Degree competences to which the subject contributes

Basic:
CB6. Ability to apply the acquired knowledge and capacity for solving problems in new or unknown environments within broader (or multidisciplinary) contexts related to their area of study.
CB9. Possession of the learning skills that enable the students to continue studying in a way that will be mainly self-directed or autonomous.

Specific:
CTE1. Capability to model, design, define the architecture, implement, manage, operate, administrate and maintain applications, networks, systems, services and computer contents.
CTE10. Capability to use and develop methodologies, methods, techniques, special-purpose programs, rules and standards for computer graphics.
CTE12. Capability to create and exploit virtual environments, and to the create, managemen and distribute of multimedia content.
CTE11. Capability to conceptualize, design, develop and evaluate human-computer interaction of products, systems, applications and informatic services.

Teaching methodology

The course will be based on weekly theory classes (2h) and fortnightly laboratory (2 hours each fortnight).

In theory classes will introduce the concepts of the subject and where appropriate will be exercises and examples that may help in achieving the theoretical concepts and practical.

Students are expected to prepare additional materials will be provided during the year in the form of notes or references (bibliographic or web) to prepare examinations and laboratory practice.

In the lab, introduced the software to use and will consider the practices that students must develop and deliver. A part-time laboratory where students will focus on solving the practical help of the teacher raised.

Learning objectives of the subject

1. Understand the components of multimedia applications, as well as be able to design a multimedia application.
2. Learn advanced concepts of 3D graphics, implementing applications that use them.
3. Understand the concept of character, as with the simulation of motion of this character in a graphical environment and the problems arising in the simulation of crowds.
4. Learn all concepts related to Virtual and Augmented Reality, its architecture and the related software and hardware.
5. Understand the concepts of 3D interaction and usability of systems in Virtual and Augmented Reality, and presence.
6. Being able to develop an application on a virtual or real + virtual 3D interaction.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Theory classes: 36h</th>
<th>24.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Practical classes: 0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 18h</td>
<td>12.00%</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Self study: 96h</td>
<td>64.00%</td>
</tr>
</tbody>
</table>
## Content

### Introduction to multimedia systems.

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

**Description:**
Basic concepts of multimedia systems, components and architecture. Applications.

### Sound.

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

**Description:**
Analogue sound and digital sound. Volume, frequency and amplitude. Most common formats. MP3 compression.

### 2D images.

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

**Description:**
Features and image formats. Some formats: PNG, JPEG, JFIF. Mipmapping and antialiasing. Filters.

### Video.

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

**Description:**

### 3D graphics.

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

**Description:**

### Character animation.

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

**Description:**
### Virtual Reality - Introduction and architecture.

<table>
<thead>
<tr>
<th>Degree competences to which the content contributes:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
</tr>
</tbody>
</table>

### Virtual Reality - Devices.

<table>
<thead>
<tr>
<th>Degree competences to which the content contributes:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
</tr>
</tbody>
</table>

### Virtual reality - stereoscopy

<table>
<thead>
<tr>
<th>Degree competences to which the content contributes:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
</tr>
</tbody>
</table>

### Virtual Reality - Software

<table>
<thead>
<tr>
<th>Degree competences to which the content contributes:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
</tr>
<tr>
<td>Virtual Reality Software. VR-juggler. XVR.</td>
</tr>
</tbody>
</table>

### Augmented Reality

<table>
<thead>
<tr>
<th>Degree competences to which the content contributes:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
</tr>
</tbody>
</table>

### 3D user interfaces.

<table>
<thead>
<tr>
<th>Degree competences to which the content contributes:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
</tr>
<tr>
<td>3D user interfaces. Selection and object manipulation. Navigation and control application.</td>
</tr>
</tbody>
</table>
**Usability and presence.**

<table>
<thead>
<tr>
<th>Degree competences to which the content contributes:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
</tr>
</tbody>
</table>
### Planning of activities

