

QUEECA

QUALITY OF ENGINEERING EDUCATION IN CENTRAL ASIA

“The QUEECA Experience Developing and Implementing a Central Asia Accreditation of Engineering Education Consistent with European Standards”



Co-funded by the
Tempus Programme
of the European Union



edited by:
Claudio Borri
Sergey Gerasimov
Elisa Guberti
Jose Carlos Quadrado
Onola Umankulova
Ulf Winkelmann



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Education Consistent with European Standards

edited by

CLAUDIO BORRI, SERGEY GERASIMOV, ELISA GUBERTI,
JOSE CARLOS QUADRADO, ONOLA UMANKULOVA, ULF WINKELMANN

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List of QUEECA Project Partners

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3	European Network for Accreditation of Engineering Education	ENAE	BE
4	Instituto Superior de Engenharia de Lisboa	ISEL	PT
5	Middlesex University	MDX	UK
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26	Ministry of Higher Education of the Republic of Uzbekistan	MHSSE	UZ
27	Tashkent State Technical University named after A. R. Beruni	TSTU	UZ
28	Tashkent University of Information Technologies	TUIT	UZ

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Foreword

*Giuliano Augusti*¹

¹Founding President, ENAEE and QUACING

Within the so-called “Bologna process”, started in 1999 with the aim of adopting throughout European higher education “a transparent system of easily readable and comparable degrees”, a key role has been played by the development of procedures able to assure the quality of educational programmes, and at the same time - especially in the professional fields - their relevance for the job market, a double objective that has been defined “pre-professional accreditation”.

In this framework, a group of 14 associations concerned with Engineering education and profession throughout Europe founded in February 2006 the international not-for-profit association “European Network for Accreditation of Engineering Education” (ENAEE), with the main purpose of implementing the “EUR-ACE (pre-professional) accreditation system” that had been envisaged by the “EUR-ACE (European Accredited Engineer)” project, supported by the European Commission (2004-2006).

The origins of EUR-ACE can be traced back to a series of EC-supported “Thematic Networks on Engineering Education” (H3E, 1997-99; E4, 2000-04; TREE, 2004-08). In 1998-99 the Thematic Network “Higher Engineering Education for Europe (H3E)” organized three ‘European Workshops for Accreditation of Engineering Programmes’ which led to the establishment in September 2000 of the “European Standing Observatory for the Engineering Profession and Education” (ESOEPE). In 2004, ESOEPE promoted the EUR-ACE project, which formulated common European standards for the accreditation of engineering education programmes, and established the main characteristics of a decentralized system in which a common European quality label (the EUR-ACE® label) is added to the accreditation awarded by a national accreditation or quality assurance agency. In order to implement and develop this system, ESOEPE was transformed in 2006 into ENAEE, the “European Network for Accreditation of Engineering Education”.

Implementation of the EUR-ACE system was started in six different countries by six Accreditation Agencies, partners of the EUR-ACE project (namely, Engineering Council, UK; Engineers Ireland; Order of Engineers, Portugal; RAEE, Russia; CTI, France; ASIIN, Germany); the first EUR-ACE® labels (approximately 100) were awarded in 2007, first year of operation.

Since 2007, the EUR-ACE system has grown and spread: now it covers systematically 14 countries (Belgium, Finland, France, Germany, Ireland, Italy, Poland, Portugal, Romania, Russia, Spain, Switzerland, Turkey, UK) within the “European Higher Education Area” (EHEA); 13 national organizations (“Agencies”) are authorized to add the EUR-ACE® label to their accreditation. At the end of 2015, over 1800 EUR-ACE® labels have been awarded to programmes of 300 different Higher Education Institutions (HEIs) of 21 countries, some even outside the EHEA.

As a matter of fact, interest arose soon for spreading EUR-ACE beyond the borders of the EHEA, as proved by the applications of a few HEIs, scattered over the world, that obtained EUR-ACE® labels.

This interest was particularly strong in Central Asia: a leading role was played by the “Kazakh Society for Engineering Education” (KazSEE) that found a committed number of persons within ENAEE and an appropriate counterpart in the Faculty (now “School”) of Engineering of the University of Florence. The University of Florence promoted and coordinated an application to the European Commission for a project called “QUEECA” that was submitted in 2009: unfortunately, this first application was not approved.

However, the presenters of the application were not discouraged: the application was updated (in the meantime, Kazakhstan had formally joined EHEA) and presented again: it was finally accepted, and this book summarizes the history of the QUEECA project and the very significant results obtained, that will start the new stages of development of EUR-ACE in Central Asia (and perhaps be the seed for analogous initiatives in other areas around Europe, like Middle East and North Africa).

Introduction*

*Claudio Borri*¹

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Dept. of Civil and Environmental Engineering, QUEECA Coordinator and Legal Representative

The ambitious overall goal settled and shared by the four main Central Asian (CA) countries (Kazakhstan, Kirgizstan, Uzbekistan and Tajikistan), **i.e. of joining the quality standards of Higher Engineering Education of EU countries**, has been faced in the last three years with great determination by some leading Universities, together with Ministries of Education, in order to favor and speed up the implementation of the Bologna process in the region (even if only Kazakhstan has yet joined the accord).

In Central Asian countries, the need for international recognition of engineering degrees has become more and more important at several levels. Two types of accreditation of education are actually taking place (for example in Kazakhstan): an *institutional* one - for an estimation of activity of the Higher Education Institutions (HEIs) and a *specialized* one - for a quality assessment of curricula. Institutional accreditation is organized by the Ministry of Education and Sciences and carried out by National Accreditation Centres. The specialized accreditation is carried out by international accreditation agencies or accreditation organizations created by (or strongly connected with) professional associations. The CA governments are interested in creating and developing internationally recognized systems of educational and professional qualifications: in particular, the creation of accreditation organizations belonging to international networks was considered as an urgent need. Kazakhstan and the other CA countries have declared their priority interest in the implementation of their Engineering and Technology programmes in analogy to the European Qualification Frameworks (EQF). However, international recognition of qualifications and programmes can only happen if the fulfilment of shared qualification standard is assessed through a periodic evaluation of study programmes by both internal QA and peer review processes. Following this growing interest towards the internalization of CA eng. degrees, the assessment procedure of the EUR-ACE system seems the natural answer to these emerging requirements. Within the above background scenario, the main aim of TEMPUS project QUEECA (Quality of Engineering Education in Central Asia; **N.530326-TEMPUS-1-2012-1-IT-TEMPUS-SMGR; 15 October 2012 – 14 April 2016**) has been that one of setting up and starting implementing a system of quality assurance (QA) of engineering education in Central Asia (CA), finalized to the accreditation of engineering programmes by the award of the EUR-ACE quality label on the basis of the EUR-ACE Framework Standards and related quality requirements and procedures. The project also takes advantage of experience in the EHEA (through ENAEE) and current efforts in Central Asia countries.

More specifically and with respect to the project application, QUEECA used as reference documents the EUR-ACE Framework Standards (EAFS) and related quality requirements and procedures for awarding the EUR-ACE quality label to the accredited programmes (adapted to the regional traditions and educational systems in the four countries above), through the following main steps:

* The QUEECA project (530326-TEMPUS-1-2012-1-IT-TEMPUS-SMGR) was conceived and its core idea was initiated by Prof. Valerij Antonov (EKSTU), whose memory is gratefully honoured here by all key persons developing the project application. Prof. Antonov was leading a small group of strongly committed experts (Prof. G. Mutanov, Rector of Al-Farabi Kazhak National University, KAZNU; Prof. G. Augusti, that time President of ENAEE, Dr. Elisa Guberti and the Undersigned (at Univ. of Florence) with the main vision of opening Central Asia to the EHEA and favouring the process of integration of that region in the quality standards and accreditation of Engineering Education.

- Create National EE Societies (in Kazakhstan, strengthen the already existing KazSEE) and a CA Federation of EES, partnered with SEFI and IFEEES.
- Adapt the EUR-ACE Framework Standards (EAFS) and formulate CA Standards (CAEAS) in Russian and English.
- Create Accreditation Centers in each country (with a Regional coordination); train the relevant experts (“accreditors”).
- Run a series of “Trial Accreditations” with international teams to test the draft CAEAS and the local accreditors.
- Taking account of the results of the “Trial Accreditations”, formulate the final version of CAEAS.
- Conduct a first run of (real) accreditations of Engrg. Programmes and award the first EUR-ACE labels throughout CA.
- Formulate a self-supporting financial plan for carrying out accreditations after the project closure (sustainability plan).

A detailed and updated list of main events (meetings, conferences, seminars, etc.) is available on the QUEECA web site (www.queeca.eu, Calendar section) and can be found in the following chapter “The achieved objectives of the QUEECA project”. With reference to the specific objectives of the project it appears pertinent to mention that the KG association for Engineering Education was officially established in October 2013. Similarly, the UZ and the TJ associations have been activated, as well as the Federation of CA Engineering Education Societies.

The “QUEECA Standards and Guidelines (‘QUEECA Model’) for the internal quality assurance of study programmes in engineering” (EN version) has been elaborated and formally approved by all the partners of the project (March 2014). Moreover, a Russian version of this document has been also produced in order to enhance its readability and applicability throughout the CA partner countries.

On the other hand, as far as the trainings of the local experts are concerned, intensive English courses (including technical English) were successfully carried out in the 4 concerned countries. Despite some difficulties mainly related to the practical implementation of the courses, the courses have been considered helpful and a number of potential experts has been exposed. Mainly those people who have been in charge of piloting accreditation within the project were trained within these English courses. Moreover, ad hoc trainings on accreditation and quality assurance topics (especially focusing on the abilities to prepare a self-assessment report) took place in all CA partner higher education institutions where experts (teaching staff members mainly) were successfully trained to become accreditors.

Moreover, the managerial structure supporting the project has been fully identified, allowing a smooth coordination of the activities and an overall control and internal monitoring of the project.

Finally, in the best interest of the project external quality assurance, two external experts have been identified and appointed.

The two experts (Prof. Stephanie Farrell and Prof. Andrzej Rucinski) have been permanently invited to all the project meetings and produced annual reports on the project progresses, mainly focused on the respect of the original plans. In particular their specific tasks included:

- To provide the project with profound and practical knowledge of Soviet, post-Soviet, European, and American educational systems in engineering;
- To provide the project with connections, knowledge, and activities in the concerned countries;
- To provide the project with specific knowledge on the State of the art development work in “disruptive education” as an enabler to transform education to add a global dimension and innovation leading to high tech entrepreneurship with case studies.

After submitting their second report (end of 2014) the appointment of the two experts has been considered fully completed and all issues related to the monitoring (quality assurance and assessment) of the QUEECA project are dealt within the Management Board.

The present e-book is intended to present all activities and results, while describing them from the perspective of the key persons and Institutions in charge of the 9 WPs and of the production of deliverables. WP 1 to 5 were dealing with the main developments, namely: 1. English intensive language courses, 2. elaboration of CA engineering accreditation standards, 3. setting national engineering education societies (EES) and the CA Federation of EES, 4. setting up National Engineering accreditation centers, 5. performing accreditation of programmes).

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All Authors and co-Authors are gratefully acknowledged: their commitment and tireless support to the project has been the greatest asset of QUEECA. A special thank you goes to Mr. Ulf Winkelmann (Ruhr-Univ. Bochum) who has taken care of the editing and publishing of the e-book. Many grateful thanks are also due to Dr. Elisa Guberti, who has guaranteed the smooth, professional and successful management of such a large and complex endeavor. Last but not least, the financial contribution of the EC, EACEA, is fully recognized and acknowledged.

Part I.
Contributions by partners

Expected Outcomes of the QUEECA Project

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Introduction

QUEECA project was an ambitious project with high expectations. It was conceived in such a way so that it would make a lasting impact on the engineering education in higher education establishments in Central Asia through the establishment and implementation of quality assurance standards relevant to the region. This impact was intended to make fundamental and structural changes to each of the partner country's engineering education system. This would result in creating appropriate quality assurance standards for engineering education provision based on the practices used in Europe and elsewhere. The very principle of this structural change was to take the best practices in Europe, using the EUR-ACE® Framework Standards (EAFS) and the European Standards and Guidelines for Quality Assurance in Higher Education and elsewhere and adopt it to the local provision and approaches. This is the unique selling point of the QUEECA project.

The project involved 28 partners but what made the project special and successful was not the actual number of partners but the diverse nature of the partner organisations contributing to the project and the wealth of experience they brought to the fore. Although the size of the project in terms of number of partners and countries made it highly complex to manage, this was also considered to be its strength.

In implementing the outcomes of a project such as QUEECA, requires bold and determined attitude and a key ingredient, which is commitment at the highest governmental support. The four partner countries, Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan that took part in this three-year project did so because they aspired to create the best Quality Assurance System for engineering education in their region. This was done so that not only their countries had a quality assured engineering education system in place but also they would have their engineering graduates' education quality assured to the levels akin to other internationally recognised standards, rendering them highly mobile and valuable.

The project had a unique expectation of creating a new accreditation system specifically developed for Central Asia in mind, taking into account of the local requirements and the higher education system in place in each of the partner countries. While the system was to be based on EUR-ACE® Framework Standards (EAFS) and the European Standards and Guidelines, the new quality assurance standards was to be relevant to the conditions present in the Central Asian region. This required a close collaboration between all the stakeholders. The system created had to be workable and understood by all key stakeholders.

The systems created would need to be finalized to the pre-professional accreditation of engineering programmes (i.e. accreditation of educational programmes as entry route to the engineering profession).

The overall project expectation of the QUEECA project outcomes were set as:

1. The accredited programmes must satisfy the same pre-requisites for the award of the EUR-ACE® quality label, i.e. the EUR-ACE® Framework Standards (EAFS) and the European Standards and Guidelines for Quality Assurance in Higher Education. This was to be achieved by the creation of a network of National Quality Assurance / Accreditation Agencies (and possibly a Regional Federation) able to accredit engineering programmes and authorized by ENAEE to award the EUR-ACE® quality label, through the following steps:

- a. Create a National Engineering Education Society where it does not exist (in Kazakhstan, strengthen the existing KazSEE) and a Central Asian Federation of Engineering Education Societies (CAFEES), partnered with SEFI and IFEES.
 - b. Adapt the EAFS and formulate analogous Central Asia Engineering Accreditation Standards (CAEAS) in Russian and English.
 - c. Create Accreditation Centres in each Central Asian partner country (with a Regional coordination); train the relevant “accreditors“.
 - d. Run a series of Trial Accreditations with international teams to test the draft CAEAS and the local accreditors.
2. Taking into account the Trial Accreditations results, formulate the final version of CAEAS.
 3. Conduct a first run of pilot accreditation of engineering programs and award the first EUR-ACE® labels in Central Asia.
 4. Formulate a self-supporting financial plan for carrying out accreditation after the project closure.

Based on the above expected outcomes and the approach proposed, the following Work Packages were devised:

Table 1: List of QUEECA Work Packages

Work Package N°:	Type of work package	Title of work package
WP1	Development	English Intensive Language Courses
WP2	Development	Elaboration of Central Asia Engineering Accreditation Standards (CAEAS)
WP3	Development	Setting up National Engineering Societies and a Central Asian Federation of Engineering Education Societies
WP4	Development	Setting up National Engineering Accreditation Centres
WP5	Development	Accreditation of programmes
WP6	Management	Project Management Meetings
WP7	Quality Plan	Quality Control and Monitoring
WP8	Dissemination	Queeca Dissemination
WP9	Exploitation	Local Workshops based on the results of first trial accreditation

The overall areas of work listed in Table 1 were further expanded and allocate to the project partners as shown in Table 2.

Table 2: List of expected outcomes specified in the project

Deliverable / Activity Ref. N°	Activities (as indicated in the Logical Framework Matrix (LFM))
1.1	Intensive English Language Courses
1.2	Technical Intensive English Courses
2.1	Revision of EURACE Framework standards in Russian
2.2	First draft of Central Asia Standards (CAEAS)
2.3	Approved Final CA Standards
3.1	Workshops to create National EE Societies in CA
3.2	Draft Statutes of the National EE Societies
3.3	Formalisation of National EE Societies
3.4	Conferences to launch the National Structures
3.5	CA Federation of EE Societies statutes
3.6	Formalization of the CA Federation
4.1	Visit to ENAEE
4.2	Candidates for “Trial Accreditations”
4.3	Trial Accreditations to test CAEAS
4.4	Accreditation Centre workshop in Central Asia
4.5	Formalization Nat. Eng. Accreditation Centres
4.6	Conf. to launch the Centres/Fed. of EE societies
5.1	Accreditation visits in Kazakhstan
5.2	Accreditation visits in Kyrgyzstan
5.3	Accreditation visits in Uzbekistan
5.4	Accreditation visits in Tajikistan
6.1	1st Management Board Meeting
6.2	2nd Management Board Meeting
6.3	3rd Management Board Meeting
6.4	4th Management Board Meeting
6.5	5th Management Board Meeting
6.6	6th Management Board Meeting
6.7	Minutes of internal meetings
6.8	Instruments for the management of the project
6.9	Tempus Representatives Meeting
6.10	1st Project Board and Kick Off-Meeting
6.11	2nd Project Board Meeting
6.12	3rd Project Board Meeting
6.13	Audits
7.1	Quality Evaluation Reports
7.2	Evaluation Questionnaires on Project Activities
8.1	QUEECA Forum
8.2	International Synergies

8.3	QUEECA web site
8.4	Informative Material
8.5	QUEECA Final Conference
8.6	QUEECA Book
9.1	Kazakhstan workshop based on results of 1st trial
9.2	Kyrgyzstan workshop based on results of 1st trial
9.3	Uzbekistan workshop based on results of 1st trial
9.4	Tajikistan workshop based on results of 1st trial

It is worth noting here that a single partner was allocated to lead each of the Work Packages while a number of partners were assigned to deliver the expanded deliverables listed in Table 2. As with any complex and ambitious project, there are inevitable changes and modifications that become necessary. In QUEECA's case such changes also occurred but it is very pleasing to report that these were extension of the outcomes already listed. A typical example of such case was adding more Management Board meetings, recognising the complexity of the project partnerships.

Full account of the outcomes achieved are provided in the next chapter entitled "The achieved objectives of the QUEECA project".

The achieved objectives of the QUEECA project

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1. Summary

QUEECA has provided all tools and measures for setting up and implementing a system of Quality Assurance (QA) of Engineering Education (EE) in Central Asian (CA) countries, finalized to the pre-professional accreditation of engineering programmes (i.e. accreditation of educational programmes as entry route to the engineering profession). The accredited programmes must satisfy the same pre-requisites for the award of the EUR-ACE quality label, i.e. the EUR-ACE Framework Standards (EAFS) and the European Standards and Guidelines for Quality Assurance in Higher Education. This has been achieved thanks to the creation of a network of National QA/accreditation Agencies together with a Regional (CA) Federation able to accredit engineering programmes and authorized by ENAEE to award the EUR-ACE quality label.

Through all above introduced structural measures, mobility of engineering students from and to Central Asia as well as the mutual recognition of degrees within the EHEA will improve decisively. Last but not least, future cooperation within HEI in Europe and Central Asia will be favoured, as for instance the participation in new Actions of the Erasmus + EU funded programme.

The main outcomes from the QUEECA TEMPUS project can be itemized as follows:

- To create a National EE Society where it does not exist (in Kazakhstan, strengthen the existing KazSEE) and a CA Federation of EE Societies, partnered with SEFI and IFEES.
- To adapt the EAFS and formulate analogous CA Standards (CAEAS) in Russian and English.
- To create Accreditation Centres in each CA country (with a Regional coordination); train the relevant “accreditors”.
- To run a series of Trial/Actual Accreditations with international teams to test and apply the draft CAEAS and the local accreditors.
- To formulate a self-supporting financial plan for carrying out accreditation.

Synergies have been sought with the previous (now expired) TEMPUS project ECDEAST and the LLP Network EUGENE. ENAEE members (mainly AEER and ASIIN) which already have a solid experience in engineering programmes accreditation in CA may award EUR-ACE labels to be included in the system set-up by QUEECA.

The main activities of the project were focused on the implementation of a system of Quality assurance for engineering education in CA. This has been done through the proposal of the EUR-ACE accreditation system to be locally managed thanks to the creation of local accreditation centres and association of engineering education.

The long lasting effect and the sustainability of the planned structural measures have been ensured by the determination repeatedly shown by the stakeholders in the involved CA countries (Ministries, HEIs, Associations etc.).

During the whole eligibility period all foreseen project activities related to the accreditation processes in the

CA partner countries have been successfully performed. All partner countries have played a very active role, so that they actually gained a significant autonomy.

The Management Board of the project, which has periodically (steadily) met, has decided in the last year a reorganization of the remaining activity without any change in the expected outcomes. The eligibility period has been accordingly extended by 6 months (from October 15, 2015 until April 14, 2016). These changes have ensured an optimization of costs and a better efficiency for the smooth running of the project.

It is worth to mention that, given its specificities, the project can be considered as a pilot one, introducing the EUR-ACE system outside the European Union with an easy replicable model are also given. In fact, expressions of interest also from outside the CA partners of this project have been received and it is reasonable to think that the EUR-ACE model could be successfully spread also to other geographical areas.

