262, Information technology ? Generic coding of moving pictures and associated audio information, 1997

6. Zieliński T., Cyfrowe przetwarzanie sygnałów. Od teorii do zastosowań, WKŁ, Warszawa 2005.

Additional bibliography:

1. ISO/IEC IS 13818-1 / ITU-T Rec. H.262: Information technology ? Generic coding of moving pictures and associated audio information. Part 1: Systems, 1997

2. Iain E.G. Richardson, Video Codec Design, John Wiley & Sons Ltd., 2002

3. EN 300 421: Digital Video Broadcasting (DVB); Framing structure, channel coding and modulation for 11/12 GHz satellite services, ETSI European Standard, 1997

Result of average student's workload

Activity	Time (working hours)
1. Lectures and practical classes	45
2. Preparation for the classes and writing a final report	15
3. Literature study	15
4. Preparation for exam	15

Student's workload

Source of workload	hours	ECTS
Total workload	80	3

Contact hours	50	2
Practical activities	35	1