International Cooperation Framework for Next Generation Engineering Students

NextGEng Co-Teaching Pilot Program

Ciprian RAD

Technical University of Cluj-Napoca

IFM^{2}E, 21 November 2023, Cluj-Napoca, TUCN

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Content

- Introduction
- Co-teaching pilot program road map
- Expected results

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About NextGEng Project

- **NextGEng Project** aims to create new pedagogical models that promotes international team-teaching with the support of new learning materials for existing courses in the curricula

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International pilot program

The main objective of the **WP3** is to develop a **PILOT PROGRAM** that implements **INTERNATIONAL TEAM TEACHING** as part of the educational process in all HEI partners for the **ENGINEERING COURSES** in their curricula.

Six joint courses **(upgrading process)** → **Developed by co-teaching teams** → **For a Pilot Program**

C1 – Strength of Materials
C2 – Industrial Automation
C3 – Design Projects
C4 – Quality Assurance and Applied Methods
C5 – Computer Aided Design
C6 – Manufacturing Technology

For each of the courses (C1-C6) an **international co-teaching team** is created that includes **HEI course responsible teachers** and **company experts** that work together in the development of **new teaching materials** and **teaching methods**.

The **pilot program** aims to introduce an evaluate the **international cooperative team-teaching process** of the six upgraded joint courses in all HEIs .

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Current teaching situation – C1…C6

Students:

- *"A more practical approach would be nice!"*
- *"Learning this course with foreign professors or making projects with international companies will be a way to work everywhere in the future."*
- *"More interactive activities / laboratory with foreign students and companies."*
- *"It would be fine to invite foreign teachers."*
- *"The professor should use more practical examples, but overall, this was a great course."*
- *"Use a little more detailed lab guide."*

Teachers:

- *"The course is a great opportunity to improve our skills."*
- *"I need extra training to further understand the different team-teaching approaches."*
- *"I consider the collaborative teaching experience by projects to be very interesting."*

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Current teaching situation – C1...C6

Rate your overall experience at the course considering the following aspects:

- learning outcomes
- course content and quality of the teaching materials
- internationalization
- teaching methods used at the course
- interaction with industry

The directions where improvements can be made:

(1) activities in collaboration with foreign teachers/companies
(2) updated didactic materials
(3) soft/green skills

Answers of the students

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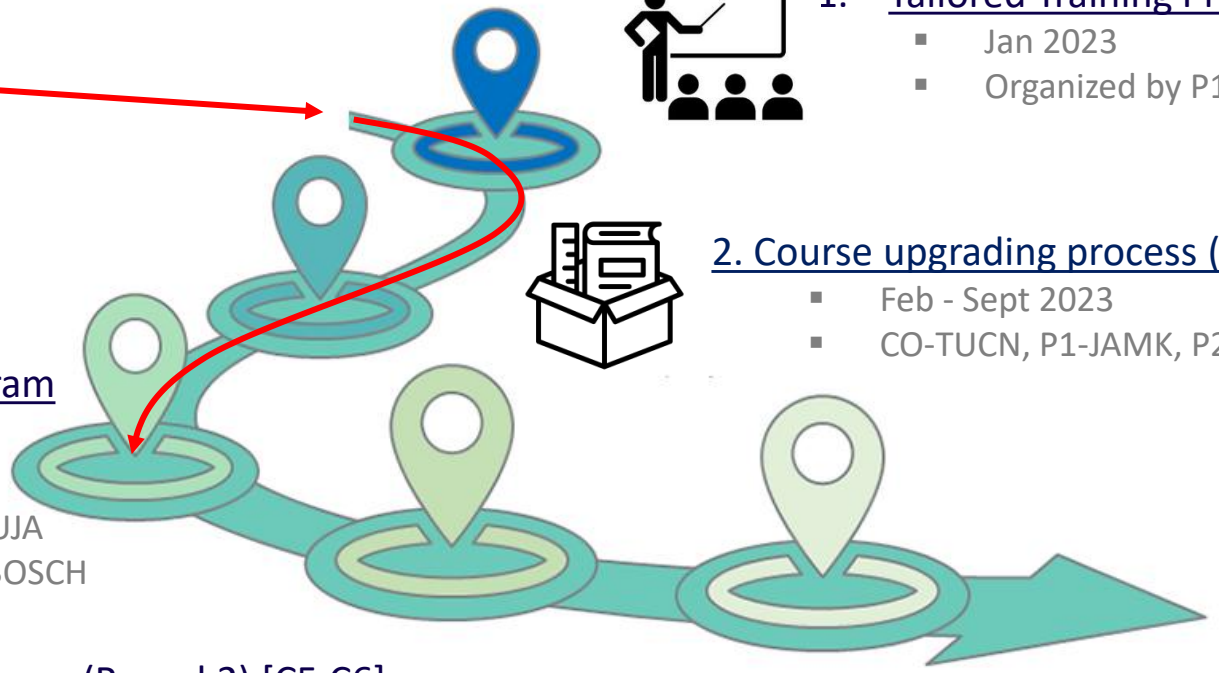
International pilot program road map



