

International Education Cooperation in the Area of Electrical Engineering and Computer Science

Zdeňka Chmelíková¹, Petr Krejčí², Pavel Santarius³, Ivo Vondrák⁴

Abstract - The Faculty of Electrical Engineering and Computer Science, which was founded as an independent faculty in 1990, is developing in line with the needs of restructuring of industry in the North Moravian region in the Czech Republic. Mutual active collaboration with big industrial and power companies, as well as smaller private firms, is essential to the faculty in terms of education and also science and research. For example the faculty enjoys long-term collaboration with Faculty of Electrical Engineering and Automation, Technical University of Opole in Poland; this collaboration intensified after accession of both countries to the EU. Collaboration developed both in the education and research areas. The result of this long-term collaboration is a project under the close-border cooperation programme INTERREG. Also, the faculty accomplishes the mobility of students and teachers above all in the Erasmus programme, which sooner was included in the Socrates programme; from this year the Erasmus programme is included to the new Lifelong Learning Programme (LLP). Students have interest above all in English speaking countries (e.g. United Kingdom); we have a few contracts with universities in these countries. Again, foreign students, who want to study at our faculty, come generally from south countries (Italy, Greece, Spain and Turkey). Dialogue between representatives of the industry and universities can contribute substantially to increasing the efficiency of collaboration, such as in field of IT - the creation of ITCluster.

Index Terms - Electrical engineering and computer science; education, research; international cooperation; mobility.

INTRODUCTION

The Czech Republic, a Central European country, underwent substantial political and economic changes after events in 1989. Changes in the economic area can be summarized in two points:

- Restructuring of industry,
- Privatization of industry, trade and services.

The change in the industry structure also significantly affected the North Moravian region of the Czech Republic, where the Technical University of Ostrava is located. This region was (and still is) dominated mainly by the heavy engineering and metallurgy industries because this part of the Silesian region is rich in high-quality black coal deposits.

Privatization (the opposite of nationalization) of the majority of industrial companies in the Czech Republic using so-called privatization occurred very quickly. However, the restructuring of industry is a long-term matter. Old technologies must be renewed, plants must be modernized and automated, and even whole companies must be restructured. This is closely linked to a change in the qualification structure of employees at such companies.

The Technical University of Ostrava reacted very quickly to these changed needs of the industry. Gradually the curriculum was modernized, new subjects were introduced, and new fields of study were launched. These changes also reflected in the university's structure in such a way that in 1991 the independent Faculty of Electrical Engineering and Computer Science was established after the splitting of the original Faculty of Mechanical and Electrical Engineering into two independent faculties.

Just like restructuring of industry in the North Moravian region cannot run without changes in the qualification structure with substantial contribution from the Technical University, so restructuring and modernization of the University cannot be undertaken without close collaboration with the industry in the region.

THE FACULTY OF ELECTRICAL ENGINEERING AND COMPUTER SCIENCE AT THE VŠB - TECHNICAL UNIVERSITY OF OSTRAVA

The history of the *Technical University in Ostrava* dates back to 1717, when the first mining school was founded in Jáchymov following the Emperor's order. In 1849, the Emperor gave order to found a mining school in Příbram, and in 1865 it got the right to use the name Mining Academy. (The year 1849 is recognized as the official year of founding of our University, and so in 1999 we celebrated our 150th anniversary). In 1894 the mining school was declared a university with all due rights. In 1904 the name was changed to the Mining University. After the end of World War II in 1945, the University was moved to Ostrava.

Historically, electrical engineering was given a significant importance in University education from the very beginning of its dynamic application in production processes in mining, metallurgy and mechanical engineering. Students were acquainted with electricity and magnetism already in 1860 during physics lectures. In 1945, an independent department of electrical engineering was founded and in 1970 the field of High-tension Electrical Engineering was

¹ Zdeňka Chmelíková, Vice-Dean, VŠB – Technical University of Ostrava, zdenka.chmelikova@vsb.cz

² Petr Krejčí, Vice-Dean, VŠB – Technical University of Ostrava, petr.krejci@vsb.cz

³ Pavel Santarius, Head of Department, VŠB – Technical University of Ostrava, pavel.santarius@vsb.cz

⁴ Ivo Vondrák, Dean, VŠB – Technical University of Ostrava, ivo.vondrak@vsb.cz

established at the Faculty of Mechanical Engineering. In 1977, the Faculty was renamed to the Faculty of Mechanical and Electrical Engineering.