2. Overall Achievements and Main Activities

As previously introduced, the TEMPUS project QUEECA (Quality of Engineering Education in Central Asia) has allowed the setting up and implementation of a system of quality assurance (QA) of engineering education in Central Asia (CA). This has been finalized to the accreditation of engineering programmes by the award of the EUR-ACE quality label based on the EUR-ACE Framework Standards and related quality requirements and procedures. The project also took advantage of previous similar experiences and current efforts in Central Asian countries.

More specifically and with respect to the original project application, QUEECA has based its work on the EUR-ACE Framework Standards (EAFS) and related quality requirements and procedures, awarding the EUR-ACE quality label to the accredited programmes.

As far as the activities carried out, following main meetings/events/activities are worth to mention:

When	What	Where
2016		
2016.04.08	QUEECA Project Board (plenary) and Management Board meeting	Tashkent, UZ
2016.04.07	QUEECA Closing Conference, Tashkent, UZ including the Launch of the book by TSTU on accreditation in Russian, Uzbek and English	Tashkent, UZ
2016.03.24-25	TJ National Conference	Dushanbe, TJ
2016.03.3-4	KG National / regional (CA) conference on industry-university cooperation	Bishkek, KG
2016.02.13	QUEECA Project Board (plenary) meeting and Management Board meeting	Ruhr University Bochum, DE
2016.02.12	e-Book authors meeting	Ruhr University Bochum, DE
2015		
2015.12.17	E-book virtual meeting	Virtual meeting
2015.12.12	Inaugural meeting of the Central Asian Federation of Engineering Education Societies	KAZNU, Almaty Kazakhstan
2015.12.11	QUEECA Management Board meeting	KAZNU, Almaty Kazakhstan
2015.11.19-20	QUEECA coordination meeting	Ruhr University Bochum, DE

2015.11.03	Erasmus Plus KZ national office monitoring visit	Kazakh National University named after al-Farabi
2015.10.20	QUEECA extraordinary (virtual) Management Board meeting	Virtual meeting
2015.10.13	QUEECA Project Board (plenary) and Management Board meeting	Chkalovsk (Khujand, TJ)
2015.10.1	Launching the Central Asian Federation of Central Asian societies for Engineering Education	Chkalovsk (Khujand, TJ)
2015.09.28	QUEECA: future developments	Brussels, BE
2015.09.25	QUEECA Project Board (plenary) and Management Board meeting	Firenze, Italy
2015.09.24	QUEECA session within WEEF2015	Firenze, Italy
2015.08.01	QUEECA Project Board meeting (morning) QUEECA Management Board meeting (afternoon)	KAZNU, Almaty Kazakhstan
2015.07.31	Central Asian workshop on the results of the accreditation visits	KAZNU, Almaty Kazakhstan
2015.06.30	QUEECA coordination meeting and dissemination event in Orleans	Orleans, France
2015.05.25-29	QUEECA internal audit visits to the CA coordinating institutions	Tashkent, UZ, Bishkek, KG, Dushanbe, TJ
2015.05.21-25	Trial/actual accreditation visits in Uzbekistan	Tashkent, UZ
2015.05.16-20	Trial/actual accreditation visits in Kyrgyzstan	Bishkek, KG
2015.05.11-15	Trial/actual accreditation visits in Tajikistan	Dushanbe, TJ
2015.06.08-09	Fair on the Tempus IV projects results in Kazakhstan	Astana, KZ
2015.04.24	UZ partners internal seminar on the recommendations and comments received from AEER after the submission of the SAR.	Tashkent State Technical University, Tashkent, UZ
2015.03.17	Erasmus Plus TJ national office monitoring visit	Tadjik Technical University, Dushanbe, Tadjikistan
2015.03.16-17	QUEECA coordination meeting	Firenze, Italy
2015.03.03	QUEECA coordination meeting	Firenze, Italy
2015.03.01-03	QUEECA Training visit	KSTU, Bishkek, KG
2015.01.28	QUEECA coordination meeting	Rome, IT
2015.01.16	QUEECA Management Board meeting	Porto, Portugal
2015.01.15	QUEECA Project Board meeting	Porto, Portugal
2014		
2014.12.21-22	QUEECA coordination meeting	Ruhr University Bochum, DE
2014.11.19	QUEECA coordination meeting (among EU partners)	Brussels, BE (ENAAE Headquarters)
2014.10.30	QUEECA coordination meeting	QUACING, IT

2014.10.24 (afternoon only)	QUEECA Management Board Meeting	Tadjik Technical University, Dushanbe, Tadjikistan
2014.10.23-24	TJ National Forum	Tadjik Technical University, Dushanbe, Tadjikistan
2014.10.20-22	Trainings for TJ experts	Tadjik Technical University, Dushanbe, Tadjikistan
2014.10.17-18	QUEECA coordination meeting	Ruhr University Bochum, DE
2014.09.17	QUEECA coordination/dissemination meeting	Middlesex University, UK
2014.07.03-04	KZ National Forum	KAZNU, Almaty Kazakhstan
2014.06.30-07.02	Trainings for KZ experts	KAZNU, Almaty Kazakhstan
2014.06.19	QUEECA coordination meeting	ENAAE Headquarters, BE
2014.06.10	QUEECA Management Board meeting	School of Engineering of the Univ. of Firenze, Italy
2014.06.09(afternoon only)	QUEECA Project Board (plenary) meeting	School of Engineering of the Univ. of Firenze, Italy
2014.06.09 (morning only)	ENAAE Workshop	School of Engineering of the Univ. of Firenze, Italy
2014.05.29-30	UZ Forum: National Scientific and Practical Conference «Current issues of quality control engineering education: Theory and Practice»	Tashkent State Technical University, Tashkent, UZ
2014.05.26-28	Trainings for UZ experts	Tashkent State Technical University, Tashkent, UZ
2014.05.22	QUEECA coordination meeting	Ruhr University Bochum, DE
2014.03.28	QUEECA Management Board Meeting	KSUCTA (Kyrgyz State University of Construction, Transport and Architecture), Bishkek, KG
2014.03.27-28	KG National Forum	KSUCTA (Kyrgyz State University of Construction, Transport and Architecture), Bishkek, KG
2014.03.24-26	Trainings for KG experts	KG State Technical University, Bishkek, KG
2013		
2013.12.27-31	QUEECA coordination meeting	Ruhr University Bochum, DE
2013.12.09	QUEECA coordination meeting (WP3 activities)	Univ. of Firenze, IT
2013.12.05	QUEECA coordination meeting (external quality assurance issues)	SEFI, HQ, Bruxelles, BE

2013.12.03-20	Intensive Technical English Courses	English School LINGVA, Bishkek, KG
2013.11.13	Inter project coaching meeting (with DOQUP TEMPUS project)	CRUI, Rome, IT
2013.11.11-13	QUEECA Dissemination at the UZ days of education (organized by the local NTO)	Tashkent, UZ
2013.10.17	Foundation meeting of the KG Association for Engineering Education	KG State Technical University, Bishkek, KG
2013.10.14 and 15	QUEECA Project Board (plenary) and Management Board meetings	Ramada Tashkent Hotel and Tashkent State Technical University, Tashkent, UZ
2013.10.02	Monitoring visit of the national TEMPUS office of Tajikistan	East Kazakhstan State Technical University, Ust Kemngorsk, KZ
2013.06.24 – 2013.11.28	Intensive English Courses.	English School LINGVA, Bishkek, KG
2013.06.22	Monitoring visit of the national TEMPUS office of Tajikistan	Tadjik Technical University, Dushanbe, TJ
2013.06.21	QUEECA Workshop in TJ	Tadjik Technical University, Dushanbe, TJ
2013.06.19	QUEECA Workshop in KG	KSTU, Bishkek, KG
2013.06.17	QUEECA Workshop in UZ	Tashkent, UZ
2013.06.05	Monitoring visit of the national TEMPUS office of Uzbekistan	Tashkent State Technical University, Tashkent, UZ
2013.05.20	Monitoring visit of the national TEMPUS office of Kyrgyzstan	Bishkek, KG
2013.04.04	Second QUEECA Management Board meeting	KazNU, Almaty, KZ
2013.04.03-04	QUEECA Forum	KazNU, Almaty, KZ
2013.02.17-06.30	Intensive and Technical English Courses	Tashkent State Technical University, Tashkent, UZ
2012.11.28	First QUEECA Management Board meeting	Villa Vigoni, Loveno di Menaggio, IT
2012.11.27-28	QUEECA Kick-Off meeting	Villa Vigoni, Loveno di Menaggio, IT
2012.11.26-27	TEMPUS Grantholders meeting	Bruxelles, BE

Besides the above listed events and with reference to the specific objectives of the project, it appears pertinent to mention that the KG association for Engineering Education was officially established in October 2013. Similarly, the UZ and the TJ associations have been activated, as well as the Federation of CA Engineering Education Societies.

The “QUEECA Standards and Guidelines (‘QUEECA Model’) for the internal quality assurance of study programmes in engineering” (EN and RU versions available) has been elaborated and formally approved by all the partners of the project at the occasion of the 4th Management Board meeting held in Bishkek (KG) in March 2014. Moreover, a Russian version of this document has been also produced in order to enhance its readability and applicability throughout the CA partner countries.

On the other hand, as far as the training of the local experts is concerned, intensive English courses (including



July 2014 – Almaty – Kazakh National Forum

technical English) were carried out in the four concerned countries. Despite some difficulties mainly related to the practical implementation, the courses have been considered helpful and a number of potential experts has been created. Mainly those people who will be in charge of piloting accreditation within the project were trained within these English courses. Moreover, ad hoc trainings on accreditation and quality assurance topics (especially focusing on the abilities to prepare a self-assessment report) have been successfully conducted in all CA partner HEI.

Moreover, the managerial structure supporting the project has been fully identified, allowing a smooth coordination of the activities and an overall control and internal monitoring of the project.

Finally, in the best interest of the project external quality assurance two experts have been identified and appointed.

The two experts (Prof. Stephanie Farrell and Prof. Andrzej Rucinski) have been permanently invited to all the project meetings and produced annual reports on the project progresses, mainly focused on the respect of the original plans. In particular their specific tasks included:

- To provide the project with profound and practical knowledge of Soviet, post-Soviet, European, and American educational systems in engineering;
- To provide the project with connections, knowledge, and activities in the concerned countries;
- To provide the project with specific knowledge on the State of the art development work in “disruptive education” as an enabler to transform education to add a global dimension and innovation leading to high tech entrepreneurship with case studies.

After submitting their second report (end of 2014) the appointment of the two experts has been considered fully completed and all issues related to the monitoring (quality assurance and assessment) of the QUEECA project are dealt within the Management Board.

3. Obstacles and shortcomings

As pointed out at the occasion of the field monitoring visits carried out by the CA National ERASMUS + agencies (former National Tempus Offices) the main obstacles encountered by the project in its starting phase were mainly related to the communication within the project (including some financial management aspects). Indeed, despite the fact that the web site of the project and a common Dropbox folder has been established quite soon (with respect to the start date of the project), effective communication among the partners has encountered some difficulties. Part of them were related to the fact that many partner representative people were not fluent in English. Moreover, it must be noted that from the very beginning a reorganization at the level of the CA partners' representative occurred since the partner countries representative person (as identified in the original application) passed away just before the approval of the project. This sad circumstance had obviously some consequences also on the start-up phase of the project, which has suffered some lack of coordination from CA side.

On the other hand, the firstly proposed financial management system (a centralized one) did not work well and therefore an alternative solution, based on pre-financing shares to be distributed among the partners on the basis of a signed bilateral partnership agreement with the coordinating institution was been adopted. While for the majority of the partners' balance has been reached, a few isolated cases of not well-tuned situations are still to be reported. It is however been ensured that, also thanks to the help of the EACEA Project Adviser, these cases have been solved.



June 2013- Bishkek, KG - QUEECA Workshop

4. *Restructuring: university management and governance*

The introduction of easy comparable practices for the accreditation of programmes in the Engineering/Technology field is the main induced change at national level this project has allowed. The self-sustainability (and consequently the success) of this strategy has been assured thanks to a massive involvement of relevant actors in all consortium members countries. Students have also played a key role in the second half of the project as they were interviewed at the occasion of training courses at HE institutions in the partners' countries. Partner countries' Ministries were also actively involved in the project in order to comply with legislation obligations as far as HE system changes are concerned. Given the project structure, it is evident that the involvement of academics and students at large scale was ensured mainly through the active participation of ENAEE and SEFI. These European associations can in fact be listed among the main actors in the field of Engineering Education with a direct involvement in the accreditation issues. With specific reference to the main priority (governance reform) of the QUEECA project, which is the introduction of quality assurance, this is to report about a general correspondence between the project activities and the actual needs and priorities of the concerned partner higher education institutions. The creation of national, self-sustainable EES (Engineering Education Societies, then linked through the foundation of the CA Federation of EES), to be strictly connected to accreditation centres in charge with quality assurance and accreditation issues, appears to be as such a very ambitious achievement of the project, impacting directly the local (KZ, UZ, KG and TJ) university management and governance. The autonomy and the self-sustainability of such bodies will represent one of the long lasting outcomes of the project: in fact, the QUEECA project has ensured to solely transfer expertise and encourage capacity building in the concerned countries. This is considered as the main benefit of the whole initiative and a great asset for the involved CA partners.

5. *Staff (re)-training*

CA partners academic staff training was one of the key activities of the QUEECA project as it precisely aimed at transferring knowledge and creating competences within the CA partners' institutions, in order to let them gain enough confidence and know how to proceed autonomously to quality assurance and accreditation processes in the field of engineering education

With this respect and in the framework of its work packages 4 (Setting up National Engineering Accreditation Centres) and 5 (Accreditation of programmes) the QUEECA project has scheduled (starting from April 2014) the intensive training session targeted to enable the local experts to become competitive specialist in the field of accreditation and quality assurance for engineering education.

More in general, the training courses foreseen in the logical framework of the project were developed mainly with the support of: 1) ENAEE Member Associations, which have a consolidated experience in accreditation of engineering programmes (mainly ASIIN, QUACING and AEER), and 2) other experts from an Europe-wide Association such as SEFI. The courses were scheduled to take place in several locations throughout Central Asia. The peers-evaluators were trained for assessing engineering educational programmes based on the EUR-ACE Standards. To implement national qualifications frameworks with an understanding of and according to the same interpretation of the overarching European framework, a common methodology based on learning outcomes (i.e. knowledge, skills and competencies descriptors), as well as a common approach to their self-certification, were probably the most important instruments of the QUEECA project. CAEAS standards were tested at a later stage and eventually approved through trial accreditations. They were followed by ad hoc workshops organized in Central Asia by accreditation centres, in order to become fully operative for starting up the accreditation visits.

Moreover the intensive English (and Technical English) training courses must also be reported under this section as they have been conceived and implemented in order to enable future specialists to be familiar with the accreditation processes.

6. *Staff Mobility*

In case of internal meetings (such as the management board meetings) the participants are the members of the designated board and no particular procedure was adopted to select the participants.

With respect to this type of mobilities active involvement of the partner institutions has been observed from the very beginning, despite the long and heavy travel itineraries between CA and Europe. Also in the light of this consideration, a merge of meetings has been adopted in order to save as much as possible both time and financial resources. The presence of all partner institutions to the project meetings has efficiently contributed to establish a friendly atmosphere and to enable the partners to know each other.

On the other hands public events (e.g. the QUEECA forum organized in Almaty in April 2013) see the participation also of a larger audience, including local stakeholders, university management representatives and policy makers, gathered through an intense activity of dissemination by the local partners.

As far as the training activities is concerned (intensive language courses and training sessions for accreditation experts) the attending participants have been identified within the CA partner institution based on a specific interest to pioneer the way. These people were mainly to be identified with the chairpersons of the degree courses that had to undergo the accreditation process in the last stage of the project. It appears to be worth to mention that every time an explicit consensus from the relevant person has been requested and that the selection process has been conducted locally without interferences from the coordinating institution.

The partner's home institution strongly encouraged the mobility of their staff and the participation of their representative people in the project activities.

As far as staff mobility is concerned, the main change with respect to the original programme is in the reduced number of the training sessions.

7. *Academic coordination and administrative management*

The Management Structure of the Project includes the Project Board (plenary assembly where all partner institutions are represented) and the Project Management Board (smaller executive board). The QUEECA Project Board (PB), was mainly focused on the general coordination and implementation of project activities, on the monitoring of the proposed objectives and outcomes/activities while the MB was managing the budget and all financial issues. The PB, as above mentioned, is constituted by one representative per partner Institution and chaired by the representative of the contracting partner (i.e. Prof. Claudio Borri). The PB identified and nominated the QUEECA Management Board (MB) made up by representatives from one Institution per involved country. The timely achievement of the project activities is being measured and demonstrated according to the project framework matrix. In case of need adjustment mechanisms are adopted by the MB.

The monitoring of the project activities, including the implementation of the quality control, is the main task of the MB and was dealt within WP7. Meetings of this governing body were taking regularly place, although in conjunction with other project activities in the best interest of the project efficiency, in order to assure the project with the necessary internal quality assessment and control. The Management Board met on average twice per year and was verifying the quality control (also taking into account the reports prepared by the external experts). Moreover, the solid experience of the EU partners in the field of European cooperation project in Engineering Education has revealed to be an asset to guarantee the project with a smooth and effective management. This experience (also considering the contribution offered in the past by University of Florence-School of Engineering to the implementation in many countries of the EUR-ACE System), has offered an effective benchmark of the expected results, allowing a continuous check of the project developments.

The Management Board was also in charge of elaborating a detailed dissemination strategy that has been implemented by all partners for the whole duration of the project and after its ending. The main target will be the external audience (stakeholders, employers, professional chambers and students) particularly in all partner countries.

As far as the task assignment within the project partners, it is worth to be mentioned that, during the kick-off meeting of the project, one Leader has been identified for each WP as reported in the table below.

WP Leader	Deliverable / Activity Ref. N°	Activities (as indicated in the Project application Logical Framework Matrix)
KAZSEE (P14)	1.1	Intensive English Language Courses
	1.2	Technical Intensive English Courses
Unigenova (P10)	2.1	Revision of EURACE Framework standards in Russian
	2.2	First draft of Central Asia Standards (CAEAS)
	2.3	Approved Final CA Standards
ISEL (P4)	3.1	Workshops to create National EE Societies in CA
	3.2	Draft Statutes of the National EE Societies
	3.3	Formalisation of National EE Societies
	3.4	Conferences to launch the National Structures
	3.5	CA Federation of EE Societies statutes
	3.6	Formalization of the CA Federation
ENAE (P3) (in strict collaboration with QUACING P6)	4.1	<i>Training Visit to ENAE (including the training of the accreditors)</i>
	4.2	Candidates for «Trial Accreditations»
	4.3	Trial Accreditations to test CAEAS
	4.4	Accreditation Centre workshop in Central Asia
	4.5	Formalization Nat. Eng. Accreditation Centres <i>(deliverable under the responsibility of the CA partners)</i>
	4.6	Conferences to launch the Centres <i>(at the occasion of 3.4)</i>
ENAE (P3) (in strict collaboration with QUACING P6)	5.1	<i>First actual Accreditation visits in Kazakhstan run according to the rules set within the CAEAS</i>
	5.2	<i>First actual Accreditation visits in Kyrgyzstan run according to the rules set within the CAEAS</i>
	5.3	<i>First actual Accreditation visits in Uzbekistan run according to the rules set within the CAEAS</i>
	5.4	<i>First actual Accreditation visits in Tajikistan run according to the rules set within the CAEAS</i>
UNIFI – Eng (P1)	6.1	1st Management Board Meeting
	6.2	2nd Management Board Meeting
	6.3	3rd Management Board Meeting
	6.4	4th Management Board Meeting
	6.5	5th Management Board Meeting
	6.6	6th Management Board Meeting
	6.7	Minutes of internal meetings
	6.8	Instruments for the management of the project
	6.9	Tempus Representatives Meeting
	6.10	1st Project Board and Kick Off-Meeting
	6.11	2nd Project Board Meeting
	6.12	3rd Project Board Meeting
	6.13	Audits

UNIFI – Eng (P1)	7.1	Quality Evaluation Reports
	7.2	Evaluation Questionnaires on Project Activities
UNIFI – Eng (P1)	8.1	QUEECA Forum
	8.2	International Synergies
	8.3	QUEECA web site
	8.4	Informative Material (<i>leaflet, booklet, posters</i>)
	8.5	QUEECA Final Conference
	8.6	QUEECA Book
ENAE (P3) (in strict cooperation with ISEL P4)	9.1	Kazakhstan workshop based on results of 1° trial (<i>pilot accreditation</i>)
	9.2	Kyrgyzstan workshop based on results of 1° trial (<i>pilot accreditation</i>)
	9.3	Uzbekistan workshop based on results of 1° trial (<i>pilot accreditation</i>)
	9.4	Tajikistan workshop based on results of 1° trial (<i>pilot accreditation</i>)

Finally, the day-by-day management activity was under the responsibility of the project manager (Elisa Guberti) identified within the coordinating institution. It appears pertinent to mention that a strict synchronization with the CA regional coordinator (Onolkan Umankulova) was maintained in order to ensure that the activities were managed in the best interest of the direct beneficiaries of the project, i.e. the CA partners. It was then the care of the CA partner coordinator to keep all institutions in CA updated on the current activities. Besides the CA (regional) coordinator, each CA country identified a national coordinator to be in touch with CA partner coordinator for assuring timely coordination of the project activities among all of the partners. Moreover, the project web site (including its private section and its twin pages in the CA languages) was maintained updated in order to keep the partners, and all the users in general, constantly informed on the project activities.