1. Tailored Training Process
   - Jan 2023
   - Organized by P1-JAMK

2. Course upgrading process (Round 1) [C1...C4]
   - Feb - Sept 2023
   - CO-TUCN, P1-JAMK, P2-UJA, P3-ISR, P4-VALMET, P5-BOSCH

3. Implementation of the Team-Teaching Pilot Program (Round 1)
   - Sept 2023 - June 2024
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4. Course upgrading process (Round 2) [C5,C6]
   - Feb - Sept 2024
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5. Implementation of the Team-Teaching Pilot Program (Round 2)
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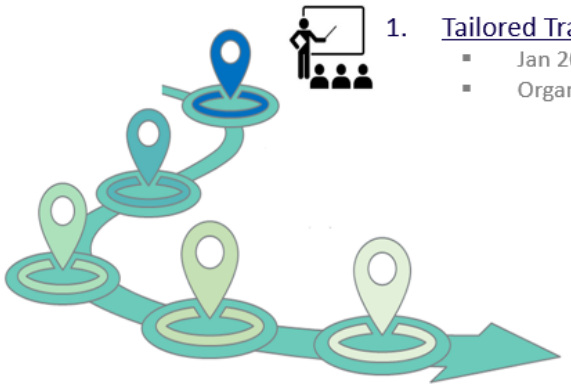
International pilot program road map



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Coagulate co-teaching teams

Co-teaching team for joint course Cx (x = 1…6)

Teacher in charge From Romania	Teacher in charge From Finland	Teacher in charge From Spain
Expert from ISR Spain	Expert from VALMET Finland	Expert from BOSCH Romania

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- **Modularity of contents and levels**
- **Student-centered elements**
- **Eco-friendly concepts**
- **Material compatible with digital teaching and learning**

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- **Modularity of contents and levels**

  ☑ for each joint course **modules** are defined

  ☑ the modules integrates **fundamental and/or state of the art topics**

  ☑ the modules promotes **personalized learning** with **different levels of complexity** **(basic – intermediate - advanced)**

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➢ **Student-centered elements**

☑ the proposed approach put the students at the **center of learning process**

☑ students are stimulated through **experiential learning** (experiments developed in collaboration with industry partners)

☑ it's all abut delivering **a better learning curve for each student**

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➢ Eco-friendly concepts

☑ Eco-friendly concepts (**green skills**) will be introduced in every module to raise awareness to students on the influence/impact on environment based on their decisions in the developing and life span of a certain engineering product

☑ Green skills are the knowledge, abilities, values and attitudes needed to live in, develop and support a **sustainable and resource-efficient society**

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➢ Material compatible with digital teaching and learning

☑ Modules will be compatible with **digital teaching and learning** and will include:

- PPT lectures, narrated PPT presentations or other mini-lecture recordings
- Videos or computer screencasts to demonstrate the concepts
- On-location videos to demonstrate real-life applications

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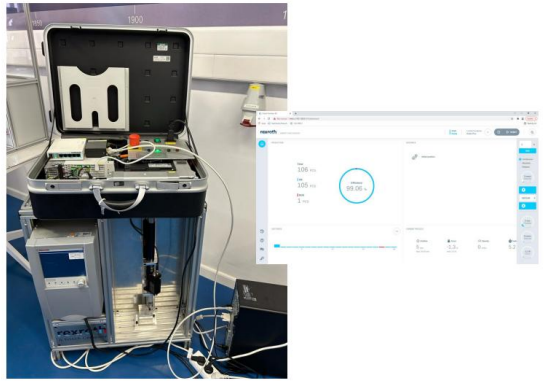
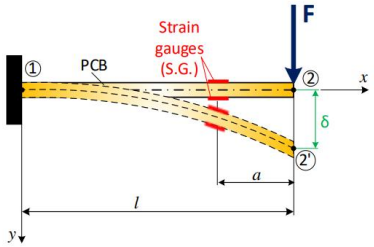
Stress measurements for PCBs

Industrial application



Conceptualization

Theoretical application



The task of Strength of Materials, based on a real topic received from Valmet:

