

Zahraničné projekty UVSM 2012

Označenie **CIII-SI-0206-05-1112**
Názov projektu Applications of Rapid Manufacturing in Biomedical Fields
Názov v slovenčine Applications of Rapid Manufacturing in Biomedical Fields
Názov v angličtine Applications of Rapid Manufacturing in Biomedical Fields
Kordinátor prof. Ing. Karol Velíšek, CSc.
Dátum od 01.09.2011
Dátum do 31.08.2012
Program Vytváranie sietí spolupracujúcich vysokých škôl
Pracovisko KTZS UVSM MTF

Označenie **CIII-BG-0614-01-1112**
Názov projektu Development of manufacturing technologies - new strategies and new challenges in education and research
Názov v slovenčine Development of manufacturing technologies-new strategies and new challenges in education and research
Názov v angličtine Development of manufacturing technologies-new strategies and new challenges in education and research
Kordinátor doc. Ing. Peter Košťál, PhD.
Dátum od 01.09.2011
Dátum do 31.08.2012
Program Vytváranie sietí spolupracujúcich vysokých škôl
Pracovisko KTZS UVSM MTF

Označenie **CIII-RO-0013-07-1112**
Názov projektu Teaching and Research of Environment-oriented Technologies in Manufacturing
Názov v slovenčine Teaching and Research of Environment-oriented Technologies in Manufacturing
Názov v angličtine Teaching and Research of Environment-oriented Technologies in Manufacturing
Kordinátor prof. Ing. Karol Velíšek, CSc.
Dátum od 01.09.2011
Dátum do 31.08.2012
Program Vytváranie sietí spolupracujúcich vysokých škôl
Pracovisko KTZS UVSM MTF

Title of the project	Engineering as Communication Language in Europe
Type of the project	CEEPUS
Number of the project	CIII-PL-0701-01-1213
Main investigator	Karol Velíšek, Professor, PhD.
Time period of the project	2011-2012
Annotation of the project	
<p>There many native languages in Europe however, very often engineers use their own slang, which is quite well understandable to them, regardless of their nationality. I have noticed, that technical tutorials, brochures or other documents which are written in technical English can by understood by people, who have only basic knowledge of English.</p> <p>The goal of the new CEEPUS Network “Engineering as Communication Language in Europe” is to create communication and cooperation between engineers dealing with various engineering branches, thanks to what we would be able to create Interdisciplinary Engineering Teams. A strong background in engineer techniques applicable to a wide variety of complex problems is in demand along with engineers who understand more than one discipline and are prepared to work at the intersection of two or more engineering and science disciplines. Nowadays research and industry sectors have high requirements towards engineers. Often a single engineer is not able to solve complicated interdisciplinary problems, but there is a great possibility that Interdisciplinary Engineering Teams would make it better and faster.</p> <p>We would like to involve teachers from partner Institutions in order to create team projects that would be main part of the program. We would also like students to take benefit from our Program. Thanks to it, students would be able to freely communicate and work - communicating with their supervisors e.g. during <i>trainings</i>, summer schools, excursions, etc.</p> <p>Within 13-14 days the students will have the possibility to gain engineering knowledge during the lectures, exercises and labs. It will be able to choose interesting themes. Planned activities will concern following topics: Science Communication, Surface Engineering, Roughness and Shape Measurements, Mechanical and Electrochemical Surface Treatments, Renewable Energy Resources, Agriculture and Forest Engineering, Corrosion Engineering, Civil Engineering, Economical Aspects in Engineering, Neural Networks, Artificial Intelligence, Experiment Planning, Statistic in Engineering, Biomaterials and Nanomaterials, Technical English for Engineers, Article Writing Secrets.</p> <p>"Engineering as Communication Language in Europe" gives the opportunity to create</p>	

successful cooperation not only between teachers but also students from the universities which are to participate in the network, as well as between beneficiaries of the freemover mobility. Teacher and student mobility within this network enables learning and research experiences exchange within related fields, helps to build personal connections, broaden professional horizons - and what is more, gives the opportunity to develop the curricula. Therefore, the knowledge exchanged between the partner Institutions will give a good possibility for the further development of the Universities as well as for increasing education standards. This network would also stimulate further topic-oriented engagement and provide the basis for such kind of work.

