

PROJECT BASED LEARNING AT CAMPUS 02 UAS DEGREE PROGRAMMES IN AUTOMATION TECHNOLOGY

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Abstract

This paper presents an example of a good practice according to implementation of innovative educational framework for producing the next generation of engineers.

The educational content and learning outcomes are well developed and integrated into study programme and curriculum. Learning outcomes correspond well with teaching methods, competences, practical problem solving of R&D applications in education and presentation of the achieved project results.

1 INTRODUCTION

"Students of today enter an increasingly globalized world in which technology plays a vital role. They must be good communicators as well as great collaborators. The new work environment requires responsibility and the ability to self-manage as well as the interpersonal and project-management skills needed for teamwork and leadership. Enter project-based learning (PBL), designed to put students into students-as-workers setting in which they learn collaboration, critical-thinking, and written and oral communication skills, along with the values of a strong work ethic, all while meeting state or national content standards. But don't confuse PBL with simply doing activities injected into traditional education to enliven things as a culminating event for a learning unit. Real PBL, in contrast, is deep, complex, rigorous, and integrated [1].

The quote mentioned so many basic skills that are very important not only in project based learning, but also in daily life. Degree programmes in Automation Technology at CAMPUS 02 provide courses each semester, for at least one of these soft skills [2].

CAMPUS 02 University of Applied Sciences in Graz, Austria, offers around 70 % part-time study places, both in business and engineering. The University is situated in

Styria. There are many companies in the field of engineering and a lot of our students are employed there.

Based on the needs of the companies in our region and on the beautiful ideas of our students and lecturers, the Bachelor Degree Programme in Automation Technology started to integrate in the curricula an innovative project based learning course named Elective Accompanying Projects. The application and implementation of the above mentioned basic skills are practiced successfully in the context of this course.

2 PROCESS AND ABILITIES OF THE STUDENTS

The inclusion and integration of students takes place in a variety of ways. On the one hand, in the context of courses, the students have the opportunity to contribute basic issues as well as specific tasks of their professional environment and to work as part of their project. In this way they can bring proposals to the course Elective Accompanying Projects in the 3rd, 4th and 5th semester. On the other hand, the experience of the student is used for choice of R & D topics of study. Students from different professional disciplines work in project teams together and complement each other so well in the different approaches, as well as the ways of thinking and mutually benefiting from this process. Thus, in the typically interdisciplinary R & D topics a wider access is given and often the solutions are pronounced accordingly.

At the end of the semester they must present their work where they get a professional feedback on their presentation technique from the audience (lecturers and company representatives).

3 EDUCATIONAL CONTENT AND OFFERD TOPICS

The course starts in the 3rd semester and extends over three semesters. A self-selected (or specified by the lecturer) project task should be solved in teamwork, usually within one semester.

The tasks deal with typical problems of automation technology. The following topics are offered:

- CAN (Control Area Network) Bus systems
- Mechatronics and Robotics
- PLC (Programmable Logical Controller) systems
- RFID (Radio Frequency Identification)
- PC Interface Technology
- LabView
- Microcontroller Technology
- Virtual Process Planning, CAM

The students have the opportunity to choose three out of potential project topics and to edit each one of these topics for a semester. Fundamental topics as well as specific tasks in their professional environment can be chosen for this purpose. This enables an individual professional deepening of students according to their personal interests and/or professional needs.

A very important point is, these projects are not generated artificially, but professionally they reflect the tasks settings of the study programme.

4 LEARNING OUTCOMES

The main goal of the project based learning process at our institution, in addition to the extension of theoretical and practical knowledge on professional level is especially the application and implementation of theoretical knowledge in projects.

At the level of personal and social-communicative competencies, the focus is on self-assessment, self-organization and critical reflection (e.g. assessment of the result of the project) as well as in the target and relationship-oriented work in the group.