The *Faculty of Electrical Engineering and Computer Science* officially began operation from 1st January 1991 after the splitting of the original Faculty of Mechanical and Electrical Engineering into two independent faculties. The faculty identifies to the century history of this University, follows in its traditions and complements the current Faculty of Mining and Geology, Faculty of Metallurgy and Materials Engineering, Faculty of Mechanical Engineering and Faculty of Economics. Later the new Faculty of Civil Engineering (1997) and the Faculty of Safety Engineering (2002) were established.

The Faculty is undergoing dynamic development. For example, the number of students enrolled into 1st year increased from 102 in 1989 to 1025 bachelor students in academic year 2006/2007. This year the Faculty has 3093 students (bachelors, masters and post-graduate courses, full-time and combined form of study) and 136 lecturers. The offer of study courses has changed over the years, after completion of planned accreditation and ending of finishing courses we should be left with two main courses – Information and Communication Technologies, and Electrical Engineering. Courses are divided further into fields and offer education in all areas of electrical engineering and computer science. Also, the Faculty offers post-graduate study of electrical engineering and computer science.

In the science and research area, Faculty staff work on grant projects of the Czech Republic, participate in international projects and collaborate with certain institutions in Europe and the USA.

COLLABORATION OF THE FACULTY WITH FOREIGN UNIVERSITIES IN ENGINEERING EDUCATION

Political changes in the Czech Republic after 1989 also brought expansion of foreign contacts of Czech citizens. This was also reflected in the foreign contacts of Czech universities, which have expanded their contacts literally around the globe. Also, the Technical University of Ostrava substantially increased its foreign contacts as can be documented from the overview of foreign contacts of the Faculty of Electrical Engineering and Computer Science. For example in 2006 a total of about 380 trips abroad were made to 20 European and 13 non-European countries.

Significant collaboration began developing especially with universities of neighbouring countries. The most significant partners being from universities in Poland, particularly Silesian Technical University of Gliwice, Technical University of Opole and others.

Excellent collaboration results have been achieved between the Department of Electrical Engineering and Computer Science in Ostrava and the Institute of Power Stations and Measurement Systems of the Faculty of Electrical Engineering and Automation, Technical University of Opole.

The *Technical University of Opole* was created in 1996, but its beginning as a higher-education institution goes back

to 1950's. It originated in 1959 as a branch of the Silesian Technical University of Gliwice. The branch was converted into an independent engineering college and in 1966 the Higher School of Engineering was founded. In 1996 the Higher School of Engineering was promoted by the Act of Polish Parliament to the full university level of Politechnika Opolska – Technical University of Opole.

In 2000, years of collaboration have culminated in joint technical projects in the field of rationalization of power usage under the Czech-Polish programme “Kontakt”. Collaboration intensified after the accession of both countries to the EU and developed in the pedagogical, as well as research areas. The result of this long-term collaboration is the joint project of the Technical University of Ostrava and the Technical University of Opole on rationalization of power usage (reg. No 21711C5027) under the close-border collaboration programme INTERREG IIIA, which was prepared and approved in 2005 (see attached Figure 1).



FIGURE 1
BORDER LINE BETWEEN CZECH REPUBLIC AND POLAND

Current forms of collaboration can be summarized as follows:

- a) Pedagogical area
 - Exchange of lecturing professors
 - Contacts between students through specialized excursions
- b) Science-technical area
 - Creation of joint research workgroups
 - Creation of a research laboratory for optimal power usage
 - Joint measurement, particularly measuring of parameters of quality of supplied electricity
 - Exchange of research staff and post-graduate students
- c) Promotion and information activities
 - Joint hosting of specialized seminars
 - Joint hosting of international conference “Power Forum” in Poland with the participation of experts from Poland and Czech Republic

THE MOBILITY OF STUDENTS AND TEACHERS

Also, the faculty accomplishes the mobility of students and teachers above all in the Erasmus programme, which sooner was included in the Socrates programme; from this year the Erasmus programme is included to the new Lifelong Learning Programme (LLP). Students have interest above all in English speaking countries (e.g. United Kingdom); we have a few contracts with universities in these countries. Again, foreign students, who want to study at our faculty, come generally from south countries (Italy, Greece, Spain and Turkey).

