

## 62228 - Computer Graphics and immersive multimedia environments

### Syllabus Information

**Academic year:** 2024/25

**Subject:** 62228 - Computer Graphics and immersive multimedia environments

**Faculty / School:** 110 - Escuela de Ingeniería y Arquitectura

**Degree:** 534 - Master's Degree in Informatics Engineering

**ECTS:** 6.0

**Year:** 1

**Semester:** Second semester

**Subject type:** Compulsory

**Module:**

### 1. General information

This course focuses on the general topic of visual computing, and in particular on its scientific foundations and its applications in industry and science. Visual computing is a largely relevant field in modern computer science, and it has a widespread presence in mostly all aspects of modern life.

It is expected that after passing the course, the student will be able to:

- Have a general perspective on the field of visual computing, including its evolution, state of the art, and open problems.
- Communicate to a general audience the acquired knowledge on visual computing.
- Understand the mathematical models and computational algorithms used in visual computing.
- Elaborate R+D projects.
- Design hardware and software products for solving problems in visual computing.
- Create and leverage virtual environments, including virtual, mixed, and augmented reality, as well as multimedia content and populated virtual environments.

### 2. Learning results

After passing the course, the student will demonstrate the following results:

1. Understand the theoretical and practical bases of synthetic image generation, including the fundamental algorithms in computer graphics, the theoretical basis of light transport, and the use of graphics hardware. He/she will know the historical evolution of the field, and its applications in entertainment, CAD, architecture, etc.
2. Know the concepts of Virtual Reality, Augmented Reality and Mixed Reality; understand their application, how virtual environments are implemented, and how can be coupled and populated using intelligent agents.
3. Know the theoretical basis of 3D reconstruction and localization in real environments, and its integration in Augmented and Mixed Reality.

### 3. Syllabus

Section 1:

- Fundamentals of Computer Graphics and synthetic image generation
- Real time Computer Graphics

Section 2:

- Light transport
- Global illumination
- Participating media

Section 3:

- Multiview geometry modeling for computer vision
- Structure from Motion (SfM)
- Visual SLAM (Simultaneous Localization and Mapping)

Section 4:

- Interactive environments. Interaction paradigms and styles
- Immersive environments
- Populated environments

#### **4. Academic activities**

The course (150 hours, 6 ECTS credits) includes the following learning tasks:

- Lectures and practical sessions: 60 hours
- Practical application or research assignments: 60 hours
- Study: 25 h
- Evaluation tests: 5h

#### **5. Assessment system**

The evaluation of the learning results of the student will be done using the following activities:

- Final written exam (40%)
- Practical assignments (50%)
- Presentations and participation (10%)

To pass the course, the students will need to have a minimum weighted average of 5/10, and at least a grade of 4/10 on each evaluation activities. If the grade of any of the activities is below 4, the maximum grade will be 4/10.

Students not opting or passing the evaluation described previously, or wanting to increase their grade, will have the right to pass through a global evaluation.

#### **6. Sustainable Development Goals**

- 8 - Decent Work and Economic Growth
- 9 - Industry, Innovation and Infrastructure
- 10 - Reduction of Inequalities