

Overview Report on Outputs of ECDEAST Project

completed within TEMPUS Programme



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Project title: Engineering Curricula Design aligned with EQF and EUR-ACE Standards

Project acronym: ECDEAST

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Duration: 36 months (October 15, 2010 – October 14, 2013)

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The idea of using professional accreditation standards as a basis for curriculum design was implemented within the ECDEAST project (Engineering Curricula Design aligned with EQF and EUR-ACE Standards). In 2010 a consortium of Russian and European Institutions received the financial support of the European Commission for the realisation of the project within the TEMPUS programme. TEMPUS¹ is the European Union's Programme which supports the modernisation of higher education in the countries of Eastern Europe, Central Asia, the Western Balkans and the Mediterranean region, mainly through university cooperation projects. It also aims to promote voluntary convergence of partner country higher education systems with EU developments in the field of higher education. In addition to institutional cooperation TEMPUS also promotes a "people to people" approach.

The alignment of EQF & EUR-ACE Standards with Russian educational standards requirements to the structure of relevant programmes and appropriate graduates' competences was a challenging task for Russian universities and the project partners as well. To be competitive in the educational market, programmes should meet the requirements of the professional community. In engineering, the requirements for graduates' attributes are formulated by both national and international professional organisations dealing with accreditation of engineering programmes and with recognition of professional qualifications. The European Qualifications Framework (EQF) acts as a translation device to make national qualifications more readable across Europe, promoting the mobility of workers and learners between countries and facilitating their lifelong learning. The EUR-ACE Framework standards define programme outcomes for engineering degree programmes. The programme outcomes describe in general terms the capabilities required of graduates from accredited First Cycle (Bachelor) and Second Cycle (Master) engineering programmes as an entry route to the profession. As framework standards of a European system for the accreditation of engineering programs, the EUR-ACE Standards are widely applicable to the variety of the engineering educational models and traditions in Europe and are broadly accepted by authorised national accreditation bodies.

¹ The Tempus Programme web-site. http://eacea.ec.europa.eu/tempus/index_en.php

Objective

The objective of the ECDEAST project² is to ensure that Russian Universities have advanced curricula for programmes which are in line with new developments in a number of chosen engineering areas and are in accordance with the Bologna Process and European standards for the quality of engineering education (EUR-ACE Standards).

The main practical objective of the project is to design new master engineering curricula for Russian Universities based on the experience of the European partners and the EUR-ACE requirements for graduate competences. It is an urgent topic for the Russian Ministry of Education and Science together with leading Russian Universities to develop master programmes in engineering within areas of specialisation in accordance with the 3rd generation of national and European quality standards. After the completion of the project the Russian partner universities are expected to apply for the EUR-ACE Label with the newly implemented programmes. A successful external evaluation will result in the enhanced mobility of graduates and students.

Partners

The official project coordinator was Hochschule Wismar (Germany). The project consortium consisted of the following partners:

- TPU – Tomsk Polytechnic University (Russia)
- BMSTU – Bauman Moscow State Technical University (Russia)
- SPbSPU – Saint-Petersburg State Polytechnical University (Russia)
- HSW – Hochschule Wismar (Germany)
- KTU – Kaunas University of Technology (Lithuania)
- LBUS – Lucian Blaga University of Sibiu (Romania)
- SEFI – Société Européenne pour la Formation d'Ingénieurs
- ENAEE – European Network for Accreditation of Engineering Education.

² The ECDEAST project web-site. <http://ecdeast.tpu.ru>

TPU, BMSTU and SPbSPU are top-ranking engineering higher education institutions in Russia and each has an excellent tradition in engineering education. These three universities were awarded the status of a *national research university* and were granted the authority to develop their own educational standards and programmes. They are actively involved in cooperation with international organisations, funding agencies and programme developers. TPU engineering programmes have been successfully evaluated by international bodies (ABET (USA) and CEAB (Canada)) and were among the first programmes in Russia to be awarded the EUR-ACE Label.

HSW, KTU and LBUS shared their experience in curricula design in accordance with Bologna principles and European quality standards within the project. Each university provided the project with its experts in a specific discipline area and in the evaluation of the quality of engineering programs.

ENAAE provided the project with experts in the evaluation of the quality of the engineering programmes and was responsible for the organisation of the evaluation of the programmes developed against the EUR-ACE Standards.

SEFI acted as a consultant for the coordinating team and served as a relay as far as dissemination of the project work and outcomes are concerned.

Activities and project outputs

The duration of the project was three years. The activities that were arranged and the outputs that were reached are as follows:

- ***Guidelines on engineering programme design***

The discussion of the requirements for learning outcomes and curriculum structure started at the *Workshop on European and National Standards Alignment* that was held at Kaunas University of Technology in 2011. The Partners agreed on the structure of master engineering curricula and graduates' attributes taking into account EQF, EUR-ACE and Federal Education Standards of Russia (FES). The Guidelines on engineering curriculum design, which were based on the alignment of Russian and European requirements for engineering graduates' competences, were developed as methodological recommendations for the academic staff of the partner universities.

The Guidelines describe a methodology for engineering curriculum design and the main steps of the methodology were the definition of the programme objectives and learning outcomes and credit allocation for programme and module learning outcomes in accordance with the FES and EUR-ACE Framework Standards requirements and the assessment of the achievement of the learning outcomes. The Guidelines are available through the project website in Russian and in English.