Examples of laboratory activities developed by co-teaching team C1

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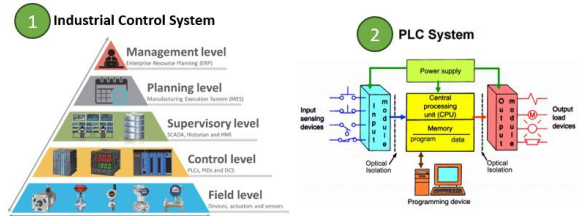
PLC Programming with Sequential Function Chart (SFC)



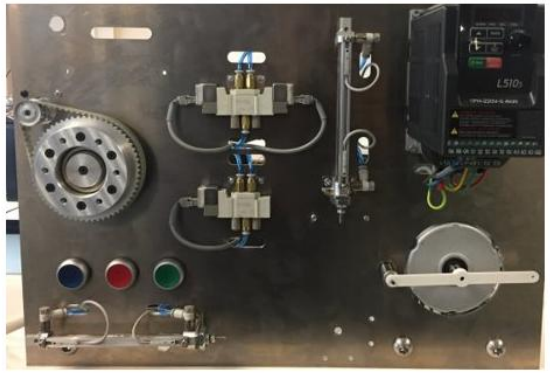
Source: Rahman, Moksadur, et al. 'A Framework for Learning System for Complex Industrial Processes'. AI and Learning Systems - Industrial Applications and Future Directions, IntechOpen, 17 Feb. 2021. Crossref, doi:10.5772/intechopen.92899.

The modular Mechatronics Training System mMS 4.0

Experimental setup

Educational demonstrator

- Equipped with:
  - Two double acted cylinders, provided with limit switch on both ends. Cylinder A is operated by a bistable valve, B cylinder is operated by a monostable valve.
  - 3 illumination provided push buttons (red, green and blue).
  - Additional elements (not used during this practice session).



Examples of laboratory activities developed by co-teaching team C2

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Ergonomic assessment and workplace design

- The topic discussed in this laboratory involves students in finding ergonomic based solutions for design, redesign and improvement of a manual assembly workstation

How to scope a project in an Industrial Tech Company (ClickUp example)

ClickUp

Examples of laboratory activities developed by co-teaching team C3

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Industrial applications for CNC tooling measurement

- High-precision contact measurement sensor 'Renischaw sprint'

- Non-contact measurement using Computer Vision 'MIDAS'

Calibration “Smart function kit press”

The aim of this activity is to calibrate a force sensor to assure that it gives precise measurement values for force.

Examples of laboratory activities developed by co-teaching team C4

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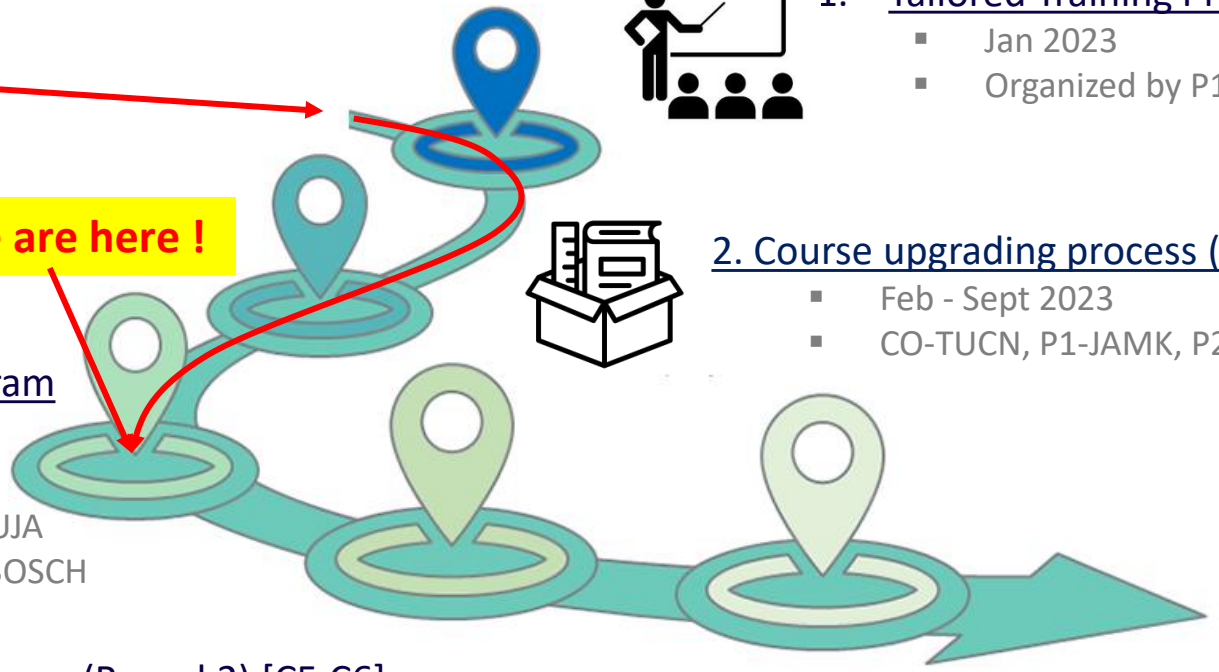
We are here !