<table>
<thead>
<tr>
<th>Introduction to Multimedia Systems</th>
<th>Hours: 4h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes: 2h</td>
<td></td>
</tr>
<tr>
<td>Practical classes: 0h</td>
<td></td>
</tr>
<tr>
<td>Laboratory classes: 0h</td>
<td></td>
</tr>
<tr>
<td>Guided activities: 0h</td>
<td></td>
</tr>
<tr>
<td>Self study: 2h</td>
<td></td>
</tr>
</tbody>
</table>

**Description:**
Introduction to basic concepts of multimedia systems, components and architecture. Applications.

**Specific objectives:**
1

<table>
<thead>
<tr>
<th>Sound.</th>
<th>Hours: 4h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes: 2h</td>
<td></td>
</tr>
<tr>
<td>Practical classes: 0h</td>
<td></td>
</tr>
<tr>
<td>Laboratory classes: 0h</td>
<td></td>
</tr>
<tr>
<td>Guided activities: 0h</td>
<td></td>
</tr>
<tr>
<td>Self study: 2h</td>
<td></td>
</tr>
</tbody>
</table>

**Description:**
Analogue sound and digital sound. Volume, frequency and amplitude. Most common formats. MP3 compression.

**Specific objectives:**
1

<table>
<thead>
<tr>
<th>2D images</th>
<th>Hours: 4h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes: 2h</td>
<td></td>
</tr>
<tr>
<td>Practical classes: 0h</td>
<td></td>
</tr>
<tr>
<td>Laboratory classes: 0h</td>
<td></td>
</tr>
<tr>
<td>Guided activities: 0h</td>
<td></td>
</tr>
<tr>
<td>Self study: 2h</td>
<td></td>
</tr>
</tbody>
</table>

**Description:**
Features and image formats. Some formats: PNG, JPEG, JFIF. Mipmapping and antialiasing. Filters.

**Specific objectives:**
1

<table>
<thead>
<tr>
<th>Introduction multimedia tools</th>
<th>Hours: 8h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes: 0h</td>
<td></td>
</tr>
<tr>
<td>Practical classes: 0h</td>
<td></td>
</tr>
<tr>
<td>Laboratory classes: 4h</td>
<td></td>
</tr>
<tr>
<td>Guided activities: 0h</td>
<td></td>
</tr>
<tr>
<td>Self study: 4h</td>
<td></td>
</tr>
</tbody>
</table>
# 270506 - SGI - Interactive Graphic Systems

## Description:
Introduction to the tools used in multimedia applications.

#### Specific objectives:
1

## Video

<table>
<thead>
<tr>
<th>Hours</th>
<th>Theory classes: 2h</th>
<th>Practical classes: 0h</th>
<th>Laboratory classes: 0h</th>
<th>Guided activities: 0h</th>
<th>Self study: 2h</th>
</tr>
</thead>
</table>

#### Description:

#### Specific objectives:
1

## 3D Graphics

<table>
<thead>
<tr>
<th>Hours</th>
<th>Theory classes: 8h</th>
<th>Practical classes: 0h</th>
<th>Laboratory classes: 6h</th>
<th>Guided activities: 0h</th>
<th>Self study: 14h</th>
</tr>
</thead>
</table>

#### Description:

#### Specific objectives:
2

## Character animation

<table>
<thead>
<tr>
<th>Hours</th>
<th>Theory classes: 4h</th>
<th>Practical classes: 0h</th>
<th>Laboratory classes: 0h</th>
<th>Guided activities: 0h</th>
<th>Self study: 2h</th>
</tr>
</thead>
</table>

#### Description:

#### Specific objectives:
3
### Partial review

**Description:**
Written examination of the view until the subject.

**Specific objectives:**
1, 2

**Hours:** 12h  
Guided activities: 2h  
Self study: 10h

### Virtual Reality - Introduction and architecture.

**Description:**

**Specific objectives:**
4

**Hours:** 4h  
Theory classes: 2h  
Practical classes: 0h  
Laboratory classes: 0h  
Guided activities: 0h  
Self study: 2h

