COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF ELECTRONICS ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	2607005	**SEMESTER**	7
COURSE TITLE	Video and Audio Broadcasting Systems		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS (ECTS)**
Lectures	3	6
Laboratory	2	
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialisation Course
PREREQUISITE COURSES:	None
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	http://radiotv.teipir.gr/

(2) LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

The objective of this course module is to provide the students the necessary knowledge on the basic function of radio and television systems. The course aims to cover theoretical and practical aspects related to the transmission, reception and playback of analog signals, the digitization of video and audio, the principles, compression standards and coding of digital video and audio signals (MPEG), the principles and standards transmission of digital television signals (DVB) and the playback of digital signals. Emphasis is given to digital broadcasting systems.

Upon successful completion of this course module students possess advanced knowledge, skills and competences in the subject of Video and Audio Broadcasting Systems that enable them to:

1. Know, understand and explain by drawing diagrams the operation and hierarchical organization of radio and television broadcasting systems,
2. Use tools to create and manage the digital content, the interface of digital subsystems,

and the operation of the most widespread terrestrial and satellite transmission protocols,

3. Analyze digital terrestrial and satellite television signals and assess the impact of each parameter in playback fidelity; select optimal settings for parameters.
4. Analyze and calculate the basic characteristics of digital terrestrial and satellite broadcasting through appropriate simulation tools.
5. Work individually or as a team member in the planning, installation and maintenance of reception and playback subsystems for digital broadcasted signals.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Working independently
- Team work

(3) COURSE CONTENT

Lectures:

1. Introduction, subject of the Course
2. Review of basic concepts: Historical overview of radio / TV, basic concepts / terms, the EM spectrum, modulation AM / FM, receivers AM / FM, antenna basics. Exercises
3. Analogue Radio and Television: Radio transmitter and receiver AM / FM, stereo transmission, multiplexing information (RDS / Direct Band). Production and transmission of television signals: Scan, synchronization, quality, range, standards.
4. Analogue Television II: General transmitter & receiver diagram. Chromatography, color television standards. Exercises.
5. Digitizing video and audio signals: Video and audio material characteristics. Basic signal digitization theory. Digitizing audio signals and standards, digitization of video signals and standards. Signal impairment due to digitization.
6. Compression of video and audio signals: Lossless compression algorithms. Compression of video signals: DCT, coding, estimation and motion compensation. Standards JPEG, MPEG1, MPEG2 - details MPEG4. Compressing audio signals: technical fields in time / frequency standards MPEG1 LI, LII, LIII. Exercises
7. Information Organization coding: MPEG1 System Layer, headings, description bitstream. MPEG2 Transport / Program flows.
8. Cryptography and modulation: Data encryption / access under conditions architectures. FEC / Formatting: Energy Dispersal, Outer / Inner Coding. Modulation QPSK / QAM, OFDM. Guard Interval.
9. Digital terrestrial transmission and reception: Scope / Coverage terrestrial, Single Frequency Networks. Architecture of reception systems / digital TV conversion.

10. Digital satellite transmission and reception: Satellite positions and power, satellite tracking, footprints. Position / size satellite dish. Multiple satellite reception systems. Low Noise Block Converters (LNBs). Satellite receivers. Modulation and coding of satellite signals.
11. Digital transmission standards: Standard DVB-T, DVB-S, DVB-S2, DVB-S2. Exercises
12. Home reproduction environment: Interconnections, Topologies, signal distribution. Specifications and standards, for Home Theaters.
13. Novel technologies and applications: HDTV / ultra high definition. Evolution of STB / smart televisions. New systems architectures. Digital TV via IP. Digital television for mobile applications.

Laboratory Experiments:

Lab 1-2: Reception of TV and FM radio signals / Field measurements / study of radio station broadcasting
Lab 3: Production and processing of material / digital video editing
Lab 4: File formats, compression standards and subjective evaluation of the digital video fidelity
Lab 5: Digital video fidelity objective evaluation measures
Lab 6: Digital satellite TV and radio signals
Lab 7: Simulation of DVB-T transmission
Lab 8: Transmission of audio / video over IP networks

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to face lectures
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Use of electronic presentation with multimedia content and interactive whiteboard in class, • Student support through the course webpage and the departmental e-learning platform, as well as by videos of lectures, • Electronic communication of instructors and students, through the course webpage and by e-mail. • Use of specialised software for reproduction fidelity analysis, in the lab. • Use digital transmission simulation software in the lab.
TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.* *The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS*	Lectures, Laboratory experiments, projects, study.

Activity	***Semester workload (hours)***
Lectures	39
Study for lectures	39
Laboratory experiments	26
Report on lab experiments	26
Individual or group projects	30
Study and preparation for exams	20
Course Total	***180***

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Final grade = Theory part grade x 60% + Lab part grade x 40% *Theory Part grade:* • Final written exam (80%), • Assignments or project (optional) (20%) or • Final written exam (100%) *Lab part grade:* • Tests /presence (10%), • Written project reports (60%), • Written final exam (30%)

(5) ATTACHED BIBLIOGRAPHY

Required bibliography

1. Lecture Notes by the instructor
2. Laboratory Handbook by the instructor
3. P. Vafeiadis, Analogue-Digital Television and Video, ISBN 978 960 7559 15 9 (in greek), or
4. K. Tsamoutalos and P. Sarantis Analogue and Digital Television, ISBN 978-960-351-948-5 (in greek)

Recommended Books

1. John Arnold, Michael Frater and Mark Pickering, Digital Television, Technology and Standards, Wiley, 2007
2. Herve Benoit, Digital Television, 3rd Edition: Satellite, Cable, Terrestrial, IPTV, Mobile TV in the DVB Framework, Focal Press, 2008
3. Michael Robin, Michel Poulin, Digital Television Fundamentals: Design and Installation of Video and Audio Systems, McGraw-Hill Education, 2000
4. I. Richardson, H. 264 and MPEG-4 Video Compression, Wiley, 2003
5. Lars-Ingemar Lundström, Understanding Digital Television: An Introduction to DVB Systems with Satellite, Cable, Broadband and Terrestrial TV, Elsevier/Focal Press, 2006
6. Seamus O'Leary, Understanding Digital Terrestrial Broadcasting, Artech House Boston, London, 2000