Program	09TT- Engineering in Telecommunication Technologies and Services

Course number and name	
Number	95000075
Name	Television
	Televisión
Semester	Y4 – S8

Credits and contact hours	
ECTS Credits	6
Contact hours	60

Coordinator's name	Francisco Morán Burgos

Specific course information

Description of course content

This course covers the techniques and standards currently used in digital TV coding and broadcasting. An introduction on the human visual system and the most commonly used formats of color and video is followed by a description of generic concepts for audio-visual signal coding. Detailed explanations are then given on how such generic concepts are specifically implemented in the most successful TV coding standards: MPEG-2 and AVC for video; MP3 and AAC for audio. Advanced standards for traditional and 3D/multiview video coding (e.g., HEVC and MVC, respectively) are also described in less detail. Finally, the DVB standards for TV broadcasting are studied in some depth. This course consists of both lectures (including problem solving lessons) and laboratory sessions (over 35% of the time) whose assignments are typically executed in pairs.

List of topics to be covered

1. Introduction to the video signal: human visual system; color formats; video formats. 2. Source coding of audio-visual signals: entropy, differential, transform-based, and hierarchical/scalable coding; motion estimation and compensation; classic hybrid video coding scheme. 3. TV coding standards: H.261; MPEG-1; MPEG-2; H.264/AVC; HEVC/H.265; MVC; MP3; AAC. 4. DVB standards for TV broadcasting.
Lab. assignments: 1. Image coding. 2. Basic video coding. 3. MPEG-2 video coding: detailed encoder control. 4. MPEG-2 and AVC video coding: visual analysis and transcoding. 5. DVB-based TV broadcasting: analysis of real transport streams.

Prerequisites or co-requisites

Signals and Systems, Random Signals, Digital Signal Processing

Course category in the program

__ R (required)	___ E (elective)	_X_ SE (selective elective)

Specific goals for the course

Specific outcomes of instruction

RA1: Knowledge and characterization of digital TV systems

RA2: Knowledge of practical problems affecting digital TV systems

RA3: Knowledge of conceptual, mathematical and software tools serving as a basis for the coding of digital TV signals

RA4: Knowledge of acquisition and presentation techniques for audio-visual signals

RA5: Knowledge of representation, processing, storage, compression and broadcasting techniques for digital TV signals

RA6: Knowledge of digital TV systems, equipment, headends and infrastructures

RA7: Knowledge of creation, coding, broadcasting and playback techniques for digital TV signals, with an emphasis on usability criteria

Student outcomes addressed by the course

CE-SI1, CE-SI2, CE-SI5

CG2, CG3, CG4, CG5, CG6, CG7, CG8, CG9, CG10, CG12

Bibliography and supplemental materials

PDF version of the slides for this course (available on-line at UPM's Moodle repository: http://moodle.upm.es/titulaciones/oficiales)

Y. Wang, J. Osterman, Y-Q. Zhang, *Video Processing & Communications*, Prentice Hall, 2002.

R.J. Clarke, *Digital Compression of Still Images and Video*, Academic Press, 1995 (available at ETSIT-UPM's library).

M. Rabbani & P.W. Jones, *Digital Image Compression Techniques*, SPIE Optical Engineering Press, 1991 (available at ETSIT-UPM's library).

K.R Rao & J.J. Hwang, *Techniques and Standards for Image, Video, and Audio Coding*, Prentice Hall, 1996 (available at ETSIT-UPM's library).

U. Reimers, *Digital Video Broadcasting (The International Standard for Digital Television)*, Springer Verlag, 2001.

H. Benoit, *Televisión Digital*, Ed. Paraninfo, 1998 (available at ETSIT-UPM's library).

Teaching methodology

_X_ lectures	_X_ problem solving sessions	___ collaborative actions	_X_ laboratory sessions
Other:			