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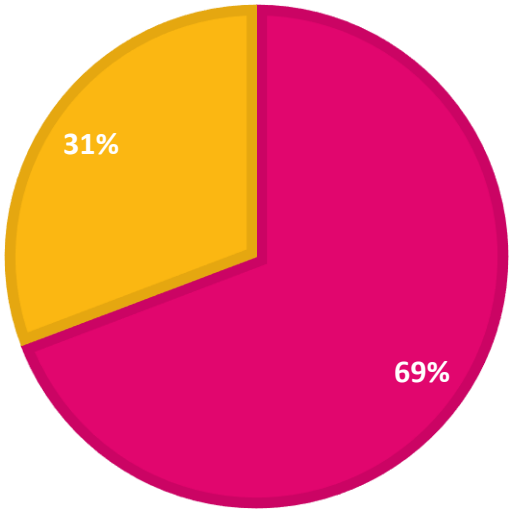
Expected results

SIX UPGRADED JOINT CURSES (C1-C6)

- 36 course modules (2 modules/course and 12 modules/HEI)
- 16 Laboratory work from company partners (ISR:4, Valmet:6, Bosch:6)



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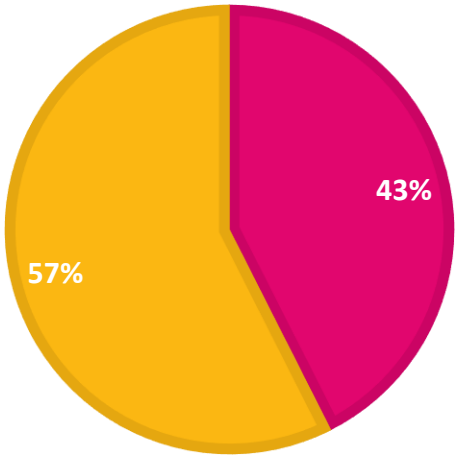
TWO TEAM-TEACHING PILOT PROGRAM IMPLEMENTATION ROUNDS

- 60 course team-teaching sesions from HEIs
- 81 laboratory/seminar team-teaching sessions from companies



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ONE BEST PRACTICE GUIDE

- ❑ for international team-teaching in engineering

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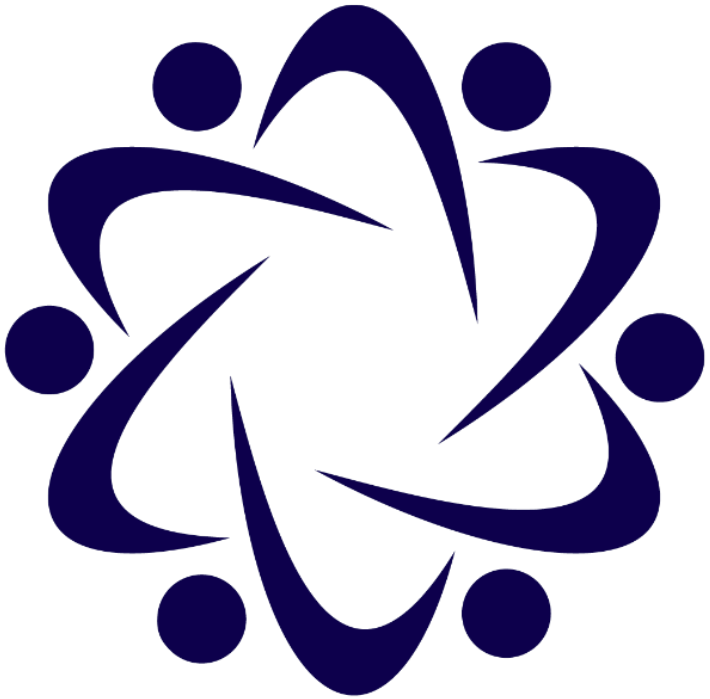
Thank you!



Kiitos!

Gracias!

Multumesc!

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