Title of the project	Development of mechanical engineering (design, technology and production management) as an essential base for progress in the area of small and medium companies' logistics - research, preparation and implementation of joint programs of study
Type of the project	CEEPUS
Number of the project	CIII-PL-0033-07-1112
Main investigator	Karol Velíšek, Professor, PhD.
Time period of the project	2011-2012
Annotation of the project	
<p>Small and medium industrial companies (SMC), according to the opinion of many experts, are the base of developing countries economy. It concerns especially the economy of Central Europe countries, which formerly had non market economy. Development of mentioned industrial enterprises nowadays depends on proper level of mechanical engineering (design, manufacturing engineering, production management) and, in particular, on proper logistics. All of this demands good level of education from proper specialized institutions especially universities. Exchange of ideas, knowledge, results of investigations, students, teachers etc. is the condition sine qua non of high level of research and education in particular university. Thus, existence of the possibility of mentioned exchange is very important from the point of the development of economy.</p> <p>Technology, one of the most important fields of knowledge of the modern world, determines manufacturing of various machines and mechanical equipment. The development of manufacturing methods is dependent on the intensity of research, the aim of which is obtaining high-quality products in mass production at as low costs as possible. Therefore, the investigations</p>	

carried out by the majority of European research centers concentrate on basic conventional technologies as well as prospective unconventional manufacturing techniques. Numerically controlled machine tools and also modern computer-aided manufacturing systems are being employed in the analysis and simulation of technological processes. The development of technology enables monitoring of particular stages of the technological process, inspection of the technical conditions of technological machines and devices and control of the production cycle of machine elements. It is also possible to check the manufacturing accuracy (product dimensions, shape, surface quality), evaluate the quality of materials used for the manufacturing of particular machine elements, evaluate and test the final products, and also test the durability and reliability of machines and devices.

A typical company makes thousands of different parts, in many different batch sizes, using a variety of different manufacturing operations, processes and technologies. It is beyond the capability of the human mind to comprehend and manipulate such vast amount of detailed data. People still need to make decisions regarding how to run a manufacturing company and success in today's competitive environment at home and foreign markets. The pressure on management is continuing to escalate as global competition drives the need for producing a greater variety of high quality products, in smaller sizes and lower costs. These outgoing demands continuously increase the level of complexity present in a manufacturing environment. What is needed, are both the strategy and a tool that can be used to achieve such a purpose.

A global world brings global problems in production engineering. Economic pressure urges manufacturers to make more customized products of high quality, in smaller series, with shorter lead time and of course, without increased costs. Time is becoming one of the most important points of company strategy. Costs are also important. More important is competitive price and the most significant are marketability of manufactured products. Therefore producers look for tools that could increase a competitive advantage of their enterprises.

Logistics is that part of the supply chain process that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services and related information between the point of origin and the point of consumption in order to meet customers' requirements. Industrial logistics is even more specialized and touches a wide range of topics related to plant supervision, demand planning and production control. Supply chain technology is a critical factor in extracting value. A supply chain strategy is needed to spot the proper supply chain technology. Selecting the right system requires a careful evaluation process that asks the right question and spot proper solutions for logistics and industrial logistics.

Taking into account all the above mentioned aspects of modern manufacturing of machines and technological devices, the following subject of a new research project to be realized within the framework of the CEEPUS program has been proposed.

Title of the project	Applications of Rapid Manufacturing in Biomedical Fields
Type of the project	CEEPUS
Number of the project	CIII-SI-0206-05-1112
Main investigator	Karol Velíšek, Professor, PhD
Time period of the project	2011-2012
Annotation of the project	

Rapid Manufacturing methods are showing a great potential in the field of medical applications. They are at their essence most suitable for individual – custom made parts that are in almost 100% demanded for medical applications. For example, hip implants are nowadays made in series of several modules – sizes. The choice is then made by the surgeon according to the patient's size and without making any mistakes at the decision there are still great chances that the chosen implant won't fit as supposed. The consequences are uneven and therefore rapid wear of an acetabular cup which leads to unplanned revision operations. Data show that 11% of all unplanned revision operations for hip implant's replacements are caused by the misalignment of the implant at the first installation. Using the Reverse Engineering and Rapid Manufacturing techniques a vast majority of these problems can be avoided.

