# Course guide
# 804411 - ERV - Virtual Reality Environments

**Last modified:** 09/09/2024

**Unit in charge:** Image Processing and Multimedia Technology Centre
**Teaching unit:** 804 - CITM - Image Processing and Multimedia Technology Centre.

**Degree:** BACHELOR'S DEGREE IN DESIGN, ANIMATION AND DIGITAL ART (Syllabus 2023). (Compulsory subject).

**Academic year:** 2024 **ECTS Credits:** 6.0 **Languages:** Catalan

## LECTURER

**Coordinating lecturer:** Galvez Llorens, Marc

**Others:**

## TEACHING METHODOLOGY

The teacher will provide a detailed explanation of the theoretical and practical concepts, which will allow students to understand the current state and the possibilities offered by the various fields covered in the subject, as well as to carry out the proposed practices throughout the course.
Practices will be carried out individually. The development of the contents and part of the practices will be done in class with the assistance of the teacher, while other activities will have to be carried out independently outside of school hours.
The results of the final project must be presented orally. Both in the explanation of the contents and in the realization of the practices, a participatory class will be promoted where the student actively intervenes, raising doubts and proposing solutions or alternatives in relation to the concepts and technologies used.

## LEARNING OBJECTIVES OF THE SUBJECT

Design interactive applications and prototypes using virtual reality development engines and tools, applying author programming techniques integrating graphic resources, models, animations and sounds.

- Be able to create virtual environments for interfaces based on immersive virtual reality (VR).
- Understand the principles of user-centered design applied to VR, as well as the challenges and applications derived from these technologies.
- Demonstrate knowledge and skills in the use of libraries and tools for the development of interactive experiences and applications in virtual reality devices and other platforms.
- Be able to design and build models that represent the information necessary for the creation and visualization of interactive images through virtual reality.
- Understand the cognitive principles and perceptual illusions generated by MR and VR technologies.

## STUDY LOAD

| Type | Hours | Percentage |
|---|---|---|
| Hours medium group | 18,0 | 12.00 |
| Hours large group | 30,0 | 20.00 |
| Self study | 90,0 | 60.00 |
| Guided activities | 12,0 | 8.00 |

**Total learning time:** 150 h

## CONTENTS

### Topic 1. Introduction to the Reality-virtuality continuum

**Description:**
What is Reality?
Mixed Reality (MR).
Virtual Reality (VR).
Real Use Cases in Extended Reality (XR) Applications.
Concepts (Immersion, Embodiment, Presence, Plausibility).

**Related activities:**
Practice 1 - Analysis of an application or video game, one based on virtual reality (VR). The analysis must include all the concepts covered in topic 1 and requires research on concepts worked on in class.

**Full-or-part-time:** 37h 30m
Theory classes: 15h
Self study : 22h 30m

### Topic 2: Principles of Virtual Reality (VR)

**Description:**
Definition, evolution, current state
Properties and effects of Virtual Reality (VR)
Embodiment: Agency, Self-location, Illusion of Ownership
Interaction and Interface Design in VR Environments.
Immersive Experiences.
Hardware and software.
Conceptualization of ideas

**Full-or-part-time:** 37h 30m
Theory classes: 15h
Self study : 22h 30m

### Topic 3: Virtual Reality Design of gamified experiences

**Description:**
Game Design (mechanics and dynamics).
Level Design (set dressing)
Tutorial Design (player guidance)
VR Design Document

**Related activities:**
Practice 2 - Creation of an immersive application environment in virtual reality (VR), incorporating aspects of user experience and all the concepts studied during the course.

**Full-or-part-time:** 37h 30m
Theory classes: 15h
Self study : 22h 30m

**Topic 4: Immersive experiences, video games and interactive applications**

**Description:**
"Storytelling", "Storyliving".
User guidance
Genres and typologies

**Full-or-part-time:** 37h 30m
Theory classes: 15h
Self study : 22h 30m

## GRADING SYSTEM

Practice 1 - Analysis: 30%
Partial Exam: 20%
Practice 2 - VR project: 40%
Participation and Learning Attitude: 10%

The evaluation of the student's participation in the training activities of the subject and his learning attitude will be done by monitoring his interventions in class and the interest shown during the course. This assessment represents 10% of the final grade.
Students who do not pass the subject during the continuous assessment may present themselves for the reassessment (only the 20% corresponding to the partial exam will be evaluated, with 5 being the maximum grade that can be obtained in the subject).