November 2012 - Villa Viogni, Loveno di Menaggio, Italy – Kick-Off meeting of the QUEECA project

As already mentioned, some difficulties were encountered in the first months of life of the project, especially related to the central management of the project financial resources and to the lack of awareness of the project partners on the QUEECA activities.

In the first case, a partnership agreement model has been proposed and approved within the partnership in order to allow the transfers of shares of the budget to the project partners (as pre-financing basis). This appeared to be a good solution even if some difficulties (mainly related to the bank account to be used for the money transfers) were encountered.

Based on this procedure all the partners have been enabled to receive a small budget for the day-by-day expenses. However, a heavier duty is now at the coordinator institution which obviously has to collect supporting documents from the partners' institutions in order to report on the expenses actually pertinent to the project activities. In some cases, it has been observed that, mainly because of inexperience in the field of EU supported project at the CA partner institutions, some expenses couldn't be considered eligible and therefore will be debited on the indirect costs of the relevant partners.

On the other hand, an intense communication is still taking place through the CA partner coordinator with the aim to enhance partners' awareness on the project activities. Moreover, twin web pages of the main QUEECA web site have been opened in the local languages.

8. Sustainability

Sustainability and long-term effectiveness of the results are key-points of the project, and they are guaranteed by the creation during the project lifetime of independent permanent agencies in Central Asia to carry out the accreditation of curricula in the field of engineering and technology in accordance to the European Quality Label EUR-ACE. Concrete steps (such as the establishment of the Kyrgyz Society for Engineering Education) have been taken in order to allow the creation of these agencies and to ensure that they gain the necessary experience to carry out self-sustainable international accreditations of curricula of the Central Asian Higher Education Institutions. This is being achieved with the help and expertise of European Higher Education Institutions and Associations and of the KZ partners who already have some experience in the field.

The new agencies will be very competitive in comparison to similar European and American ones as the accreditations will have lower costs due to the significant reduction of transport costs and the lower wages of experts of Central Asia. In addition, the possible award of the EUR-ACE label will improve attractiveness and international recognition of such accreditations. The sustainability is also foreseen within partnership with Central Asian Network for Quality Assurance (CANQA), that will provide the platform for communication among the agencies and other CA partners in QA area.

QUEECA is moreover helping to improve the preparation of quality of experts in the field of engineering and technologies in CA, their competitiveness at international level, and also the transparency and comparability of their titles, through the creation of accreditation agencies and systems respecting the developed international criteria corresponding to the European quality label EUR-ACE. The increase in the international recognition of the degrees of engineering graduates of the Central Asian HEIs in the European countries will take place as the accreditation of programmes according to the EUR-ACE Framework Standards allows the comparison of outcome results i.e. of the content of the formation, instead of the duration of the curricula. The project is promoting the development of curricula in cooperation with the European universities, to the creation of double degree programmes and the development of curricula in Central Asia that are similar to the ones of European Union.

9. Conclusive Remarks

This section presented the main outcomes of the Tempus project QUEECA led by the University of Florence, School of Engineering. The QUEECA project involved 4 (Kazakhstan, Kyrgyzstan, Uzbekistan and Tajikistan) out of 5 TEMPUS countries in Central Asia (CA) and aims at setting up and implementing a system of Quality

Assurance (QA) of Engineering Education (EE) in CA countries through the creation of a network of National QA accreditation Agencies able to accredit engineering programmes and authorized by ENAEE to award the EUR-ACE quality. At the present moment (April 2014) the project has arrived to its half lifetime. In the second half of the eligibility period all project activities related to the accreditation processes in the CA partner countries have been planned. It is expected that the partner countries will have a very active role and that they will gain significant autonomy. The Management Board of the project, which has repeatedly met, has now decided a reorganization of some remaining activity without any change in the expected outcomes. These changes are aimed at a better efficiency for the smooth running of the project. It appears pertinent to mention that given its specificities the project can be considered a pioneer one, introducing the EUR-ACE system outside the European Union with an easy replicable model are also given.

As a matter of fact expressions of interest also from outside the CA partners of this project have been received and it is reasonable to think that the EUR-ACE model could be successfully spread also to other geographical areas. In this framework the QUEECA TEMPUS project appears to be an important asset for the European Accreditation System as it significantly contributes to its spreading also behind the European Union area. Moreover it appears important to mention that the adopted approach appears to be fully bottom up thus giving important prior guarantees on its possible success.

As to the unexpected outcomes, it is quite evident that amongst the CA Institution the expectations concerning a rapid integration into European QA standards are concretely rising. It is likely that the CA accreditation agencies will join ENAEE.

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Revision of the EUR-ACE® Framework Standards and Guidelines

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1. Introduction

The mission of ENAE [1] is to serve the public and society through the promotion and advancement of engineering education in Europe and abroad. ENAE aims at building a pan-European framework for the accreditation of engineering education programmes, in order to enhance the quality of engineering graduates, to facilitate the mobility of professional engineers and to promote quality and innovation in engineering education.

The ENAE mission is rooted in the so-called Bologna process which aims at building a European Higher Education Area (EHEA), by strengthening the competitiveness and attractiveness of European higher education and fostering student mobility and employability.

To achieve its goals, ENAE has established the EUR-ACE® system [2]: a de-centralized system for the standards of accreditation of engineering education degree programmes, leading to pan-European recognition of national accreditation decisions.

Membership of ENAE is open to all bodies concerned with educational and professional standards in engineering throughout the European Higher Education Area (EHEA) and beyond. Such bodies may include accreditation and quality assurance agencies, professional organisations, associations of higher education institutions, employers' associations, and engineering student bodies and their associations.

ENAE carries out its mission by evaluating quality assurance and accreditation agencies in the EHEA in respect of their standards and procedures when accrediting engineering degree programmes. Those agencies which satisfy ENAE in respect of these matters are authorised by ENAE to award the EUR-ACE® [2] label to the engineering degree programmes which they accredit.

The EUR-ACE® Framework Standards and Guidelines (EAFSG) [3] constitute the basis upon which authorisation to award the EUR-ACE® label is granted to quality assurance and accreditation agencies. They are intended to be widely applicable and inclusive so that they can be applied to all branches of engineering; and to reflect the diversity of engineering degree programmes in the EHEA, which provides the education necessary for graduates to enter the engineering profession and to have their qualifications recognised throughout the area.

2. The need for a revision

Since 2006, the EUR-ACE® label has, to date, been awarded to more than 2000 engineering programmes, delivered in more than 300 universities in 28 countries in Europe and worldwide. The EUR-ACE® system has hence proven its reliability and its adaptability to diverse national contexts.

However, after eight years of implementation, the time has come to revise the ENAE reference documents, not by altering their fundamental standards which remain unchanged, but to take into account the feedback of ENAE stakeholders, to clarify and simplify the presentation and to produce this new document, the EUR-ACE® Framework Standards and Guidelines (EAFSG), in a web-based format.

From 2014, a working group was set up with representatives of the ENAE membership, and in particular

of the authorised agencies. The working group drafted several versions until the final one which was approved by the ENAEE administrative Council in March 2015.

3. The structure of the revised EAFSG

The EAFSG [3] are structured under two headings, respectively “Programmes” and “Agencies”.

3.1 Programmes

The Student Workload Requirements and the Programme Outcomes are compliant with the overarching Framework of Qualifications for the European Higher Education Area (EQF), adopted by the Bergen Conference of European Ministers responsible for Higher Education on 19-20 May 2005.

The framework “*comprises three cycles (including, within national contexts, the possibility of intermediate qualifications), generic descriptors for each cycle based on learning outcomes, and credit ranges in the first and second cycles*”.

The overall result of the application of the EQF is a range of Bachelor and Master Degree programmes in engineering.

1. *Student workload Requirements* are described using ECTS credits. ENAEE describes the Programme Outcomes for Bachelor and Master Degree programmes normally structured as follows:

- Bachelor Degree programmes, of a minimum of 180 ECTS credits.
- Master Degree programmes, of a minimum of 90 ECTS credits (60 in some educational systems).
- Master Degree programmes which are integrated and which, normally, do not include the award of a Bachelor Degree, should comprise ECTS credits consistent with the above: i.e. a minimum of 270 ECTS credits (240 in some education systems).

2. *Programme Outcomes* describe the knowledge, understanding, skills and abilities which an accredited engineering degree programme must enable a graduate to demonstrate. They outline expected and achieved Programme Outcomes for Bachelor and Master Degree programmes.

There are eight domains of programme outcomes for engineering graduates:

- Knowledge and understanding
- Engineering analysis
- Engineering design
- Investigations
- Engineering practice
- Making judgement
- Communication and team-working
- Lifelong learning

3. *Programme Management* covers the following

- Programme aims
- Teaching and learning process
- Resources
- Student admission, transfer, progression and graduation
- Internal quality assurance

The programmes seeking the label should demonstrate that they are managed according to quality assurance principles as outlined by the ESG/Bologna process [4].

3.2 Agencies

ENAAEE requires quality assurance and accreditation agencies awarding the EUR-ACE® Label to apply the standards described here. These standards apply to the effectiveness of the agency accreditation procedures in the evaluation of the learning process of the degree programme being accredited and its compliance with the Student Workload Requirements, Programme Outcomes and Programme Management, for Bachelor and Master Degree programmes respectively.

1. *Programme evaluation and accreditation* covers methods and procedures, documentation required, the accreditation process, decision-making and publication.

- The methods and procedures of the agency must ensure that engineering degree programmes are accredited accurately in accordance with the agency's established standards.
- Documentation: The accreditation standards and procedures must be publicly available in an accessible format.
- The accreditation process must be effective in acquiring all the evidence necessary to
- make decisions.
- Accreditation decisions must be demonstrably accurate, consistent and unbiased.
- The agency must publish the outcome of the accreditation evaluation.

2. *Quality assurance* of the accrediting agency covers administration, status and resources:

- Administration: The management, organization and administration of the agency must ensure that the accreditation functions of the agency are implemented accurately and reliably.
- Status and resources: The agency must be independent of outside influences and have adequate resources to undertake accreditation.

4. Prospects

ENAAEE and the EUR-ACE system are rooted in the so-called Bologna process which aims at building a European Higher Education Area (EHEA). However, EUR-ACE draws more and more interest beyond the European area, either from higher education institutions which wish to benchmark their programmes against international standards, or from countries which wish to improve the quality of their engineering education system and to set up an accreditation system according to the ENAAEE standards.

ENAAEE contributes also to the building of a global framework for engineering education and pre-professional accreditation. With this purpose, a working group has been set up jointly by ENAAEE and the International Engineering Alliance (IEA [5], the constituents of which are respectively the Washington, Sydney and Dublin Accords).

A first output of this working group is a document on *Best Practice in Engineering Programme Accreditation* [6], which was jointly adopted in June 2015 at Istanbul (Turkey) and published in July 2015 by ENAAEE and IEA.

This document is a significant achievement as it represents the agreement and common understanding of best practice in engineering accreditation by the 30 countries/accreditation agencies involved in the two organisations worldwide. The elements of best practice in the document are those that have been found to ensure best functioning of accreditation systems. Such peer review accreditation systems are in turn major contributors to the development of high quality engineering education.

The next step will be the analysis of the programme outcomes respectively required by ENAAEE and IEA, and the worldwide recognized definition of the threshold competencies for professional engineers.

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Adaption of EAFS: Central Asia Engineering Accreditation Standards & Guidelines (CAEAS&G)

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Abstract

This chapter introduces the Standards and Guidelines for Quality Assurance in the European Higher Education Area and the EUR-ACE Framework Standard and Guidelines, the main references for the definition of the Central Asia Engineering Accreditation Standards & Guidelines (CAEAS&G) for the quality assurance of study programmes in engineering.

The approach to the definition of the CAEAS&G is described in the fourth section of the chapter.

1. Introduction

Main aim of the QUEECA project was the implementation of the EUR-ACE accreditation in Central Asian countries – Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan – that have adopted an organization of University studies consistent with the Bologna process requirements.

The EUR-ACE standards for accreditation are defined in terms of student workload requirements, programme (learning) outcomes and programme management.

The adaption to Partner Countries of the standards and guidelines on programme management established in the document *EUR-ACE Framework Standards for Accreditation of Engineering Programmes* (EAFS) [1] was the main aim of Work Package 2 of the QUEECA project under the coordination of the University of Genova. Another important objective was the definition of a QA system fully consistent with the revised version of the *Standards and Guidelines for Quality Assurance in the European Higher Education Area* (ESG) [2].

The revised version of the ESG and the EAFS have been the fundamental references for the definition of the *Central Asia Engineering Accreditation Standards and Guidelines* (CAEAS&G) for the quality assurance (QA) of study programmes (SPs) in engineering.

2. Standards and Guidelines for Quality Assurance in the European Higher Education Area

Today the definition of suitable academic strategies in order to promote SP quality can rely on the standards and guidelines for internal quality assurance (iQA) of higher education (HE) established in the ESG. This document was prepared by the European Association for Quality Assurance in Higher Education (ENQA) in co-operation with the European Students' Union (ESU), the European University Association (EUA) and the European Association of Institutions in Higher Education (EURASHE). The Ministers of Higher Education of the European Higher Education Area (EHEA) adopted the document in the meeting in Bergen (Norway) on 19-20 May 2005. ENQA, ESU, EUA, EURASHE, Education International, BUSINESS EUROPE and European Quality Assurance Register for Higher Education (EQAR) revised the document and the Ministers of Higher Education of the EHEA adopted the revised ESG in the meeting in Yerevan (Armenia) on 14-15 May 2015. In the ESG, the term 'quality assurance' is used to describe all activities within the continuous improvement cycle (i.e. assurance and enhancement activities).

ESG have found a generalised acceptance in the European context.

The ‘standards’ set out agreed and accepted practice for QA in higher education (HE) in the EHEA and should, therefore, be taken account of and adhered to by those concerned in all types of HE provision.

The ‘guidelines’ explain why the standard is important and describe how standards might be implemented. They set out good practice in the relevant area for consideration by the actors involved in QA. Implementation will vary depending on different contexts.

It is important to note that the purpose of these standards and guidelines is to provide a source of assistance and guidance to Higher Education Institutions (HEIs) in developing their own QA system, as well as to contribute to a common frame of reference, which can be used by institutions. It is not the intention that these standards and guidelines should dictate practice or be interpreted as prescriptive or unchangeable.

The document has also introduced the concepts of internal and external QA. With reference to SPs, ‘internal quality assurance’ regards the activities of QA in the responsibility of the SP or of the structure the SP belongs to. ‘External quality assurance’ regards the activities of the QA agencies and can include assessment and/or accreditation of SPs.

The standards and guidelines for iQA within HEIs are set out in Part 1 of the ESG¹.

3. EUR-ACE Framework Standards and Guidelines

EUR-ACE (EUROpean ACcredited Engineer) is the label awarded to engineering SPs at Bachelor and Master level, listed by the European Commission among the ‘European Quality labels’.

The EUR-ACE label is run by the European Network for Accreditation of Engineering Education (ENAE) (www.enaee.eu). Wider objective of ENAE is the mutual recognition of engineering qualifications awarded by accredited SPs. Currently ENAE has 22 full members and 3 associate members. The agencies authorized to award the EUR-ACE label are 13, the SPs accredited are more than 2.000, not only in Europe.

The EUR-ACE standards for accreditation established in the EAFS have been recently revised. The new standards are established in the document *EUR-ACE Framework Standards and Guidelines* (EAFSG) [3], approved by the ENAE Administrative Council on March 2015.

In the EAFSG, the programme management standards are five and are organized in the following sequence:

5. Programme Aims;
6. Teaching and Learning Process;
7. Resources;
8. Student Admission, Transfer, Progression and Graduation;
9. Internal Quality Assurance.

They specify the key areas of programme management that an agency must evaluate in order to be authorised to award the EUR-ACE label and that SPs must fulfil in order to be accredited.

The guidelines that follow the standards are not prescriptive, but are intended to assist agencies and HEIs in meeting the standards. Programme managers are free to satisfy the standards in accordance with their own traditions and resources.

It seems important to underline that the organization of the EAFSG standards for programme management by prefixing the definition of the programme aims to the definition of the teaching and learning process promotes the design of ‘student-centred’ SPs.

With ‘student-centred SP’ it has to be intended a SP which takes the student as the centre of the teaching and learning process, according to the methodology for design educational programmes consistent with the

¹ The standards are in three parts covering internal QA (Part 1), external QA (Part 2) and QA agencies (Part 3). The standards for QA agencies regard the characteristics that should be fulfilled by QA agencies.

Bologna process principles developed within the framework of the Tuning Educational Structures in Europe². The aim of student-centred SPs is to make students as competent as is feasible in a given timeframe for their future role in society. In these SPs, the focus is no more on what a student has been taught, but on what a student has learned and is able to do. Therefore, SPs leading to a bachelor or master degree are no longer to be described and planned solely according to their content, but mainly according to the ‘competences’³ expected in the graduates at the end of the educational process and the ‘learning outcomes’⁴ to be achieved by students during the educational process.

Appendix 1 of the EAFSG specifies also the documentation that should be made available by SPs in an accreditation process.

Even if the CAEAS&G have been established with reference to the standards and guidelines on programme management established in the EAFS, they are fully consistent also with the standards and guidelines established in the EAFSG.

4. CAEA approach to internal Quality Assurance of Study Programmes in Engineering

Consistently with the standards for iQA of HE established in the ESG and the standards for programme management established in the EAFS, the CAEA approach to iQA of SPs in engineering assumes that a SP may be said ‘of quality’ when it complies with the national standards and requirements and:

- it establishes educational objectives consistent with the mission of the institution the SP belongs to and the educational needs of the labour market of reference, and learning outcomes consistent with the educational objectives;
- it designs and implements an educational process adequate to achieve the learning outcomes, which embeds a student-centred learning approach, assures a correct assessment of students’ learning, keeps under control its development and establishes appropriate regulations for students’ admission, recognition, progression and attestation;
- teaching staff, facilities, student support services, partnerships with businesses, research institutions and other HEIs, and financial resources are adequate to achieve the learning outcomes and are kept under control;
- it monitors the results of the educational process;
- it adopts an adequate and effective management system able to assure the SP quality and its continual improvement, and guarantees public access to the information on the SP.
- These principles should inspire design, development and control of any SP.
- Correspondingly, the CAEA approach defines five ‘**CAEA Standards**’ for the iQA of SPs in engineering:

1. Needs and Objectives
2. Educational Process
3. Resources
4. Monitoring and Results
5. Management System

² Tuning (<http://www.unideusto.org/tuningeu/>) is a university driven initiative originally set up to offer a concrete approach to implement the European Bologna process at the level of HEIs and subject areas, and has become the leading approach within the common European education space.

³ The European Qualifications Framework for Lifelong Learning ([http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008H0506\(01\)&from=EN](http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008H0506(01)&from=EN)) defines competence as ‘the ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development’.

The ISO 9000:2015 norm defines competence as ‘ability to apply knowledge and skills to achieve intended results’.

The two definitions can be considered equivalent.

⁴ The European Qualifications Framework for Lifelong Learning defines learning outcome as ‘statement of what a learner is expected to know, understand and/or be able to demonstrate after completion of a process of learning’.

The definition of the iQA system of a SP requires the identification of all the activities (processes) for a ‘management for quality’ of the SP.

The processes associated to each CAEA standard to be considered fundamental to assure the quality of SPs in engineering have been identified again in agreement with the standards and guidelines for iQA of HE established in the ESG and the standards and guidelines for programme management established in the EAFS. They are shown in Table 1.

Table 1 – Identified fundamental processes of the QA of SPs in engineering

Standard	Fundamental processes
A Needs and Objectives	A1 - Identification of the educational needs of the labour market A2 - Definition of the educational objectives A3 - Definition of the learning outcomes
B Educational Process	B1 - Design and planning of the educational process B2 - Admission, recognition, progression and attestation B3 - Realization of the educational process
C Resources	C1 - Identification and assignment of the teaching staff C2 - Identification and allocation of facilities (in particular: lecture and study rooms, laboratories, libraries) and support staff C3 - Organisation and management of student support (orienteeing, tutoring and assistance) services C4 - Establishment of partnerships with national and international businesses, research institutions and other Higher Education Institutions for carrying out students’ external education and mobility C5 - Identification of the needs for and allocation of financial resources
D Monitoring and Results	D1 - Monitoring of the entrance students D2 - Monitoring of the students’ learning D3 - Monitoring of the students’ progression in their studies D4 - Monitoring of the students’ opinion on the educational process D5 - Monitoring of the graduates’ placement D6 - Monitoring of the employed graduates’ opinion on the education received D7 - Monitoring of the employer’s opinion on the graduates’ education
E Management System	E1 - Definition of the policy and organization for quality assurance of study programmes E2 - Definition of the management system of the study programme E3 - Review E4 - Provision of public access to information on the study programme

Then the ‘**CAEA Requirements for quality**’, i.e. the needs or expectations for quality, with the expected activities for their accomplishment, associated to each identified process have been established still in agreement with the standards and guidelines for iQA of HE established in the ESG and the standards and guidelines for programme management established in the EAFS.