Within the frame of Erasmus programme under the academical year 2005/2006 13 students were sent for foreign educational studentship and we received 7 foreign students. In the academical year 2006/2007 13 students were sent for foreign educational studentship and the number of received foreign students grown to 17. The biggest branch interest of foreign students is in technical subjects from Department of computer science, Department of telecommunications and Department of measurement and control. Following Figure 2 shows number of student's mobility in the academical year 2005/2006 in singles faculties. More information you can find on <http://en.vsb.cz/information-about/study/mobilities>.

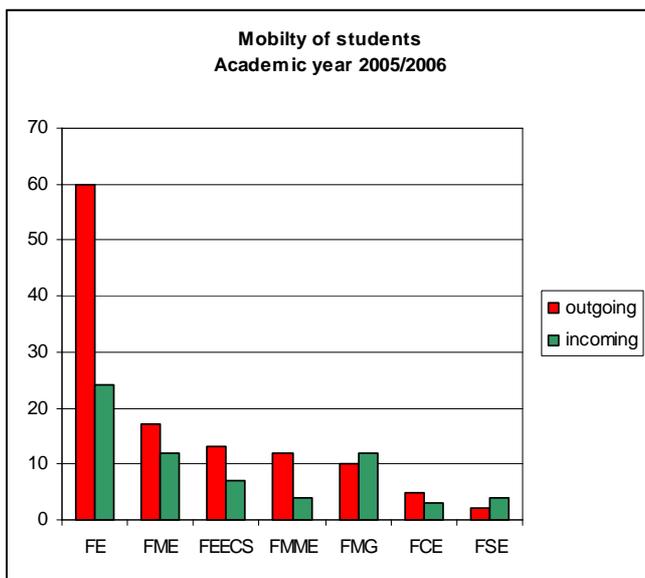


FIGURE 2
MOBILITY OF STUDENTS

FE - Faculty of Economics, FME - Faculty of Mechanical Engineering, FEECS - Faculty of Electrical Engineering and Computer Science, FMME - Faculty of Metallurgy and Materials Engineering, FMG - Faculty of Mining and Geology, FCE - Faculty of Civil Engineering, FSE - Faculty of Safety Engineering.

COOPERATION OF THE FACULTY WITH THE INDUSTRY DURING TRAINING OF ENGINEERS

The Faculty of Electrical Engineering and Computer Science is developing in line with the needs of restructuring of

industry in the North Moravian region in the Czech Republic. Mutual active collaboration with industrial companies, as well as smaller private firms, is essential to the Faculty because:

- The Faculty receives up-to-date information on the need to train specialists and thanks to the credit training system, which is fully implemented at the Faculty, it can quickly (within 2 years) provide training of such specialists;
- The economic situation of universities does not enable quick technical equipping of new laboratories and renovation of older ones.
- Understanding of this situation and financial help from the industry well help solve this problem much faster.

No less important are other problems that can be solved in collaboration with industrial companies and private firms, e.g. financial support of socially weaker students, job offers for graduates, collaboration in solving grant research projects, etc. We also perceive as important the support of handicapped students at our University (particularly through financial support of necessary technical modifications on University and hostel buildings).

Lately, job offers are a significant factor of collaboration between the Faculty and firms, because recent economic problems and the need to complete the restructuring of industry is leading to an increased unemployment rate in the North Moravian region and insufficient job vacancies are gradually starting to affect university graduates too.

Collaboration with companies has developed along with the development of the Faculty. The list of collaborating companies includes the branch offices of major international companies, like Siemens, ABB, as well as Texas Instruments, National Instruments and Bang and Olufsen. Recently we have seen a development of collaboration with companies from the IT industry. Quite obviously, the most intensive collaboration takes place with companies from the immediate vicinity of the University, i.e. North Moravian region. In terms of the development of the Faculty of Electrical Engineering and Computer Science, Northern-Moravian power Company has been and is a significant partner, with whom collaboration is running for a number of years, basically from the start of the Electrical Power course in 1970. Privatization of industry and power sectors after 1989 has also lead to the establishment of new private firms, of which numerous ones have gradually become significant Czech firms. One such example is Moravia Energo, a.s., which is currently a significant player on the electricity production and supply market.

Contact with these companies is supported by faculty management; practical implementation typically continues between individual departments and these companies.