Although a lot of research work has already been done in this field the methods of surgical operations' planning and using the custom made implants haven't been widely adopted by the medical staff. Reasons for that are very diverse but the most common one is a lack of understanding on both, medical as well as engineering side. The proposed network is aimed to overcome these obstacles by joining a small group of medical and engineering institution to develop a common knowledge base that will enable mutual understanding of ever changing research subjects.

The research and educational work in the frame of the network will mostly be aimed to the following research/educational topics:

Processing of the medical images (from CT and MRI).

Printing Rapid Prototyping (RP) master models for medical applications (planning fitting, training, education).

Designing and dynamically and statically analyzing medical implants

Production of bio-compatible implants (casting and direct manufacturing).

Developing new bio-compatible materials, suitable for RP technologies.

Case studies of using the RP parts for medical purposes.

Analyzing the costs / benefits of using the RP for medical applications.

Disseminating the knowledge and results, etc...

Student and teacher mobility, will offer good possibilities for knowledge exchange and development of new teaching strategies that will address the multidisciplinary aspect of the network's topics – cooperation among medical doctors and engineers. Moreover during the mobility people will learn and benefit from new customs in foreign countries and institutes, develop new friendships and consecutively improve their habits, working principles and knowledge.

Students (under- and post-graduate) will benefit by having a chance to use the large »equipment base« placed over different laboratories of participating universities what will enable them to prepare better final theses.

New contents for interdisciplinary subjects to be taught in the participating institutions will be developed and evaluated during the workshop which will be held between September 15th and 20th in Maribor. The topics will include:

Rapid Manufacturing – medical applications

Quality in medical equipment's production,

Ethics in medicine and engineering,

Reverse engineering of body parts – CT and MRI data conversion and reconstruction of 3D parts, image processing and medical devices,

Design and design optimization for rapid prototyping

Dynamic model construction and simulation for the sizing of implants.

- Implantation process – surgeon's view

Title of the project	Teaching and Research of Environment-oriented Technologies in Manufacturing
Type of the project	CEEPUS
Number of the project	CIII-RO-0013-07-1112
Main investigator	Karol Velíšek, Professor, PhD.
Time period of the project	2011 - 2012
Annotation of the project	

Student mobility - professional achievements - language knowledge - previous or current concerns regarding the aspects of environmental protection and modern technologies in this field

Short Term Student mobility - scientific achievements in the field of environment aspects of manufacturing technologies - language knowledge - publications in the field of network topics - previously contacts between partners

Teacher mobility - professional and teaching achievements in the topics of network; - language knowledge - leading of diploma works and philosophical degrees in this field - previously contacts between colleagues from partner's departments - participation at scientific conferences, workshops organized by partners - common specific activities with PhD students.

The coordinator of the network and the representatives of the partner institutions establish a working procedure at the beginning of the academic year. The working procedure contains the objectives of the activities, the responsibilities of each partner and deadlines. The coordinator of the network checks the fulfillment of each activity according to the previously elaborated working procedure. At the end of the academic year, the coordinator writes a final report on the basis of the partial reports submitted by the participants and summaries received from the teachers and students which were involved in this program. Also we intend to build one particular web-page of the network in which we plan to present the main aspects of activities from network. Publishing the main results at Scientific Conferences organized by partners.

Title of the project	Implementation and utilization of e-learning systems in study area of production engineering in Central European Region
Type of the project	CEEPUS
Number of the project	CIII-RO-0202-05-1112
Main investigator	Karol Velíšek, Professor, PhD.
Time period of the project	2011 - 2012
Annotation of the project	

Access to lifelong learning can be solved using the e-learning systems. Information and communication technologies (ICT), properly used, contribute to the quality of education and training and to Europe's move to a knowledge-based society.

The universities have to know to respond on global problems and to be prepared to educate the specialist. Many of the new methods used in production engineering and in CA systems and technologies as rapid machining, virtual prototyping, CAD/CAM/CAE/CMMS are based on "e" (electronic) activities because reduce the time (time is becoming rapidly the most strategic topic of companies) and increase the quality of products without increasing the costs.