Furthermore, for each identified quality requirement, the **information and data** to be documented by the SPs in order to provide evidence of the quality of the educational service offered, and therefore to assure their quality, have been established. Also the information and data have been established in agreement with the ESG standards and guidelines for iQA of HE and the standards and guidelines for programme management established in the EAFS.

It seems important to underline that information and data to be documented will have to fulfil specific characteristics directly connected with the specific objectives of the QUEECA project.

In order to increase the transparency of SPs and promote the modernisation of HEIs, the documentation should be easily accessible on the net, have a simple structure and be drawn up in a short and essential form, which

shall optimize all aspects related to the interaction with all the stakeholders.

Furthermore, in order to promote the comparability of SPs and enhance mutual trust in their quality, the documentation will have to be prepared according to drawing-up modes (extension, language, reading format) homogeneous at national (and international) level.

The whole of standards and guidelines (i.e. quality requirements, expected activities for their accomplishment and information and data to be documented) constitutes the *Central Asia Engineering Accreditation Standards & Guidelines* for iQA of SPs in engineering.

CAEAS&G standards and quality requirements, with associated required documentation, are shown in Appendix 1.

5. Conclusions

The CAEAS&G developed under the QUEECA project are fully consistent with the standards and guidelines for iQA established in the ESG and with the standards and guidelines for programme management established in the EAFSG.

Furthermore, the documentation of the QA required by the CAEAS&G in order to assure the quality of SPs is fully consistent with the documentation required by Appendix 1 of the EAFSG

Consequently, the CAEAS&G can be a fundamental reference for the definition, implementation and documentation of QA systems of Central Asia SPs in engineering consistent with the ESG and the EAFSG and able to:

promote the design of student-centred SPs, focused on the definition of learning outcomes consistent with the needs of the IPs;

enhance quality of SPs and increase their transparency and comparability, also in order to enhance mutual trust in the quality of SPs and to allow all IPs to formulate an informed judgment on the educational process offered by SPs.

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Gathering the Engineering Education Stakeholders in Central Asia Establishment of National Societies for Engineering Education

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1. Context

The QUEECA (Quality of Engineering Education in Central Asia [1]) TEMPUS project main aim is to set up and to implement a system of quality assurance (QA) of engineering education in Central Asia (CA), finalised to the accreditation of engineering programmes by the award of the EUR-ACE quality label on the basis of the EUR-ACE Framework Standards and related quality requirements and procedures.

The introduction of easy comparable practices for the accreditation of programmes in the engineering/technology field is hence the main change at national level the QUEECA TEMPUS project is aiming at. The self-sustainability of this strategy is being assured thanks to a massive involvement of relevant actors in all consortium members' countries. Partner countries' Ministries are actively involved in the project in order to comply with legislation obligations as far as Higher Education (HE) system changes are concerned.

The involvement of academics and students at large scale is also being ensured through the active participation of ENAEE and SEFI associations (the main actors in the field of engineering education with a direct involvement in the accreditation issues). With specific reference to the main priority of the QUEECA project, which is the introduction of quality assurance, this is to report about a general correspondence between the project activities and the actual needs and priorities of the concerned partner higher education institutions.

The creation of Central Asian (CA) self-sustainable National Societies for Engineering Education (NSEE) aimed to foster the strictly connected accreditation centres in charge with quality assurance and accreditation issues appeared at first to be as such a very ambitious goal of the project impacting directly the partners' university management and governance.

The development of autonomy and the self-sustainability of the NSEE's involving all the stakeholders aimed to solely transfer know how and encourage capacity building in the concerned countries is described. This is believed to be the main added value of the whole initiative and a great asset for the involved CA partners.

2. Concept

To build up National Societies (NS) is a concept that needs some understanding on the principles that formed them, i.e. how to bring all the stakeholders together. In the National Societies the stakeholders have more than monetary interests in a the society to be created, they are really a motley crew of people, of which the founding partners are just a part – besides the natural environment or future generations, to name but a few. While this has become a truism of sorts, and while there's certainly money at stake in some of these dealings, what's often forgotten is that a stakeholder's stake in a company may just as well be more than money.

A stakeholder perspective, obviously, tends to complicate things in society relations. You could also say that it renders them more realistic. The stakeholder reasoning reinstitutes the NS operation as a social affair – in the very context of societal changes and a new political role of corporations that the neoliberal revolution had co-created. Stakeholder management, then, is an effort to cope with this new reality – to make it manageable. At the same time, stakeholder thinking takes a critical, normative stance against what the “functional

fundamentalist's" view of self-contained operation implies: an undue preoccupation with NSs' interests, at the expense of others, and the view that an NS is nothing but a legal-economic entity, no social responsibility added. Indeed, "stakeholderism" can be seen as an aspect of the corporate social responsibility movement that gained momentum with neoliberal globalisation and its discontents. The very "disembedding" and social irresponsibility of NS operations that had been observed, thus, inspired a renewed understanding of NS as a socially embedded entity that had to be responsive and accountable to other social constituents as well – so much the more since the so-called "third sector" beyond business and politics (a. k. a. "stakeholder society") had been hailed to become the determining force of the 21st century information age.

When we build up a NS, the double perspective on stakeholder management is at stake here. It is based on both descriptive and normative tenets of the stakeholder model: that being responsive to stakeholders is not only better and more legitimate in ethical terms, but that it's also better and more efficient in operational terms. This is what today is widely referred to as the "business case" of stakeholder management and CSR. It well captures the basic tenets that NS don't act in a social vacuum, that they are entangled in various networks of relationships, and that their very success depends on whether they are able to meet these various claims and expectations – in order to attain much needed resources and remain sustainable.

The basic challenge for stakeholder management, then, will be to revalue such relations as a resource, yet at the same not to use them only as a means to NS ends. What's needed, thus, is an ethically enlightened approach to stakeholder management that does critically address, but need not contradict operational interests.

While defining who are the Stakeholders, it may seem that the term "stakeholder" has become so much part of our vernacular and even our mind-sets that there's no need to specify. Indeed, when it is true that we live in a "stakeholder society", then we are certainly all stakeholders, somehow – and therefore we should know. The thing is: just when terms have become so widely accepted and used, they sometimes get rather superficial and unspecific in the process – and may fall prey to political and corporate spin, as long as what the terms vaguely connote hasn't worn out yet: This holds for "stakeholders" as much as it does for the terms "sustainability" or "social responsibility". So, when new notions become part of colloquial speech, their original meanings are sometimes lost or obscured. That's why it might pay to look a little more closely to where they've come from. A "stake", for that matter, originally meant some kind of wooden stick, peg, pole or post – something which can be used to "stake out" one's territory or to "stake a claim": Originally and physically, this meant to declare a tenure on a "staked claim". Over time and in the figurative sense, to "stake a claim" was extended to include all kinds of vested interests, and the concept of "stake", at the same time, came to be identified with the claim it was supposed to represent, as a symbol. That's why, today, a "stake", figuratively, denotes one's input, involvement, investment, even one's share, but also one's "being affected" by some situation, action or enterprise – anything that's "at stake" and which may justify a legitimate interest.

All this suggests that "stakes" are a fairly controversial subject. "Stakes", on the other hand, are also meant to justify claims, yet these need to be justified as well: to stake one's claims at the same time means to claim one's stake. It is all about justifying one's interests in an affair.

Actually, this inherently controversial nature of stakes is quite well captured in the original notion of a "stakeholder". It actually referred to a person that was supposed to "hold a stake" – in the sense of retaining it – until claims over a property were settled. This, actually, is the meaning that the term still has in legal terminology: there, a stakeholder is basically a third party – a custodian, a garnishee or trustee – who temporarily holds money or property while its owner yet has to be determined.

Conventionally, however, and this is also how the term was used throughout our NS implementation, a stakeholder is seen as someone who has a vested interest in some situation, action or enterprise – whose stake is at stake. In this general meaning, the term supposedly first appeared in 1963, in a paper issued by the Stanford Research Institute [5]. Already back then, the intention was to open up managers' strategic view to constituents beyond the narrow circle of stockholders. After this first sign of life, however, stakeholder thinking did not arrive in mainstream management discourse until twenty years later.

According to R. Edward Freeman's 1984 landmark book "Strategic Management", a Stakeholder Approach [5] can be seen as the proverbial "birth certificate" (or at least the "baptismal certificate") of stakeholder

management. How he defined stakeholders back then still carries some sort of “canonical authority” – and on this level of abstraction, Freeman’s general definition of what stakeholders are still serves as a good starting point for a discussion of the matter: “(A) stakeholder is any group or individual who can affect, or is affected by, the achievement of a corporation’s purpose.”

2.1 Stakeholders model

It comes as no surprise, then, that the stakeholder perspective spread and developed in close connection with the “corporate social responsibility” movement. Both, theoretically, are based on the premise that an organisation, however self-contained and effective its peculiar rationality may be, is still part of society, embedded in networks of social relationships, norms and expectations. Both, ethically, focus on the collateral damage that has arisen from an undue focus on owner’s interests at the expense of all others. It is their critique of the corporation as a legally enforced “externalising machine” that fundamentally joins stakeholder theory and CSR.

The concept of shareholder model (that it is not covered in this chapter) has its roots in the massive post-War western transformation from “owner-entrepreneurship” to “managerial” or “shareholder capitalism”. The separation of management and ownership had been an occasional issue whenever there was an increased need for capital for new industries and ventures, way back into the history of capitalism. The rise of the shareholder paradigm to general dominance throughout the 1970s, however, was fuelled by major transformations in the global economy. Central Asian nations did not experience the same western transformation arriving therefor to the concept of stakeholders from more recent social changes in their countries after the disappearance of USSR.

With increasing deregulation of global markets and the massive reorganisation of global production in its wake, the pressure on efficiency – caused by foreign competition mainly and the opportunities to cut costs through global outsourcing – proved significantly higher than pressure on corporate legitimacy imposed by non-business interest groups. In addition to that, the privatisation of Central Asia formerly socialised industries and the liberalisation of financial markets had made it increasingly popular and attractive to embrace the stakeholders’ western philosophy.

In this new paradigm, to secure resources and assistance from different actors and remain competitive, in an increasingly transparent and moralised environment, strategy and social responsibility from this perspective have to be actively matched in an integrative perspective. The process of stakeholder management as it was implemented in this creation of the NSEE in each country from Central Asia can be split in four distinct stages:

1. Map stakeholder relations
2. Classify stakeholder groups
3. Determine on whom to act
4. Determine how to act

The methodology was applied as described.

2.2 Mapping stakeholder relations

The relationships with stakeholders that constitute the NS can be mapped in very different ways. A very basic graphical representation of these relations is the “hub”, which puts the NS in the centre of a number of two-way relationships with surrounding stakeholders. This model is certainly more inclusive and realistic than the conventional “input-output model”, which only maps those stakeholders immediately concerned with the process of value creation (investors, suppliers, customers). Yet, stakeholders do not only relate to the company, but they may also interact with each other, including coalitions on particular issues of concern for the NS. What’s more, it may be illuminating to drop the “NS-centric” view altogether and place the NS in an

“eccentric” position inside a network that’s heavily interconnected – so that changes in one part of this “web” will likely effect changes in any other.

So in the creation of each NSEE this mapping was done, trying to avoid the NS-centric view, depending on the different countries, different results were achieved.

2.3 Classify stakeholder groups

In the first place, stakeholder management has to define who should qualify as a stakeholder. Narrow, extended and broad definitions of stakeholders actually often correspond to descriptive, instrumental and normative approach to stakeholder management.

A narrow definition contains only those stakeholders that are able to actively influence decisions or activities of an organisation because they participate in decision-making. An extended definition also contains those on which the organisation depends immediately, in economic terms, even though they do not contribute to the process of value creation (such as customers and government). A broad definition transcends the immediate economic relationships to any group or individual who can affect, or is affected by, the achievement of a organisation’s purpose, such as NGOs, media, unions, consumer, animal or human rights groups. The broad definition adds the criterion of “being affected” to the discussion. This equally includes “representative” stakeholders (those who represent the moral claims of so-called “non-social” stakeholders that can’t speak for themselves, such as “nature”, “animals” or “future generations”). Obviously, this definition is based on a concept of moral rights – i.e. it is about legitimacy, not efficiency.

Over and above this scheme, it is possible to distinguish stakeholder groups according to a variety of different criteria. To find out just what their stakeholders want, what they fear, what their resources and relations to others are, few entered into a dialogue with them – or at least to open up to let their stakeholders be heard, by creating workshops that had an “open door” policy that invited stakeholders to make their point clear. Basically, based on this information, it was possible to distinguish primary and secondary stakeholders:

- Primary stakeholders on whom the organisation depends heavily for its success and continuous existence. They have formal and legal claims against the organisation and contribute to the process of value added. In the NS build-up, the students and the professors were identified as the primary stakeholders in all the countries although in one country the students were not considered in this category and in another the alumni were also included in this group.
- Secondary stakeholders that do not immediately contribute to the added value, but who may influence primary stakeholders. In the NS build-up, the industry was identified as the secondary stakeholder in all the countries although in one country the students were also considered in this category and in another the universities and the government were also included in this group.

The classification could also be done according to their formal affiliation with the NS,

- Internal stakeholders (such as members and management) may be distinguished from
- External stakeholders (such as EU partners and industry).

According to relationships of power,

- Dominant stakeholders (such as partner’s universities professors and EU partners) may be distinguished from
- Dependent stakeholders (such as professors from other universities, future generations and industries).

According to the degree of potential conflict,

- Discretionary stakeholders (such as universities and other recipients of funding) may be distinguished from
- Dissonant stakeholders (such as active professors and existing accreditation agencies).

According to the degree of cooperation,

- Supportive stakeholders (such as governing bodies, industry and professional unions, some NGOs) may be distinguished from
- Non-supportive stakeholders (such existing accreditation and multi-sectorial agencies).

Some of these classifications did and may continue to help the NSEE management to better understand the general, shared characteristics of singular stakeholders groups. In order to determine on which stakeholders to act (“salience”) in what ways (“strategy”), management is advised to systematically combine sets of different criteria.

2.4 Determining on whom to act

A quite popular model to predict stakeholder behaviour and, therefore, to determine their salience is based on criteria such as legitimacy, urgency and power [5]. Based on these criteria, several types of stakeholders and associated claims may be distinguished, such as: “long-term key stakeholders” who have power and legitimacy, but no urgent claims (e.g. university managers); “dependent stakeholders” who make legitimate and urgent claims, but have no sufficient power resources (e.g. students); “aggressive stakeholders” who have power and make urgent claims, but lack legitimacy (e.g. existing agencies). All of them – and other types of stakeholder groups – long to attain the status of “immediate core stakeholders”.

All of this identification was done by analysing the different stakeholders in action in the workshops created in each country with this purpose.

2.5 Determining how to act

After having determined the “salience” of different stakeholder groups and their claims, the management of each NS had to decide just how to address these claims. A popular way to determine what strategy to use in managing stakeholder relations, applied in this case, was based on stakeholders’ potential to threaten or cooperate with the NS. The generic strategy option open to corporations based on the assessment of stakeholders’ goals and means of power was not used.

Strategies based on similar models suggest a spectrum ranging from ignorance, information and consultation to cooperation, based on stakeholders’ interests and influence. Whatever the concrete advice: obviously, these models are somewhat lopsided in the sense that they advise management to act only on those stakeholders that are active themselves. So the NS in each country were build using exclusively the partners that responded to the call to participate in the above referred workshops.

What distinguishes a more profoundly ethical stakeholder management from such a narrow strategic approach used, is its general vision of the NS as a social institution to generate value for society, based not mainly on power and control, but on partnership and dialogue also with those that are only affected by the NS. In some cases clearly other stakeholders should have been included.

2.6 An ethically informed stakeholder management

A narrowly strategic approach to stakeholder management may not only be lopsided, blinding out and ignoring the interests of those that are only affected by the NS. It may actually imply an exploitation of the instrument. So, stakeholder management understood this way may likely mean to ignore powerless stakeholders, to lead a fake dialogue with the nasty ones, in order to keep them busy and in touch, and to cooperate with those that can really hurt the NS.

From an ethical perspective, fake stakeholder management that's based on defensive strategies, selective information and pure consultation without effective change needs to be replaced by true participation, involvement and dialogue. This model of stakeholder management rests on an inclusive definition of stakeholders and, accordingly, of the NS.

Legitimacy of stakeholder claims – not their power or contribution to the process of value creation – is the core criterion. The main challenge, then, is to assess the legitimacy of claims and how they shall be compared and balanced. To this end, management is well advised to enter into an open dialogue with the stakeholders, that is based on ethical principles of care, fairness and a discourse among equals.

A serious stakeholder dialogue, therefore, involves a loss of power on the part of the NS, and it is based on the following principles:

- Transparency, in order to decrease information asymmetries and to adjust policies,
- Fairness, in order to balance opposing interests,
- Accorded rule and sanctioning mechanisms, in order to make the dialogue calculable
- Stakeholder participation irrespective of power.

In the formed NS, the stakeholder dialogues may help to exchange positions, discuss interests and expectations, make claims and develop standards, based on partnership and mutual respect. Ideally, they promise a trade-off for all parties involved, and a win-win situation between strategic management and stakeholder claims.

3. Implementation

Following the stakeholders model presented in the previous chapter it was possible to establish the 4 National Engineering Education Societies in the 4 involved Central Asian countries.

This was fundamental for the QUEECA aim at setting up and implementing a system of QA of engineering education in CA countries, finalised to the pre-professional accreditation of engineering programmes (i.e. accreditation of educational programmes as entry route to the engineer profession).

The NSEE were the umbrella to establish the National Engineering Accreditation Centres. The 4 involved countries have reported about the successful creation of national Engineering Accreditation Centres that had a very active role in the trial/actual accreditation visits scheduled under the QUEECA project [8]. The accredited programmes were to satisfy the same pre-requisites for the award of the EUR-ACE quality label, i.e. the EUR-ACE Framework Standards (EAFS) and the European Standards and Guidelines for Quality Assurance in Higher Education.

This is being achieved by the creation of a network of National QA/accreditation Agencies able to accredit engineering programmes and authorised by ENAEE to award the EUR-ACE quality label [9]. Through all above introduced structural measures, mobility of engineering students from and to Central Asia as well as the mutual recognition of degrees within the EHEA will improve decisively. The NSEE in each country gain therefor recognition nationally for this achievement.

3.1 Kazakhstan

In Kazakhstan, the NSEE already existed so the challenge was to strengthen the existing KazSEE and to use the connexions with the European society SEFI and the world society IFEEES, to promote to all the other societies the best practices. The first meeting was therefor in Almaty on the 5 April 2013, figure 1.

This meeting served as the first contact for the delegations of the other central countries with KazSEE, the local NSEE, and to understand in loco what were the challenges of creating a stakeholder based group in Central Asia. The President of KazSEE, offered immediately to support the neighbour countries in the creation of their NSEE.



Figure 1 KazSEE 05. 04. 2013

3.2 Kyrgyzstan

To create a National EE Society where it does not exist, like what happened in Kyrgyzstan , was a challenge with good results. The partners from QUEECA brought up together the different stakeholders into an event, where they understood the importance of creating their NSEE, the AEEK, figure 2.



Figure 2 AEEK 17. 10. 2013

Immediately after the creation of AEEK, the AEEK was invited to join the international networks on engineering education. However it took them an extensive long time to complete all the necessary bureaucracy to become a legal entity. The lack of experience was overcome by the hard work of the founding members of this NSEE. AEEK have all the necessary components to become a long lasting stakeholders' based organisation, it is already actively pushing to achieve a future sustainable financial situation.

3.3 Uzbekistan

In Uzbekistan the creation was even more complicated because it was necessary to overcome the existing traditional concept of not expanding the cooperation to all the stakeholders, either by the perception of a stratified Higher Education system, or simply by the perception of a national competition among the academic stakeholders. However, following the perception of the need to evolve, the AEEUz, was created, figure 3. After the creation of this NSEE, it became clear that it would be difficult to integrate all the stakeholders, as well as to generate the necessary funds to integrate in the international networks. However, due to a commitment from the founding members, it is expected that some of the problems of managing a stakeholders' based organisation will be slowly overcome. The major risk is that AEEUz might not manage to enlarge the scope and diversity and overpassed the current volunteers into a sustainable growing future.

3.4 Tajikistan

In Tajikistan, the situation was probably the most complex from the point of view of the NSEE creation. The academia is/was dominated by a reference technical university in the capital, that by being one of the members of the QUEECA project, was not able to generate an autonomous stakeholders group. This situation was not created by the impossibility of joining the different stakeholders, but by the recognition that the NSEE independent from the reference university would have a negligible ability to promote the necessary discussions in the field of engineering education.



Figure 3 AEEUz 30. 05. 2014

So the approach, the only approach, that could remove this unbalance in the academic society, other than fight the current status quo was to use the well organised stakeholders group of the alumni of this reference university, that, by-the-way, are spread all over the key positions in academia, government and industry. So the solution was to add the NSEE role to the reference university alumni group, figure 4.

The solution encountered was a creative one, in particular when the ties between the academic and the industry are so close, as in this country. However, the expectation is that, one day, in a few years the role of NSEE will be separated from the present organisation. The negative consequences of this NSEE configuration are the impossibility to join international networks of engineering education and the need to depend on external specialists for a true autonomous evaluation of the reference university, extending thereafter the country dependence on foreign experts during the necessary development evaluations.

