Course guide
804476 - RVA - Virtual and Augmented Reality

Last modified: 11/07/2024

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

Degree: BACHELOR'S DEGREE IN DIGITAL DESIGN AND MULTIMEDIA TECHNOLOGIES (Syllabus 2023). (Compulsory subject).

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

LECTURER

Coordinating lecturer: Galvez Llorens, Marc

Others:

TEACHING METHODOLOGY

The lecturer will provide a detailed explanation of the theoretical and practical concepts, which will allow students to understand the current state of the art and the possibilities offered by the various fields covered in the course, as well as to carry out the practices proposed throughout the course.
Some practices will be carried out individually, while the final projects of the course will be carried out in groups of 3 to 4 people. 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 class hours.
The results of the final project will have to be presented orally. Both in the explanation of the contents and in the performance of the practicals, a participative class will be promoted in which the student actively participates, raising doubts and proposing solutions or alternatives in relation to the concepts and technologies used.

LEARNING OBJECTIVES OF THE SUBJECT

Knowledge
Identify the principles of design and implementation of virtual, augmented and mixed reality applications, as well as the potential of electronics and tangible interaction in digital products and multimedia applications.

Skills
Program interactive virtual environments, in both immersive and non-immersive formats, for use in the field of multimedia development.

- Be able to create interactive experiences for interfaces based on augmented reality (AR) and immersive virtual reality (VR).
- Understand the principles of user-centred design applied to AR and 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 on mobile devices and other platforms.
- Be able to design and build models that represent the information necessary for the creation and visualization of interactive images using virtual and augmented reality.
- Understand the cognitive principles and perceptual illusions generated by AR and VR technologies.

STUDY LOAD

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

Total learning time: 150 h

CONTENTS

Topic 1. Introduction to the Reality-virtuality continuum

Description:
What is Reality?
Augmented Reality (AR)
Mixed Reality (MR)
Virtual Reality (VR)
Real use cases in Extended Reality Applications (XR)
Concepts (Immersion, Embodiment, Presence, Plausibility)

Full-or-part-time: 29h
Theory classes: 12h
Guided activities: 2h
Self study : 15h

Topic 2: Principles of Augmented Reality (AR)

Description:
Definition, evolution, current status
Properties and effects of Augmented Reality (AR)
Interaction and Interface Design in AR Environments
Immersive Experiences
Hardware and software
Conceptualization of ideas

Full-or-part-time: 49h
Theory classes: 6h
Practical classes: 9h
Guided activities: 4h
Self study : 30h

Theme 3: Principles of Virtual Reality (VR)

Description:
Definition, evolution, current status
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
Conceptualisation of ideas

Full-or-part-time: 59h
Theory classes: 6h
Practical classes: 9h
Guided activities: 4h
Self study : 40h

Theme 4: Immersive experiences, video games and interactive applications

Description:
Storytelling, Storyliving
Mechanics and dynamics
User orientation
Genres and typologies

Full-or-part-time: 13h
Theory classes: 6h
Guided activities: 2h
Self study : 5h

GRADING SYSTEM

Practice 1 - Analysis: 10%
Exam: 10%
Practical 2 - AR project: 40% Practice 2 - AR project: 40% Practice 3 - VR project: 40% Practice 4 - VR project: 40%
Practical 3 - VR project: 40%
Participation and Learning Attitude: 10%
The evaluation of the student's participation in the formative activities of the subject and their learning attitude will be done by monitoring their interventions in class and the interest shown during the course. This evaluation represents 10% of the final grade.

Irregular actions that may lead to a significant variation in the grade of one or more students constitute a fraudulent performance of an evaluation act. This action will lead to a descriptive grade of fail and a numerical grade of 0 for the ordinary global assessment of the subject, without the right to re-evaluation.
If the teachers have evidence of the use of AI tools that are not permitted in the assessment tests, they may summon the students involved to an oral test or a meeting to verify the authorship.

EXAMINATION RULES.

The practical exercises will begin during the class hours set aside for this purpose and will have to be completed outside class hours following the instructions provided on the Practical Exercise Sheet and the indications of the teaching staff. Some exercises will be carried out in groups, while others will be individual, as clearly detailed in each practical exercise. The resolution of the practical exercises will be done in the space provided on the virtual campus for each practical, following the conditions indicated. At the end of the practical, the required files will be released. The correct management of the documentation provided forms part of the competences to be acquired and is therefore subject to assessment. The evaluation of the practicals includes not only the resolution of the proposed exercises, but also the defence of the results when the student is required to do so at the beginning of the classes.
Any incident that prevents the practice or exams from being completed within the indicated deadline must be communicated to the lecturer, degree coordinator or head of studies, by means of a corresponding message on the virtual campus. Subsequently, the relevance or otherwise of the reasons given for the non-submission of the exercise will be determined and alternatives will be established to complete the assessment if the reasons are justified. Failure to submit practical work, projects and exams on the established dates, without justification, will result in a mark of 0 in the percentage corresponding to these activities.

BIBLIOGRAPHY

Basic:
- Herman Narula. Virtual Society: The Metaverse and the New Frontiers of Human Experience. ISBN 13 978-0241616598.
- Geroimenko, Vladimir . Augmented Reality Games II: The Gamification of Education, Medicine and Art. Springer, 2019. ISBN 978-3-030-15619-0.
- Jerald, Jason. The VR book : human-centered design for virtual reality. ACM Books, 2016. ISBN 978-1-97000-112-9.
- Murray, Janet Horowitz. Hamlet en la holocubierta : el futuro de la narrativa en el ciberespacio. Barcelona: Paidós, 1999. ISBN 8449307651.
- Bolter, David; Engber, Maria. Reality media: augmented and virtual reality. The MIT Press, 2021.
- Fisher, Joshua. Augmented and mixed reality for communities. CRC Press, 2021.

Complementary:
- Manovich, L. The poetics of augmented space. 2005.
- Rakkolainen, I., Farooq, A., Kangas, J., Hakulinen, J., Rantala, J., Turunen, M. y Raisamo, R. . Technologies for Multimodal. 2021.

RESOURCES

Other resources:
ACM Siggraph. http://www.siggraph.org/- VR Developers Conference. http://www.vrdconf.com/- IEEE Virtual Reality. http://ieeevr.org- Unity3D. https://unity3d.com/es- Vuforia Developer Portal. https://developer.vuforia.com/- Spark AR Studio