E-learning comprises all forms of electronically supported [learning](#) and [teaching](#). E-learning applications and processes include Web-based learning, computer-based learning, virtual classroom opportunities and digital collaboration. Content is delivered via the Internet, intranet/extranet, audio or video tape, satellite TV, and CD-ROM. It can be self-paced or instructor-led and includes media in the form of text, image, animation, streaming video and audio.

The main action lines of the e-learning systems in study area of production engineering are based on

- -Information and Communication Technologies (ICT):
- -Digital literacy as e-books, e-papers, e-courses, etc.
- -The teaching process must be based on e-presentations (slide-shows, papershow system, etc.).
- -Development of virtual laboratories especially in case of equipments with large dimensions.
- -Development of simulations for improves the functions parameters.
- -Using the virtual tests for find the possible errors in design.
- -Using the simulations for improve the maintenance and reliability of machines and equipments.
- -Implementation of virtual laboratories specific for each University and realization of virtual laboratory network between Universities
- -Implementation of modern communications technologies, especially for the case of lifelong learning, between the students and teaching staff of universities
- -Simulations of industrial logistics activities.

All activities concerning the “e” (electronic) are keys for solving of global problems of producers and global problems of universities. It is necessary to solve the legislative frame of common interest and accord the national legislative frame with the European legislative frame.

Joint programs give a good platform for an increase of collaborated universities and using of e-learning systems can increase the efficiency. Therefore the subject of new CEEPUS III network is titled *“Implementation and utilization of e-learning systems in study area of production engineering in central european region”*

The principal motive is elaboration and implementation of Joint programs in study area of Production engineering based on collaboration agreements between partners. The proposed network wants to develop the existent collaborations agreements between partners (North University of Baia Mare College of Nyíregyháza, Poznan University of Technology, Technical University of Cluj Napoca, St. Istvan University from Godollo, University Politehnica Bucuresti, University of Žilina Technical University in Košice) and to put the bases for the next agreements. All presented activities (organizing of conferences and workshops, seminars for students and PhD students, support for elaboration and finishing of PhD thesis, excursion) will be hence forward supported and there will be effort to increase their level in framework of Joint programs.

The e-learning initiative of the European Commission seeks to mobilise the educational and cultural communities, as well as the economic and social players in Europe, in order to speed up changes in the education and training systems for Europe's move to a knowledge-based society.

Title of the project	Technical Characteristics Researching of Modern Products in Machine Industry (Machine Design,
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	Fluid Technics and Calculations) with the Purpose of Improvement Their Market Characteristics and Better Placement on the Market
Type of the project	CEEPUS
Number of the project	CIII-RS-0304-04-1112
Main investigator	Karol Velíšek, Professor, PhD.
Time period of the project	2011 – 2012
Annotation of the project	
<p>Market globalization has had an effect on product assortment extension on the market, which brought many benefits to the consumers. They are enabled to buy products of different quality, price, design and terms of delivery. Major manufacturers have received globalization with a great pleasure, because globalization enabled them expansion of the market and all the preferences that follow with this. Small and medium manufacturers are the most affected with globalization, because of presence of concurrents, so they can't place their products anymore in such amount like before, or even they can't do it at all. Due to globalization, they had to reduce their assortment and intensively to develop existent products, so they could become more competitive. All who didn't succeed this, had to change their production program, or simply to close their factories.</p> <p>The global world brings global problems in industrial production. Economic pressure urges producers to make more customized products of high quality, in smaller series, with shorter lead time and of course, without increased costs. Time is becoming one of the most important point of the companies strategy. Costs are also important. More important is competitive price and the most significant are marketability of manufactured products. Therefore producers look for different ways (new design, modern tools, etc.) to increase a competitive advantage of their products.</p> <p>In most cases, leading competitors bought all perspective companies (their potential competitors), so they continued to produce, but, after this, different products.</p> <p>So, if small and medium manufacturers want to stay on a globalized market, they intensively and incessantly must develop their products, apply new technologies and nourish aggressive marketing, because it is the only way to subsist at the market.</p> <p>When some product is being analysed, we can discuss its aesthetic characteristics (shape, color, style), its technical characteristics (dimensions, mass), its service characteristics (capacity, energy consumption), functional characteristics (principle of functioning), and design (construction and performance way). However, when the product occurs on the market, its market characteristics become very important. It is necessary that manufacturers</p>	

always have to develop market characteristics of their products in order to encourage potential customers to choose their products. The final selection of the products and producers by consumers is dependent on the market characteristics of the product, ability of marketers and retailers or buyers and sellers to point out those characteristics and use them in forming the prices and other sales aid activities (delayed payments, credit, exchange etc.)