## EXAMINATION RULES.

The practical exercises will begin during the class hours intended for this purpose and must be completed outside the school hours following the instructions provided in the Practical Exercise Sheet and the instructions of the teaching staff. Some exercises will be done in groups, while others will be individual, as clearly detailed in the statement of each practice. The resolution of the practical exercises will be given in the space enabled on the virtual campus for each practice, following the conditions indicated. At the end of the practice, the required files will be delivered. The correct management of the documentation provided is part of the skills to be acquired and, therefore, is subject to evaluation. The evaluation of the practices includes not only the resolution of the proposed exercises, but also the defense of the results when the student is required for this at the beginning of the classes.
Any incident that prevents you from solving the practice or the exams within the indicated period must be communicated to the teacher, degree coordinator, or head of studies, through a corresponding message on the virtual campus. Subsequently, the relevance or not of the alleged causes for the non-presentation of the exercise will be determined and alternatives will be established to complete the assessment if the causes are justified. The non-presentation of practical work, projects and exams on the established dates, without justification, will result in a grade of 0 in the percentage corresponding to these activities.

Irregular actions that can lead to a significant variation in the grade of one or more students constitute a fraudulent performance of an assessment act. This action entails the descriptive qualification of suspension and a numerical grade of 0 in the overall ordinary assessment of the subject, without the right to re-evaluation.

If the teachers have indications of the use of AI tools not allowed in the assessment tests, they can call the students involved to an oral test or a meeting to verify their authorship.

## BIBLIOGRAPHY

**Basic:**
- Narula, Herman . Virtual Society: The Metaverse and the New Frontiers of Human Experience. ISBN 13 978-0241616598.
- Jerald, Jason. The VR book : human-centered design for virtual reality . [s.l.] : ACM Books , 2016. ISBN 978-1-97000-112-9.

## RESOURCES

**Other resources:**

Rakkolainen, I., Farooq, A., Kangas, J., Hakulinen, J., Rantala, J., Turunen, M. y Raisamo, R. (2021). Technologies for Multimodal Interaction in Extended Reality—A Scoping Review. Multimodal Technologies and Interaction, 5 (81). Fecha: 03/06/2024 Página: 6 / 6
Seinfeld, S., Feuchtner, T., Maselli, A., & Müller, J. (2020). User Representations in Human-Computer Interaction. Human-Computer Interaction.
Seinfeld, S., & Müller, J. (2020). Impact of visuomotor feedback on the embodiment of virtual hands detached from the body. Scientific Reports, 10(1), 1–15.
Slater, M. (2009). Place illusion and plausibility can lead to realistic behaviour in immersive virtual environments. Philosophical Transactions of the Royal Society B: Biological Sciences, 364(1535), 3549–3557.
Slater, M., Gonzalez-Liencres, C., Haggard, P., Vinkers, C., Gregory-Clarke, R., Jelley, S., Watson, Z., Breen, G., Schwarz, R., Steptoe, W., Szostak, D., Halan, S., Fox, D., & Silver, J. (2020). The Ethics of Realism in Virtual and Augmented Reality. Frontiers in Virtual Reality, 1, 1.
Slater, M., & Sanchez-Vives, M. V. (2016). Enhancing our lives with immersive virtual reality. In Frontiers Robotics AI (Vol. 3, Issue DEC, p. 74). Frontiers Media S.A.
Skarbez, R., Neyret, S., Brooks, F. P., Slater, M., & Whitton, M. C. (2017). A psychophysical experiment regarding components of the plausibility illusion. IEEE transactions on visualization and computer graphics, 23(4), 1369-1378.
Wetzel, R., McCall, R., Braun, A. K., & Broll, W. (2008). Guidelines for designing augmented reality games. ACM Future Play 2008 International Academic Conference on the Future of Game Design and Technology, Future Play: Research, Play, Share, 173–180.
Zollmann, S., Langlotz, T., Grasset, R., Hong Lo, W., Mori, S. & Regenbrech, H. (2021). Visualization Techniques in Augmented Reality: A Taxonomy, Methods and Patterns. IEEE Transactions on Visualization and Computer Graphics, Vol 27 (9), 3808 - 3825.