UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

# COURSE SYLLABUS

# Virtual and Augmented Reality Technologies

**2526-2-F1702Q015-F1702Q01502**

## Aims

**1. Knowledge and understanding**
This 3-credit module introduces the basic theoretical concepts of Virtual Reality (VR) and Augmented Reality (AR). It addresses the fundamental principles that characterize VR and AR, including introductory notions of design principles and application motivations.
Enabling technologies, both hardware and software, for VR and AR will also be analyzed.
**2. Applying knowledge and understanding**
Students will learn how to design VR and AR applications at a high level, being able to select the most appropriate hardware and software technologies for the specific application being developed.
**3. Making judgements**
By the end of the course, students will be able to critically assess the actual usefulness of VR and AR techniques and their applicability in various contexts.
**4. Communication skills**
Students will be expected to describe and justify the design and technological choices made during the planning of their application prototype.
**5. Learning skills**
The course will provide students with the foundational knowledge needed to independently explore and study emerging tools and technologies in the field of VR and AR.
Methods for evaluating applications will also be introduced, including user testing and analysis of adverse effects.

## Contents

The aim of this module of the course is to introduce the basic concepts of VR and AR from a theoretical point of view.
The fundamental principles that characterize VR and AR will be addressed, with basics of design principles and motivations of VR and AR applications.

For both VR and AR, basic enabling technologies will be studied (hints on HW and SW).
Finally, we will see basics of the evaluation (user tests, evaluation of adverse effects) of VR / AR applications.

## Detailed program

Theory
Introduction to the basic concepts of VR and AR in the “mixed reality continuum” (a line that starts from a real environment, passes through augmented reality and arrives at virtual reality), differences and similarities between the two technologies
Notes on design principles, motivations and history of VR and AR
Output devices and vision
Input Devices, Tracking
Virtual Worlds, Locomotion, Interaction
Notes on the evaluation of VR / AR applications (usability, evaluation of adverse effects, user tests), concrete case studies

## Prerequisites

none

## Teaching form

Lectures (21 hours, in presence, in erogative modality: If necessary for organizational reasons, some hours may be held remotely, either online or offline) concerning the theoretical aspects of both VR and AR.
At least other 4 hours are usually devoted to visiting VR/AR laboratories of the University, or to seminars (interactive modality, in precence, or in some cases remotely for seminars).
All lessons and exercices are recorded and made available one/two days after they were done.
The official language of the course is English.

## Textbook and teaching resource

Slides from the teacher.
Technical documentation and tutorials for Unity.
**Books:**
Virtual and Augmented Reality (VR/AR), Ralf Doerner, Wolfgang Broll, Paul Grimm, Bernhard Jung Editors. Springer, 2022
Augmented Reality: Principles and Practice (Usability) - Dieter Schmalstieg Tobias Hollerer, 2016

## Semester

Second semester

## Assessment method

Written test (carried out in the laboratory on examonline) on the topics seen in lectures.
The written test includes both closed multiple choice questions and open questions, and covers all the topics seen in class. Regarding the practical part, the questions include both closed multiple answers, open answers, and questions regarding how the student would project a simple VR/AR application.
Oral exam upon request by the professor or the student.

## Office hours

By appointment

## Sustainable Development Goals

REDUCED INEQUALITIES | SUSTAINABLE CITIES AND COMMUNITIES