Program	59EC – Communications Electronic Engineering B. Eng. 59SC – Telecommunications Systems Engineering B. Eng. 59SO – Sound and Image Engineering B.Eng. 59TL – Telematics Engineering B. Eng.

Course number and name	
Number	595024128
Name	Image and Video Technologies
Semester	S5 [(September-January)]

Credits and contact hours	
ECTS Credits	6
Contact hours	60

Coordinator's name	Eckert, Martina [martina.eckert@upm.es]

Specific course information

Description of course content

The subject of "Image and Vídeo Technologies" aims at transmitting the basic knowledge about coding and decoding processes for video contents, which are actually employed in television systems. To achieve this, firstly basics about analogic signals are recalled, which are necessary to understand the digitalization process treated in the following topic. The digitalization process consists of two parts: subsampling and quantizing, and is applicable as well as to individual images as to the frames composing a video stream. The main part of the course then treats the compression which could be achieved with or without loss of information. In this context, the human visual system is analysed to show the possibilities to exploit redundancies and irrelevancies presented in the image content with the aim to reduce information by eliminating the unnecessary one. This process is afterwards combined with the reduction of temporal redundancies with help of predictive processes. Here, completely new concepts like motion estimation and compensation are explained. This part of the subject is the most difficult, but also the most important one, as it builds the basics to understand any type of predictive video codec. At the end of the course, in the last topic, advanced video coding techniques of MPEG-4 are outlined, as this is the actual standard for TV and videoconferencing applications.

An important part of the subject are the laboratory sessions which take place in parallel to the theory classes and directly apply the knowledge obtained. The workload is considerably high and requires a constant dedication during the semester, with the benefit to obtain a profound knowledge and to improve transversal competencies like report writing. The assistance to all laboratory sessions is mandatory to pass the subject.

List of topics to be covered

1. Basic features of Audio and Video signals

2. Digitalization and Encoding
3. Image and Video Compression
4. Advanced Video Encoding
Lab sessions:
1. Presentation and introduction of the tools
2. Decimation, Interpolation and Quantization
3. VideoCodec I: Sampling, Quantization and Interpolation in Colour
4. VideoCodec II: Transformation, Quantization and Coding:
4.1. INTRA coding
4.2. INTER coding
5. MPEG-2 video: analysis and compression

Prerequisites or co-requisites

Digital Signal Processing
Signals and Systems
Audiovisual Systems
Sound and Image Fundamentals

Specific goals for the course

Specific outcomes of instruction

- CE SI01 Ability to build, utilize and manage telecommunication services and applications for the purpose of acquiring, treating analogically and digitally, encoding, transporting, representing, processing, storing, reproducing, managing and presenting audiovisual services and multimedia information.
- CE SI05 Ability to create, encode, manage, broadcast and distribute multimedia content, taking into account usability and accessibility criteria for audiovisual, broadcast and interactive services.
- CE TEL01 Ability to independently learn new knowledge and skills adequate for the design, development or utilization of telecommunication systems and services.
- CG 02 Ability to search and select information, develop critical thinking and produce and defend arguments within the area.
- CG 03 Ability to express oneself in oral and written form, and to convey information through documents and public presentations.
- CG 04 Ability to abstract, analyze, and synthesize, and to solve problems.
- CG 05 Ability for teamwork in multidisciplinary environments..
- CG 11 Skills for the use of Information and Communication Technologies.
- CG 13 Learning skills with a high degree of autonomy.

Further reading and supplementary materials

– Moodle.