



**DYNAMIC – Towards responsive engineering
curricula through europeanisation of dual higher education**

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IMPLEMENTATION REPORT ROMANIA - LBUS

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I. INTRODUCTION

The present Implementation Report (IR) is based on the results of the practical activities organized by LBUS, with the partner companies within the framework of the European project titled **DYNAMIC – Towards responsive engineering curricula through europeanisation of dual higher education** under ERASMUS + Programme, Key Action 2.

The Implementation Report was written in the context of the project background:

“The project will address the need for more flexible routes for acquiring current industry-related skills necessary to boost and sustain innovation in the sectors identified by the national strategies of Smart Specialisation and regional innovation in the new member states. For this purpose, regular practical phases in enterprises will be integrated in the ongoing engineering curricula to accelerate the update of knowledge traditionally provided by higher education institutions. To achieve that the project will apply a county-adapted model of dual higher education.

The aim of the DYNAMIC project is to develop, implement, test and validate 3 undergraduate programmes in the field of Mechatronics and Robotics (Sibiu, Romania), Shipbuilding and Construction (Varna, Bulgaria) and Mechanical Engineering and Production (Pula, Croatia). In order to ensure successful implementation of the 3 dual programmes, the project will develop a toolkit documentation and assessment of the practical training for academic supervisors. To strengthen the training capacities of the enterprises involved in dual education, the project will develop materials for a presence training of industrial supervisors.

The main intellectual output of the project is “Methodological guidelines for design and implementation of practice-integrated dual higher education programmes in Science & Technology Studies” in the context of Bulgaria, Romania and Croatia. The output will satisfy the need for strategic approach in updating engineering curricula implicating the dual education model. The knowledge and experience gained within the project will be synthesized in this methodological document that will describe the different sets of methods employed at the different stages of the process.

The full commitment of 16 partners from Bulgaria, Romania, Croatia, Germany and Austria and the active involvement of key stakeholders will ensure sustainable long-term exploitation of project results beyond the project life-time.”

2.OBJECTIVES AND METHODOLOGY

2.1. Objectives of the Implementation Report

The present Implementation Report (IR) aims at:

- presenting the general structure of the practical activities unfolded by the students enrolled at Mechatronics dual-study programme;
- analysing the results of practical activities organized by LBUS with the partner companies;
- quantifying the development, implementation and validation of the dual undergraduate programme in the field of Mechatronics;
- assessing the degree of satisfaction of the main participants involved in the practical activities, the students and companies.

2.2. Methodology used

The Report is based on the results of the practical activities unfolded during the academic year 2018/2019 by the students enrolled at the dual study programme of Mechatronics at LBUS.

Practical activities were organized by LBUS and the partner companies and unfolded at the companies. Data for the present report were collected by discussions, which involved all participants (staff from companies and students) and session data forms. Significant information and data were also provided directly by representatives of the companies.

3. OVERVIEW

“Mechatronics” started as study programme at LBUS in the academic year 2008/2009. Since then it became one of the most successful specializations of Engineering Faculty at LBUS. Graduates of Mechatronics are highly required on the labor market, their degree of employability being close to 100%.

At LBUS, Mechatronics as study program is organized both in Romanian (MECH-RO) and in English (MECH-EN) languages.

These facts corroborated with the rapid industrial development of the Sibiu area led to the need of organizing Mechatronics as dual-study specialization.

Mechatronics at LBUS, as regular study program is unfolded on 8 semesters, with a compulsory amount of practical activities of 240 hours. Students do not pursue practical activities in the first study year (1st and 2nd semesters).

For the dual-study Mechatronics study program, supplementary hours of practical activities were added. A supplementary amount of 810 hours of practical activities were added to the existing 240, which will lead to a total amount of 1050 hour for the dual study option.

The integration of the supplementary hours of practical activities into the present curriculum is shown in figure 1. Nine weeks of supplementary hours were added at the end of the 2nd, 4th and 6th semesters (a period which now is allocated to the summer holidays). Consequently, the total amount of hours for practical activities will reach 1050 for the dual-study specialization.

Another difference between the regular and dual study forms is that students from dual study program must attend the extracurricular courses organized by the companies (mandatory requirement), while for the students from the regular study program the attendance is optional.

The students in the academic year 2018-2019 were able to choose between the regular form and the dual form of the Mechatronics specialization. A limited number of places were allocated to the dual study specialization, and the selection of the students was done according to a selection procedure proposed and agreed between LBUS and the industrial partners.

