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Experiences and Results of TEMPUS Project “International Accreditation of Engineering Studies”

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Abstract

The project 144856-TEMPUS-2008-RS-JPGR (15/01/2009-14/01/2013) was dedicated to the introduction and implementation of the procedures needed for international accreditation of engineering studies. These procedures comprised quality assurance fulfilments in all aspects, not just at the level of studies, but also at the level of institution. Engineering studies are specific in a sense that very close up connection to technology is needed and a feedback from industry plays an important role in quality of studies. Also, practical and soft skills are to be transferred to future engineers, so they can work in technology transfer and innovation demanding environment. Learning know-how and getting experience in these fields was very important to all the participants in the project, and results are obvious in several ways: formally the accreditation seal of the studies from ASIIN is going to be gained for some partners, as well as the EUR-ACE label, but in essence all the partners improved the quality of studies, as well as the connection to industry and innovation. Qualitative engineering education represents a compulsory presumption for technology transfer. The paper presents some results of the project.

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Keywords: Accreditation of Engineering Studies; ASIIN; EUR-ACE; Technology transfer; Knowledge triangle

1. Introduction

University of Belgrade, Faculty of Mechanical Engineering (UB-FME), was the Grantholder of the EC funded project 144856-TEMPUS-2008-RS-JPGR – International Accreditation of Engineering Studies (IAES) [1], with Prof. Dr. Milos Nedeljkovic as responsible Project leader. Partner institutions in this project were: TU Munich (as EU partner in charge for coordination of activities, with Prof. Dr. Hans-Joachim Bungartz as responsible person), Uni-Karlsruhe, ASIIN (Akkreditierungsagentur für Studiengänge der Ingenieurwissenschaften, der Informatik, der Naturwissenschaften und der Mathematik e.V.) Germany, Imperial College London, Polytechnic University of Catalonia - Barcelona, German University in Cairo, Uni-

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Belgrade, Uni-Kragujevac (with Prof. Dr. Milan Matijevic as coordinator), Uni-Nis (with Prof. Dr. Zarko Cojbasic as coordinator), Serbian Ministry of Education, Robotina-Slovenia, Institute "Mihajlo Pupin", Informatika, IvDam Process Control, all Belgrade. The proposal for the project has been submitted in April 2008 and was selected to be granted in October 2008. The project started in mid-January 2009 and was planned to last until mid-January 2012 [1]. For several reasons, it has been approved to be extended for one year, and to finally end in mid-January 2013. The intermediate report was submitted in mid-July 2010, and the final report in mid-March 2013 [2]. Considering the role of ASIIN [3], its double activity must be noted – as a consultant-participant in the project from one side, and as an agency to which accreditation application was planned to be submitted on the other side. GUC used accreditation agency ACQUIN (Akkreditierungs-, Zertifizierungs- und Qualitätssicherungs-Instituts) [4] since that one was used even before the Project. UB-FME used also RINA [5] for accreditation of its Department for naval architecture.

2. Activities

The essential part of the project was the necessary improvement at beneficiary universities concerning all relevant faculty/university processes and relevant engineering study programs with all of their characteristics, in order to reach a new and relevant quality in engineering education verified by international accreditation of these study programs. **Planned activities** were: Quality assurance and enhancement system for engineering education (Review of existing national and international quality assurance and enhancement systems for engineering education; Establishment of Committee for quality of engineering education; Proposal of quality assurance and enhancement system for engineering education; Promotion of necessity of quality assurance and enhancement system based on the best international practice; Implementation of quality assurance and enhancement system at beneficiary faculties), New flexible study program models in order to reach interdisciplinarity and new qualifications frameworks (Review of current standards in engineering education and contemporary qualifications frameworks; Creation of new flexible study program models in order to reach interdisciplinarity and new qualifications frameworks), New laboratory, library, learning and teaching facilities as well as administrative/student services improvement (Selection, procurement and installation of laboratory software and equipment; Library facilities and administrative/student services improvement; Developing of partnership with enterprises through student practice organization), Pilot project of international accreditation of engineering studies (Accreditation of at least two selected study programs with ASIIN).

