Integration of Augmented Reality in Courses for VET

To teach the contents related to **Augmented Reality**, we decided to integrate the subject into relevant courses in each department, enriching the existing curriculum. In every department, one course was selected as an example for implementation, such as:

- Materials Science Laboratory- Mechatronic department
- Pulmonary Medicine- Medical devices department
- Electrical and Electronics Laboratory- Electricity department
- Control and Automation- Electronics - department

Teaching Approaches

Two different approaches were piloted:

1. **Synchronous approach in class** – The lecturer taught the topic of 3D scanning through demonstrations and scanning exercises around the campus, followed by hands-on practice for the students.
2. **Asynchronous course** – Lecturers developed an online course divided into two modules:
    - **Module 1**: Introduction to 3D scanning, explained through short video lectures and accompanied by practical assignments.
    - **Module 2**: Learning how to annotate and add information to specific tagging points within the 3D model.

Link to the course:

https://web.betayeda.com/ortbraudepracticalengineering/signup/0a562826-ca1e-4b01-a2b0-d949ca004952

Evaluation and Outcomes

Lecturers' evaluations revealed that the **asynchronous learning model** was more successful. Students quickly mastered the technological aspects (in many cases more efficiently than the lecturers themselves). This approach saved valuable class time and allowed more focus on practice, recording, and creating small projects.

To consolidate the acquired knowledge, students were required to complete a **final project** in their course. Each project involved scanning a space using 3D techniques and annotating multiple points with relevant information.

Examples of student projects (full list in the annex):

Project Title	Department / Course	Description
Instrumental Analysis Laboratory (GC)	Biotechnology	3D scanning and annotation of laboratory instruments to support analytical chemistry learning.
TCB Electrical Laboratory	Electrical Engineering	Digital mapping of the electrical lab with tagging of key devices and circuits.
LA RIAD	Medical Technology	3D model of laboratory setup for respiratory analysis, including tagged explanations of equipment functions.
Production Line Project	Industrial Engineering	Virtual representation of a small-scale production line, with annotations describing each stage of the process.
Dialysis Machine – Naharia Hospital	Medical Technology	3D scanning of a dialysis machine, including annotations on components and their clinical functions.
Alnadlan Project	Architecture	3D mapping of a real estate project with AR-based annotations on design elements and building phases.
TDK Software	Software Engineering	Development of an interactive 3D environment where software functions and system modules are explained through tagging.

Conclusions

This method successfully covered the required knowledge while encouraging **self-learning** – a skill of high importance for industry preparation, where much of the training on equipment is acquired through video tutorials or online lectures.

Students demonstrated strong interest and engagement in the subject. The use of AR and tagging made the courses more dynamic, while also providing tools for reviewing and summarizing the material.