Current *forms of collaboration* can be summarized as follows:

a) Pedagogical area

- Training of experts according to the needs of the industry at bachelors, masters and post-graduate levels (lately, electrical engineering students are required to extend their training in computer science, telecommunications, economics and law)

- Collaboration in preparing bachelors and diploma thesis (topics of most diploma thesis are given by external industry experts)
- Lectures by specialists at masters and post-graduate level, which brings a pleasant change to lectures and presentation of current industry needs
- Specialized lectures and courses held by the faculty for the industries

b) Science-technical area

- Collaboration of faculty experts during solution of technical industry problems
- Expert reviews of projects
- Cooperation in solving scientific grant projects.

ITCLUSTER – A NEW FORM OF COOPERATION WITH THE INDUSTRY IN THE FIELD OF IT

IT industry is one of the most rapidly evolving sectors in the area of North Moravia. New investors coming to Ostrava (among others ASUS and TietoEnator) have changed relatively stable situation in the area of availability of human resources educated in information and communication technologies. We are talking not just about hundreds of new positions for graduates but about thousands that are offered by industry in a near future. This kind of difficult situation required to find new way how to establish effectively working partnership between the Faculty of Electrical Engineering and Computer Science and the IT industry located in the region of North Moravia. Based on intensive communication between new incoming investors, original companies and the Faculty the alliance ITCluster was established in January 2006. The two main topics addressed and represented by slogan of ITCluster are: "People for IT | IT for People".

- People for IT - this point of interest is focused on how to educate more graduates and how to provide them with the knowledge that enables painless absorption of new graduates in the industry. The answer how to solve this issue varies from the simple approach to the complex ones. For example new courses provided by experts from industry were opened. The number of diploma theses motivated by practical problems is rapidly growing. The complex approach is represented by opening of the new portal www.people4IT.cz that joins together positions offered by industry and demands of students or fresh graduates. One of the ITCluster members organizes evening classes to solve one of the most painful problems which is the ability to speak English fluently.
- IT for People – it is obvious that the tertiary education requires to implement elements of research and development into the educational processes mainly in master and PhD levels of the study. ITCluster serves as a platform where new innovative projects are discussed and then opened. Right now some of them have been running and the results obtained show a potential of such kind of cooperation.

The success of this non-traditional way of cooperation between university and industry documents the number of members of ITCluster. Original number of members was 18 companies including the Faculty. Right now it has 30 members and there are other companies thinking about joining ITCluster.

SUMMARY

The Faculty of Electrical Engineering and Computer Science trains for surrounding industrial companies and the power industry specialists in all electrical engineering and computer science fields. Based on requirements and needs of companies in the region, the faculty also trains specialists with a broader range of expertise. For example, in the field of electrical power engineering and based on new requirements from the power industry, the faculty even trains specialists focusing on computer science, telecommunications and economics in the power industry.

Dialogue between representatives of the industry and universities can contribute substantially to increasing the efficiency in all the above fields of collaboration by facilitating access to new training methods, mediating acquaintance with new technologies, contributing to the finding of further ways to support universities by the industry.

We can confidently say that collaboration between the Faculty of Electrical Engineering and Computer Science and the industry at the current level is mutually prosperous because:

- Graduates are well prepared for the industrial and power sectors needs
- A two-way flow of technical information is ensured
- The results of solutions to technical industry problems provided by faculty specialists are practically utilizable immediately and in numerous cases the solution is cheaper than if provided by other companies

A substantial contribution to the faculty is various forms of financial support, particularly during renovation and building of new laboratories.

We must also mention the usefulness of the foreign contacts of faculty staff in this field. These foreign contacts of the Faculty of Electrical Engineering and Computer Science staff enable accessing latest information (e.g. visiting professors, access to the latest dedicated literature, visits of faculty staff at state-of-the-art foreign institutions), which are then used in the course of training. Initial experience with short-term and long-term stays (in one case 3 years) of foreign professors is very positive.

Also, collaboration in the INTERREG program with the Technical University of Opole has brought tangible results. Collaboration in research is developing successfully. During specialized seminars, current scientific information is exchanged which contributes to more effective solutions of scientific problems. Further, mutual exchange of professors (through lectures at partner universities) and students (through student exchange programmes) contributes to increasing integration tendencies within the EU.