



# EU-PC Double Degree Master Program in Automation and Mechatronics

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*Abstract:* This paper reports the main results of the Program of Double Master's Degree Diploma in the field of Automation and Mechatronics realized between Novosibirsk State Technical University (NSTU) and Technical University of Liberec (Czech Republic).

*Key words:* higher education, master's degree, mobility, Erasmus +, Tempus, automatics, mechatronics, robotics, information technologies

## INTRODUCTION

This paper reports the main results of the Program of Double Master's Degree Diploma in the field of Automation and Mechatronics realized between Novosibirsk State Technical University (NSTU) and Technical University of Liberec (Czech Republic) [1–4].

## SEVERAL MAIN RESULTS OF THE TEMPUS-MPAM IN NSTU

The harmonization of curricula with partner universities has led to the modernization of the master's curriculum in the field of "Management in technical systems".

The Universities have concluded new international cooperation agreements.

The project has led to an increase in the attractiveness of the educational program; the competition for applicants has increased.

## THE ESSENCE OF THE DOUBLE MASTER-DEGREE DIPLOMA PROGRAM (DMDDP)

Main Higher Education partner is Technical University of Liberec, Liberec, Czech Republic (TUL).

According to the Program, first year 3 students have mobility for accomplishing DMDDP. They both have graduated the both Universities successfully, with the highest estimates.

One of them entered PhD program in TUL.

In 2016 one student repeated this experience for the support of domestic University, NSTU. He has graduated the both Universities successfully, with the highest estimates.

In 2017 two students repeated this experience for the support of ERASMUS+ KA107A, initiated by TUL. They both have graduated the both

Universities successfully, with the highest estimates.

In 2018 three students repeated this experience for the support of ERASMUS+ KA107A, initiated by TUL.

They both have entered PhD program in TUL.

Hence, the Program not only has results, but it also develops, and the amount of the participants increases.

## IMPACT TO DOMESTIC UNIVERSITY (NSTU)

Main Higher Education partner is Technical University of Liberec, Liberec, Czech Republic.

International mobility between the two universities, NSTU and TUL, is urgently needed for both universities. The partnership of our universities in the field of joint educational programs and joint scientific research has very great results and is developing at an increasing rate, which contributes to improving the quality of student training, promotes the exchange of scientific ideas and new technologies of higher education. Regular participation of two to three students in a joint educational program in the direction of training "Automation and Mechatronics" is based on the preliminary implementation of the TEMPUS-MPAM project, supported by the European Union. The objectives of this project, which was successfully completed, were not only to create a precedent and implement mobility under the Double Master's Degree Program once, but also to ensure that this program was implemented further and developed, bringing its positive results. Under the terms of this Program, further mobility support was assumed precisely through new "Erasmus+" projects. This option was successfully held in 2017 and 2018. Students who have completed double degrees in 2018

successfully enrolled in graduate school and are currently studying at TUL, participating in scientific research at this university. Two students who have previously completed this program are also enrolled in the postgraduate program TUL, their training is successful, one of them, in accordance with the schedule, will defend PhD theses in the very near future and, possibly, will join the staff of TUL teachers or researchers.

#### **THE USE OF THE RESULTS OF THE PROGRAM “TEMPUS-MPAM” IN NSTU**

The period of 2018 was particularly fruitful under the interaction program, because during this period not only two students successfully completed the double degree program with excellent grades, received diplomas from both universities and enrolled in TUL in graduate school, but also an exchange of teaching mobility took place: two NSTU professors visited TUL for a period of 1 week and one teacher from TUL visited NSTU for the same period, and also participated in a foreign international conference; during the visits, lectures on relevant topics were given on Automation and Mechatronics, among the listeners were students, PhD students, teachers, associate professors and professors of universities participating in the Program. Professors participating in the mobility program exchanged their monographs and textbooks for universities published in English. Also, as a result of the trips, a long-term scientific cooperation was established, which allowed obtaining new scientific results, on the basis of these results three joint monographs were written in English and one textbook in Russian (in press). Also, one post-graduate student from TUL visited NSTU for advanced training for a period of 3 months. As a result of this visit, he studied in detail the localization method for managing nonlinear and non-stationary objects, the numerical optimization method for calculating regulators for linear and non-linear, stationary and non-stationary (interval specified) objects, to control transcendental and multichannel objects. The results of the advanced training significantly advanced his personal scientific research, the results of which are used to prepare a scientific article. TUL activities on scientific and pedagogical cooperation were highly appreciated by the whole NSTU team, the NSTU Academic Council awarded by unanimous vote to TUL Professor Jaroslav Nosek, the honorary title “Honorary Doctor of NSTU” as a result of his many years of productive efforts in this field. Also several joint scientific articles has been published, including in journals and collections of international conferences that are part of the Scopus database [1].