- ***Training of faculty*** of TPU, BMSTU and SPbSPU for curriculum design

Faculty training workshops were organised at each of the Russian partner universities and these workshops included lectures, discussions, case studies, and practical exercises on curricula design. Attention was also paid to active methods of student-oriented learning (team work, problem-based learning). The experience of the European partners in these topics was shared with the participants and was of great benefit in helping achieve the project objective. Materials on the methodology were published and distributed among the faculty involved in the project and are posted on the project website.

- ***Faculty mobility***

Extensive faculty exchanges were organised in order to share the experience of the Russian faculty with the EU partners for the development and updating of new modules and courses, teaching materials, and methods for the assessment of the achievement of programme learning outcomes. Faculty mobility was organised in two rounds. The first round was aimed at sharing experience and traditions in curriculum design and general issues of programme and module structure. For the second round key faculty members were selected for face-to-face meetings and discussions on specific modules, teaching materials and the facilities required.

- ***Updated syllabi and teaching materials***

The updated syllabi and teaching materials for courses and modules with ECTS credits mapped to learning outcomes were developed by September 2012. The most up-to-date textbooks for the areas of programme specialisation were selected with the advice of the European partners and purchased for TPU, BMSTU and SPbSPU. State-of-the-art powerful software packages for engineering design were also purchased from leading European companies in order to extend the opportunities for advanced master studies.

- ***New curricula and three master programmes***

Discussion and approval of the new master programmes was held at the end of the second year of the project during the *Conference “International Cooperation in Engineering Education”* at SPbSPU at which there was broad participation of all the partners, Russian engineering universities, professional community (Russian and European), and representatives of the Ministry of Education and Science of the Russian Federation.

The following master curricula were developed in close cooperation of the partner universities from Russia and the EU (which worked in pairs):

- Master programme in *Computer Technologies for Design of Thermal and Nuclear Power Plants* (TPU and HSW);
- Master programme in *Cryogenic Engineering and Technology* (BMSTU and KTU);
- Master programme in *Intellectual Systems and Technologies* (SPbSPU and LBUS).

Following the development of the curricula, the Russian Universities (TPU, BMSTU and SPbSPU) started these new programmes in the autumn of 2012, when the first classes of students (10 students in TPU, 5 students in SPbSPU, and 8 students in BMSTU) were enrolled. The newly developed teaching materials and methodologies were applied, and the recently purchased up-to-date software and textbooks were used in corresponding modules.

- ***Evaluation of Programmes against EUR-ACE Standards***

Evaluations of the new programmes at the Russian partner universities were carried out by review teams with a balance of international accreditation expertise and experience of Russian education system. Each team was composed of three international experts, with considerable experience of international accreditation, two Russian professors and two Russian students. The international experts were affiliated to either ENAEE or SEFI. The Russian professors and students on each team were nominated by the other two participating universities, and were able to translate and interpret as necessary for the international members. The student members in each team had the important role of meeting the students on the individual programmes to obtain evidence of their perception of the programmes.

Prior to the visits, the departments delivering the programmes were asked to provide a Self-Assessment Report in English, that included background information about the department and the university, the structure of the Programme, details of the modules, comparison with international and national standards, and information about Programme delivery.

The evaluation visits lasted two days and were organised in a similar way to an accreditation visit and included evaluating the programme methodological documents and meetings with faculty, students, graduates and employers.

The evaluation teams reported on the following *positive aspects* of the programmes:

- Specification of the programme objectives and learning outcomes.
- Programme documentation including module descriptors, credit allocation and module learning outcomes.
- Industrial support for the programmes including input into programme design, teaching and project work.
- Positive comments from students about the programme and teaching.
- Programmes supported by research activities.
- Content and Level of the programmes appears to be consistent with EUR- ACE.

Possible Improvements which were proposed:

- Wording of the programme learning outcomes could be improved by emphasising competences instead of knowledge.
- Module descriptors should include more information about assessment, and how the learning outcomes are achieved.
- The formal University methods of top down quality assurance should be supplemented by feedback from students using departmental questionnaires.

As a formal requirement for the accreditation of a programme is that there are graduates from the programme and since there were no graduates available within the duration of the project, the result of evaluation by the ENAEE was considered as a preliminary evaluation of the compliance of the programme to EUR-ACE Framework Standards and will be used for the programme improvement.

Conclusion

The programmes developed within the project met both the requirements of the third generation national standards of RF and the EUR-ACE Standards for engineering programmes. The development and implementation of master programmes in engineering by leading Russian engineering schools is an important step for the Bologna process in Russia, where the introduction of a 3 cycle degree system is progressing rather slowly. The experience gained in the project by the universities will be distributed through the Educational and Methodological Association of Engineering Institutions of Russia, which is an entity of BMSTU and is responsible for framework standards of engineering study programmes and their dissemination among most of the technical universities of Russia.

After the first graduations from the new programmes developed, the Russian universities are expected to apply for formal accreditation against the EUR-ACE Standards. The recognition of the programme quality through the EUR-ACE Label will contribute to spreading project outcomes through its positive impact on governmental structures and professional engineering organisations. The project outcomes and the best practices developed will be disseminated among the Russian engineering schools and the engineering community.