

PILOT ACTION EVALUATION

DT252 - PP5 - Partner Report on Pilot 3

Version 2
05 2019





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1. Short overview of the Pilot Action

FabLabs are technical prototyping platforms for innovation and invention inviting a society at large to become innovators. University Fablab “strojLAB” is platform for all students on Faculty of Mechanical Engineering. The Fablab supports novel non-frontal education approach on Institute of Machine and Industrial Design based on project learning system and is implemented directly into education program:

Support of project base learning courses

Master degree program M2I-P Mechanical Engineering, branch: Mechanical Engineering Design
Branch Mechanical engineering covers also subjects focused on project base learning education and team work. The aim of the subjects is to learn theory and practically improve the knowledge via projects. The projects cover digital technologies, CAD, FEM, tribology and technical diagnostic. Outcomes of subject are typically functional mechanical mechanisms, devices, prototypes. Fablab supports the implementation of student’s semestral projects and diploma projects within the subjects: Team Project (FSI-ZKP), Mechanical Design Project (FSI-ZIP), Engineering Project (FSI-ZKR), Diploma Project II (M-KSI, M-PDS) (FSI-ZD5), Machine and Process Control (FSI-ZAE)



2. Lessons learnt

Students learn via “Learning by doing” and “Do it yourself (DIY)”. They cooperate in workgroups and they must finely manufacture functional product. It is assumed basic knowledge of CAD modeling and machine parts.

Stop Doing

- Teaching CAD base knowledge in master degree program
- Teaching of theoretical knowledge without applying to real problems

Keep doing

- Project base learning and team work - Students receive feedback and will realize what a knowledge is theoretically mastered and what is not
- Open access to 3D printers and another equipment

Start doing

- Project based on industry cooperation
- Mentoring of enthusiasts students
- We began to address the student community regularly and promote the Fablab idea
- We are looking for students enthusiasts

3. Outcomes

All courses were supported by FME BUT fablab. The main objective of the courses is to bring students closer to digital manufacturing and team co-operation. Students received the advanced information about technologies presented in the frame of fablab and standard education. During the whole courses they have used the 3D printers, robotic workshop, 3D scanning, Arduino platform, CAD programs, FEM analysis etc.

Students had to prepared project plan and project management. Each student was responsible for task and also presented outcomes. Students received feedback by when defending projects. The commission was formed by professionals of FME BUT Brno.

Importance

Pilot 3 project is important mainly by changing the way of teaching. Students will learn the technologies themselves. They are not dependent on a contact form of teaching, they achieve results faster and have a personal experience with teamwork. Therefore, within standard teaching, it is possible to devote to fundamental knowledge usable for project form of teaching.

4. Sustainability

Fablab is implemented into Master's study program subjects as project learning support. Students use Fablab equipment to design and implement functional products. Costs of material will be sponsored by Institute of Machine and Industrial Design.

Students obtain an information about Fablab integration directly from the subject's description: "This course was supported under the FabLabNet project from the European Regional Development Fund within the programme "Interreg Central Europe". The course uses facilities of the open-access student workshop "StrojLab", built with the support of Institute of Machine and Industrial Design and the FabLabNet project."

Supported courses:

Engineering Project (ZKR)

Mechanical Design Project (ZIP)

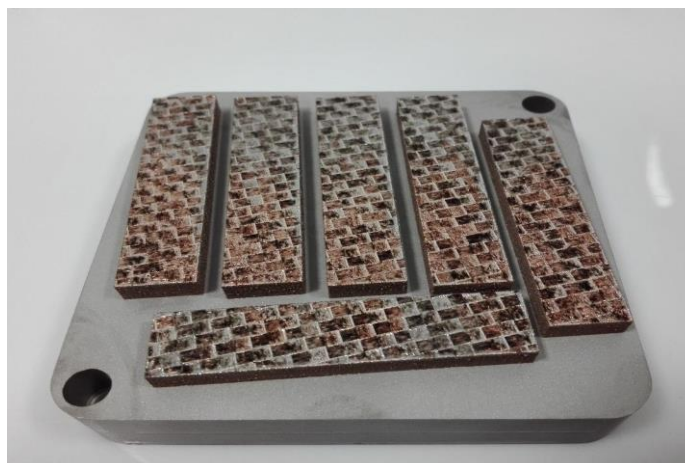
Team Project (ZKP)