But not all is negative; on the contrary, by having this configuration it is easy to reach all the stakeholders that already have a common ground and are used to cooperate together now for many years. The future success of the NSEE in Tajikistan it is very much dependent on how the alumni association will face the future need to let the NSEE to be an autonomous organisation. Until then the only major part in this field is to generate experts that can support the quality assurance of the engineering education degrees in the region.



Figure 4 Alumni TUD 23. 10. 2014

3.5 Central Asian federation

After all the NSEE were formed and each one of Central Asian countries were supporting their accreditation bodies, it was possible to reach a cooperation agreement between all of them, this was named the Khujand¹ Accord. View in appendix 2 the Khujand Accord. This accord between 4 Accreditation Agencies of Central Asian countries will for sure have the same impact in the Central Asian region than the EUR-ACE accord had to Europe, and the Washington Accord or the Sydney Accord had for the world. Moreover it is the realisation that the national stakeholders from

each NSEE can also play an important role in referring the best practices to other countries in the region.

It is expected that this will attract soon other countries from the region and it is clearly one of the top achievements of the QUEECA project. The NSEE's are now working under this accord on the Khujand descriptors. By assuming that these meetings will be occurring on a regular basis, the mechanism to promote the internal debate on the important issues for the engineering Education among the stakeholders is in place.



Figure 5 Khujand Accord 14. 10. 2015

¹Khujand — the capital of northern Tajikistan and the second-largest city in the country. One of the ancient cities of Central Asia. The history of the city goes to an extreme antiquity. The modern historical science considers that archaic Khujand existed at a dynasty Akhemenidov, that is before arrival to coast of Syr-Darya of troops of Alexander of Macedon. Having seized the city, they strengthened it, having called Alexandria Eskhat (Extreme). In the subsequent periods Khujand had to appear in the center of historical events more than once. In the VIII century he was captured by Arabs, in the XIII century the city showed fierce resistance to the Mongolian aggressors, having for a while detained advance of hordes of Genghis Khan to the west. Since the most ancient times Khujand, being at the intersection of trade ways of the East, was one of the most important economic, strategic and cultural centers of Transoxiana. It passed the Great silk way connecting Ancient Greece, Rome, Asia Minor, Egypt, Iran with India, China and Japan through it. Khujand was the homeland of famous astronomers, mathematicians, doctors, historians, poets, musicians.

The news of this accord was sent to all the partners of the QUEECA project as well as all the engineering education networks around the world. Several partners around the world congratulate the NSEE about this amazing development in the Central Asian region for the engineering education world in general and for the quality assurance in the engineering education in particular.

4. NSEE's sustainability

Sustainability and long-term effectiveness of the results are key-points of the QUEECA project, and they are guaranteed by the creation during the project lifetime of the NSEE's as well as the independent permanent agencies in Central Asia to carry out the accreditation of curricula in the field of engineering and technology in accordance to the European quality Label EUR-ACE.

Concrete steps (such as the establishment of the Kyrgyz, Tajik and Uzbek NSEE's) have been taken in order to allow the creation of these agencies and to ensure that they gain the necessary experience to carry out self-sustainable international accreditations of curricula of the Central Asian Higher Education Institutions. This was achieved with the help and expertise of European Higher Education Institutions and Associations and of the KZ NSEE's who already have some experience in the field. The new agencies are expected to become very competitive in comparison to similar European and American ones, as the experience accumulated from other NSEE's is already significant and since the accreditations will have lower costs due to the significant reduction of transport costs and the lower wages of experts of Central Asia. In addition, the possible award of the EUR-ACE label will improve attractiveness and international recognition of such accreditations. Since the beginning of the project KazSEE is already a full member of ENAEE and it is a soon to be new international recognised EUR-ACE label awardee in the European Higher Education Area.[3].

QUEECA project by empowering the NSEE's helped to improve the preparation of quality of experts in the field of engineering and technologies in CA, their competitiveness at international level, and also the transparency and comparability of their titles, through the creation of accreditation agencies and systems respecting the developed international criteria corresponding to the European quality label EUR-ACE [4]. The increase in the international recognition of the degrees of engineering graduates of the Central Asian HEIs in the European countries is taking place as the accreditation of programmes according to the EUR-ACE Framework Standards allows the comparison of outcome results i.e. of the content of the formation, instead of the duration of the curricula. The project promoted the development of curricula in cooperation with some of the European universities, to the creation of double degree programmes and the development of curricula in Central Asia, which are in essence similar to the ones of the European Union countries [10].

5. Lessons learned

The need for international recognition of engineering degrees is becoming more and more demanded at several levels. Several types of accreditation of education did take place during the lifetime of the QUEECA project, for example: institutional accreditations - for an estimation of activity of the Higher Education Institutions (HEIs); and specialised ones - for a quality estimation of curricula. Institutional accreditations are normally ensured by the Ministries of Education and Science and carried out by National Accreditation Centres. The specialised accreditations are carried out by international accreditation agencies or accreditation organisations created by (or strongly connected with) professional associations. The existence of the NSEE's was of paramount importance in both processes, and will be even more in the future during the quality assurance follow up process.

The Central Asian governments are interested in creating and developing internationally recognised systems of educational and professional qualifications: in particular, the creation of accreditation organisations belonging to international networks is felt as an urgent need in the Central Asian countries. The NSEE's created were actively supporting the training of experts and promoting the necessary realisation of the importance of the quality assurance. The Central Asian countries have declared their priority interest in the implementation of their engineering and technical programmes in analogy to the European Qualification Frameworks (EQF). However, international

recognition of qualifications and programmes can only happen if the fulfilment of shared qualification standard is assessed. These assessments are done through a periodic evaluation of study programmes by both internal Quality Assurance (QA) and peer review processes, and are fully dependent on the stakeholders commitment. The NSEE's are the opportunity to create the required commitment.

Following this growing interest towards the internalisation of Central Asian engineering degrees, the assessment procedure of the EUR-ACE system appeared to be the natural answer to these emerging requirements. In this respect, the QUEECA project aimed to promote the adoption of the EUR-ACE system in the partner countries, thus increasing the impact and attractiveness of Bologna principles among engineering and technology higher education institutions: the achievement of objectives for QUEECA is expected now to bring a significant contribution to the effective implementation of the Bologna process among the involved partner countries and region.

By analysing the process of stakeholders gathering in Central Asia, it was clear that the cultural aspects were shaping the reality of the NSEE's creation, however, in all the countries the willing to achieve a continuous improvement was, and is, very strong. No doubts exist that these countries will be the focus of a transformation of the Engineering Education, for their countries, their region and the world.

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Creation of the Engineering Education Societies as a step to create accreditation agencies

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Along with literacy, expected length of life and its quality, education level of the population is a comparative measure included into the human development index (HDI). This index is used to reveal differences between developed, developing and underdeveloped countries, as well as to assess the impact of economic policy on life quality in a particular country. It seems impossible to deny the relevance of the education quality level to values characterizing the economic development and the national life quality. No country in the world is able to provide civilized level of its progress and existence, as well as political and economic independence without an efficient higher education system and scientific research organization. That is why all countries are vitally interested in processes aimed at building of adequate national higher education systems.

Global economic transformations result in emergence of new international ties in the higher education system, as well as direct dependency on the relevant world processes. The new opportunities and challenges are related to the potential globalization impacts on higher education that depend on the priorities in policy and resources, strengths and weaknesses of the country. The following factors can be named among the potential opportunities:

- Widening of educational services spectrum and more extensive access of students to them;
- Support of the knowledge economy;
- Development of the mutual degrees;
- Merging and rapprochement of cultures;
- Strengthening of the qualification comparability;
- Strengthening of role of the market-oriented approaches;
- Economic benefits for providers of educational services;
- Diversification and creation of new conditions for operation of academic institutions.
- The following factors can be named among the potential challenges:
- Lowering of quality of rendered services;
- Unequal access to educational services;
- Growing problem of physical and virtual outflow of properly qualified workforce from developing countries into developed;
- Weakening of role of the state in development of national policy targets in the field of education;
- Increase of number of market-oriented programs, especially in the field of business comparing to the number of scientific disciplines.

However, all the new opportunities and challenges mentioned above are equally natural for all countries. These processes may be opportunities for some countries and, at the same time, challenges for the other. But each country has to strive to gain profit from globalization by creation of mechanisms and development of national level policies to become capable to control and monitor provision of educational services by both national higher educational institutions and foreign states. For instance, registration and licensing of foreign service providers, as well as provision of quality and accreditation of new programs and providers.

The most sufficient challenges for globalization of higher education (especially in Central Asia countries) are

those related to education quality assurance, retaining of the national culture and identity, secure priority of national governments to define national policy targets in the field of higher education, as well as to ensure fair access to that.

Recently, a global trend became obvious: both citizens' and employers' demand in higher education grows significantly. For citizens, the education is a way to make career and achieve well-being. Employers more and more become aware of that highly educated people work several times more effective than under graduated people. Unfortunately, mass growth of higher education, as well as increase of costs paid by students does not always accompanied by similar growth of the education quality. Under these circumstances, protection of interests of higher education consumers (i.e. students, their parents, employers and the whole society) by taking of measures capable to ensure the education quality becomes of special importance.

The quality of national higher education and its assessment not only exert the decisive influence on the social and economic wellbeing of the country, but is the factor that determines the international status of the given higher education system. Establishment of an adequate quality assurance system becomes a critical task to monitor not just the national higher education quality, but its competitiveness on the international level. That is why the number of institutions involved in quality assurance and accreditation of higher education has sufficiently increased for the last two decades.

The present review of institutions involved in accreditation activities in the field of professional higher education evidently illustrates the worldwide extent of the problem of securing the education quality.

Accreditation is a proven tool of education quality assessment applied in many countries of the world. However, in every country it has its specific features. In Western and Central Europe (for example, in Germany, Austria, Holland, etc.) accreditation became popular due to requirements of the Bologna process, as well as demands in demonstration of competitiveness of the education. Upon acceptance of the Bologna declaration, virtually all countries established their own accreditation agencies, which predetermined the necessity to develop and accept some unified requirements and conditions of their creation and functioning.

In Central Asia, the active interest to accreditation has been caused by the significant extent of labor migration (including higher educated people), commercialization of higher education institutions and insistent necessity to improve the quality of higher education and protect it from all forms of low quality transnational education. Today, countries of Central Asia recognize the necessity to use the positive international experience of establishment of such non-governmental (public) organizations as the associations of higher education institutions, student organizations, professor unions, networks of institutions joined to ensure quality and accreditation, organizations involved in recognition and assessment of diplomas, as well as the professional organizations aimed at international cooperation development to ensure quality of trans-border higher education. Experience of countries with high level of education has shown the special significance of such public organizations for establishment of independent centers for accreditation of educational programs.

The primary parties interested in the public and professional accreditation are, first of all, school leaders and their parents who are choosing a future profession and the relevant higher education institution to receive quality education and subsequently become employed, make use of the expected revenue yield and professional career. Secondly, these are employers and investors interested in the high level of training of their future employees, investors who are interested in reception of reliable information on structures and scientific schools that may be invested without the sufficient risks.

It seems expedient to note that in international practice of independent accreditation, the role of employers in activities of educational institutions and assessment of education quality they offer. The employers more actively interact with educational institutions, participate in both shaping the way the specialists of the required profile and qualification are prepared, and assessment of quality of aliment and preparation of alumnus. Contemporary employers need adequate warranties of that they be able to find professionals on the labor market, which will possess the required qualification and be capable to get down to work without extra training. Employers play the dominant role in shaping of demands in specialists and assessment of quality of their training. In such conditions, in the course of development and implementation of programs, educational institutions must take the employer requirements into account, create mechanisms capable on a permanent basis to track

changes in the labor market and requirements of the primary consumers for the education quality. Professional and public accreditation of educational programs must be undoubtedly accessible for those employers only that actively employ graduates and are really interested in well trained specialists. Such employers are capable to objectively assess the extent in which a freshly graduated specialist is fluent in contemporary technologies, familiar with the latest achievements in the field of his professional activities. In addition to that, the employer is capable to assess if activity of such specialist increase the competitive strength of his company.

In processes of public and professional accreditation, employers may act as consumers of activity results of higher education institutions interested in determining of the real program potential and assessment of the education quality in terms of its sufficiency for running the professional activity of their enterprises. As such consumers, the employers may extend their participation in determining of training goals and set of competences gained in the course of the training, as well as in provision of consulting services to educational institutions to help the development and improve their educational programs, maintain the conformity of the program objectives to the relevant labor market requirements, assurance of the program competitiveness. The employers may also pose as experts who act for and on behalf of the independent expert organizations. In such a case they take part in the assessment as independent experts with extensive knowledge of the employer requirements, and are liable to observe the relevant norms and rules outlined by expert organization. They also are not able to be lobbyists of interests of the appropriate enterprises and professional communities.

As a rule, the accreditation centers are established on the basis of the relevant public organizations that ensure independence of their activities from governments, higher education institutions, business and the industry. To provide high level of education, a practice of accreditation has been formed in the end of XIX – beginning of XX century in USA, based on non-governmental assessment of educational institutions and programs. To assess the quality, public educational associations have determined procedures and accepted criteria for educational programs and education institutions as a whole. During the meeting in Berlin (2003), the ministers of education from 17 countries have formulated the unified requirements applicable to European organizations involved in accreditation of higher education institutions and their academic programs. In this aspect, establishment of engineering unions/communities in countries of Central Asia stipulated by project “Quality of engineering education in Central Asia (QUEECA)” has proved its expediency. The similar public organizations have been established in Uzbekistan and Kyrgyzstan. In Tajikistan, implementation of this project was oriented on the previously established association of alumnus of the technical university, which is the primary university of the country to train the engineering staff. One of the primary objectives of public engineering educational communities in Central Asia is to support the engineering staff training quality. These communities are aimed to raise competitiveness of national engineering higher education institutions.

The purpose of accreditation centers is to ensure competitiveness of higher education institutions. However, such competitiveness is not only the economic stability and wellbeing of the institution, but first of all the quality of education, because quality of the graduates determines the position of this institution in the society. Besides, the public and professional accreditation ensures proper awareness of all the interested parties and the relevant government bodies of education quality offered by the given higher education institution.

In the result of implementation of some international projects, along with the state accreditation, prerequisites for public accreditation are now emerged and still emerging in Central Asia countries. The purpose of such accreditation is to confirm the conformity of the provided education to the requirements of customers and/or the consumers, assist them in choosing of organization involved in the relevant educational activities and programs, raise competitiveness of the organizations that perform activities at national, regional and international markets, as well as the programs they offer.

As a rule, systems of quality assurance and accreditation applied in various countries differ from each other. Sometimes, different systems are used in the same countries. In some countries, it is the state authorities who are in charge for ensuring quality and accreditation, whereas non-governmental organizations are involved in these activities in other countries. In the course of the project implementation in the Central Asian partner

countries there was no experience of independent accreditation; this mission has been performed by reputable foreign organizations.

In Central Asia, professional higher education accreditation system may be created and developed by four primary ways, as follows:

- Improvement of the state accreditation system for universities in each country;
- Establishment of the relevant national public and professional systems for independent accreditation of educational programs offered by of higher education institutions, on the basis of public professional organizations;
- Integration of the national systems of state and public accreditation into the international higher education institutions accreditation system;
- Establishment of the Central Asian regional accreditation center for educational programs, subsequent integration thereof into European, American and the other international accreditation systems.

The Khojend agreement signed on Oct 12, 2015 (“agreement”) between “Kazakh engineering education association (KAZSEE)”, “Tashkent city association of engineering education (AIOK)”, “Kyrgyzstan association of engineering education (AIOK)” and “Association of graduates from TTU-TPU (AVTTU)” regarding the establishment of Central Asian federation of engineering education associations QUEECA has laid the foundation for implementation of such activity directions, integration of regional education systems, development of mobility of graduates from the relevant higher education institutions and arrangement of the unified educational services market. Today, we can see intensive competitive struggle for the Central Asian education market between various countries far beyond the limits of this region. In accordance with the agreement, activities of the Central Asian federation of engineering education associations are aimed at implementation of the mutually beneficial objectives in the following fields:

- Cooperation on the issues of training of higher educated staff, including experts of technics and technologies and professional engineers in Central Asia;
- Development of accreditation of the relevant engineering and scientific/educational programs;
- Development of international ties and contacts between higher education institutions of Central Asia involved in engineering and scientific/educational programs.

In future, the targets pursued by the Central Asian federation of engineering education associations may be extended; the Internet site of this organization is the platform for establishing of the various ties within the engineering society, as well as ties with engineering societies of Europe, America and Asia. Development of international cooperation is one of paramount targets outlined by the Central Asian federation of engineering education associations.

Establishment of unions and associations of engineers is widely accepted all over the world. More than 120 major national engineering unions operate in the world today. In addition to that, worldwide congresses related to engineering education are held; for instance, such a congress has been organized in Portsmouth in 1992 to set the international requirements for graduates of engineering higher education institutions. As of today, the Worldwide engineer forum has been held, which is a visible evidence of high degree of public organization natural to the engineering community, as well as the necessity of taking mutual decisions. In the contemporary conditions, mutual efforts of engineers all over the world aimed at solving of a number of global issues are necessary. The first among such issues is to create unified energy saving, transportation and security systems. It is obvious that the Central Asian federation of engineering education associations is yet to become an integral part of this movement to make use of all its benefits.

It seems that the appropriate structures will be created on the basis of the Central Asian federation of engineering education associations to subsequently promote the results of their efforts, strengthen economies of Central Asia countries. Today, many engineers or groups of engineering in these countries are isolated from each other;

meanwhile their professional interests are very close. The Central Asian federation of engineering education associations would also allow it to ensure integration of engineers interested in data exchange among wide groups of the professional society.

Besides the education activities, the expert councils of the Central Asian federation of engineering education associations may also render the relevant consulting services related to taking the intergovernmental decisions on issues of technology (for instance, to development of the regional energy market), the efficient use of the water and energy regional potential, and performance of the expertise of the international cooperation projects in engineering field.

Creation of accreditation centers

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1. Introduction

One of the main steps of the QUEECA Project reflected in the WP4 and aimed to set up a system of Quality Assurance and accreditation of engineering education in Central Asia is to create National Engineering Accreditation Centres that can award the EUR-ACE label quality to the accredited engineering programs.

These agencies were to be created during the project and the necessary experience to carry out self-sustainable international accreditations of curricula of the Central - Asian Higher Education Institutions will be achieved with the help and expertise of European Higher Education Institutions and Associations. It is supposed that these independent permanent agencies in Central Asia will carry out of the accreditation of curricula in the field of engineering and technology in accordance to international standards, and in particular the requirements of the European Quality Label EUR-ACE. That will guarantee the sustainability and long-term effectiveness of the results of the project.

The new agencies will be very competitive in comparison to similar European and American ones as the accreditations will have lower costs due to the significant reduction of transport costs and the lower wages of experts of Central Asia. In addition, the possible award of the EUR-ACE label will improve attractiveness and international recognition of such accreditations.

QUEECA helped to improve the preparation of quality of experts in the field of engineering and technologies in Central Asia, their competitiveness at international level, and the transparency and comparability of their titles, through the creation of accreditation agencies and systems respecting the developed international criteria corresponding to the European quality label EUR-ACE.

The increase in the international recognition of the degrees of engineering graduates of the Central Asian HEIs in the European countries will take place as the accreditation of programs according to the EUR-ACE Framework Standards allows the comparison of outcome results i.e. of the content of the formation, instead of the duration of the curricula.

2. Kazakhstan

Currently, the Law on Education includes a separate article 9-1 on accreditation as one of the most important tools to improve the quality of educational services. According to it, national and international accreditation bodies based on their own standards have the right to conduct accreditation. The ministry of education and Science (MES) forms registry of recognized accrediting agencies in Kazakhstan. Currently, the registry includes six agencies:

IAAR (Independent Agency for Accreditation and Rating of Kazakhstan);

IQAA (Independent Kazakhstan Quality Assurance Agency in Education, Kazakhstan);

ASIIN (Agency for Accreditation of Training Programs in Engineering, Informatics, Natural Sciences and Mathematics, Germany);

ACQUIN (Institute for Accreditation, Certification and Quality Assurance, Germany);
 AQA (Austrian Quality Assurance Agency, Austria);
 ABET (Accreditation Council in the Field of Engineering and Technology, the United States).

The ministry recognizes only accreditations awarded by the agencies included in the list.

In Kazakhstan, it is the Kazakhstan Society of Engineering Education (KazSEE) that became the agency created in the framework of the QUEECA Project which will accredit engineering programs. For that purpose, the KazSEE created an Accreditation Counsel that has approved the Standards for the Accreditation of Engineering Programs (Minute #7, March 20, 2015), which were developed in the framework of the QUEECA project. These standards will provide that engineering programs accredited by the KazSEE meet international criteria corresponding to the European quality label EUR-ACE. In addition, forms and instructions were developed for the preparation of the report of the self-examination of an engineering program for the submission it to the KazSEE with the purpose of accreditation. The forms consist of three volumes: Volume 1 –Description of the Program; Volume 2 - Course Description and Summary of Teachers; Volume 3 - Description of the University and Departments.