#### **IMPACT OF MOBILITY RESULTS TO PARTICIPANTS, PARTNER ORGANIZATION**

At the university level, the positive impact of mobility results consists in enhancing the prestige of the university as a whole and technical specialties, in particular. The result also consists in increasing the competition to the magistracy in the direction of “Management in technical systems”, which in 2018 amounted to 2 people per place, which was the highest level of competition in the university.

The impact at the national level is that the results of the program are widely published in scientific articles, including articles in the Scopus database scientists and teachers in Russia and around the world can familiarize themselves with these results and use them in their activities in a similar direction.

#### **DISSEMINATION OF THE PROJECT RESULTS IN THE PARTNER COUNTRY (CONCRETE MEASURES)**

The results are disseminated in the partner country in the following ways.

1. On the university website
2. In the periodical press on the pages of the magazine “Automation & Software Engineering”.
3. In international editions included in the Scopus database.
4. In the handouts for applicants entering the bachelor degree, as well as for bachelors entering the magistracy.
5. On youth radio “Uniton” FM100.7 <https://uniton.ru/radio/> in the form of sound advertising (advertising duration 1 minute, the file can be sent, rental time - five times a day during the month on workdays).
6. In an interview with the head of the department V.A. Zhmud on radio “Mayak” [http://www.nsktv.ru/onair/radio\\_mayak/](http://www.nsktv.ru/onair/radio_mayak/) (once a year)

#### **FUTURE OF THE PROGRAM**

The mobility plans for 2019 are expected to achieve the following goals.

1. Preparation of three students in the double degree program (mobility of 3 people for 10 months from NSTU to TUL).
2. Improving the qualifications of one graduate student from TUL (mobility of 1 person from TUL to NSTU).
3. Preparation and writing of at least three joint textbooks on mechatronics, automation, computer-aided design, optimization, management in technical systems (mobility of 1 professor from TUL in NSTU for 5 days and mobility of one professor from NSTU in TUL in 5 days).
4. Preparation of international accreditation of the “Management in technical systems” training area (international name “Mechatronics and

Automatics”) at the expense of self-financing of the NSTU.

5. Joint scientific research with the aim of writing scientific articles included in the Scopus

and Web of Science databases, monographs, textbooks.



Photo 1. The moment of veritas: receiving of the Diplomas of Master Degree

### RECOGNITION OF MOBILITY RESULTS BY THE PARTNER ORGANIZATION

Learning outcomes during mobility are fully recognized by the partner organization on the basis of an agreement concluded on the mutual recognition of educational programs in automation and mechatronics with the attached complete list of compliance of the disciplines studied.

The term of study during mobility is recognized for the period of study under the program “Management in technical systems” according to the approved individual educational trajectory, this training completely replaces the period of study in the partner organization, the learning outcomes are read as the results of the educational program. In case of successful training during the mobility, the participant of the mobility program has the right to defend the final qualifying work under the master's program “Management in technical systems” without additional training. According to the results of successful protection, he is awarded a master's degree with a state diploma.

All students previously sent under this program fully realized this opportunity, defended their final qualifying work for an “excellent” grade and received the appropriate diplomas.



Photo 2. Leaders of the Russian and Czech Sides of the Program: Head of the Dept. of Automation in NSTU Prof. Vadim Zhmud, Professor of Dept. of Automation in NSTU Galina Frantsuzova and Prof. of Faculty of Automation, Informatics and Interdisciplinary Education of Technical University of Liberec Jaroslav Nosek in TUL (Liberec) on May of 2018.

## CONCLUSION

The results of the influence of the Program after it was finished to the native University (NSTU) are very important. The essence of the Program is overviewed in publications [1–4]. The scientific researches produces significant results concentrated in the jointed publications [5–33] and even in jointed monographs [34–35].

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