SYLLABUS

Discipline name	Television Engineering
Profile	Electronics and Telecommunications Engineering
Specialization	Telecommunications Technologies and Systems
Code	51324409
Course leader	Professor Aurel Vlaicu, Ph.D. – Aurel.Vlaicu@com.utcluj.ro
Collaborators	Assoc. Prof. Bogdan Orza, Ph.D. – Bogdan.Orza@com.utcluj.ro Eng. Serban Meza, Ph.D. student – Serban.Meza@com.utcluj.ro
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	**Engineering**	**2**	**-**	**2**	**-**	**28**	**-**	**28**	**-**	**94**	**150**	**5**	**Exam**

Acquired competences :

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

- recognize and interpret the components of the black and white television signals and color television signals
- have in depth knowledge and be able to use the analog television standards: PAL, SECAM, NTSC
- have theoretical and working knowledge of the TV signal displays (CRT, LCD and plasma) along with the mechanism of displaying the television signals on a monitor, needed to design, operate and perform the maintenance of such systems
- have theoretical and working knowledge of the composite video signal, with particular emphasize on the vertical and horizontal retrace signals and their role in rendering the video on the screen, to be able to ensure maintenance of the television systems based on the examination of the signals at the receiver
- be able to mix the television signals using audio-video professional production equipments, based on in-depth acquired knowledge of the principles, structure and functionalities of these equipments

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

- be familiar with and be able to use the full functionalities of a FLUKE video signal generator for various television standards: PAL, SECAM, NTSC
- perform measurements on the composite video signal using a digital oscilloscope with lines selector
- use the commercial video cameras Panasonic VDR-D300 and Panasonic AG-HVX200E
- use the video editing controller PANASONIC AG-A850E, the audio-video digital mixer PANASONIC AG-MX 70 E and the DVD-recorder PANASONIC DMR-EH65 for practical audio-video creation and editing applications

Prerequisites (if necessary):

Knowledge on fundamental electronic devices and circuits;
Basic knowledge on electrical signals, information theory, modulation techniques

A. Course/Lecture (course/lecture titles)	
1	Image scanning methods. The video signal, the synchronization signals and the retrace/blanking signals. Clamping and equalisation impulses. The composie video signal. Frequency characteristics of the TV signal
2	The Black&White TV signal components: intensity signal, synchronization signals and retrace/blanking signals; clamping and equalisation pulses; the composite video signal; frequency characteristics
3	Color television systems: features and characteristics. Introduction to colorimetry. Colorimetric systems. Transmitted signals in color television systems. The overlapping of luminance and color signal spectrae. The NTSC color television system. Disadvantages of the NTSC system
4	The PAL color television system: features and characteristics. Transmitted signals in the PAL TV systems. The PAL composite video signal. The SECAM color television system: features and characteristics. Transmitted signals in the SECAM TV systems. The SECAM composite video signal. Chrominance signals processing. Color identification and synchronization in the SECAM system.
5	Video capturing electronic tubes: functionality; clasification. Charge transfer video capturing devices. CCD integrated systems. Video rendering tubes: the black&white cinescopic tube. Electronic beam modulation. Color cinescopic tubes: features and characteristics. LCD and plasma displays: features and characteristics
6	Scanning systems. The horizontal and the vertical scanning approach. Electronic beam deflection. Generating a linearly variable current through the deflection coils. Horizontal versus vertical deflection.
7	The vertical deflection. The vertical deflection block: basic diagram and functionality.
8	The horizontal deflection. The basic principle used in the horizontal deflection process. The basic electrical schematic and functionality of the final horizontal deflection stage.

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9	Corrections made in the final horizontal deflection stage. The real electrical schematic of a horizontal deflection stage. Corections made in the final horizontal deflection stages in color TV receivers.
10	Video signal amplification and processing. The video-frequency pre-amplifier. Noise correction and amplitude-frequency characteristic correction. Intermediate video-frequency amplifier. The re-generation of the DC component of the video signal. Aperture distortion correction. Contrast correction
11	Changing the polarity of the video signal. White level limitation. Adding the sinchronization and retrace/blanking signals
12	Synchronization signal processing: syncro-generators and syncro-processors. The generation of synchronization signals. The separation of synchronization signals
13	Additional TV features: the Teletext. Teletext systems. Signal time-plots.
14	Course summary, exam preparation.

B. Applications – **Laboratory** (list of laboratories), **Seminar** (contents), **Project** (project contents)	
1	The TV signal: structure and components
2	The color TV signal: PAL
3	The color TV signal: NTSC
4	The color TV signal: SECAM
5	RGB to PAL/NTSC conversion using the CI AD725 circuit
6	The vertical deflection stage from a black&white TV receiver (IC based implementation)
7	The vertical deflection stage of extra-flat TV receivers: – characteristics and functional description
8	The vertical deflection stage of extra-flat TV receivers: – signal temporal diagrams, practical aspects
9	The horizontal deflection stage from a black&white TV receiver (IC based implementation)
10	The horizontal deflection stage of extra-flat TV receivers: – characteristics and functional description
11	Corection circuits in color TV - EW, the diode modulator
12	Production methods for audio-video content
13	TV Seminar: the black&white and color TV signal
14	TV Seminar: the vertical and horizontal screen scanning. Revision.

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

Building complex audio-visual systems by interconnecting audio-visual equipments (synthesis literature reports)
Audio-video processing applications using existing software (mini-projects)

Individual study structure	Course study	Problem solving, laboratory, project	Applications preparation	Examination time	Additional reference study	Total no. of individual study hours
Hours	28	23	18	5	20	94

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

1. A.Vlaicu - Televiziune alb-negru şi color, Ed. Compress, 1994
2. A. Vlaicu - Transmisia şi recepţia semnalelor de televiziune, Ed. Interferente, 1995
3. A. Vlaicu, ş.a. – Televiziune – Lucrări practice, Ed. Risoprint, 1999
4. B. Orza, D. Ivascanu, A. Vlaicu, T. Samuila – Televiziune aplicata, Ed. UTPress, Cluj-Napoca, 2007
5. J. Whitaker – Master Handbook of Video Production – Ed. McGraw-Hill, 2007
6. H. Zettl – Television Production Handbook – Ed. Thomson&Wadsworth, 2006
7. B.Orza, D.Ivascanu, A.Vlaicu, T.Samuila, „Applied Television", ed. UTPress, 2007

On-line references

1. A.Vlaicu, B.Orza – *„Broadcasting television" lecture slides (Powerpoint)*, icar.utcluj.ro – Discipline

Final evaluation	
Evaluation method	Written exam (E): quiz test and classical subject (short essay) (2.5 hours).
Mark components	Exam (E: 0…10 pts); Laboratory (L: 0…10 pts); Mini-projects (M: 0…10 pts);
Mark computation	M = 0.6E + 0.2L + 0.2M. Pass if: E≥5 and L≥5 and M≥5

Course leader,

Professor Aurel VLAICU, Ph.D.

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