Course Syllabus for
Industry 4.0 PhD
(years 2022-23 /2023-24)

Course title	Xtended Realities for Industry 4.0
Scientific Discipline Sector	ING-IND-15
Hours of instruction	20 hours
CFU	2 CFU
Semester	First semester
Goal	Quickly introduce the researchers to the Augmented, Virtual, and Mixed technologies providing the key concepts and methods, and by a hands-on practical laboratory. The goal is to explore and envisions new and disruptive research domains and applications.
Syllabus	Methods (1CFU) 1. **Next-Gen interfaces (4 h, 0.5 CFU)**: Milgram continuum, AR vs. VR, trends, AR-enabling Technologies, Virtual-Digital combiner (Spatially Augmented Reality, Spatial see-through display, Head-up displays, Handheld Displays, Video see-through HMD, Optical see-through HMD, retinal), AR tracking, AR UI, AR applications. 2. **Mixed Reality experiences development (4 h, 0.5 CFU)**: concepts, workflow, architecture, editor simulation and deployment, authoring, scenes, object hierarchy, assets, import process, rendering pipeline, object, components, scripts, Troubleshooting. Laboratory (1CFU) 1. **Unity 3D Basics (4 h, 0.5 CFU)**: installation, configuration, start a new project, interface layout, play-mode, creation and navigation of the scene, graphics primitives, hierarchy, project folder explorer and asset store integration. 2. **AR authoring (4 h, 0.5 CFU)**: Setting cameras, tracking and lights, import CAD files with materials, Physics Engine, Gravity, Colliders, Triggers, Rigidbodies, Build and deploy AR application.
Bibliography	• Augmented Reality: Principles and Practice, by Dieter Schmalstieg, Tobias Höllerer Released June 2016 Publisher(s): Addison-Wesley Professional ISBN: 9780133153217 • Unity 3D online Documentation, https://docs.unity3d.com/Manual/index.html
Examination method	Final project presentation and oral discussion.