Machine and Process Control (ZAE)

5. Supported courses description

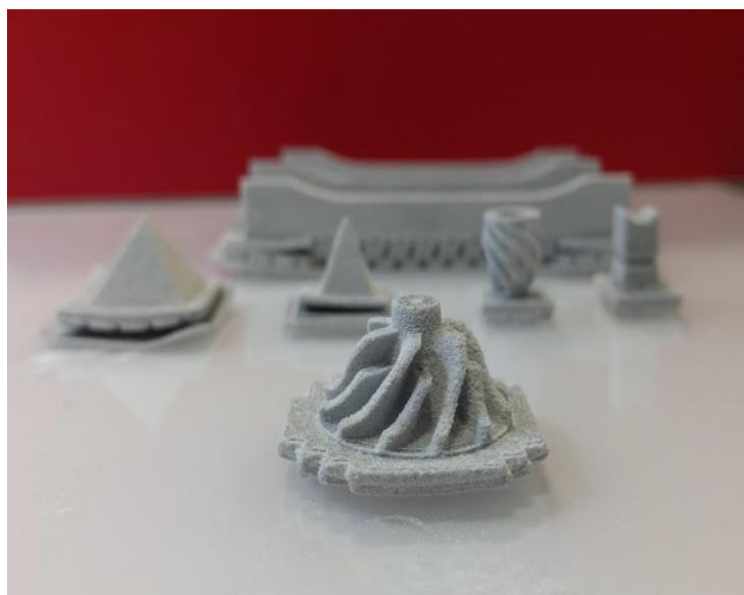
Engineering Project (ZKR)

The course follows the subject Design project and another courses from previous studies. Four different topics of projects are assigned in relation to the currently addressed research and development projects. Students are divided into teams of 3-5 members. Each team solves one project. For successful solution of the project, which include complex engineering problems, students must manage to apply previously acquired knowledge, methods and procedures in the areas of engineering analysis, experiment control, virtual prototyping and parametric modeling. Each topic is led by supervisor of the project who checks the progress, consults possibilities of solution and ensures financing of realization, or communication with investor. Emphasis is placed on quality of outcomes and effectiveness and appropriateness of solutions including the choice of production technologies. At the end of the course, students defend the outcomes in front of the committee. Examples of selected problem situations - project assignments: Design and implementation of clamping fixture for digitization of parts of the human body. Steward vibroisolation platform for astronautics. Construction of an experimental stand for simulation of the contact of real wheel and rail. Design of an active drive of hip joint simulator.



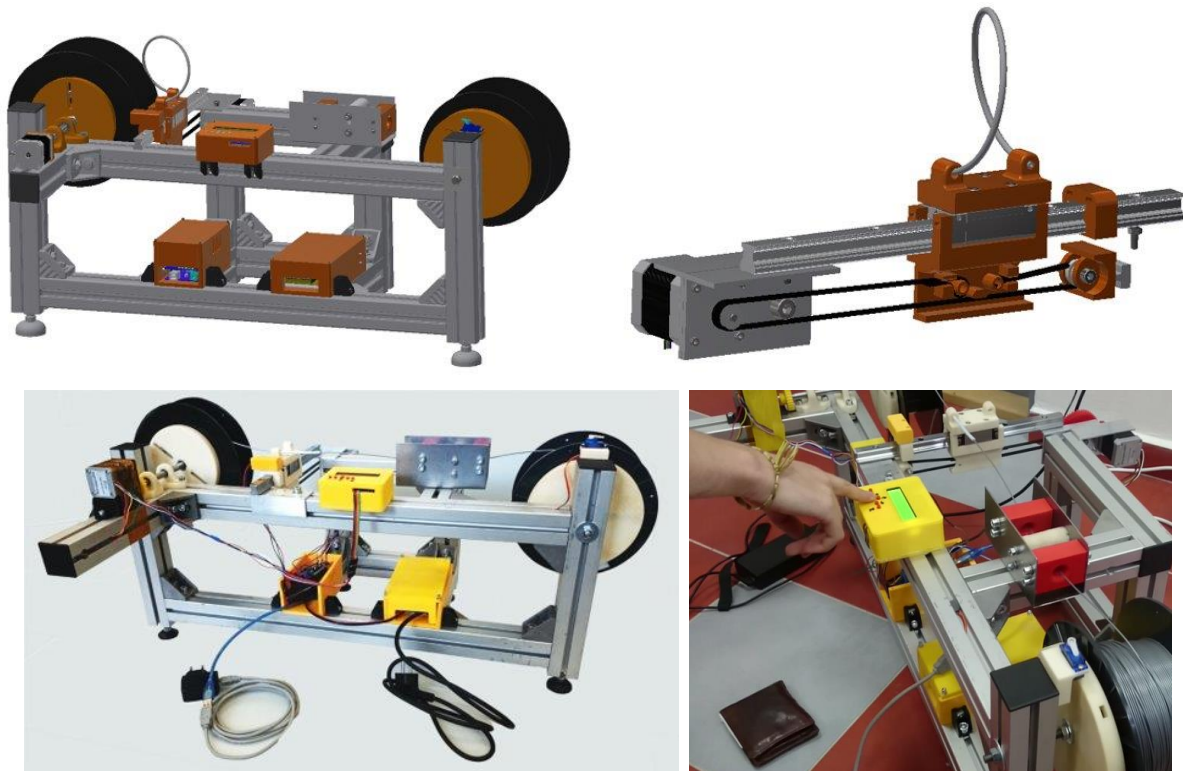


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			% ne-sintrovaného prášku	24,66
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			% částice hlínku	17,20
			% sintrovaného prášku	55,99
			% ne-sintrovaného prášku	26,82
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			% sintrovaného prášku	39,02
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			% částice hlínku	9,14
			% sintrovaného prášku	23,70
			% ne-sintrovaného prášku	67,15
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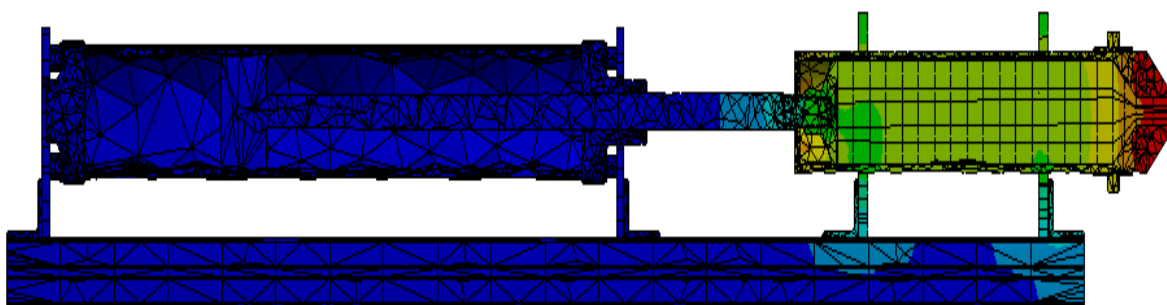
Team project (ZKP)

The course directly follows Parametric modeling - Inventor, Catia, Rhinoceros, Tribology, Finite element methods - ANSYS Classic, Measurement and Experiment. For each previous course a 4 project topics are presented, thus 16 projects altogether. Project topics are aimed to selected basic problems from these branches. An emphasis is put to the balance between design and analytical topics. Students divide themselves into teams of 3 to 5 members. Every team chooses one topic from each branch. Therefore, one team is managing four projects through the semester. Each project topic is supervised by the guarantor who ensures technical leading of the project through regular consultation sessions and provides additional theory background and materials. He also checks course of actions, explains mistakes to the students and show clues to successful solution. Defense of the project solution in front of expert committee takes place in the end of the course.



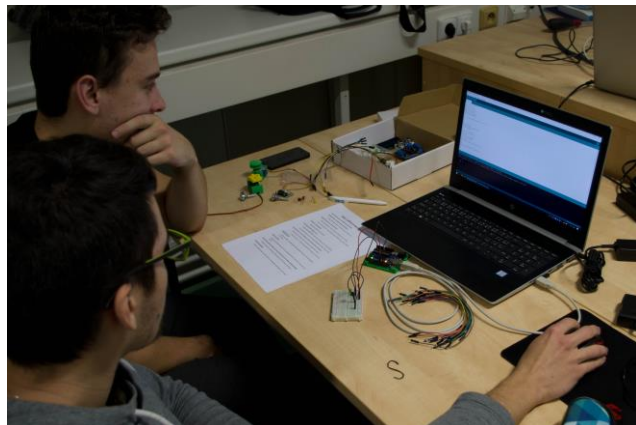
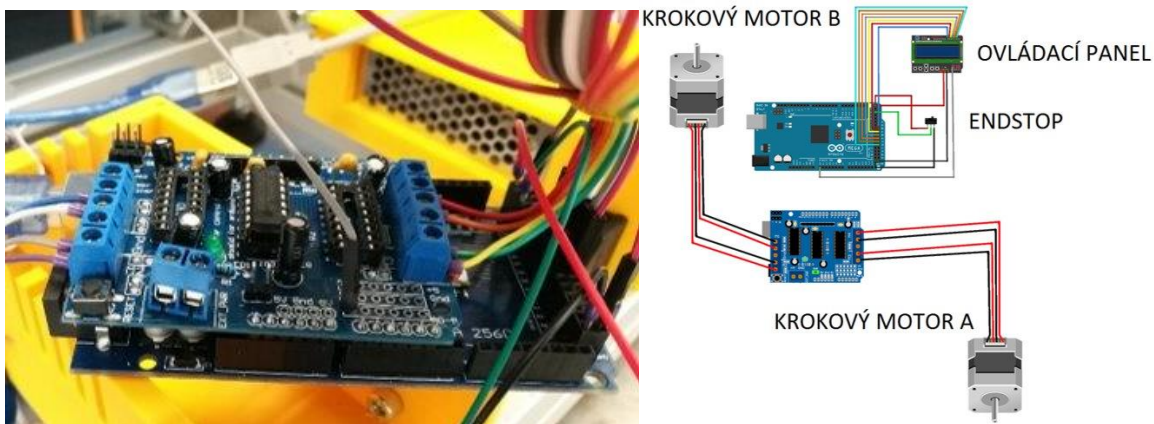
Mechanical Design Project (ZIP)

Course builds on subjects Parametric modeling - Pro/Engineer, Finite element method - ANSYS Workbench, Diagnostics systems and courses from previous semester. For those areas, 8 projects in total are announced, according to actual research projects or industrial cooperation. Students are divided into groups of 3 to 5 members. Each team solves two projects. Themes contain challenging structural tasks. To be able to successfully solve these problems, students have to apply gained knowledge, methods and procedures. Each topic is headed by supervisor, who ensures professional leadership; checks process; analyzes faults; and consults the possible solutions. Synthetic thinking is emphasised, as well as ability to formulate own conclusions. Project output is physical implementation and experimental verification of the proposed design. At the end of the course, it is necessary to defend the project.



Machine and Process Control (ZAE)

The course introduces students to the ways of controlling the various machines and processes. Students will gain practical experience with control systems based on Arduino development boards and PLC from B&R Company. Students will program the control in open and closed loop for various dynamic systems. Skills obtained in this course shall enable a student to gain understanding of fundamentals in electric control systems and shall enable to specify the control system requirements for specific application. The course will be taught in a form of practical exercises assigned during seminars and computer labs. Practical exercises will be supported by lectures.



Printscreen

This course was supported under the FabLabNet project from the European Regional Development Fund within the programme "Interreg Central Europe". The course uses facilities of the open-access student workshop "StrojLab", built with the support of Institute of Machine and Industrial Design and the FabLabNet project.