After successful completion of the course the students are able to:

- acquire and apply detailed knowledge and deeper knowledge, through appropriate practical oriented exercises
- design, develop and carry out projects
- define a technical task, estimate the time frame and process the tasks in the form of a project
- divide work among multiple people and define clear interfaces between the work areas
- implement practical work and work in groups

- acquire new knowledge for the solution of the project independently
- summarize and document the results
- prepare and present a finished technical project to a professional audience in an appropriate final presentation

During iterative feedback process, by sharing knowledge, problems and thoughts, also the lecturers benefit inside on current trends and challenges and can use the findings in their professional environment.

5 EXAMPLES OF COMPLETED STUDENT PROJECTS

Some of the completed projects of the students are pointed out as follows:

5.1 Force measurement by KUKA robot

The students have set themselves the ambitious target, to open a traditional wine bottle with cork by a 6-axis KUKA robot. During the uncorking, the resulting forces, torque and bending moments must be measured and visualized via LabVIEW.

A measuring device was designed and simulated, the measuring concept was created and visualization including robot programming in the reality implemented.



Figure 1 Force measurement by KUKA robot

5.2 Development of an automated test system

An automotive company made the request, to design a system, which can be used as a method for crack analysis of threaded tubes. Based on this, a quality testing laboratory at start of production orders and 100 % test in the series can be developed.

The development of a test method started with first plant layouts and ended with a test system which was carried out in practice.

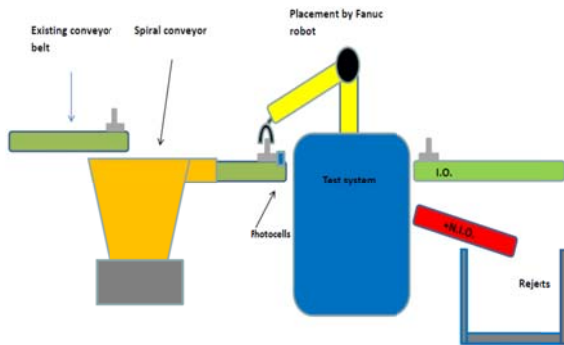


Figure 2 Development of an automated test system for non-destructive testing of threaded tube in cooperation with an automotive company

5.3 Object information using NFC

At the beginning of this project, tests of different NFC (Near Field Communication) tags on different surfaces (e.g. metal) were carried out. After that, the programming of NFC tags was implemented and enables the link to documents on a server.

The future vision is to get the information directly on the object in industry, office, household and possibly to implement the NFC chips in new credit cards.

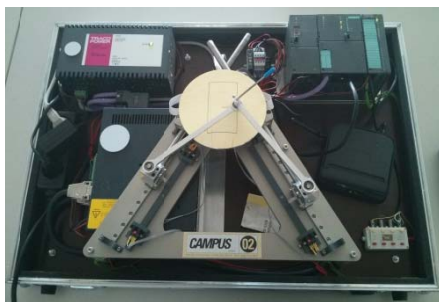


Figure 3 Object information using NFC (Near Field Communication)

5.4 Remote Controlled Car by Raspberry

The aim of this project was to control a RC Car via web access by any terminal. The target was achieved. An emergency stop function has been added. The Raspberry system and the rest of the required hardware were mounted on the RC Car.



Figure 4 Remote Controlled Car by Raspberry

6 CONCLUSION

The focus of research in the study programme of automation technology at CAMPUS 02 is based on topics that are relevant to small and medium enterprises.

The measures necessary for achieving the objectives and to ensure the principles of the Degree programme application-oriented research and development work by the members of the teaching staff in conjunction with the students, as part of practice-oriented, business-related project work are professionally implemented in this course. Benefits from this process contribute to the Degree programme, as well as to participating companies. This represents not only a part of research and development, but also ensures the systematic integration of operational problems in the teaching ("research guided teaching").

The structure, content and learning outcomes of the project based learning course Elective Accompanying Projects at the Degree programme in Automation Technology, provide a wide basis, to achieve the objectives mentioned before.

7 REFERENCES

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