The next important step is that KazSEE is included into the National register #1 with the purpose to begin EUR-ACE label accreditation of engineering educational programs. For that, a lot of work have been done and a lot of work is planned. For example, the supporting letters were obtained from the QUEECA Project - Coordinator



Figure 2: KazSEE is a member of ENAEE

Claudio Borri; Managing Director of ASIIN – Iring Wasser; President of ENAEE – Bernard Remaud. In addition, the Central Asian session of the World Engineering Education Forum, held in the Florence (Italy) on September 20-24, 2015 recommended to the Ministry of Education and Science of the Republic of Kazakhstan to include the KazSEE Accreditation Center into the National Register #1.

In 2015, the KazSEE became a member of both ENAEE (European Network for Accreditation of Engineering Education) and FEANI (European Federation of National Engineering Associations) that will allow Kazakhstan to have a quality assurance system integrated into the European Union. In addition, in order to implement best international practices into its operations, the KazSEE entered into agreements with several international institutions, such as Institution of Civil Engineers (Portugal), Russian Association of Engineering Education (Russia), International Society for Engineering Pedagogy (IGIP), European Network for Accreditation of Engineering Education (ENAEE).

The list of local experts of the KazSEE included in databases of foreign accreditation agencies consists of 25 people trained in the framework of the QUEECA Project. The list of international experts of the KazSEE includes 20 people, of which seven are experts from Central Asia countries also prepared in the framework of the QUEECA Project. In addition, the KazSEE prepared a list of 35 industry experts working in various sectors of the Kazakhstan economy, and list of 20 students of engineering programs of the KazNU.

Many people contributed to the process of the creation of the engineering accreditation agency in Kazakhstan. Among them are Galym Mutanov (rector of KazNU), Shyngys Ergobek, Barlyk Shaikenov, Aizhan Smailova, Anar Zholdybekova and others.

Thus, the accreditation agency created in the framework of the QUEECA Project has done all necessary preparatory work for further the sustainable and long-term work after the QUEECA Project finishes.

3. Kyrgyzstan

As of today in Kyrgyzstan, the accreditation of engineering education programs was carried out only in the framework of the QUEECA Project. Namely, Kyrgyz State Technical University (KSTU) and Kyrgyz State University of Construction, Transport and Architecture (KSUCTA) each accredited per one program. Besides KSTU and KSUCTA conducted accreditation of one program each with the financial support of DAAD through the German accreditation agency ASIIN in accordance with its standards and procedures.

Kyrgyz Association for Engineering Education was founded in the framework of the QUEECA Project by seven institutions, of which five are engineering higher education institutions and two are large companies (SeverElectro and NarynGidroElektroStroy). In turn, the Kyrgyz Association for Engineering Education has established an accreditation agency for the accreditation of engineering programs. The work of the accreditation agency is based entirely on the methodological and expert base, which were created by the QUEECA Project. It is supposed that the agency will accredit engineering programs in accordance with the QUEECA standards. On the other hand, an existing accreditation agency EdNet, which is also a partner of the Project, uses extensively the QUEECA standards in its activities.

The agency plans to start its activities on September 1, 2016 - the date of the commencement of independent accreditation and recognition of accreditation agencies by the National Accreditation Board of the Ministry of Education and Science of the Kyrgyz Republic according to the provisions of the Government of the country. To date, the accreditation agency has not yet conducted any accreditation, but at the same time it is the only potential agency that will carry out the accreditation of engineering programs of universities of Kyrgyzstan after September 1, 2016.

The agency relies on the standards developed in the framework of the QUEECA Project, and a database of experts trained by the Project during the 2012-2015 period. Thus, to date, more than 20 people were trained, mostly representatives of the faculty of KSTU and KSUCTA and agency experts of EdNet. Experts of KSTU and KSUCTA are potential experts who will take part in the work of the agency in 2016. The training was conducted by both the ASIIN and the Association for Engineering Education of Russia on accreditation standards, methods of assessment of learning outcomes and other issues related to accreditation.

It is planned that the agency will be self-financing, and the main source of income will be the fees from universities for the accreditation of their engineering programs. In addition, the agency will get money through the participation in various projects. This will provide financial stability of the agency after the finish of the QUEECA Project.

The main actors in the creation and development of the accreditation of engineering education programs are QUEECA Project partners, namely:

Ismailov Bakytbek, KSTU professor, President of the Association for Engineering Education.

Cheychebaev Marat, member of the international department of KSTU.

Umankulvoa Onolkan, executive director of the Agency for Quality Assurance in Education EdNet.

Abilov Saidulla, Vice Rector of KSUCTA.

4. Uzbekistan

The system of social and professional accreditation of education programs had not existed yet in Uzbekistan before the QUEECA Project started. In particular, the “Electronics and Instrumentation” program that was accredited in the framework of the QUEECA Project became the first program accreditation experience in the country. Therefore, it can be said that the QUEECA Project has launched the social and professional accreditation process in the country.

In accordance with the Regulation “On the procedure of state accreditation of educational institutions of the Republic of Uzbekistan” № 4 dated February 10, 2006 all educational institutions and programs should be accredited only through the National State Testing Center of the Cabinet of Ministers. However, the Association for Engineering Education of Tashkent created on May 05, 2015, for its part, can contribute to the accreditation of engineering education programs. This process will involve a group of teachers - experts who have been trained at the training workshop on accreditation, organized within the project QUEECA on May 26-28, 2014.



Figure 2 Seminar-training for accreditation experts in Uzbekistan

There is an ongoing discussion on the creation of an independent non-governmental engineering accreditation agency with the Ministry of Higher and Specialized Secondary Education and the State Testing Center of the Cabinet of Ministers. It is planned that the agency will be functioning under the umbrella of the Association for Engineering Education. It will use QUEECA standards and will be participated by experts prepared in the framework of the QUEECA Project.

Among the people who take active part in the creation of the engineering accreditation agency in Uzbekistan are Karimov M.M., Magrupov T.M., Fayzullaev U.C., Mambetov N.M., Talatov. Y.T and others.

5. Conclusions

Thus, the goal of the creation of accreditation centers in Central Asian countries was achieved to very much varying degrees across the participating countries. The most complete result was achieved in Kazakhstan with its developed accreditation system and the preparedness of engineering higher education institutions to comply with the international standards of the accreditation.

The accreditation agency in Kazakhstan was created under the umbrella of the Kazakhstan Society of Engineering Education (KazSEE). The agency has already developed all necessary internal documents for the accreditation and has a database of internal and external experts most of whom were prepared in the framework of the QUEECA Project. The most urgent and important problem that the Agency has to address is the inclusion to the National Register #1. After that, the perspective of financial and organizational sustainability of the Agency seems to be very optimistic.

In the case of Kyrgyzstan, there have already been an accreditation agency in the country and a new one was created in the framework of the QUEECA project for the accreditation of engineering programs. However, it is planned that this Agency will start working only after September 1, 2016, the planned date of the start of the official accreditation system in the country. Nevertheless, the agency has a list of prepared experts and QUEECA standards that will be carried out.

In the case of Uzbekistan, it had not been any accreditation system in the country before the QUEECA project started. It is planned that the Ministry of education of the country will accredit educational institutions itself according to the local standards. Therefore, the perspective of the engineering accreditation agency created in the framework of the QUEECA Project is very vague.

In Uzbekistan, the system of accreditation held by the State Testing Center under the Cabinet of Ministry of the Republic of Uzbekistan. Organization of social and professional accreditation center will be carried out after agreement with the Ministry of Higher and Secondary Special Education and state testing center.

Independent accreditation as the most important tool on the way to high quality national education

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The issue of an introduction of accreditation in Kyrgyzstan is discussed for several years. Meanwhile the interested society has been divided in two parts: those who stand for independent accreditation and those who stand against it. There are lots of reasons for such opinions. Among those are the issues of accreditation financing and requisite level of preparation of the educational system for this process, the scope of work that should be done by each educational institution to pass accreditation, and many others. Besides, there is one more critical issue: the problem of transferring of the major lever of influence on higher education from the Ministry of Education and Science of the Republic of Kyrgyzstan (MofES RK) to the independence accreditation agencies, which must receive trust.

Nevertheless, individual participants of this process already work successfully, and the first results of preparation and introduction of accreditation are tracked in Kyrgyzstan. They give the hope that the entire society will recognize this mechanism at all the levels of its implementation as a major step towards the quality education. In spite of the fact that the accreditation implementation timeframe has been prolonged till September 1, 2016, as of today a great amount work was performed in this respect. The planned preparation for introduction of accreditation in the education system has been commenced since 2007. At first, the initiator of discussion and introduction of individual elements of the quality assurance system was the EdNet association; later on, the other organizations have also joined to this activity. In 2009, the first TEMPUS CANQA project (the Central Asia quality assurance network) was launched. On the basis of this project, the first experts of this problem were trained; workshops and trainings were held in several higher education institutions to present European approaches to quality assurance and accreditation. Since then several projects were implemented in the Republic of Kyrgyzstan related to the quality assurance and accreditation system based on various programs, including «Soros – Kyrgyzstan» Foundation, TEMPUS and GIZ. Upon adoption of the law to substitute the state certification with independent accreditation in 2013, drafts of several important legal acts to govern independent accreditation were prepared but still were not enacted on the governmental level. These events significantly increased the entire academic community and higher education institutions aimed at improvement of educational services quality, and active work to establish internal quality assurance processes began.

In the meantime, one of the main results of the entire process of preparation for independent accreditation was reflected in changes to awareness and approaches to specifying and shaping of quality by academic community at all levels of the educational system. It means that transition from the soviet way of thinking in the field of education quality assurance to new approaches applicable in international practice is a complicated and painful process. In spite of the fact that the extent of activities related to training employees involved in accreditation is still insufficient, in course of the more detailed consideration of problems of the internal and external quality assurance system becomes evident that number of the independent accreditation supporters is growing.

One of the first steps towards understanding of accreditation and adaptation of international experience taking into account conditions of our country was made in 2012. It was an independent program accreditation in two higher education institutions: Osh State University (OshSU) and Kyrgyz Economic University (KEU). Three years have passed, and the results of the pilot accreditations produced their outcomes. When operating with various higher education institutions you may see that those that have passed the pilot accreditation are

perceived the external accreditation as an instrument for improvement of the quality of educational services. In this respect the considerable progress is observed, i.e. the approach to organization of educational process is changing. The approach to interaction of educational institutions with employers in the assessment of training quality is also changing. In the meantime the progress is observed on the level of understanding connections between mission of an institution, objectives of an educational program and training results, the entire process leads to the presumable quality results. Alterations in the internal processes directly impact the training results quality thus affecting the external image of the relevant higher education institution. So several employers noted that graduates of some higher education institutions that have passed the pilot accreditation in accordance with the proposed recommendations demonstrate the progress that have reflected in their activity, professional skills and the living concept as a whole. It seems expedient to note also the fact that such a progress became possible only by virtue of strong political support from the side higher education institutions management. As of today, the pilot accreditation with the local EdNet accreditation agency have passed 5 programs of 4 national higher education institutions; 2 programs of the other higher education institutions have passed accreditation with the German accreditation agencies.

As of today, the pioneers in the field of accreditation are KEU and OshSU that demonstrate the excellent results in solving of issues related to providing the quality education to their students. With reference to the personal experience, in course of one interview the President of OshSU Kananbeck Abuvasitovich Isakov noted the importance of accreditation. As he said, «the experience gained in process of passing the pilot accreditation greatly helped me in organization and tuning the quality management in our institution». Being aware of the importance and value of this process in context of the institution development prospects, today OshSU is completely ready for passing accreditation for 15 professions. In its turn, KEU intends to pass the independent accreditation with American accreditation agency. Being aware of the entire work volume that has to be done for passing such accreditation, higher education institutions are ready to invest their time, human and financial resources to attain the adequate results both at national and international levels. Today many progressive managers of educational institutions prefer to pass the independent accreditation instead of the relevant state certification hence supporting the international integration of the national education system.

The other important aspect is the circumstance that introduction of the independent accreditation has rouse the entire academic community and has induced the creation and implementation of the internal quality assurance system (QAS) in the higher education institutions. Such a tendency is evident: so in USA and the European Union countries implementation of the internal QAS commences with implementation of the independent accreditation. Proceeding from results of pilot accreditations, many panel discussions, meetings with representatives of higher education institutions, the relevant diagnostic outcomes and workshops/trainings results that cover practically all Kyrgyz educational institutions (beginning from 2009), it is possible to note that individual components of the internal QAS have been successfully implemented in some higher education institutions. Meanwhile as of today the vision of the integrated QAS building is lacking as well as the interrelation between the individual processes the approach to the assessment of training results. All these aspects are the subject of study in process of passing the independent accreditation. That is why all progressive higher education institutions are active involved in the development and introduction of the integrated QAS to provide its direct influence on the end product, i.e. the quality graduate from the relevant institutions. Irrespective of the fact that the Ministry of Education and Science of the Republic of Kyrgyzstan (MofES RK) and all higher education institutions have striven for setting up their own quality sections even in the beginning of 2000ies, in the long run they have been established only formally. The real activity of these sections have commenced only since the period of discussions and introduction of the independent accreditation. Previously they act in the university structure in a formal manner, but functionally they have failed to play the role assigned. As a rule, they have been represented by sole employee that held in parallel in the relevant higher education institution the position of the head of quality department, i.e. his employment in the section above mentioned was not his main workplace. Today the approach of organization of the quality department in institutions is changed; accordingly, their role and the importance in the institution structure are also modified. As a rule, they include several primary officers, their authorities are extended, and more attention to the improvement of their

respective potential is paid. All these circumstances are connected with the necessity to form, implement and the further usage of the internal QAS for attaining the quality results; all these functions have to be performed by the individual structural subdivision and not in result of holding more than one office. It seems expedient to repeat that the alterations above mentioned have been dynamically launched upon entering the relevant amendments in law «Regarding the education» dated 2013 within the frameworks of which the independent accreditation have been introduced.

In prospect, the outcomes of the reforms of national approaches to the quality assurance will produce even greater effect both on national and international levels that will reflect in the transition from state certification to independent accreditation. Owing to the results of independent accreditation that are to reflect and take into account the opinions of the various interested parties (government, employers, students and the general public), the qualitative selection takes place among the educational institutions and programs thus resulting to growing competition at the market based on rendering the more qualitative educational services. According to the relevant requirements and criteria of independent accreditation, not every educational institution is in a position to pass assessment by the independent accreditation agencies and, accordingly, withstand the market competition. The attitude of employers, students and the society that allow it to realize that they are also the part of education and may affect the accreditation results is also modified. Therefore they recognize the partial responsibility for the quality of services that may be rendered by educational institutions. Consequently, the independent accreditation becomes the more transparent and efficient instrument for revealing the inappropriate and low-grade educational institutions and programs and identification of the most successive programs thus simplifying the institution selection for parents and applicants; as regards the employers they are simplifying the selection of specialists graduated from the various higher education institutions.

The striving of higher education institution to pass international accreditation (i.e. the accreditation in the recognized foreign accreditation agencies) for the purpose to mutually recognize the relevant diplomas thus providing the academic and labor mobility for their students and graduates that directly impacts the institution competitiveness at educational services market, becomes the factor of paramount importance. In the given situation implementation of the independent accreditation in Kyrgyzstan becomes the launching pad for entering the national higher education institutions into the international educational environment as far as the methodology and criteria applied by accreditation agencies are in accordance with international practice.

Operation and activity of accreditation agencies is another one important issue of providing the quality and transparent procedure of the independent accreditation. One part of the society does not support the accreditation institute; they don't express confidence to operation of accreditation agencies and presume that such system may discredit itself and become another one component of corruption schemes existent in the education system. It seems expedient to admit that such risk really exists; nevertheless, transparency of the agencies in many aspects will depend on the primary agencies selection that will be recognized by National accreditation council (NAC) acting under MofES RK in charge of certifying agencies authorized to run accreditation. The quality of work of accreditation agencies will depend on its content determined by NAC and the relevant criteria applicable to the agencies selection. Therefore, the primary selection of the adequate, quality and open agencies shall determine the transparency and quality of the entire national independent accreditation system. As of today, there are 3 accreditation agencies that possess the full methodological and expert base; they are ready to proceed to their principal activity. All 3 agencies have been set up in result of the various projects, as follows: EdNet – the first accreditation agency in the higher education system created within the frameworks of TEMPUS CANQA project; accreditation agency in field of professional and engineering education created within the frameworks of GIZ program, and agency for accreditation of engineering programs created within the frameworks of QUEECA project. Two of these agencies already possess the adequate experience of running the pilot accreditations, and the prepared experts base who works on preparing the systems of higher and professional education for independent accreditation by running various workshops, trainings and information meetings. Moreover, EdNet is involved in the performance of diagnostic of the internal processes in higher education institutions, the internal QAS. Purpose of this activity is the assessment of the level of preparation of institutions of independent accreditation and working out the relevant recommendations for the quality

improvement. It is important to note that methodological base of all three agencies has been formed on the basis of European standards and ESG manuals and upon the close cooperation/consultations with foreign experts in field of quality supporting the development of such standards and procedures in accordance with international practice of independent accreditation. Such an approach has been elaborated for the purpose to bring nearer our educational system to the comparable international education quality requirements to provide recognition of training results of the local educational institutions in the international environment.

It is necessary to remember that the agencies should be interested in the transparent and quality accreditation process as far as the struggle at the accreditation services market shall be reflected not only in choosing by some educational institution the specific accreditation agency but in their respective outcomes duly recognized by the employers, parents, students, graduates and the society as a whole. All these factors created the rather rigid and definite requirements applicable to the agencies' operation; later on they shall be playing the major role in process of the secondary selection and survival of the agencies. Besides recognition of agencies at the local market, it seems important to provide also their recognition by the other foreign organizations/associations of accreditation agencies that shall also impact running their transparent activity. Meanwhile, to gain international recognition, first of all the agencies should be recognized by their own national system. In Kyrgyzstan the relevant regulatory legal acts (RLAs) related to accreditation are not yet adopted; accordingly we're not talking of any national either the international recognition. For instance the issue of developing the accreditation-related RLAs has been considered on Feb 24, 2015 during a meeting of the Parliament Committee for education, culture and sport; in course thereof the new timeframes of the developing and approval of RLAs (June 1, 2015) and the introduction of the independent accreditation (Sept 1, 2016) have been outlined. Committee chairman and parliamentarian Osmonaliev Kanabeck Osmonalievich has noted that the history of accreditation has counted 150 years all over the world and that international accreditation would allow it to take the adequate independent decision regarding the activity of higher education institutions without any official pressure. The government shall be assigned only the function of issuance the appropriate license authorizing the holder thereof to exercise educational activity. In the long run, in case of recognizing the accreditation agencies on international level the relevant benefits shall be gained by all the interested parties (i.e. students, professors and scientists) who possess the great opportunities to take part in the other international educational programs and gain training in foreign educational institutions. According to Kanabeck Osmonaliev, «in case of state certification and state accreditation all this work (the relevant outcomes) shall be assigned only to MofES RK. In situation of independent accreditation the main players are represented by the employers, civil community and international organizations. Accordingly, accreditation system realized by independent organizations seems the most preferable». All the relevant accreditation RLAs (i.e. the procedures of recognizing education-related accreditation agencies and procedures of accreditation of the educational organizations and programs) have been authorized on Sept 29, 2015 (Resolution No 670). Meanwhile the discussions to determine the minimum requirements for educational programs on all levels of the education system are still in progress and to the end of 2015 they are not completed. In spite of the fact that originally in the professional environment the development of the unified standards has been presume, now it is evident that the framework requirements to systems of basic professional, secondary professional, professional engineering and the higher education shall differ from each other. In this connection as of today in a quality of potential minimum requirements are deemed criteria developed within the frameworks CANQA, DOQUP and QUEECA projects. Meanwhile it is reasonable to note the standards of all these three projects are not contradicting to each other because they are based on ESG.

It is necessary to realize that in the education system there is still a lot of unsolved issues related to independent accreditation. But it also seems expedient to realize that if Kyrgyzstan is aimed at the further qualitative development of the educational system in accordance with international criteria, the accreditation is an important and progressive step forward. Often an opinion is expressed that state control over quality in our country is already obsolete and is not capable to promote the dynamical development of educational system and it is a time to change the system in line with international practice. Hence the occurrence in our country of the first internationally reputed educational institutions shall depend upon the duration of passing on the independent accreditation system. The progress in this respect has already commenced; as of today, the major factor is continuation of this process to provide as soon as possible the implementation of accreditation for the purpose of its further support. Meanwhile the lack of the requisite legal documents and mechanisms is the major obstacle for progress in field of the education quality in spite of all work that has been done by individual organizations and educational institutions, the degree of readiness of individual players of the entire independent accreditation system.

In Kyrgyzstan, the quality and education have to become synonyms, and as of today the independent accreditation is one of the tools that would help us to achieve this objective. Of course, this is a hard, but positively attainable way.

Strategic aspects of the development of engineering education in Tajikistan

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Abstract

The article examines the strategic aspects of engineering education in Tajikistan in the context of globalization. The research on globalization and its impact on education show positive as well as negative trends. The authors propose steps to mitigate the threats of globalization to the national system of higher education and bring rationales for identification of strategic priorities for the development of engineering education in Tajikistan. They also evaluate international cooperation and its role in the implementation of joint programs to improve the quality of engineering education.