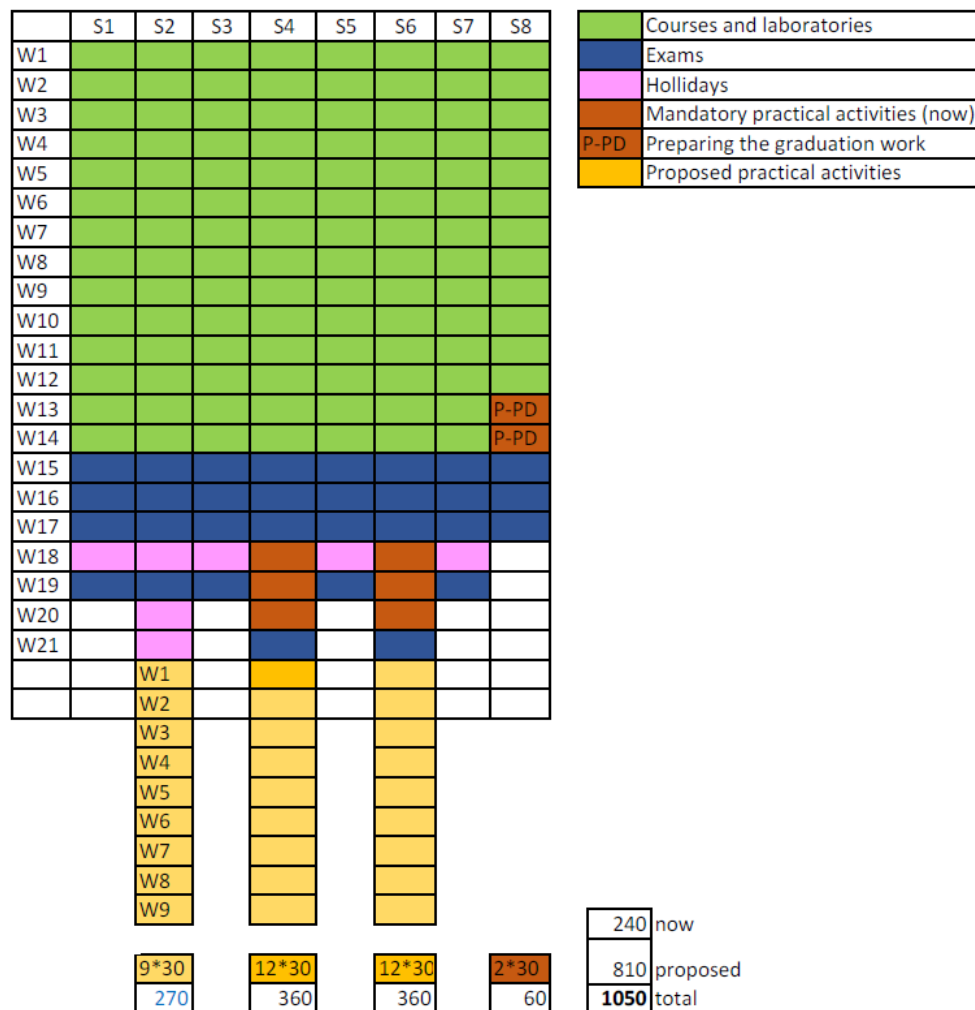


Figure 1: Structure for practical activities for the dual study program

4. IMPLEMENTATION OF THE PRACTICAL ACTIVITIES

4.1 Specific objective

The specific objective of the practical activities agreed between LBUS and partner companies was to develop students' competences in such way that they acquire current industry-related skills, by focusing more on the practical side.

4.2 Duration

The practical activities organized at the partner companies during the summer 2019 were unfolded between 08.07.19 and 16.09.19. The above-mentioned period included the nine weeks of internship and one week for assessment activities.

4.3 Location

Practical activities were unfolded at partner companies Continental Automotive Systems Sibiu (CASS) and Marquardt Schaltsysteme SCS Sibiu (MSS).

Both companies have large production plants and R&D facilities in Sibiu.

4.4 Participants

All students enrolled at Mechatronics specialization (57) were presented the possibility to follow the program in a dual system, by means of a dedicated presentation at LBUS (September 2018) and a visit at the two partner companies (September 2018). A number of 41 students were selected by the companies. Finally, a total number of 35 students attended and finalized the internship.

The participants (students from dual study Mechatronics study programme), were selected by means of a selection process and divided as:

- 26 students at Continental Automotive Systems Sibiu (CASS);
- 9 students at Marquardt Schaltsysteme SCS Sibiu (MSS).

4.5 General structure of the practical activities

Even if the practical activities were unfolded at two different companies, there were many similarities in their general structure. The content of the practical activities was tailored to comply both the requirements of the industrial partners and the new syllabus designed by LBUS.

During practical activities, students were permanently mentored by tutors from the two companies involved in the dual study programme.

The mentors from both companies were also trained for this role, by means of the *Train the Trainer* course organized by AHK Romania.

Because all students were enrolled in the 1st year, both companies decided that they should start with a Rotation Plan and try out more activities afterwards, after getting familiar with the structure and activities of host companies.

Figure 2 presents the Rotation Plan for the students at Continental Automotive Systems Sibiu (CASS).

Plant/ R&D	Department	Area	Students/ 3 week period	Total Students for 9 weeks
Plant	Industrial Engineering	Smart Applications Lab (multidisciplinary)	4	26
R&D	Qualification Laboratory	Qualification Lab (multidisciplinary)	4	
Plant	Interior Body & Security	Test (Software & Electronics)	3	26
Plant	Transmission & Engine Systems	Test (Software & Electronics)	3	
Plant	Advanced Driver Assistance Systems	Test (Software & Electronics)	3	
R&D	Vehicle Dynamics	Mechanical Design & Laboratory	5	26
R&D	Engine & Drivetrain Systems	Mechanical Design & Simulation	4	

Figure 2: Rotation Plan at CASS (source: CASS)

According to the data provided by Marquardt Schaltsysteme SCS Sibiu (MSS), the Rotation Plan at the company included activities in the following departments:

- Initial training (08.07-09.07)
- Assembly Department (10.07-16.07)
- Varnishing Department (17.07-23.07)
- R&D Department (24.07-06.08)
- Quality Department (07.08-20.08)
- Logistics Department (21.08-27.08)
- Industrialization Department (28.08-10.09)

The structure of practical activities at Marquardt Schaltsysteme SCS Sibiu (MSS) is presented in figure 3.

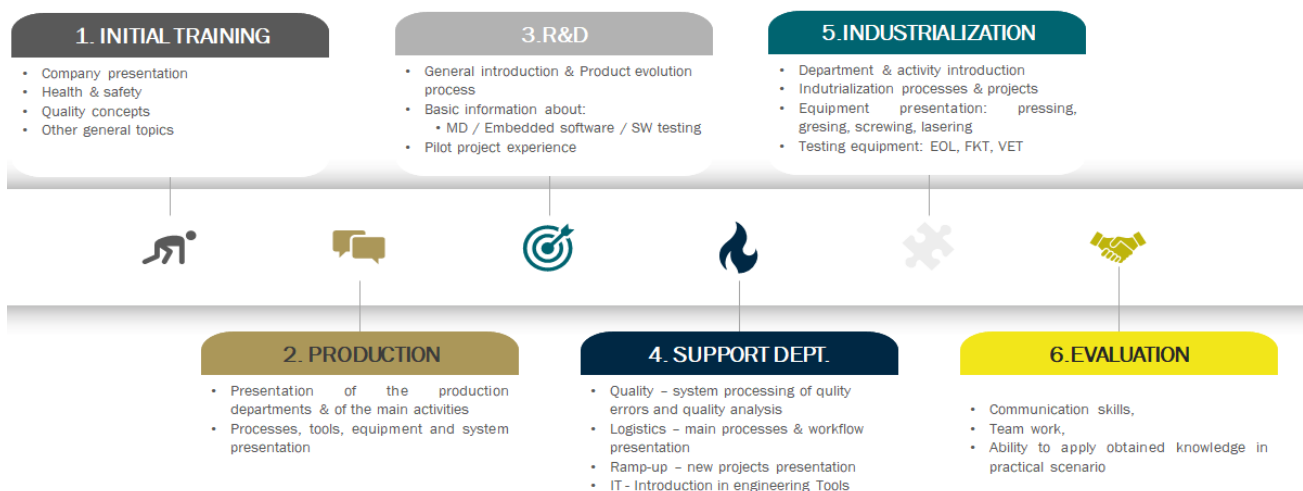


Figure 3: General structure of practical activities at MSS (source: MSS)

The students were paid during the internship (the amount of the payment was agreed between students and companies, according to the laws and regulations. Accommodation was also offered by the companies for the students living outside from Sibiu.

5. EVALUATION

The student’s evaluation took place at the end of the practical activities. Tutors from each department included in the Rotation Plan evaluated the students.

At CASS, the tutors had to evaluate students by filling up the table presented below (figure 4).

Student	Department	Direct Superior	Overall Performance of Summer Intern	Contract Decision	IF Prolongation: Write the ending date of the contract	TLs Comments

Figure 4: Evaluation table at CASS (source: CASS)

At MSS, several criteria were defined for the evaluation, and the tutors had to fill up the following table (figure 5).