Some of **activities done** were: At GUC a review of current standards in engineering education and contemporary qualifications frameworks has been processed by the Quality Management and Accreditation Committee (QMAC), as shown in the National Academic Reference Standards (NARS) publications of January and August 2009 with active participation of GUC. Also, GUC thoroughly studied the European Qualification Framework (EQF) & the German Qualification Framework (GQF). The QMAC held several meetings with EMS curriculum committee staff members to discuss NARS, EQF & GQF. Comparison of Mechatronics study programs of 5 different degree awarding institutions was prepared by GUC. Modernization of the Mechatronics Bachelor & Master programs, together with Design & Production Engineering Bachelor & Master programs, was made and the learning outcomes were modified in compliance with Bologna process with verification of the allocated student workload and the courses' syllabi catalogues preparation. Two study programs at both BSc and MSc study level were under modification to confirm to the accreditation requirements, taking into consideration the modular structure and flexibility. Finally, GUC has submitted applications for international accreditation to ACQUIN for two study programs. After accreditation of international Mechatronics study programs by ACQUIN, GUC and University of Ulm will establish joint degree programmes in Mechatronics (at Bachelor and Master level). ACQUIN accreditation will make necessary compatibility with quality assurance and education system at University of Ulm. In essential sense there aren't differences between ASIIN and ACQUIN approach in international accreditation.

At the Faculty of Mechanical Engineering, University of Belgrade (UB-FME), establishing of a new system curricula design was done as a part of quality assurance mechanisms. This solution was accredited by CAQA. It is a unique accredited solution in Serbia at BSc study level with inherent flexibility for students to collect elective subjects from different areas of engineering, science and soft skills. Professors can offer new elective courses in each year and propose new modules with defined line of courses (within different old modules, with both new and old courses). Students have opportunity to expand their qualification framework related to elected subjects within one or more modules.

In this manner, at Faculty of Engineering (Faculty of Mechanical Engineering up to 28th July 2011) at University of Kragujevac (UKg-FE) new study programs were also formed from the old courses within different study modules of Mechanical Engineering study program at both BSc and MSc study levels. At this faculty the dominant opinion was that "new" study programs like Automotive Engineering and Military-Industrial Engineering are more useful for attracting enrolment of new students than proposed elective path within Mechanical Engineering study program, which was the solution of Faculty of Mechanical Engineering at University of Belgrade.

3. Equipment

At all the beneficiary faculties, laboratory equipment is planned to support education in Mechatronics as an interdisciplinary engineering field which is a part Mechanical Engineering education too. New laboratory facilities are showed at <http://cpa.fin.kg.ac.rs:30/Home/EquipmentUniversity>. At the Faculty of Mechanical Engineering University of Belgrade a new laboratory for 25 students is formed, and procured laboratory equipment for individual student's work. At the Faculty of Engineering (former Faculty of Mechanical Engineering) at University of Kragujevac, two laboratories with 8 and 20 student places are improved. Additional donation resources from industry were used in order to improve some laboratory aspects (furniture, and so on). At the Faculty of Mechanical Engineering at University of Nis, existing Mechatronics educational laboratory is improved. Laboratory equipment at RS beneficiary faculties is available for teachers and students in accordance with adopted quality assurance system. Note that equipment is a part of teaching laboratories. The Mechatronics Department at GUC purchased two new educational equipment sets that are used in the Mechatronics Lab. Full details on equipment with photos are given at: <http://tempus.mas.bg.ac.rs/equip.html>.

4. Some experiences and results

All the beneficiary institutions gained very valuable experience through participation in the project. Cooperation among the partners was well established and intensive. Although principles and procedures of QA and accreditation were already known (for instance all Serbian universities were already accredited by national accreditation agency CAQA [6]), a lot of new details were learned in intercommunication, and were applied by all the partners.

