

Projects-to-Classrooms (P2C) Program Enhancement

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Abstract

There are many **challenges** related to the implementation of project-based learning (PBL) in the engineering curriculum:

- The amount of work required by instructors to **design well-posed projects**
- Poorly designed PBL activities cause **frustration** among students, create **extra work** for instructors and students alike, and detract from the intended learning outcomes

Frustration

Typical student reaction to ill-posed course projects that do not align well with the learning objectives.



The **Projects-to-Classrooms (P2C)** program is a unique **co-curricular** program that supports instructors in the **creation of high-quality and high-impact PBL activities**. The program is innovative as it involves and benefits multiple stakeholders including students employed through the program, faculty, industry, and the engineering curriculum.

Goals of the P2C program

The P2C program **employs undergraduate students** to work on special projects in engineering design based on **real-world/industry problems**. P2C projects are then **integrated into undergraduate courses as case studies, projects, or labs**.

Engagement with local industry in the form of consultation, donations, or sponsorship is encouraged. The goals of the program are to:

- Give students an opportunity to solve **real-world** engineering problems through application-driven case studies
- Increase the number and quality of **project-based learning** into undergraduate courses
- Maximize the use of **existing lab infrastructure** to support project-based learning
- Create and strengthen relationships with local **industry** through engagement and sponsorship
- Establish a formal **mechanism for industry to help train students** in workforce skills without fundamentally changing the curriculum
- **Continually improve** and keep the undergraduate engineering program relevant

P2C is **student-focused** and aims to enhance the undergraduate student experience; it is not used to fund engineering research.

Implementation

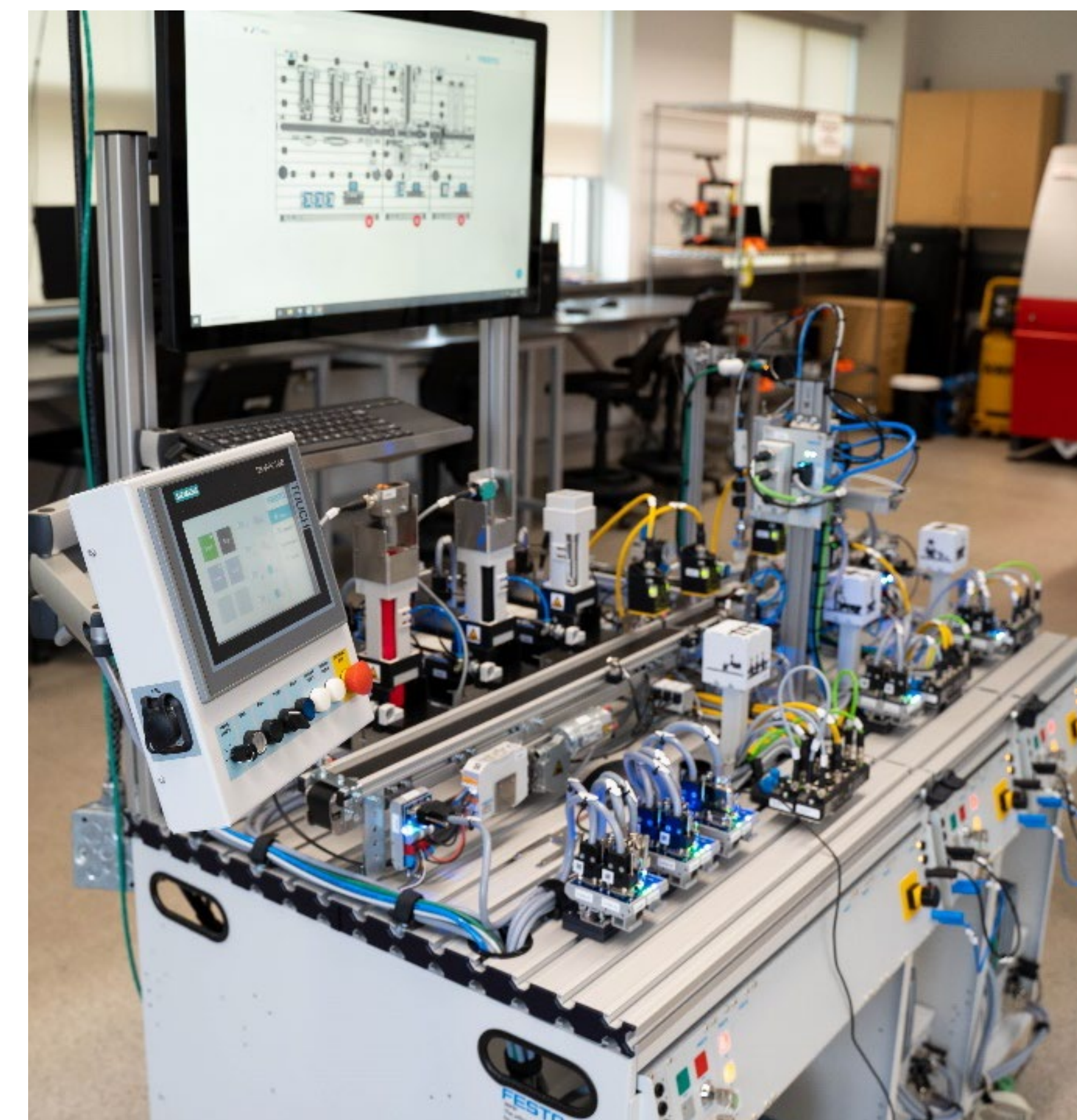
Instructors submit a project proposal including the project title, **course(s) which the project outcomes will be integrated**, project description, rationale, resources needed, and a hiring and training plan. For the rationale, instructors elaborate on **how the P2C project outcomes will be integrated into the course(s) identified and how it will improve the course**. The hiring and training plan should explain how equity, diversity, and inclusion will be supported and how the project will be successful and student-focused.

Proposed project descriptions are then published on the program website and **students apply** for as many P2C projects as they like, but can only hold one P2C position during their degree.

P2C work terms are **up to 170 hours per student** and aligned with the academic terms.

Industry 4.0 modular production system

Equipment used by a student for a P2C project. This project has been integrated as a lab in an industrial automation fourth year design elective course.



Example projects

- Development of a **resistance spot weld** process for automotive applications
- **CNC machining** of 3D solid & surface models
- **Sheet metal & plastic molding** optimization
- Advanced **metrology and laser scanning**
- Data science for **industrial automation**
- Validation of the thermomechanical properties of materials, and boundary conditions for **industrial casting and forming** processes

Enhancements to the program

To provide P2C students **formal and consistent training** on how to manage their projects or translate them into curricular material, we are developing resources on topics that are uniquely relevant to the goals of the program, including:

- **Writing effective learning outcomes**
- **Content delivery & assessment strategies**
- **CEAB GA process & reporting**
- **Inclusive curriculum**

We are also defining **reporting milestones and rubrics** to (i) guide students and faculty members through their projects, and (ii) facilitate an objective and **consistent evaluation of P2C** projects.

Resistance spot welding

Machine used by a student for a P2C project. This project has been integrated as a lab in a welding and joining fourth year technical elective course.



Acknowledgement

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