The course presents the basic principles and development of the TV systems. It offers a broad view of the analog and digital audiovisual communication systems as well as of the services and functionalities that these systems offer.

Prior skills

Basic knowledge of Analog and Digital Signals and Systems, Signal Processing and Communications.

Requirements

Signals and Systems, Communications

Teaching methodology

This course is taught through lectures (3h/week) and laboratory sessions (2h every 2 weeks), with a continuous evaluation control by mid course consisting in a series of short questions. The special assignment is a cooperative learning experience. In previous editions of this course, this has been either reviewing and adding new entries to the Wikipedia (in Catalan, Spanish or English) or preparing a debate of the kind "59 seconds" on topics related to the subject.

Learning objectives of the subject

The course presents the basic principles and development of the TV systems. It offers a broad view of the analog and digital audiovisual communication systems as well as of the services and functionalities that these systems offer.

Study load

<table>
<thead>
<tr>
<th>Total learning time:</th>
<th>150h</th>
<th>Hours large group:</th>
<th>39h</th>
<th>26.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Hours small group:</td>
<td>13h</td>
<td>8.67%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Self study:</td>
<td>98h</td>
<td>65.33%</td>
</tr>
</tbody>
</table>
# 230201 - TV - Television Systems

## Content

### 1. Introduction (3h)

**Degree competences to which the content contributes:**

**Description:**
1.1 Television engineering: elements of a visual communication system
1.2 Human Visual System: color sensitivity, gamma, spatial/temporal resolution

**Related activities:**
Lab session 0

**Specific objectives:**

### 2. TV Signal (9h)

**Degree competences to which the content contributes:**

**Description:**
2.1 Signal values: light and color, colorimetric representations (YCbCr), quantization
2.2 Signal domain: how to convert video to 1D? Scanning (sampling), progressive/interlaced
2.3 Standardization: SDTV/HDTV (ITU-R BT.601/BT.709), composite, component, SDI
2.4 Timing and synchronization: raster formats (4:2:2, 4:1:1, 4:2:0)
2.5 TV audio: analog stereo/dual, digital AES/EBU audio channels

**Related activities:**
Lab session 1

**Specific objectives:**

### 3. Coding (6h)

**Degree competences to which the content contributes:**

**Description:**
3.1 Compression principles. Early strategies in TV: interlacing, color differences, chroma interleaving, NTSC, PAL, SECAM
3.2 Audiovisual coding: spatial-temporal compression, audio coding
3.3 MPEG2, SMPTE 421M (VC-1), H.264/AVC (HDTV)

**Related activities:**
Lab session 2

**Specific objectives:**

### 4. Multiplex and Signaling (6h)

**Degree competences to which the content contributes:**
5. Modulation and Transmission (6h)

Degree competences to which the content contributes:

Description:
4.1 Analog multiplex (FDM): TV signal and spectrum
4.2 Digital multiplex (TDM):
- Program Streams ES, PES, time stamps (PTS/DTS)
- Transport Streams: PCR, PID, PSI, conditional access

Related activities:
Lab session 3

Specific objectives:

6. Other environments: perspective (6h)

Degree competences to which the content contributes:

Description:
5.1 Analog modulation for color TV signals
5.2 Digital modulation for TV signals
5.3 Broadcasting standards: DVB, ATSC ¿ANSI/SMPTE
5.4 Datacasting

Related activities:
Lab session 4

Specific objectives:

7. Image Acquisition and Reproduction Systems (3h)

Degree competences to which the content contributes:

Description:
7.1 Cameras and CCDs
7.2 Displays: CRTs, flat screens and projection systems
Specific objectives:

LABORATORI SESSIONS

Degree competences to which the content contributes:

Description:
0. Introduction to the TV lab (LABMU)
1. TV Signal (YCbCr+scanning)
2. Coding: program stream
3. Multiplex: transport stream
4. Modulation and transmission
5. Interactive TV (MHP)
LAB5. API MHP: development of an interactive application

Qualification system

- Mid term control: 15%
- Special assignment: 15%
- Laboratory: 30%
- Final exam: 40%

Regulations for carrying out activities
Bibliography

Basic:


Complementary:


Others resources:

- Lecture notes available from the Digital Campus