SYLLABUS

Discipline name	Audio-Video Digital Techniques
Profile	Electronics and Telecommunications Engineering
Specialization	Telecommunications Technologies and Systems
Code	51325009-1
Course leader	Professor Radu Arsinte, Ph.D – Radu.Arsinte@com.utcluj.ro
Collaborators	
Department	Communications
Faculty	Electronics, Telecommunications and Information Technology

Sem.	Type of discipline	Course	Applications			Course	Applications			Ind. study	TOTAL	Credits	Form of assessment
		[hours/week]				[hours/semester]							
			S	L	P		S	L	P				
7	**Speciality, Optional**	**2**	**-**	**1**	**1**	**28**	**-**	**14**	**14**	**64**	**120**	**4**	**Verification**

Acquired competences :

Acquired skills (what the student is able to do):

- Interconnect audio-video equipment with different processing and storage equipment
- Evaluation of functionality of audio-video equipment using presentation and/or service manual
- Interconnection and integration of processing and recording equipment in systems with complex functionality including computer controlled devices
- Creation of complex processing functions for audio-video signals using a general purpose programming language
- Streaming of acquired audio-video information in an appropriate format using communications protocols and tools

Acquired abilities (what type of equipment/ instruments/ software the student is able to handle):

- measure the main qualitative parameters for an audio-video system using classical or computerized equipment
- measure the bit error rate of an physical informational support, signal to noise ratio, binary throughput of different audio-video streams
- acquire audio and video content, process this content and create physicals supports with audio-video content (CD, VCD, DVD)
- Use computerized equipment for audio and video acquisition, with internal or external devices
- Modify the software support of internal audio-video boards (sound card, tuner board) to achieve new performances and functionality
- use of standalone equipment (spectrum analyzer) to evaluate audio qualtiy
- use of standalone equipment (video generator, digital video generator) to evaluate performances of video links

Prerequisites (if necessary):

Basic knowledge of video systems (television), signal processing, programming (C), error detection and correction codes.

A. Course/Lecture (course/lecture titles)	
1	Informational aspects of audio signals. Human hearing characteristics. Electrical – acoustical characteristics.
2	Audio signal digitization. Digital processing of audio signal. Analog to digital conversion of audio signal. Music and voice signal formatting.
3	Magnetic recording. Analog magnetic recording. Digital magnetic recording. DAT system.
4	Audio optical recording; principles, optical aperture
5	Informational aspects. Functional versions: Audio CD, VCD, CDROM
6	Main parameters of digital audio systems. Frequency response, distortions, cross-talk
7	Special audio effects in digital technology. Echo, noise suppression
8	Digital interfaces in audio technology. Serial interfaces. PC based implementations
9	Informational characteristics of video signal. Video signal statistics. B/W and color entropy
10	Video signal digitization. Digital preprocessing of video. Preprocessing of video signals (clamp, filtering). Analog/digital conversion.
11	Primary video sources Analog and digital video recorders. Rotary head principle.
12	Compression techniques adaptation for audio-video optical and magnetic storage. Video compression principles. Commercial video formats: MPEG 2, MPEG4
13	Audio-video optical storage: DVD, HD-DVD, BluRay. High density recording principle. Logical and

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	informational organization of storage supports
14	Integrated audio-video processing systems based on high performance computers. Nonlinear audio-video editing. Workstations and software for nonlinear editing

B. Applications – **Laboratory** (list of laboratories), **Seminar** (contents), **Project** (project contents)	
1	Audacity audio processing environment. Audio acquisition and conversion using Audacity.
2	Noise reduction techniques using Audacity.
3	Audio system performance evaluation using PC
4	Video acquisition programs. VirtualDub. Video filtering under VirtualDub
5	Video acquisition in computer environment. Audio-video device management under Windows and Linux.
6	Codes used in optical and magnetic storage
7	Laboratory test
	Projects
1	Project presentation. Project planning
2	Audio information acquisition and preprocessing using Audacity
3	Video information acquisition using CVBS video sources
4	Video information acquisition from streaming sources
5	Audio video content creation for CD/DVD using VirtualDub and Ulead Video Studio
6	Evaluation of different options for the support (CD, DVD)
7	Project presentation and evaluation

C. Individual study (reference study contents, synthesis materials, projects, applications etc.)

12 sets of problems and questions (the conclusion part in every laboratory)
6 sets of problems (course homework)

Individual study structure	Course study	Problem solving, laboratory, project	Applications preparation	Examination time	Additional reference study	Total no. of individual study hours
Hours	28	6	18	3	9	64

References (Textbooks, courses, laboratory manual, exercise book)

1. Jerry C. Whitaker, Blair K. Benson, *Standard Handbook of Audio and Radio Engineering*, McGraw-Hill Professional, 2002
2. Editor Ian R. Sinclair - *Audio and Hi-Fi Handbook - Third Edition*, Newnes, Reed Educational and Professional Publishing 1998
3. Stefan Winkler, *Digital Video Quality - Vision Models and Metrics,* John Wiley and Sons, 2005
4. F. Alton Everest, *Master Handbook of Acoustics*, McGraw Hill, 2001

On – line references
1. R. Arsinte, *Audio-Video Digital Techniques*, http://users.utcluj.ro/~arsinte/TDAV
2. R.Arsinte ., *Audio-Video Digital Techniques*, http://users.utcluj.ro/~arsinte/TDAV

Final evaluation	
Evaluation method	Written exam (E): problem solving (30%) and theoretical subjects (70%).
Mark components	Exam (E: 0…10 points); Laboratory (L: 0…10 points); Project (P: 0…10 points);
Mark computation	M = 0.5E + 0.25L + 0.25P. Pass if: E≥4 , L≥4 , P≥ 4 and M≥4.5

Course leader,

Professor Radu Arsinte, Ph.D.

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