The market characteristics are the following: nature and complexity of the product, specific characteristics, variety of the palette of products, quality, design, price, product brand, image of the product, packaging, production date, distinctiveness and protection of the product, sales brochures and catalogues, marketing support, availability of the product, customer service, timing of product delivery, warranty terms, technical support, service support, etc.

The majority of market characteristics are influenced by the producers themselves, and they have the biggest responsibility for the sales of their own products. However, the role of the retailers is also important, which leads to the conclusion that the sales problem should be tackled with a complex approach, with the full cooperation of all involved parties. This is especially relevant today, when increase of the sales of domestic products is a priority and all the relevant information regarding the quality of the products should be disclosed. Also, it is very important to secure availability of the domestic products supply, keep the public informed of where those products are sold, ensure that they are recognizable in retail outlets, label separately that they are produced domestically, outline the reasons why consumers should choose them over competition, train the sales staff in detail about the advantages of the domestic products and encourage them to present that to the consumers. All of these factors can have a significant influence on the consumers, and in addition to affordable pricing, credit financing, attractive design and good image, they can play a determining role in decision-making regarding the purchase of domestic products by the consumers. It is also important to accentuate high impact of the image of the product, which is dependent on the image of the producer, image of the current customer base, product design image, packaging image, image of the visual graphics displayed on the product and packaging, image and perception of pricing, image of retail outlets, image of the promotional activities, image of the after sales support services etc.

Technical characteristics depend on the nature of the product so that with sports equipment importance is in design, comfort, recognition and price; with household appliances importance is in design, ease of handling, low weight, easy maintenance, low noise and price; with transport vehicles, design, comfort, fuel usage, low emissions and environmental issues; with working machinery, capacity, precision, and the degree of automation; with generators and energy converters, power, and effective utilization which show the degree of perfection of converting the energy. Technical characteristics can significantly improve the market characteristics of the product and such can influence the better placement on the market.

Taking into account all the above mentioned aspects of technical and market characteristics of the products, the following subject of a new research project to be realized within the framework of the CEEPUS program has been proposed:

Technical Characteristics Researching of Modern Products in Machine Industry (Machine Design, Fluid Technics and Calculations) with the Purpose of Improvement Their Market

Characteristics and Better Placement on the Market

The necessity of the network cooperation

The universities included in this network have been collaborating with each other, though not always formally, for a number of years. Several partners have experience and achievements in the CEEPUS projects cooperation. CEEPUS project represents a very useful formal way for cooperation between the partner institutions. The network assures an efficient possibility for students and teachers mobility, that contribute to mutual acquaintance and to valuable educational and research programs development. Exchange of knowledge and experience is very important for each university teacher and student. Not only acquisition of necessary information has big significance but also dissemination is characteristic for universities and other scientific institutions. Another important possibility is the possibility to create joint programs of study, common evaluation of diploma and PhD works.

Title of the project	Development of manufacturing technologies – new strategies and new challenges in education and research
Type of the project	CEEPUS
Number of the project	CIII-BG-0614-01-1112
Main investigator	Peter Košťál, Assoc. Professor, PhD.
Time period of the project	2011 - 2012
Annotation of the project	
<p>Time and digital technology are the most strategic topics for companies in order to survive. Nowadays manufacturing is characterized by intensive use of computers, communication and information technologies.</p> <p>New methods of manufacturing technology, computer aided systems and information technologies, virtual machining are indeed strong tools for solving the global problems. The manufacturers look for tools to improve their enterprise competitiveness - to produce more products with less material, less energy and less waste. Additionally, they have to take environmental considerations. This means that the choice of materials and the designed solution cannot be done on purely technical and economical criteria, but must also take recycling, pollution and disassembly concerns into account.</p> <p>This new project will allow our future engineers to work more project oriented, and to combine state of</p>	

the art know-how with theoretical insight. Thus, this project will meet future industrial needs for highly trained professionals in the manufacturing industry. It will be directly linked to technology and innovation across the universities in Central and Eastern Europe.