The appraisal scale used was 1-10, similar to the one used at the university.

Competences applied during the internship:	Appraisal:									Total gen.
	R&D Dep.	OP6 Dep.	OP3 Dep.	QM Dep.	LO Dep.	IEE Dep.	IEI Dep.	IT Dep.	OPS Dep.	
Communication skills										
Team work										
Independent decision making										
Ability for evaluation and self-evaluation										
Cooperation with specialists/experts from other domains										
Ability to apply obtained knowledge in practical scenarios										
Ability to adjust to new situations										
Care for obtaining quality										
Execution of complex tasks										
Appraisal result:										

Figure 5: Evaluation table at MSS (source: MSS)

Feedback meetings were organized to assess the students’ feedback regarding the first results of the internship program. At CASS, feedback questionnaires were distributed to the students. Figure 6 presents some results with regards of the students’ feedback at CASS.

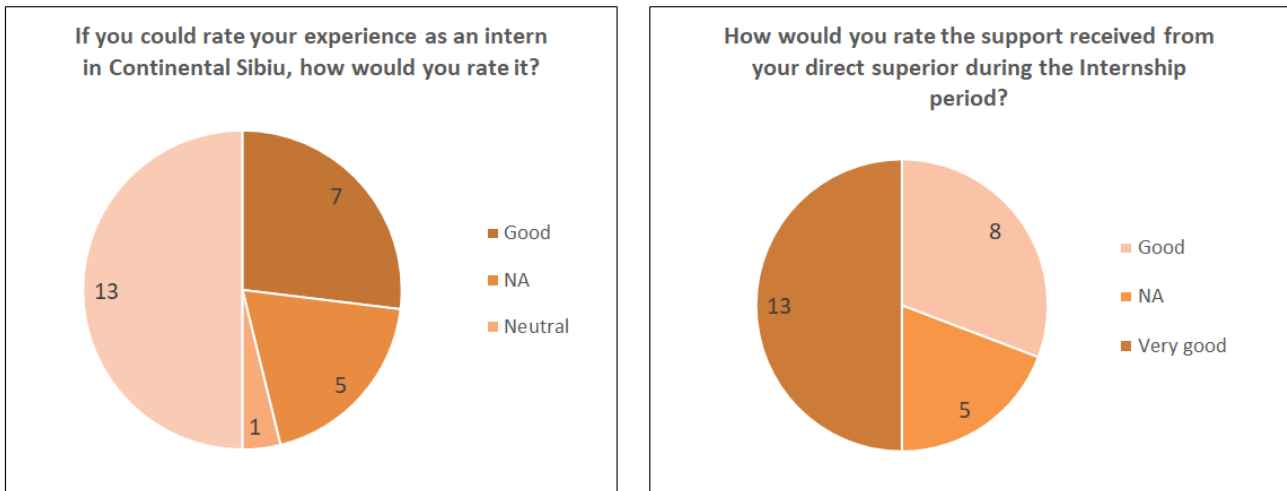


Figure 6: Students feedback at CASS (source: CASS)

Some opinions of the students which participated at practical activities in the companies are also presented below:

“I have learned many things that will definitely help me further”;

“I met a lot of people that are friendly, open-minded and ready to answer every question a summer intern would have. I had the opportunity to see how a cobot is working, how tests on the components are made”;

“Practical experience is the best, and internships give us that hands-on experience that we need. This was a quality internship and essential to develop key skills that we can't get in a classroom”.

Some images collected during the practical activities in the partner companies are presented in figures 7-10.



Figure 7: Images from summer internship 2019 – dual study programme, CASS (source: CASS)



Fig. 8: AHK Train the Trainer course at CASS (source: CASS)



Fig. 9: Some members of the team attending practical activities at MSS (source: MSS)



Fig. 10: Students and tutors at CASS (source: CASS)

6. CONCLUSIONS AND FUTURE ACTIONS

This project aims to implement the dual study option for the existing “Mechatronics” specialization at Lucian Blaga University of Sibiu.

Out of the 41 students which expressed their intention to pursue practical activities in the framework of the dual study Mechatronics study programme, 35 had finalized the first 9 week of internship.

For the 2019-2020 academic year, the following actions will be implemented:

- Students will develop practical competences focused within their field of specialization Mechatronics;
- Besides these technical competences’ students will also learn the principles and processes underlying the activity within the departments;
- Coaching and Mentoring competences will be also an important part of their training.

Mechatronics, as dual-study program will continue in the framework of Dynamic project, but will have also a new start in 2019-2020, with students in the 1st semester:

- 15 students at CASS
- 10 students at MSS

ACKNOWLEDGEMENT

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