DEEP TECH BRAIN: VIRTUAL REALITY
STUDY PLAN

Course type: Microcredential
Teaching modality: Distance learning
Language of instruction: English

Number of credits: 3

General features of the teaching methodology:

- 15 hours of group practical sessions related to theoretical content.
- 15 hours of theoretical sessions delivered asynchronously (Lecture-style, contents presented orally by a professor without active student participation).

TEACHING PLAN

Contents:
This course is structured into 3 theoretical thematic blocks, each with a specific group practical activity, and a final project activity.

Thematic blocks:

1. Fundamentals of Virtual Reality
    - Topic 1: Introduction to Virtual Reality
    - Topic 2: Unity for VR: Fundamentals and Environment Setup
2. Development of Interactive Environments
    - Topic 3: Interaction in VR Environments
    - Topic 4: Optimization and Performance
3. Virtual Reality Applied to Neuroscience
    - Topic 5: Simulation of Cognitive Processes in VR
    - Topic 6: Real-time signals and standard Lab Streaming Layer (LSL)

Practices:

Practical classes aim to equip students with the skills necessary to autonomously and effectively use and combine various Virtual Reality tools in human neuroscience research and clinical practice. There are three practical activities corresponding to each of the three thematic blocks. These activities involve programming in Unity and analysis of academic articles. Active participation is expected.

- Practice type: Computer-based practical
    - P1: Creation of a Simple VR Environment with XR Simulator
    - P2: Development of an interactive VR application

- P3: Analysis of a scientific article
- VR Project applied to Neuroscience

Project:

The final project involves developing a Virtual Reality application in the neuroscience field to consolidate and apply the knowledge gained during the course. Students are encouraged to actively contribute, demonstrating understanding and engagement.

- Activity type: Autonomous work
- Duration: 15 hours

Objectives:

- Understand the basic principles of Virtual Reality and its potential in Neuroscience.
- Learn to use Unity and XR Simulator to develop immersive environments.
- Identify the key elements of an effective virtual environment.
- Implement interaction and optimization techniques in Unity and XR Simulator.
- Adapt Virtual Reality tools to neuroscience research scenarios.

EVALUATION

- Continuous assessment (3 practical group exercises): 50%
- Final Virtual Reality project applied to Neuroscience: 50%

RECOMMENDED BIBLIOGRAPHY

- Sherman, W. R., & Craig, A. B. (2018). *Understanding Virtual Reality*. Morgan Kaufmann.
- Bailenson, J. N. (2018). *Experience on Demand: What Virtual Reality Is, How It Works, and What It Can Do*. W. W. Norton.
- Unity Technologies. (2020). *Unity manual and scripting API*. Unity. https://docs.unity3d.com/Manual/index.html
- XR Simulator Team. (2021). *XR Simulator documentation*. Unity. https://docs.xr-simulator.com
- Slater, M., & Sanchez-Vives, M. V. (2016). Enhancing our lives with immersive virtual reality. *Frontiers in Robotics and AI*, 3(74). https://doi.org/10.3389/frobt.2016.00074
- Kothe, C. A. (n.d.). *Lab Streaming Layer (LSL) Documentation*. https://labstreaminglayer.readthedocs.io