Achieved results related to national/regional priorities: The essential part of the project was the necessary improvements at beneficiary universities concerning all relevant faculty/university processes and relevant engineering study programs with all of their characteristics, in order to reach a new and relevant quality in engineering education verified by international accreditation of these study programs. Study of European Qualification Framework (EQF) & the German Qualification Framework (GQF) as well as study of EU engineering programs were necessary for relevant modernization of partner country engineering study programs, taking into consideration modular structure and flexibility. Interdisciplinary study programs were more focused by this project. Also, implementation of relevant quality assurance system is necessary in order to reach international accreditation.

According to the project application, in the final phase of this project, at faculties with similar structural characteristics, the implemented activities will be tested and verified through the international accreditation at

least on two study programs. This pilot international accreditation encompasses updating of laboratories and libraries, student counselling practices, organization of student mobility and industrial practice, as well as informational facilities, administrative & student services, etc.

Up to now, Faculty of Mechanical Engineering, University of Belgrade has got international accreditation for the study program in Naval Architecture Engineering (MSc level), and German University in Cairo for the study programs in Material Science (BSc and MSc levels).

Also, GUC has submitted applications for international accreditation for two interdisciplinary study programs: Mechatronics Engineering International Bachelor of Science Program (in English), and Mechatronics Engineering International Master of Science Program (in English). These international study programs were targeted focus of GUC in this project during the overall project realization. Development of international relations as a priority will be obviously reached by accreditation of international study programs. As a logical extension of this project, GUC has started with establishing joint degree programmes in Mechatronics (at Bachelor and Master level) with University of Ulm.

Faculty of Mechanical Engineering at University of Belgrade has submitted applications for international accreditation to ASIIN for two study programs: Mechanical Engineering - Bachelor of Science Program (in Serbian/ English), and Mechanical Engineering – Master of Science Program (in Serbian/ English) with all teaching modules (elective line of courses in order to reach foreseen specialization in engineering including interdisciplinary engineering specialization like Automatic Control or Mechatronics, and so on).

Faculty of Engineering at University of Kragujevac prepared itself for international accreditation in the same manner as the Faculty of Mechanical Engineering at University of Belgrade, as well as the Faculty of Mechanical Engineering at University of Nis did, but no formal applications were made yet.

All beneficiary faculties had enhanced the quality and relevance of higher education in engineering field and achieved following objectives during the project: 1) Adoption of quality assurance and enhancement system (related to criteria of national and international accreditation agencies), 2) Improvement of laboratory, library, learning and teaching facilities.

Also, during the project different forms of partnership with enterprises were developed: 1) Quality assurance procedure for student practice organization was established and adopted, 2) Partnership based on infrastructure development for better education (different donations of enterprises have been implemented), 3) Partnership based on employment of students & graduates in accordance with defined of enterprises needs (for example, Center for Applied Automatic Control at FE UNI KG has selected 10 students & graduates for Muehlbauer Technologies doo, and at the same time has got donation from Muehlbauer (for infrastructure needs)).

Achieved results related to set of the project proposal objectives: The project has achieved its set objective which matches the needs identified in the original application in accordance to the available project budget and to planned activities.

The overall objective of this project was to enhance the quality and relevance of higher education in engineering area in partner countries, in order to reach the integration of partner country universities into the European higher education system, with obvious result manifested by international accreditation of engineering studies.

References

- [1] Official web site of the project: <http://tempus.mas.bg.ac.rs>.
- [2] Final Report on implementation of the project (FR), Summary report for publication and Financial Statement, March 2013, available on the official website.
- [3] Web site of the German accreditation agencies for consultancy and accreditation seal ASIIN: <http://www.asiin.de/>. ASIIN Consult was the participant in the project, while ASIIN e.V. was the agency for executing accreditation procedure.
- [4] Web site of the German accreditation agency ACQUIN: <http://www.acquin.org/en/index.php>.
- [5] Web site of the Royal Institution of Naval Architects from United Kingdom: <http://www.rina.org.uk/institution.html>.
- [6] Web site of the Serbian accreditation agency CAQA: <http://www.kapk.org/>, and <http://www.enqa.eu/agencydet.lasso?id=102>.