### Virtual Reality - Devices.

**Description:**

**Specific objectives:**
4

**Hours:** 4h  
Theory classes: 2h  
Practical classes: 0h  
Laboratory classes: 0h  
Guided activities: 0h  
Self study: 2h

### Virtual reality - stereoscopy

**Description:**

**Specific objectives:**
4

**Hours:** 4h  
Theory classes: 2h  
Practical classes: 0h  
Laboratory classes: 0h  
Guided activities: 0h  
Self study: 2h
<table>
<thead>
<tr>
<th>Section</th>
<th>Hours</th>
<th>Theory classes</th>
<th>Practical classes</th>
<th>Laboratory classes</th>
<th>Guided activities</th>
<th>Self study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtual Reality - Software</td>
<td>8h</td>
<td>0h</td>
<td>0h</td>
<td>4h</td>
<td>0h</td>
<td>4h</td>
</tr>
<tr>
<td>Description: Virtual Reality Software. VR-Juggler. XVR.</td>
<td>Specific objectives: 4, 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Augmented Reality</td>
<td>8h</td>
<td>2h</td>
<td>0h</td>
<td>2h</td>
<td>0h</td>
<td>4h</td>
</tr>
<tr>
<td>Description: Concept of augmented reality. Different architectures. Software: AR-Toolkit.</td>
<td>Specific objectives: 4, 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3D user interfaces.</td>
<td>4h</td>
<td>2h</td>
<td>0h</td>
<td>0h</td>
<td>0h</td>
<td>2h</td>
</tr>
<tr>
<td>Description: 3D user interfaces. Selection and object manipulation. Navigation and control application.</td>
<td>Specific objectives: 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Usability and presence.</td>
<td>4h</td>
<td>2h</td>
<td>0h</td>
<td>0h</td>
<td>0h</td>
<td>2h</td>
</tr>
</tbody>
</table>
## Description:

### Specific objectives:
5

## Final Exam

<table>
<thead>
<tr>
<th>Hours: 12h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guided activities: 2h</td>
</tr>
<tr>
<td>Self study: 10h</td>
</tr>
</tbody>
</table>

### Description:
Final examination of theory and exercises for the course.

### Specific objectives:
3, 4, 5, 6

## Practical 3D graphics and multimedia

<table>
<thead>
<tr>
<th>Hours: 0h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guided activities: 0h</td>
</tr>
<tr>
<td>Self study: 0h</td>
</tr>
</tbody>
</table>

### Description:
Practical exercise on multimedia and 3D graphics.

### Specific objectives:
1, 2

## Practice of Virtual Reality and Augmented

<table>
<thead>
<tr>
<th>Hours: 0h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guided activities: 0h</td>
</tr>
<tr>
<td>Self study: 0h</td>
</tr>
</tbody>
</table>

### Description:
Practical exercise on Virtual Reality and Augmented

### Specific objectives:
4, 5, 6
The evaluation of the course is given by the combination of theoretical and practical part.

The theory is evaluated with 2 written exams, the first at 9 weeks of the course and the second at week 18. Both will have a 50% of the theoretical part of the course.

\[ NT = + 0.5 \times 0.5 \times N_{PrimerExamen} \times N_{SegonExamen} \]

The practical part will be evaluated by two parts: the first will evaluate everything that has to do with multimedia applications and 3D graphics (NP1), and the second will assess knowledge in Virtual and Augmented Reality and 3D interaction and usability (NP2). The two notes of the practical parts are coptaram 50% each.

\[ NP = + 0.5 \times 0.5 \times NP1 \times NP2 \]

Finally the final grade for the course is calculated as 40% of the practice and 60% of the theoretical part. Therefore the final grade:

\[ NF = 0.4 \times 0.6 \times NP + NT \]

The assessment of basic skills CB9 will be based on the grade achieved in practice NP1.

The assessment of basic skills CB6 will be based on the grade achieved in practice NP2.

### Bibliography

#### Basic: