



Master's program "Management in technical systems". Double degree program with European universities in the Czech Republic, Germany, Greece, Latvia, Bulgaria

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Abstract. This article talks about the progress of the implementation of two double degree programs by the Novosibirsk State Technical University in partnership with European, Russian and Asian universities, the level of training is a master's degree, the direction of training is "Management in technical systems". The program is also called "Automation and Mechatronics" within the framework of an international program with a Czech university (Technical University of Liberec), and under a partnership program with a German university (Technical University of Chemnitz) it is called "Smart City Technologies and the Internet of Things". The base department at NSTU in both cases is the department of automation. To implement these programs, it was required to perform a lot of preliminary research and approvals, trainings, and mutual trainings. Many joint textbooks have been prepared and published, and a special hybrid educational space has been created. Currently, the program with the Czech University is in full swing, it receives annual support from the Erasmus + Foundation. This article continues the series of articles on this topic. This article is addressed primarily to students who can take part in it, as well as their parents and sponsors, as well as other teachers in order to exchange useful experience.

Key words: double diploma, automation, smart city, smart home, automation, mechatronics, mobility, computer science, computer technology

INTRODUCTION

Recently, teachers may notice a significant decrease in average student motivation to study effectively at universities. Perhaps this is due to the low dependence of an employee's income on the level and quality of his education. There are many professions that do not require higher education and provide a fairly high standard of living. There are also many professions and positions where higher education is required only as such, that is, you need a diploma of higher education, and the specific type of work and specific job descriptions do not correlate too much with the knowledge and skills acquired. Awareness of this situation creates all the prerequisites for the fact that students are only interested in the fact of receiving a diploma, are less interested in high grades in this diploma and are

practically not at all interested in obtaining specific professional knowledge. The foregoing applies only to the average mass of students, since at all times there have been and exist extremes, on the one hand, students who will not be interested in obtaining high-quality knowledge never, no matter what their university and future employer attracted, and students who are self-sufficient in their motivation, are interested in gaining knowledge (and, of course, on this basis in obtaining an honors degree), regardless of the current recessions or the growing interest in the quality of higher education in society.

Experience shows that in the middle group of 20-24 masters there are always at least three to five students who are interested in their own development and in entering the best possible

educational path in order to further the best employment. It is these students that are targeted at double degree programs.

STATEMENT OF THE PROBLEM

The Education Law grants students the right to study along an individual educational path.

This implies the possibility of studying at several universities in succession in order to obtain a diploma from at least one of these universities, while the competencies of the graduate are formed by all universities participating in this process. Indeed, it seems attractive to study each group of subjects at the university that provides the best education in this group of subjects. Another motivation is to freely choose exactly those subjects that the student sees as the most important and useful for his further development and participation in the production and research or pedagogical process. Those subjects that are not taught at the chosen base university can be studied at another university. In its simplest form, this concept can be implemented at one university by moving from one educational direction to another. As a rule, this is not implemented in order to improve education, but is implemented only if the student has changed his priorities. For example, he entered one direction of study, then realized that there is another direction in the same university, more interesting for him, or easier, or his friends or girlfriends are studying in this direction, and so on. The student may not explain the motivation, but simply exercise his right to transfer to another direction of study at the same university. Of course, if the new program contains subjects that this student did not study, then he must study them on his own and pass all credits and exams that are treated as academic debts. If the first few semesters at a given university are completely the same for all areas of study, then the transition can be made without losing a year of study and without having to pay such debts. If the subjects differ, the student may need an additional year to eliminate arrears, so the transition is carried out with the loss of a year, for example, instead of transferring to the fourth year, the student will study for another year in the third year, but in a new direction of training. This option does not give the student a much better education quality, it simply solves his problems, which have arisen as a result of insufficiently correct choice when entering the university. It also happens that a student, upon admission, does not go to the chosen direction, and when he is faced with a choice, to study in the chosen direction under a contract (for money), or to study in another direction for free (since the passing score is lower there), then the student can choose this path, which from the position of teachers does not seem entirely honest, since the student takes someone else's place.

Indeed, after all, perhaps someone who would like to study in this direction may not have passed, whereas this student has passed, but was not going

to graduate from the university in this direction. Therefore, while this option is legal, it does not appear to be ethical enough.

Studying at several universities looks completely different, especially if one of these universities is foreign.

The most attractive in this training option are the following possibilities:

1. Getting the best education at a leading European university.
2. Obtaining two diplomas at the end of the training: from the university in which the training was started and from the university in which the training was completed.
3. The best social and technical conditions for studying at a European university.
4. Excellent language practice.
5. An excellent chance for admission to graduate school at a European university (and not only in the one in which there was a master's degree).
6. Excellent job prospects in a European country or in another developed country.

These distinctive features of such a program create over-motivation for students, even in cases where the conditions in the country of residence are not very conducive to motivation, even at an average level. Indeed, if a student is focused on international mobility, then participation in a program that already has financial support due to the efforts of the organizers of this process, i.e. partner universities, then he just needs to wish to participate in this program and pass the selection in a not too strong competition among students of the same group. Three conditions are almost always sufficient for victory: a) successful education in undergraduate and graduate programs; b) sufficient knowledge of a foreign language, as a rule, English (but knowledge of the language of the country in which the study is supposed to be sufficient); c) sufficient motivation and the ability to explain it at the interview.

WHY NOT BACHELOR

Preliminary information about the implemented programs can be found in earlier publications on this topic [1–13].

The main idea of this program, in accordance with the Bologna Process, is that the two universities recognize the education of students in each of them to be sufficiently equivalent. In this case, each university recognizes the completed study at another university as a sufficient basis for transferring these subjects to this university.

To understand the essence of this process, let us turn to such a process as obtaining a second higher education on the basis of the existing first higher education. If a student successfully graduated from the university and has one higher education, but wants to have a higher education in another specialty, then he does not need to re-learn those subjects that are present in both programs. The

more such subjects that are the same in both programs, the shorter the training for obtaining a second higher education can be. For example, let us consider the situation in the case of the implementation of the “two plus two” system by the university; such a system of the undergraduate level, in which the first two years (four semesters) of study in all areas of training are completely identical. Then the holder of one diploma, for example, in economics, if he wishes to receive a diploma in another direction, for example, in computer science, can receive a second diploma following the results of two additional years of study. If the training programs are even closer, for example, differ only in two semesters, then such a graduate of one of such programs may, after one year of study, receive a diploma in the second direction of training. This does not happen automatically, of course, but only if there is an appropriate educational center providing such services - a second higher education based on the first.

If now we imagine that the programs are completely identical, it turns out that in order to get a second diploma, it is enough to simply “ask” it at the second university. But, of course, things are not so simple. The second university has no reason to issue a diploma if it did not participate in the training of this student.

But the situation becomes logical and justified in the event that a student received half of the required amount of knowledge as a result of studying at one university, and acquired the other half of the amount of knowledge as a result of studying at another university. If these universities have the required agreement, and if the two programs are deemed to be related to such an extent that study on the proposed program does not require any additional study beyond the usual period of study, then the student can receive two diplomas based on the results of studies in only one standard period. ...

Of course, for a bachelor's degree, this procedure for coordinating the two programs would be much more complicated. After all, it would be necessary to agree on the volume of not a two-year, but a four-year direction of training. In addition, the need for such a double degree program for bachelors is questionable. Currently, the most advanced employers consider the undergraduate program as the minimum higher education, in fact it is the level of a highly qualified employee who can maintain numerically controlled machines, participate in the production process using rather complex equipment, maintain and repair software and hardware. But this level is not enough for deep scientific research, especially independent, for the management of scientific research, for pedagogical work at the university, for research work in a scientific institute. Of course, this requires a master's level.

Therefore, two bachelor's degrees will allow you to enter the master's program, but one bachelor's degree also allows you to enter the master's program. Thus, the second bachelor's degree is superfluous. Even three or more bachelor's degrees do not give the right to enter postgraduate studies, while one specialist or master's diploma gives such a right.

Thus, a double degree undergraduate program would be much more difficult for universities to implement, and for students it would be completely meaningless.

By analogy, one might assume that it is better to study not under a double degree program for a magistracy, but to enter a double graduate school. But this analogy doesn't work. It is the master's degree for the dual degree program that is best suited.

WHY A MASTER'S, NOT A POSTGRADUATE

Developing the thoughts expressed in the previous section, it can be assumed that one should not rush to a double master's degree, the issue can be resolved at the postgraduate level.

But such an opinion would be erroneous.

The difference between a master's program and a postgraduate study is also that the duration of study in a master's program is the shortest. This makes it the most attractive for creating a dual degree program for universities, since less training is easier to synchronize and reconcile. But this is not the only argument.

Postgraduate studies are most often not a formal stage of education, although there is a tendency towards such a metamorphosis, but it is assumed that it will soon be canceled on the territory of the Russian Federation.

Traditionally, postgraduate studies in Russia lasted three years, but according to the latest standard, it began to last four academic years. And it is already clear that the logic that was in effect when deciding on such a change did not live up to expectations.

Previously, the difference between postgraduate studies in the Russian Federation and European postgraduate studies was that after graduating from the European one, almost all graduates received the title of PhD. The procedure for defending a thesis (namely, a thesis, not a thesis) is not too different from the procedure for defending a master's and bachelor's degree thesis. The Defense Commission, as a rule, consists of the professors of the given university, and in some cases may contain invited external professors. In fact, completing postgraduate studies at European universities is almost guaranteed to secure the desired degree. The situation is similar in the United States, China and other countries. Of course, a situation is possible when, according to the results of the defense, the desired degree is not awarded, but almost all students who have successfully prepared their

theses are allowed to the defense itself. Of course, plagiarism is unacceptable, and certain formalities are also required. And yet, planned defense at home university gives the best chance for success. If the defense did not take place, it can be postponed, but this should already be recognized as some serious failure.

In the Russian Federation, postgraduate studies, when it lasted three years, did not imply the issuance of any diplomas at the end of it, except for the document on the passed candidate exams. The defense of a Ph.D. thesis did not require the mandatory completion of postgraduate studies. Accordingly, it could be said that the defense of a dissertation is more difficult, it is not part of the educational process, the applicant is not guaranteed to be provided with a dissertation council at a given university, and any external dissertation council is much more complicated for the defense procedure. The number of such a dissertation council is significantly higher than the commission for the defense of theses for the title of PhD. We do not question the level of the PhD commission, it's just a different procedure. As a rule, the result was such that if the success of graduating from postgraduate studies was determined by obtaining diplomas, then postgraduate studies in the Russian Federation were the least successful. By the time of graduation, not all graduate students had a finished dissertation. It should be noted that a dissertation is not a thesis, but a full-fledged scientific work, moreover, it should be based only on the printed works already published by the author. If there are no published works, or they are insufficient in quantity (less than three) or in quality (publications are not included in the publications included in the list of the Higher Attestation Commission), then the thesis cannot be defended. Efficiency at the level of 30% is defined as sufficient for a positive assessment of postgraduate studies, i.e. even if only a third of the students receive diplomas at the end of their studies, that will be good. In addition, the term of protection was indicated as a year from the date of graduation, i.e. in fact, the dissertation had been prepared not for three years, but four years before its defense.

In the new version of the standard, which has been in effect for several years, postgraduate studies began to be carried out for four years. In addition, at the end of the training, the final qualifying work should be defended. This protection does not give the academic title of Candidate of Sciences, but it allows you to issue a diploma of completion of postgraduate studies, and if there was no defense, then only a certificate of training and a certificate of passing the candidate exams (if passed) is issued.

It turns out nonsense. Ideally, a graduate student should defend his work twice, and it is issued twice, according to different requirements. If a graduate student defended his final qualifying work (WQ), then after that he is expelled from graduate school.

Consequently, he did not have time to formally defend his dissertation before the end of his postgraduate studies. Whether he will protect her after that is a big question. Communication with the supervisor is formally terminated, except for the personal relations of the graduate student and the supervisor, nothing else binds. A graduate student needs to improve his life, find a job. Most often, at a new place of work (if he did not get a job at a university or in a research institute), the dissertation practically does not give any advantages. Consequently, the motivation to complete the dissertation preparation process and to defend it is greatly reduced. In this situation, defenses rarely occur, much less often than one would like. So, if a graduate student successfully defended his FQP, most often this is where it all ends. Just like in European universities, a graduate student must defend his theses in accordance with the calendar schedule, but unlike European graduate school, such protection gives practically nothing.

Let us now consider the situation when a postgraduate student, due to particular success, was able to prepare and defend a candidate dissertation during his postgraduate studies. Or at least send her to the dissertation council, where she was accepted for defense. The question is, why would he, in this case, protect the WRC? What will she give him? If you have a PhD diploma, the possession of a postgraduate diploma does not matter, it is pointless. It turns out that the most successful graduate students can make a negative contribution to the statistics of graduate school, because they will be early expelled. Probably, there is a possibility of sending some letters with a request to consider the defense of a Ph.D. thesis as proof of the successful completion of graduate school, but formally, if the curriculum includes the defense of an FQP, and it has not happened, therefore, the graduate school has not been completed successfully. Some kind of confusion turns out. This WRC is not needed, neither in that case, nor in the other. It should have been canceled and only the dissertation defense should be left, or its status should be equated to the dissertation defense.

It is also pertinent to mention the terms of study in different countries. Master's degree in some countries lasts not two years, but one and a half years. Of course, this is some obstacle, but it can be overcome. A student can simply study, for example, in Russia, for the first year, then in Bulgaria - six months and defend the FQP, then return to Russia and study for another six months, and then defend the FQP at the university where he began his studies. If we talk about postgraduate studies, then the mismatch of terms is more significant: in Russia it lasts four years, and in most European countries only three years.

Suppose that a postgraduate student of two universities has successfully completed his postgraduate studies at a European university and defended his theses, received a PhD diploma. What

is the point in this case for him to study for another year in graduate school in Russia and what is the point of defending the FQP? After all, he can simply nostrify this PhD diploma. Or it may not do this, formally it is equated to a candidate's diploma. He can get a job as an assistant professor at a university or a leading researcher at a research institute. He will even be equated with a foreign assistant professor, that is, the university can include the euro in the report on an indicator that includes the number of foreign teachers. And if it is not needed, then who will do it? It turns out that when studying in two postgraduate studies, in case of successful completion of studies in European postgraduate studies, there is no need to wait for the completion of postgraduate studies in Russia. And if training in European postgraduate studies is not successful, then what was it for? And this and that makes no sense. In addition, formally, such dual education in graduate school is not defined in any way. Universities can sign as many agreements as they want, but it makes no sense for a person who enrolled in a European postgraduate study to enroll in a Russian graduate school. If, while studying in Russian graduate school, he can simultaneously enter the European graduate school, then, most likely, only in order to help in obtaining funding for trips to this European university, and in case of successful graduation with a defense, his connection with the Russian university will naturally be lost. as unnecessary. Thus, a double postgraduate study is an unnecessary exoticism, it does not seem to make much sense for two universities to invest in the development of this method of interaction, except, of course, a situation when, well, two professors really want to be joint supervisors of some talented graduate student.

THE MASTER PROGRAM IS THE ONLY VARIANT

The advantages of implementing a double degree program (two degrees from two different universities, one of which is European) follow from the above.

Master's studies are completed within a two-year period. Division into two periods of one academic year is most natural. The first year of study is carried out at a Russian university, in this case, at NSTU. Also participating in this program is another Russian university, Saratov State Technical University. Gagarina Yu. A. This university also implements many joint educational programs, one of which was created in a joint project [8], [10]. This project lasts three years and ends in November this year. Upon completion, six joint educational programs will be implemented, respectively, between six pairs of universities. European universities are represented by three technical universities: these are universities from Greece (International Hellenic University, ex Alexander Technological Educational Institute of Thessaloniki), Germany (Chemnitz Technical

University) and Latvia (Riga Technical University). The Technical University of Sofia (Bulgaria, Sofia) also participates in the project, which is the coordinator responsible for the distribution and proper use of project funds from the Erasmus + fund. Among the universities that are implementing joint master's educational programs in this partnership are two mentioned Russian universities, Novosibirsk State Technical University (NSTU-NETI) and Saratov State Technical University named after I. Gagarina Yu.A. (SSTU). These Russian universities send their students to Chemnitz, Germany, to the Chemnitz University of Technology. Also in partnership are two universities from Kazakhstan, namely the Kazakh National University. Al-Farabi (KazNU, see <https://www.kaznu.kz/ru>) and the Eurasian National University. L.N. Gumilyov (ENU, see <https://www.enu.kz/ru/>). These universities are implementing a joint educational program in conjunction with the University of Greece (International Hellenic University, ex Alexander Technological Educational Institute of Thessaloniki). In addition, two universities from Mongolia participate in the project, they are the Mongolian State University (National University of Mongolia, NUM, <https://www.num.edu.mn/en/>) and the Mongolian University of Science and Technology, MUST, <https://www.must.edu.mn/en/>). This university sends its students for the second year of study to Latvia, to the Riga Technical University. Also in the project, organizations from Romania, Mongolia, Kazakhstan and Russia are present as coordinators from industrial organizations and employers.

Students from Mongolia (two students from each of the above-mentioned universities) have already successfully completed their studies under the program and received diplomas from both universities, which is an overfulfillment of the project plans, which involved the implementation of trial training, but did not necessarily require its full implementation, which is necessary to be carried out only by the end of the project. Nevertheless, the project allowed and recommended this, therefore, the successful implementation of this project can be noted.

The four other partner couples were unable to achieve such a brilliant result, exceeding the project's plans, as student travel was interrupted by the coronavirus pandemic. The borders turned out to be closed, so students from NSTU did not have time to leave for Germany, although students from SSTU left and successfully arrived in Chemnitz. But upon their arrival, a lockdown was announced, in fact, they had to study remotely from hotels, although their personal arrival allowed them to apply for admission. These students from SSTU have a chance to receive double diplomas, the issue has not yet been resolved. Students from NSTU studied remotely, the teaching procedure was no different from the procedure for teaching students

from SSTU and students from the Technical University of Chemnitz, who also studied remotely during this period.

Of course, the double degree program is not at all focused on a remote form of study, although this form of study is not excluded. Still, its main goal is student mobility, support for student travel to other countries in order to obtain high-quality European education.

Also, the arrival of students from Kazakhstan to Greece turned out to be problematic, which was impossible to predict at the stage of writing this project and at the first stage of its implementation, however, all parties took all available opportunities to implement the project program in full, therefore, distance learning took place in all cases. , all students who were selected through a competition to participate in this program at the expense of the project participated, at least, in the learning process in a distance form using skype, zoom and other similar Internet technologies for online communication.

One of the advantages of implementing this program for masters is that the entire program naturally develops into two parts: the first two semesters are mainly filled with the so-called ringing hours, when the student studies in the mode of lectures, workshops, seminars, practices and laboratory works. The third and fourth semesters are mainly devoted to scientific research with the aim of completing the final qualifying work and writing this final qualifying work, as well as its defense. FQP protection is carried out in both universities. Accordingly, the student receives a supervisor for FQP at a European university, and a co-director from a domestic university is responsible for the student's acquisition of knowledge in the first two semesters, participates in the choice of a topic, advises the student in a distance form, and also advises him on the preparation of FQP in a domestic university.

ON THE INTERNATIONAL ACCREDITATION OF JOINT EDUCATIONAL PROGRAMS

Of course, every educational program receives state accreditation. The presence of state accreditation is recognized by the international community as the presence of international accreditation (formally), however, the procedure for international and public accreditation is very desirable, since it allows the quality of education to be checked by an independent international expert community, which, as a result, recommends the appropriate authorities to issue certificates of international accreditation of the established sample. In Fig. 1, 2 3 shows certificates (certificates) of international accreditation of the relevant technical areas of NSTU, which also includes the direction "Management in technical systems", these certificates were obtained as a result of the accreditation procedure, they testify to the

high quality of student training at NSTU in these areas, which is confirmed by an independent examination of a collegium of reputable scientists, teachers and employers from several countries.

EXPERIENCE IN IMPLEMENTATION OF DOUBLE MASTERS WITH CZECH UNIVERSITY

NSTU has a long-term positive experience in implementing a double degree program with the Technical University of Liberec, Liberec, Czech Republic. The state of this type of international activity can be characterized by the rating "Extremely successful". Indeed, the first program funded from the TEMPUS fund (TEMPUS MPAM project) was intended only to create conditions for the implementation of a double degree program, as well as to train two students from each pair of partner universities. The program involved three universities from Russia and Ukraine, as well as one university from France, the Czech Republic, and Bulgaria. Each university from Russia and Ukraine had to send two students to the university that was most convenient for the implementation of the double degree program. The choice naturally settled on a university from the Czech Republic, since, firstly, the duration of study coincides (two calendar years), and secondly, the Technical University of Liberec (TUL) successfully resolved the issue of not taking money for student tuition. For example, the Technical University of Sofia could not solve this issue, although the university administration would be ready to give up this money, but the legislative framework in Bulgaria does not allow this: foreign students must study for a fee, other options are excluded.

The first two students studied completely in accordance with the curriculum, they completed all tasks on time, passed tests and exams, defended their Graduation qualification works and received TUL diplomas. After that, they returned to NSTU and defended their Graduation qualification works in Russian at NSTU; based on the results of the defense, they also received master's degrees from this university.

Other students from other universities had similar achievements, not always as successful, but generally satisfactory. This ended the financing of cooperation between universities, since the project was completed, all the goals were achieved. It was further proposed to continue this program with support from other sources, including the ERASMUS + fund.

Due to the extraordinary activity of the TUL teachers (in particular, personally Professor Yaroslav Nosek), applications for support to the ERASMUS + fund were submitted annually from this university, each time the project was written so reasonably and efficiently that there was never a situation when it was not supported.

In addition, an effective strategy for conducting a competitive selection and preventive registration

of documents for a trip by students was developed, which made it possible to fulfill all the conditions of the new project in full every time. The essence of this is that the selection of students by competition and the preparation of documents for the trip should be started in advance, when it is not yet known whether the project will receive support or not. The paperwork is associated with some costs, which NSTU compensated for the students so that they do not get into a situation where the result is not yet known, but it is already necessary to pay. Therefore, students were only asked to invest in this project their interest, their activities, their knowledge and learning outcomes. As a result, since 2014, almost every year (with the exception of 2016 and 2020), the Department of Automation of NSTU has sent two or three students to TUL to implement training in the third and fourth semesters within the framework of this program of a double master's degree in the direction of "Automation and Mechatronics", the corresponding direction in NSTU "Management in technical systems". Due to the grant, students were paid for the flight, as well as a scholarship (800 euros per month) was paid

throughout the entire period of study (9 months). The university provides an extremely favorable learning environment. The university has the most modern educational equipment, educational and research stands, robots, computers, 3D printers, etc. There are opportunities for the development and manufacture of complex electronic products, mechanics, mechatronics.

This creates extremely favorable conditions for teaching, scientific research, for writing a high-quality FQP and its positive defense. In addition, during the training, students have the opportunity to write and publish articles in journals or conference proceedings included in the highly rated databases. This provides excellent opportunities for admission to graduate school, and not only in TUL, but also in any other European university.

This cooperation greatly contributed to the improvement of the quality of education at NSTU in the direction of "Management in technical systems". One of the obvious results is obtaining international certificates of international and public-professional accreditation (see Fig. 1 – Fig. 3).



Fig. 1. Certificate of international accreditation of the direction "Management in technical systems" in NSTU and other areas (document in English)

Several graduates of the double master's program have already successfully defended their theses and received PHD diplomas, one of the graduates did this at the University of Munich, the rest at the University of Liberec. Interestingly, at one stage, TUL students, also within the framework of international cooperation in the field of higher education, traveled to Germany for an internship at

a German university. Thus, for students from Russia there was an opportunity to study sequentially in two European universities.

Students applying for this program are only required to study well and know English well enough, since teaching at TUL to foreign students is carried out in English.



Fig. 2. Certificate of international accreditation of the direction "Management in technical systems" in NSTU and other areas (document in Russian)



Fig. 3. Certificate of professional and public accreditation of the direction "Management in technical systems" in NSTU and other areas (document in Russian)

Photos 1–12 show the performance of research and laboratory work by undergraduate and graduate students at the Technical

University of Liberec (Liberec, Czech Republic).



Photo 1. Nuclear power plant Temelin and students of TUL



Photo 2. Electro mobile developed in TUL with the help of students



Photo 3. Students developing robotic device



Photo 4. Students developing robotic device



Photo 5. Students developing robotic device



Photo 6. Students developing robotic device



Photo 7. Students of TUL doing laboratory works

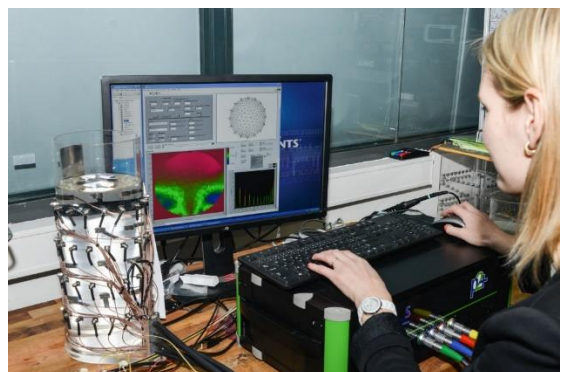


Photo 8. Students of TUL doing laboratory works

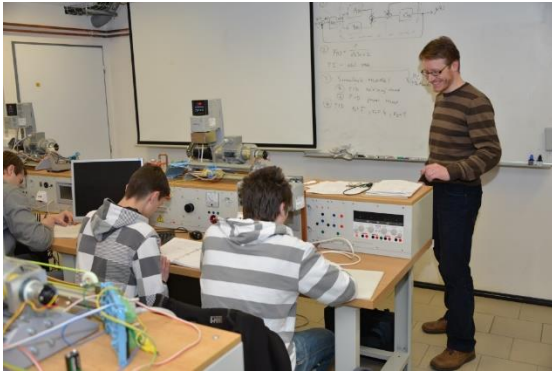


Photo 9. Students of TUL doing laboratory works

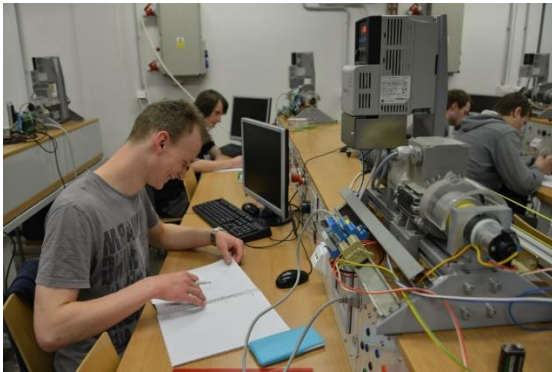


Photo 10. Students of TUL doing laboratory works

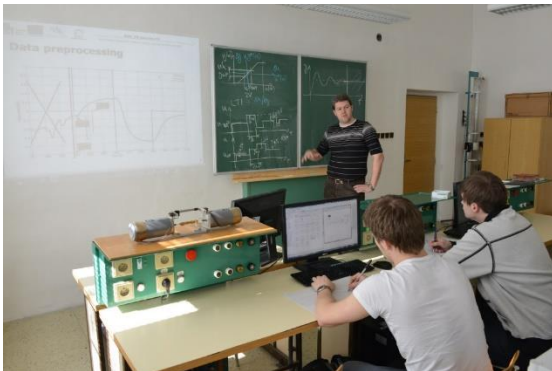


Photo 11. Students of TUL doing laboratory works



Photo 12. Students of TUL doing laboratory works



Photo 13. Exterior of the main building of the Technical University of Liberec

Photos 14-21 show laboratory work at the Technical University of Sofia (Sofia, Bulgaria) in the construction of robots. This university was also a partner in the TEMPUS-MPAM project, and is also a coordinator for the Smart City project.

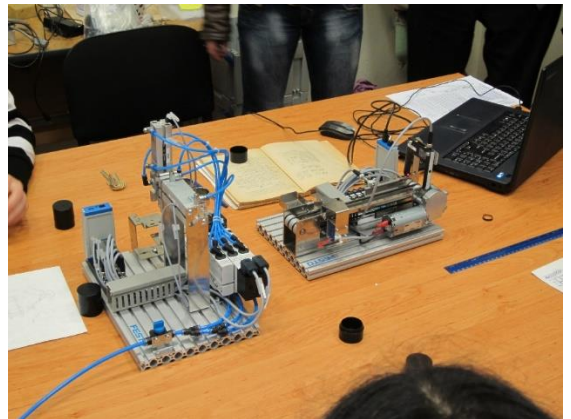


Photo 14. Robots constructed in TUS

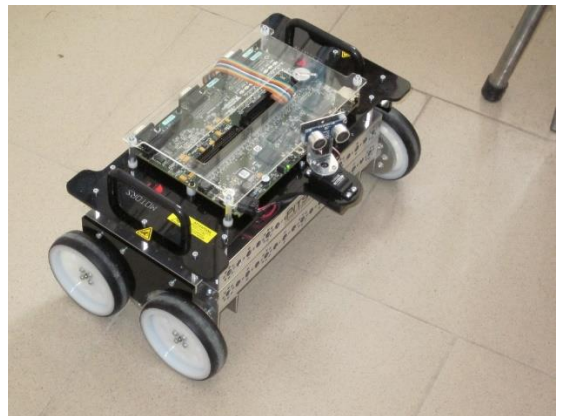


Photo 15. Robots constructed in TUS

Photo 13 shows the exterior of the main building of the Technical University of Liberec.



Photo 16. Laboratory works on robotics in TUS

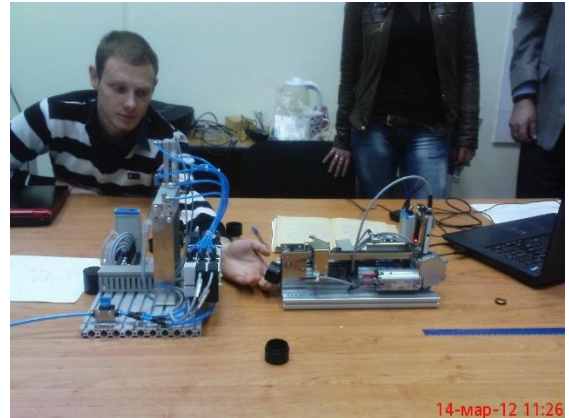


Photo 20. Laboratory works on robotics in TUS



Photo 17. Laboratory works on robotics in TUS



Photo 21. Laboratory works on robotics in TUS



Photo 18. Robots constructed in TUS



Photo 19. Robots constructed in TUS

CONCLUSION

Information on the progress of the project is regularly published on the project website [11] and is updated monthly. You can also find out the latest news about the projects on the Facebook pages of the communities on the following pages:

Smart City Erasmus + Project
<https://www.facebook.com/groups/349998796335081>

"Program of double diplomas of NSTU-TUL (RF-Czech Republic)"
<https://www.facebook.com/groups/177129647808372>.

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