Globalization is a developing process, which has a long-term nature, and applies to all aspects of human facets. Despite the positive effects of globalization, the world community is still concerned with its magnitude and speed of distribution on all spheres of life provoking relevant threats. Higher education is not an exception. Global economic changes lead to the emergence of new international linkages in higher education and directly depend on global processes. Currently, there are different and even opposite points of view on the nature, causes and consequences of globalization of higher education.

With the development of globalization, the importance of knowledge as a factor of economic development has increased significantly. No country can guarantee its political and economic independence without an effective system of higher education and scientific research organization. For this reason, all countries are interested in the process of building adequate national systems of higher education. Due to the fact that the economies of many countries are becoming transnational, universities must build the ability to adapt to this trend and to cope with new challenges in their students.

There are many global trends in higher education of the twenty-first century, which apply to many countries. Among these trends we can name the following:

- an absolute increase in the number of students: in 1960 the number of students in the world was only 13 million people, and according to UNESCO, by 2025 the total number of students in the world will increase to 260 million people;
- global internationalization and openness of education;
- the rising cost of higher education and its expenditures;
- using of technologies in education;
- development of distance learning;
- the growth of the age of the students due to the need for multiple skills throughout life;
- the extension of the influence of the Anglo-Saxon system of higher education under the scheme of multi-level education: bachelor – master – doctor, which requires the transformation of national higher education systems;
- the dominance of the English language, partly due to the globalization of telecommunication technologies;
- development of a system of quality control of education, which takes the leading position in the global market of educational services.

Globalization of higher education also demonstrates itself in various forms such as:

- mobility of students and teachers;
- internationalization of curricula;
- transnational education;
- joint programs, dual and triple diploma;
- different types of trade in educational services.

Current realities indicate that globalization removes national borders, but develop common global criteria for assessing the quality education requirements for the organization of training programs and professional qualifications. At the same time such trends in the development of higher education, the increased importance of the competitiveness of individual countries, violate countries' traditional and socio-cultural orientation, facilitating the formation of the higher school not as a separate social institution, but as a part of the economic relations and primarily market relations.

The processes of globalization have created preconditions for the emergence of a new sector of the world economy – the global higher education market, which is now becoming one of the largest sectors of the global trade. Higher education, especially in economically developed countries, is developing as an export industry of those countries' national economies. The processes of formation and development of the global market of educational services are aimed to transform the educational product for global market for profit purposes similar to the establishment of industrial transnational corporations.

According to current estimates the global market of educational services is about 45 billion dollars. The US controls 40% of this market, second place is the UK, then Canada, Australia, New Zealand, East and South-East Asia. In the U.S. the number of foreign students is 31% of the total, in the UK 16%, Germany - 12%, France - 8%, Australia 8%, Russia - 4%.

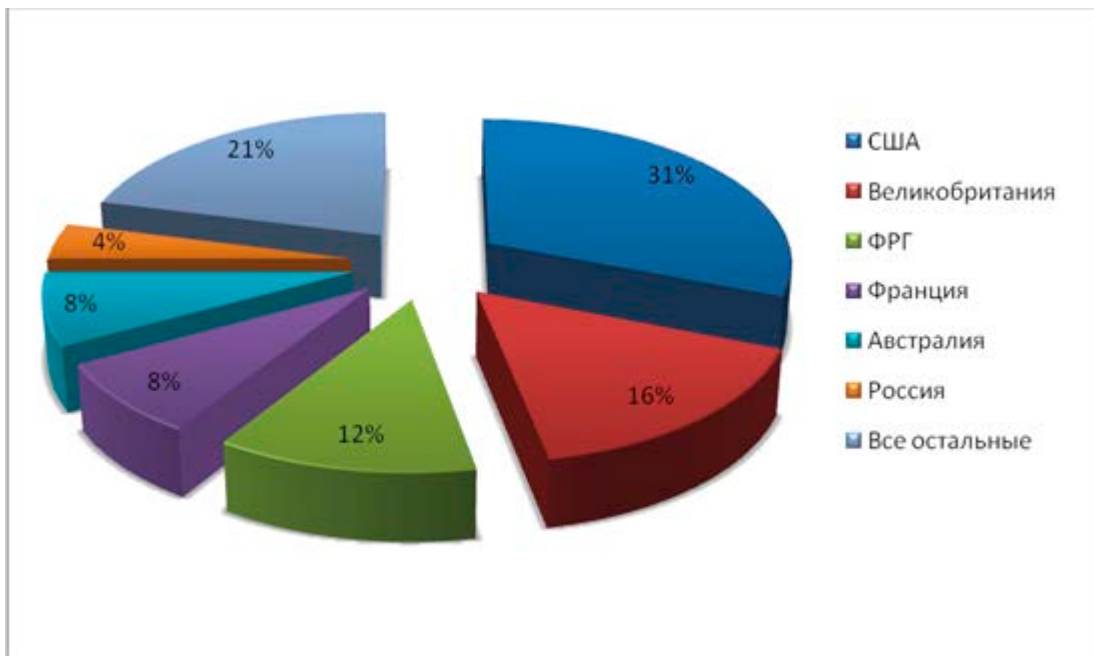


Figure 1. The structure of the world market of educational services

One of the leaders in exportation of educational services is Australia. In Australia, the tertiary education costs lower almost by double compare to the average cost of education in the US. The English language of the Australian education allows access to Australian universities to European and American students, which

certainly increases its attractiveness and competitiveness. About 10% of gross domestic product of Australia is formed from education through the education of students from China, Taiwan, Malaysia and other Asian countries. A similar policy on the export of education is carried out in Netherlands, where 30 major universities have high international rankings and a significant proportion of international students.

One of the trends of the global education market is the growth in the number of exporters. For example, if Republic of China was an importer of educational services of 5-6 billion dollars a year, now this country is positioning among exporters of educational services. The balance is changing also for Malaysia, Gulf countries; however, Latin America and Africa remain as importers. In CIS countries, there is a trend of the predominance of imports over exports in the field of education.

In Tajikistan, the export of services in the sphere of education is about 300,000.00 US Dollars. For some countries it accounts for more than 90 % of all export of educational services. Imports of educational services are amounted to approximately 1,250,000.00 US Dollars, which is 4 times higher than exports. The import of educational services from the CIS countries is only 13 %. The total number of students enrolled in the 2012-2013 academic year in 34 universities in the country is one hundred and fifty thousand or 1,88% of the total population.

Research of national and international markets of educational services allows to conclude that globalization in higher education can provoke threats to sustainable economic development of developing countries as well as to their national security in general. Globalization, in one way or another, forcing developing countries to reduce the role of government in education, which may pose a threat to countries with weak national labor market and an unstable economy.

The education system in general and higher education in particular, as a socially significant sphere, has always been within the exclusive competence of each government, and the universities of different countries had distinct national orientation and function. At the present time there is an opinion that universities are international by nature and the role of government should be minimized. Also, the practice shows that the global crisis in the economy of recent years highlighted and reinforced the value of education set by the governments, including the governments of the developed countries, linking funding for universities and the performance of the country.

The notable characteristic of globalization is the migration of the population, including people with higher education, which also requires appropriate government intervention. The latter is particularly important for developing countries, including Tajikistan. It is known that the skilled and high value workforces are characterized by greater mobility and are able to effectively find their market niche. In the context of globalization, all countries try to attract talented professionals and skilled workers, providing them working visas and letting them to enter labor markets.

Also, the global market for higher education determines the need for global approaches to identify the quality of education and to develop common criteria for evaluation. There are evolving prerequisites for the organization of international systems of licensing and accreditation as a tool of enhancing the international mobility of professionals. International experience shows that the response of governments to these processes characterized by the desire to protect the national education market, to preserve the achievements of the development of the national system of higher education and its identity using the complex mechanisms of accreditation and licensing.

One of the contradictions of globalization is the language of instruction. What language should students learn in the context of globalization? For the last 20 years, in European countries higher education was dominated by the trend of English languages as an alternative to mother-tongue education. The predominant part of the Tajik students is not motivated to learn foreign languages. The problem is complicated by the low education quality and their unpreparedness because access to Internet resources and literature demands the appropriate level of knowledge of Russian or English languages.

It is obvious that higher education can no longer be provided only within the national borders of the country. Higher education has become global. Today, the universities of Tajikistan cannot ignore the processes of globalization and strategic priorities include not only domestic demand for specialists.

Highly qualified specialists created by higher education are integral parts of national wealth. In the context of globalization, the importance of higher education in the sustainable development of Tajikistan and its economic security is obvious.

In Tajikistan engineering specialists are a strategic resource and their qualities largely determine the competitiveness of the national economy. There are many researches about the importance and a dependence of the economy on knowledge. We cannot deny that the quality of engineering education is a result of the joined activities, not only the university itself, but the whole society as well. It is also a system of indicators that fills the definition of “quality of training”. The quality of engineering education in the country reflects the structure of its exports as well. Tajikistan exports aluminum, cotton fiber, fruits and vegetables. Migrant workers are mostly uneducated part of the population. Machines, equipment and technologies are not export products here, unlike the U.S. and Japan, which account for about 40% and 42 % respectively.

One of the global challenges for the national higher education including engineering education is Tajikistan’s accession to the WTO and the Bologna process as well as attraction of foreign capital for the development of natural resources. It is clear that the evidence of the ability to achieve sustainable economic growth is in ways in which national governments are developing and reforming their systems of higher education in response to the influence of globalization processes. Tajikistan, as well as the vast majority of countries of the world community, does not deny the connection between national higher education systems with the processes of globalization. The analysis shows that in order to mitigate the threats of globalization countries are required to develop an adequate reaction of the higher education of Tajikistan, providing the ability to adapt to new conditions and take advantage of the chances offered by globalization. Turning globalization threats into a stimulus for the development of higher education requires the development of governance at the national, regional and university levels, which should be based on the understanding of the relationship of what is happening on the educational market in order to develop policies and the selection of an appropriate model of higher education.

Education is one of the areas, often lagging behind the development of the economy, so it especially requires some planning. Strategic plans for the development of engineering education should be linked with the relevant policies of other sectors of the economy, which create demand for engineers and research in science.

Strategic priorities for engineering education in Tajikistan include

- the compliance with the requirements of the modern economy – the knowledge economy;
- extending the links between engineering universities and the real economy;
- participation in international and national competitions for grants for projects with participation of international experts and students;
- focus on new systems and methods of standardization, which would increase the chances of academic research and creativity;
- creation of research clusters (power and energy, power engineering and construction etc.);
- initiating the organization of the dissertation councils in Tajik universities, including foreign ones;
- creation of research centers combining science and the commercialization of scientific achievements;
- implementation of programs of training of the engineering staff, which are the demand of local industry and enterprises

There are already positive results from the implementation of development strategies of engineering education. There are various of areas of cooperation of Tajikistan with the EU in the field of engineering education including implementation of joint projects to improve the quality of education, development of joint learning programs, research and mobility of faculty and students.

The Tajik Technical University actively participates in international projects in the field of training engineers. The University has successfully implemented international projects of the EU “Tempus”, “Erasmus+”, the virtual university of the SCO, and project on networking universities of the CIS. As part of the university’s development strategy until 2020 there is a program, which will be rating research and publication activities of

the faculty, which will help to increase the professional level of faculty members.

The development of international cooperation as a priority of our strategy is reflected in the active implementation of joint training programs of engineering and scientific-pedagogical personnel with the CIS countries (Russia, Belarus, Ukraine, Kazakhstan), the European Union, China, USA. There is a notable change in the development of the mobility of students and faculty members.

International standardization of education can be seen as a form of global social control of higher education. Improving the quality of higher education involves the creation of a set of agreed standards, procedures and guidelines for quality assurance, and exploration of ways of creating an adequate harmonized system of quality assurance and accreditation agencies and organizations involved in the evaluation of quality in higher education.

In the framework of the international projects the Tajik Technical University named after academician M. S. Osimi is developing a comprehensive mechanism to ensure the quality of engineering education, which will provide internationally accreditation of educational programs, will attract potential employers to evaluate the quality of engineering education and will allow to establish a public, professional accreditation board of engineering programs. Accreditation of educational programs will allow the university:

- to obtain an independent assessment of the quality of educational programs and training;
- to demonstrate a commitment to quality education;
- to receive recommendations for the improvement of educational programs;
- to increase the competitiveness in the market of educational services;
- to ensure the competitiveness and mobility of graduates of engineering Tajik universities.

In the framework of the project “QUECCA” of the EU Tempus program (Erasmus +), international experts were able to assess the quality of engineering education by accreditation of the two most popular educational programs in our country: “Electrical stations” and “Designing of buildings and constructions”. A positive result of the project “QUECCA” also includes the active participation of representatives of business entities in the preparation of training plans and evaluation of the quality of training of engineering personnel. The representatives of the engineering business in the framework of the project “QUECCA” were prepared as certified experts in auditing educational programs. Today, they have all the international qualifications for assessing the quality of training programs for engineers; these experts also conduct effective personnel policy in their companies, and for their customers. Thus, education and training are becoming permanent parts of the business strategies of the industry.

The continuity of the project “QUECCA” is ensured by the creation of the center of public accreditation of engineering programs. Currently, the Ministry of Education and Science of the Republic of Tajikistan with the support of the EU, initiated a large project on international accreditation of educational programs of Tajik universities. Certified experts in auditing the quality of educational programs, prepared in the framework of the project “QUECCA”, will actively participate in the implementation of this new project.

About carrying out the tasks of the project QUEECA: the partner TSTU from Uzbekistan

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1. Introduction

According to the Law “On Education”, the quality of education provided by the state educational standards (SES), which contains detailed information on the structure and content of the curriculum, quality control, training, mandatory components (list of disciplines), and a description of learning outcomes competences [1]. Quality assurance, certification and accreditation of educational institutions of all types, as well as educational programs are a top priority. The curriculum - a normative document, which defines the range of basic knowledge, skills and abilities to be assimilated for every single school subject, approved as part of the curriculum in a particular direction in conjunction with the SES. [2]

The quality of higher education is provided by the SES, which establishes the minimum requirements for each level of education, determine the main characteristics, structure, content and implementation of curricula, quality control knowledge in a specific discipline.

In the development of the state educational standards main attention focuses on the integration of science, education and industry, as well as better coordination of activities of universities with the requirements of the labor market. In order to strengthen cooperation between universities and enterprises there are established bilateral partnerships between universities and manufacturing companies in their respective sectors of the Uzbek economy. Due to the strengthening of ties universities receive assistance in updating and improving the curriculum to meet the requirements of the manufacturing sector, as well as the latest scientific and technological development and equipment of material - technical base.



2. The main objectives in line with the objectives of the project.

In recent years, Tempus projects in Uzbekistan have opened opportunities for the development of new curricula and courses at undergraduate and graduate programs. This work is carried out mainly in technical areas and application technology according to the requirements of the local market needs of enterprises, ministries, chamber of commerce and other non-academic institutions [3.4].

In this regard, cooperation with European universities in the framework of the Tempus project contributes one way or another, promoting the principles of the Bologna process [5].

Today, the main goal of the modernization of higher education is to ensure quality through the further development of SES and strengthening structures for the assessment and accreditation, as well as capacity building of the teaching staff, and improving the material and technical base.

It is necessary to introduce a qualitative change, based on the experience of an international certification, accreditation of educational programs in the field of engineering education.

In this regard, the project «QUEECA: quality of engineering education in Central Asia» 530326-TEMPUS-1-2012-1-IT-TEMPUS-SMGR is very relevant.

The aim of the project «Quality of Engineering Education in Central Asia» (QUEECA) is the creation and implementation of a system to ensure the quality of engineering education (IO) in the countries of Central Asia, a fully developed until the accreditation of engineering education programs as pre-service training (i.e. accreditation of engineering education programs).

Based on the aims and the main issues of the project the following issues, which are must find their solutions may be allocated for the Republic of Uzbekistan:

- Establishment of the National Society for Engineering Education in Uzbekistan in partnership with SEFI and IFEES;
- Adaptation EAFSG and formulating similar standards CA (CAEAS) in Russian and English languages. The formulation of the final version SAEAS based on the results of trial accreditations;
- Education accrediting employees - experts on accreditation of engineering education programs;
- Accreditation of engineering education programs with the participation of international and national teams and the implementation of the local accrediting inspection staff;
- Carrying out the first pilot program accreditation of training engineers in Uzbekistan awarding signs EUR-ACE;
- Creation of the Accreditation Centre in Uzbekistan;
- Finding ways to address the organization self-supporting organization for accreditation after the completion of the project.

To solve these problems, in accordance with the project QUEECA there have been identified the following steps:

1. Analyze the experience in quality assurance and accreditation of engineering education in foreign countries;
2. Prepare specialists with knowledge of the English language, including technical English. Organization of an intensive English language course;
3. Create the association of engineering education in Uzbekistan;
4. To study the international experience of accreditation of engineering education programs;
5. Carry out preparatory work for accreditation;
6. Develop educational programs for accreditation;
7. Prepare documentation for the accreditation of educational programs for selected self-examination
8. Carry out an audit of the educational program;
9. Identify ways to create a center of accreditation;
10. To disseminate the project results QUEECA through other universities of the republic;
11. Participate in seminars, meetings, conferences and forums held by direction of the project;
12. Conduct local workshops on the project objectives and results of accreditation.

3. Study the experience and the realization of quality assurance and accreditation of educational programs

For the implementation of the tasks management phases within the Republic of Tashkent State Technical University are carried out by the project. Original details on the purpose and objectives of the project was devoted to the first meeting of all partners in the project organized by the main coordinator of the project QUEECA University of Florence 27-28 November 2012 [8]. In this seminar the reports of the European partners about the main provisions and objectives of the project were heard and their implementation as well. The organizational and financial issues were considered, coordinators for the republics were identified, as well as project management. Representatives from Uzbekistan familiarized with the issues of the Association for Engineering Education in different countries. This seminar earned the union of all the representatives of 28 partners from 8 countries in the solution of a problem - ensuring the quality of engineering education. We received very useful information and reports about the project and its relevance in the present stage of development of science and technology.

The experience of Kazakhstan in the field of engineering societies and accreditation of educational programs were given, it was decided to hold the first forum of the project QUEECA Tempus hold on 3-4 April 2013 in Almaty (Kazakhstan).



The meeting was a seminar on 27-28 November 2012

The first forum was organized by the project QUEECA Kazakh Society for Engineering Education and the National Academy of Sciences of the Higher School of Kazakhstan on 3-4 April 2013. The reports of the main coordinator prof. Claudio Borri (Italy), coordinator of the project partners, GM Mutanova (Kazakhstan), Alfredo Skvartsoni (Italy), TM Magrupov (Uzbekistan), AD Akhrorova (Tajikistan), OA Umankulovoy (Kyrgyzstan), Jose Carlos Kvadrado (Portugal), Mehmet Karamanoğlu (UK), JP Pokholkov (Russia) and others were heard in the Forum.

The reports focused on experience of the EU to create a society of engineering education and accreditation center, the use of the framework of standards for accreditation of engineering programs in the EU as well as the

status and problems in the field of quality assurance and accreditation of engineering programs in the republics of Central Asia.

The Forum discussed issues of regional cooperation, national and transnational issues of recognition, creation and development of national accreditation procedures and harmonization with the European framework for the accreditation of engineering education for sign EUR-ACE.

To ensure the successful implementation of the project objectives there have been accepted decisions by Project Board QUEECA:

- Take into account the differences in educational standards related to the training of engineers;
- To recognize the existence of different approaches training of engineers in the Republic;
- Determine the need for international recognition of diplomas of engineering education, as well as compatibility and certification of engineering specialists;
- Show your commitment to the integration processes in the world educational space;
- Note the development of partnerships to improve the quality of engineering education and training of engineers in Central Asia;
- Co-operate the further implementation of the project QUEECA «The quality of engineering education in Central Asia», which is an important mechanism for improving and assessing the quality of engineering education;
- Continue the study of accreditation and quality assurance of relevant experience of the world of engineering associations (e.g., KazSEE, FEANI, SEFI, ENAEE, RAEE, IFEEES) for further use in the countries of Central Asia;
- Co-operate the development of the Central - Asian Engineering Education Societies to develop a framework for a unified system of accreditation of engineering programs to improve their quality in the Central Asian region, using KazSEE experience;
- Encourage the practice of transnational recognition of engineering qualifications and facilitate mobility of engineering specialties taking into account the regional economy and integration in Central Asia and in the world educational space.



First Meeting of the Forum on 3-4 April 2013

The successful solution of the project tasks largely depends on the system of monitoring, which is determined and controlled by their current implementation. In this regard, June 5, 2013 at the Tashkent State Technical University named after Beruni was conducted the monitoring on the project under the direction of coordinator QUEECA NTO Uzbekistan Aziza Abdurahmanova [10]. The monitoring of the project was attended by teachers and students of TSTU and TUIT. The issues related to implementation of the project objectives and expected results at this stage of its implementation were considered.



Meeting monitoring from June 5, 2013

It should be noted that the creation of engineering societies and accreditation of educational programs is the main problem of the project QUEECA. On 16-17 June 2013 was held the “International Seminar on Development of National Engineering Education Societies in Central Asia - Uzbekistan” in Tashkent State Technical University with the participation of representatives of the Tempus NTO Uzbekistan [11]. There were heard and discussed the reports of Rector for Academic Affairs Prof. TSTU. M. Karimov, project managers QUEECA Guberti Elisa (Elisa Guberti, Italy) and Prof. TSTU. Magrupov T M, as well as representatives of Kazakhstan and Tajikistan. The reports noted the work performed by the partners and the prospect of the development of modern engineering education through the implementation of European experience in the organization of the process of accreditation of engineering education programs, the role of engineering societies and accreditation centers in the partner countries, as well as the active participation of universities aimed at strengthening international cooperation in the academic field. The issues of the organization and the development of activities of Society for Engineering Education and Accreditation Centre were also considered. The coordinator of the Tempus NTO Uzbekistan Aziz Abdurakhmonova attended in the discussions with her valuable recommendations.



Meeting of the international seminar on 16-17 June 2013

Based on the reports of the workshop participants put forward the following points:

1. Issues related to provide quality of engineering education are important factors that affect the quality of the education system as a whole, as well as in the preparation of engineering specialists.
2. QUEECA is a project of Tempus, aimed at the development and implementation of quality assurance system of engineering education in the countries of Central Asia, aimed at pre-professional accreditation of engineering programs. This accredited program must meet the same criteria (have prerequisites) for the award of the quality label EUR-ACE, i.e. meet the standards framework EUR-ACE and the European standards and guidelines for quality assurance in higher education.
3. Analysis of the results and materials for the project at this stage of the project shows the need to improve the system of engineering education in the partner countries from Central Asia.
4. Creation of the National Societies of engineering education in Central Asia, which should provide connection “education-science-production” and coordination in the field of engineering education.
5. Taking into account the European experience in the field of accreditation of educational programs, it is advisable to introduce the creation of accreditation centers and procedures for accrediting employees.
6. In order to achieve tangible results and effective implementation of the project it is advisable to carry out the accreditation of a number of engineering educational programs
7. On the basis of studying the experience of international accreditation, particularly ENAEE, define procedures for accreditation of engineering education programs.

ENAEE - European Network for Accreditation of Engineering Education is an accrediting center, which aims at creating and maintaining a pan-European system of accreditation of engineering educational programs in Europe, which implemented the project of EUR-ACE. EUR-ACE Project proposed the creation of the framework of the European system of standards and accreditation of engineering education programs. In this regard, the draft provides for the implementation QUEECA framework of standards and accreditation system of engineering education programs of technical universities in Central Asia.

It should be noted that the international accreditation of engineering education programs enable the academic and professional recognition of educational programs and mobility.

In this context, the solution of problems related to the quality of engineering education programs are dedicated to UZ Forum: National Scientific and Practical Conference “Actual problems of quality management of engineering education: Theory and Practice” project “QUEECA - quality of engineering education in Central Asia”, organized in Tashkent State Technical University on 29-30 May 2014 with the participation and support of the project partners in the framework of the planned activities.

In conference attended the representatives of the Ministry of Higher and Secondary Special Education, Coordinator of the National TEMPUS Office in Uzbekistan, the European and Central Asian partners of the project “Quality of Engineering Education in Central Asia”, representatives of universities, employers, academic institutions, business of the Republic of Uzbekistan and, students of TSTU.



The participants of the conference, May 29-30, 2014, Tashkent



UZ-Forum: The National Scientific and Practical Conference “Actual problems of quality management of engineering education: Theory and Practice”, Tashkent, on 29-30 May 2014



Speech Abdurahmanova AK, national coordinator Tempus Office in Uzbekistan

After the reports and presentations on the results of the conference participants adopted a conclusion.

The conference was held in a business like and fruitful atmosphere. Having heard and discussed reports and presentations on the current and planned activities of the project, expected results. Comprehensive discussion undergone state and prospects of development of modern engineering education through the development and implementation of new approaches to the accreditation of engineering programs, the role of engineering societies in the partner countries, the activities of higher education institutions, aimed at promoting international cooperation in the academic and scientific spheres.

The conference, being guided interest in the project full and comprehensive implementation of the objectives to promote the reform and modernization to improve the quality and efficiency of higher education, creating the possibility of higher education institutions in the partner countries and the EU for international cooperation and the process of modernization, support for the positioning of universities in society , human resource development and improvement of mutual understanding between cultures and EU partner countries, as well as stating the need for effective and timely implementation of planned activities and the provisions of the draft, there were noted the following:

1. Draft QUEECA Tempus program aims at creating and implementing a system to ensure the quality of engineering education in the countries of Central Asia, particularly in Uzbekistan.
2. The results for the current period of the project, point to the need to improve the system of engineering education in the partner countries from Central Asia, in accordance with the requirements of employers, to meet the criteria and requirements for the content of professional standards of engineering education.
3. The project provides pre-professional accreditation of engineering education programs. This accredited program must meet the same criteria for the award of the quality label EUR-ACE and guidelines to ensure the quality of higher education.
4. The problem of the quality of engineering education in higher education is an important factor, comprising, accredited high school with one hand, and the accreditation of educational programs on the other.
5. Taking into account the European experience in the field of quality of higher education, namely the accreditation of educational programs, it is necessary to provide training for accreditation, as well as methods of organizing the process of accreditation of engineering education programs.
6. In order to achieve real practical results and effective implementation of the project, it is advisable to conduct a preliminary accreditation of educational programs at the choice of universities - partners of Uzbekistan.
7. In order to meet the challenges of the project it is advisable to support the organization of the Association for Engineering Education of Uzbekistan.

In the period of June 9-10, at the University of Florence, was a meeting of the Executive Board of the project (9 Tyunyaev) and Management Board (June 10), the partners from Europe (Belgium, Portugal, Italy, United Kingdom, Germany) and Central Asia (Uzbekistan, Kazakhstan, Tajikistan, Kyrgyzstan) attended in it.

On the agenda of the June 9th were the issues of accreditation of engineering programs. In the morning, I heard reports and presentations G. Augusti (Italy), B. Remaud (Belgium), A. Squarzoni (Italy), JC Arditti (Belgium), S. Farrell (Belgium), A. Rucinski (USA), as well as, D. Grath, G. Heitmann (Germany), S. Gerasimov (Russia), O. Umankulova (Kyrgyzstan).

Then, the reports were discussed and the results of the discussions held on accreditation of educational programs and were identified ways to implement the accreditation in each Central Asian country with the establishment of order in them.

In the afternoon on June 9, we heard reports coordinators- partners from Central Asia - Uzbekistan (T. Magrupov), Kazakhstan (S. Turgunbaev), Kyrgyzstan (O. Umankulova), Tajikistan (A. Ahrorova).

In addition, the reports were deserved on the activities of the project and participants' criticism, partners from Europe and the organization involved in the accreditation of engineering education (ASIIN, ENAEE, ISEL, Middlex University, QUACING, Ruhr University, Bochum, SEFI, University of Rom La Sapienza, USFIT Unigenova)

At the end of the day the reports on the quality of the project, experts from the US and Germany were heard.



Meeting 9 June the University of Florence (Italy)





Speech T.M. Magrupov meeting on 9 June in the University of Florence (Italy)

June 10, it was the fifth meeting of the project management. On this day the work on the project for 1.5 years was analyzed and refined plans. Special attention is paid to conduct training on the preparation of experts' accreditation. On the basis of the training in Bishkek and Tashkent, it was decided to carry out further training in Almaty and Bishkek with representatives of the Central Asian partners on the preparation of the protocol and report on the accreditation of engineering programs.

Finally, the board decided:

- The tasks of the project will be carried out in accordance with the project plan;
- Note the high level of partners;
- To approve a revised plan for the year 2014-2015:
- Prepare the necessary documentation for accreditation

At the University of Porto (Portugal) in the period 15-16 January 2015 was the 7th meeting of the members and the board QUEECA - «The quality of engineering education in Central Asia»- meeting of partners in Europe and Central Asia.

Presentations were made by Claudio **Borri** (Italy), Elisa Guberti (Italy) about the possibility of receiving a mark of quality European engineering education programs. They noted the importance of accreditation of educational programs, to clarify the rules and procedures of the audit. This was followed by the entry of other partners from Europe and Central Asia. Each of them made a report on the feasibility of the audit, and noted financing and receipt of the expert committee, with the term of the audit. Thus defined the terms of the audit for each Central Asian country with the definition of an educational program for accreditation.

The second day of January 16, there was a meeting of the project management team. The terms of the audit of the educational program were approved and educational program was chosen. By two educational programs for accreditation were identified for each Central Asian country. In addition, they discussed the financial situation of the project and approved the reallocation of the project budget. They discussed the organization of the web

site of the project and requested that each country has prepared materials for this website. In conclusion, the meeting identified the following dates for the meetings and the timing of the audit of the educational program in Central Asia.

In the period of June 29 - July 2, 2015 in the conference SEFI-2015 held at the University of Orleans (France), “Diversity in Engineering Education - the possibility of solving the new trends in technology (Diversity in Engineering Education - An opportunity to face new trends in engineering) “and the Coordinating Council on the draft QUEECA- quality of engineering education in Central Asia all representatives participated.

New trends in engineering education were discussed for the successful implementation of tasks performed by professors –teachers staff of the department “Instrument making “of Tashkent State Technical University on the quality of technical education, and public and professional accreditation of engineering education programs, as well as requirements were defined for types of job training plans and programs.

Currently, special attention is paying to the quality of engineering education in the world. Therefore, this conference SEFI Annual Conference 2015 (European Society for Engineering Education) was devoted to the development of engineering education in the new trends in engineering. The conference was attended by representatives of the members of SEFI HEE (High Education Establishments)- European countries and Central Asia. The reports and presentations focused on the community of universities of the European Union and Central Asia. The bond also was approved by many representatives of the European Union.

In accordance with the program of the conference during the period from June 29 to July 2, 2015 there were discussed the problems: innovative pedagogical approaches to improving engineering education; variety of engineering education and engineering education; tenders and diversity in engineering education innovation programs; the inclusion of business - cases of technical studies; engineering education as a vector for social development.

The conference began on June 29, 2015, in the plenary session the issues of quality of technical education, the practice of training programs in public or online modes were discussed, as well as innovation in engineering education. The plenary session decided that in future meetings will be held on the sections in accordance with the issues of the conference, in separate working groups in parallel.



On the second day there was a coordination meeting of QUEECA. After, the report Claudio Borri and Carlos *Quadrado* and participants from Poland, Germany and the UK as a technical education and socio-professional accreditation of engineering education were heard. They discussed joint efforts to ensure the quality of engineering education in the universities of the European Union. We made a report on the experiences and results of the project QUEECA in Uzbekistan.



The conference lasted till the 1-2nd July, 2015. We participated in a group of quality and innovation in engineering education. Reports were presented and issues of quality of engineering education on the themes: “Research for Engineering Education”, “New training concept for Engineering Education”, “New ways of development in the field of engineering education”, “Accreditation of Engineering Education”. “Ensuring the quality of engineering education.” were discussed.

In addition, the familiar engineering education programs have received a sign of quality EUR-ACE European Commission ENAEE, which enables the preparation of engineering education program to the European accreditation in accordance with the requirements, criteria and procedures for quality assurance of training programs.

Every meeting with experts in engineering education has enabled the strengthening of ties with the engineering society of foreign countries and the establishment of contacts in the solution of engineering problems in the field of science, technology and education. It is important to establish the Association of Engineering Education in Uzbekistan.

4. Creation of the Association for Engineering Education in Uzbekistan.

The main objectives of the Association:

- Assistance improvement and development in Uzbekistan engineering education and engineering activities in all their forms, relating to the educational, scientific and technological fields, including the processes of teaching, consulting, research, development, engineering solutions, technology transfer, a wide range of offering educational services, providing public relations, production, science;
- To create conditions for the most effective realization of creative potential members of the Association for the development of scientific and technological progress and innovation development;
- Representation of legal interests, contribute to the protection of professional, civic, social, copyright and related rights of the Association members;
- Development of international relations and contacts in the field of engineering education, facilitating the integration of Uzbek scientists, teachers of technical high educational institutions and professionals with engineering education in the international scientific and educational space.
- Co-operate to system building and creating the conditions for the preparation and formation of a new generation of highly educated professionals in the field of engineering, able to implement sustainable dynamic economic development and breakthrough development of various areas of practice;
- Develop and constantly update the doctrine of engineering education, participate in the development of educational standards;
- Promote the concentration of the engineering potential of Uzbekistan, members Association on breakthrough technologies and directions, creating conditions for the full life of the population of Uzbekistan;
- Contribute to the reconstruction and development of engineering schools in Uzbekistan, effective use them to develop a strategy for sustainable development of the country;
- Carry out active life, aimed at uniting the efforts of the government, educational institutions, organizations, enterprises and the public for the implementation of the priority development of engineering education based on progressive pedagogical ideas, the use of “high” educational technology, a combination of the best traditions of domestic and foreign training of engineers’ experience;
- Conduct an independent social and scientific expertise of public and private programs for the development and improvement of engineering education in Uzbekistan, legal acts, research programs, development, inventions and discoveries in accordance with the signed agreements in the established order;
- Conduct research problems of vocational education, promoting the formation of new organizational structures of education (distance teaching “virtual university”, continuing education, etc.);
- Organize public and professional accreditation of educational programs of vocational education in accordance with international standards, as well as increase mobility of students’ academic mobility to improve the quality of engineering education;
- Improve the system of retraining and qualification faculty of engineering universities and engineering body of the country;
- Promote the establishment and development of relations and cooperation with the unions, funds and foreign institutions, organizes mutual exchanges of professionals, trainees, and doctoral students
- Promote new educational technology training of engineers, leaders of engineering education around the world;
- To participate, organize and conduct scientific and methodological and scientific-practical meetings, conferences, symposia, seminars, creative discussions, academic reading on engineering education and engineering activity;
- Create a website on the Internet, WWW-servers on *engineering* education.



The initiative group “Association for Engineering Education of Uzbekistan”

Finally, organize a “round table» QUEECA involving teams TSTU, TUIT and organizers of “Association for Engineering Education of Uzbekistan” and representatives of various organizations and universities.

Representatives from employers, universities, research institutes of the Academy of Sciences of Uzbekistan, as well as business and students under the direction of Jose Carlos Kvadrado, President of the Institute of Engineering of Lisbon, Portugal attended in the discussions.

Discussion leader proposed the following objectives for the discussion and decision-making:

- The role and prospects of development of the Association to improve the quality of engineering education in the country;
- The role of science and technology training;
- To determine the requirements for the level of skill of teaching staff of the university;
- To define the requirements for knowledge and skills of students;
- Studying the requirements and meet the needs of employers;
- Ways and means to achieve the quality of engineering education;
- The place and role of the laboratory practical classes, course projects, professional practices to improve the quality of engineering education, and others.

For the objective discussion was formed 3 groups of 8-10 participants for the preparation of decisions and proposals. After a meaningful debate and discussion group leaders reported progress reports and a decision on the content of discussions.



Discussions in the group 1



Discussions in the group 2



Discussions in the group 3



Final Discussion

Unique view of participants, reflected in the outcome document highlights the need to improve the quality of engineering education through the organization of the Association for Engineering Education in Central Asia.

5. Preparation of experts for accreditation

Educational Programs

The main objectives of the project QUEECA «The quality of engineering education in Central Asia (QUEECA)» - are to prepare experts for accreditation of engineering education programs. The content of the project in accordance with the program of European Network for Accreditation of Engineering Education (ENAEE) was provided for the implementation of the training of experts for the accreditation of educational programs. To education experts scheduled training seminar on “Accreditation of engineering programs” consisting of three parts:

- the main provisions and objectives of the accreditation of engineering education programs;
- practical solution to problems of educational programs accreditation;
- a customized solution for the specific tasks students object, i.e. according to the direction of education undergraduate or master specialties of choice students.

In this regard, during the period of May 26-28 2014 “by the Association of Engineering Education of Russia” conducted seminars in Tashkent State Technical University.



The participants of the seminar-training on 26-28 May 2014 TSTU, Tashkent, Uzbekistan

To participate in the seminar for the selection of students in TSTU and Tashkent University of Information Technologies (TUIT) - the main partners of the project QUEECA - commission was established. Invited to the seminar on the faculties of TSTU 7 employees TUIT - 4 for the preparation of proposals from faculty members to participate in the training seminar. On the basis of proposals from university departments Commission were selected 36 participants from TSTU - 30 and TUIT - 6.

The first day was held seminars on the topics:

1. Development of a system of professional accreditation of educational programs;
2. The criteria and procedures for accreditation of educational programs;
3. Procedures for self-study high school and educational programs;
4. Audit of the educational programs of the university.

On the second day on the basis of the skills and abilities the participants divided into 6 groups of 5-7 people each by practical training in the form of exercises.



The process of working groups and other training May 27, 2014 TSTU

Theme workshops included the following exercises:

1. The objectives of the educational program;
2. Learning outcomes;
3. Compliance with the objectives and learning outcomes;
4. Relevance of the training requirements of the RAEE;
5. The relationship of disciplines and learning outcomes;
6. Methods of monitoring and evaluation.

After each exercise, all students' groups discussed the results of the work. At the end of the workshops ratings of each group were summarized and determined.

On the third day the participants analyzed the level of individual homework assignments using handouts. To do this, the students were divided into groups of 2 people. Each group chose a separate line education undergraduate or master specialties to perform individual tasks.



Discussion of the results of the exercises May 27, 2014 in TSTU



Presentation of individual assignments and discussion May 28, 2014 in TSTU

Individual tasks include matters subject workshops of the second day of the seminar.

Student subgroup, acting speaking as an expert, on the basis of the accreditation criteria defined goals of the educational program, their strengths and weaknesses, and compliance with, the characteristics and the comparative evaluation of the results of other subgroups. Based on the results requirements for the purposes of the educational program were formulated.

To check the results of study the educational program blocks was analyzed: math and science; general professional and special disciplines. Each unit selected one discipline and learning outcomes were determined based on the criteria and requirements. Thus, checking assignments on a comprehensive assessment of the educational program, and subgroups mastered technique of audit of the educational program: compliance of learning outcomes to develop the standards were realized.

During the discussions the extent learning outcomes were analyzed as well:

- Achieve the objectives of the educational program and establish their conformity;
- Meet the requirements of the educational program accreditation criteria;
- Provide educational program learning outcomes of individual disciplines.

Listeners of subgroups, who acted as expert quality educational program define the method to evaluate each learning outcome. The results for each subgroup were presented in the form of presentation slides and evaluated in scale.

Representatives of Accreditation Center of the Association of Engineering Education of Russia (RAEE) evaluated skills, abilities and the level of knowledge of each participant of the training, acting as an expert. Participants (24 people from TSTU and 4 people from TUIT), most successfully completed training at a training seminar on “Vocational and social international accreditation of educational programs,” and received two certificates - AEER “accreditation of engineering education programs” and ENAEE.



Presentation of certificates to 29 May 2014 in TSTU.

6. Implementation of the system of education quality management and accreditation of educational programs in Tashkent State Technical University

Ensuring the development of comprehensive education of the young generation is one of the priority areas under the leadership of President Islam Karimov’s government policies. Priority is confirmed by the radical improvement of the quality and content of education and training programs, respectively, the full stimulation of teachers. These changes are directly related to the problem of international accreditation of the university and

educational programs, i.e., sufficient recognition of education quality in a specific institution, and educational programs.

The effectiveness of Uzbekistan's economy, people's living standards are determined by the level of development of the industry, which directly depends on the qualification of engineering work. Therefore, the quality of modern engineering education is a pressing issue.

However, to ensure the required level of training of engineers, despite some progress, is not an easy task. One of the major difficulties is due to lack of engineering fields of modern material base of the educational process, the problems of the organization of effective manufacturing practices.

Education quality problem is nationwide, which depends on the competitiveness of the state and its output to the world market of educational activities. To one of the most important components of the problem concerns the quality management system of higher education in the university, which goal is to improve the effectiveness of training highly qualified specialists in accordance with international standards.

Quality management system of higher education - a set of organizational structures, procedures, processes and resources required for planning, governance, and improving the quality of education. It covers such interrelated areas of activity of the university as a training, teaching, scientific, administrative, economic.

Successful operation of the quality management system of education at the expense of involvement of the entire team, with the rector as the head assumes full responsibility for achieving the goals of quality education.

In connection with the transition to a multi-level system of higher education traditional approaches are changing to the educational process, scientific research and other activities in the field of higher engineering education. Modern management tasks require informal decisions at all levels of higher education. It is necessary to use the experience, skills, knowledge of all interested stakeholders.

Rebuilding the education system in accordance with modern requirements should be accompanied by profound changes in the objectives, content, forms and methods of training, changing the traditional structure of the education system and the principles on which it was based before.

One of these areas - purposeful work on the creation and implementation of quality management systems based on the requirements of international quality standards.

Currently, the creation of such systems started at Tashkent State Technical University. University consistently and steadily applies modern methods and quality management standards, develops innovative entrepreneurial activity, thereby seeking to conquer the market of educational services and high-tech products and a strong position focusing on consumers, which include the state, society, students and employers.

In recent years, a comprehensive assessment of the activities of the University began to take into account advances in creating inter higher quality management systems of education, the use of modern quality management systems.

However, currently the models used by University for quality management of higher education are not without drawbacks, raising the quality of education remains a top priority.

Therefore, finding ways to improve the quality of education at the University are continuing.

Guided by an international standard, the University determines the quality of education not only with the degree of compliance with the standard curriculum content or level test scores of high school students, but also the degree of satisfaction of explicit and implicit needs of the diverse groups of participants in the educational process - students, teachers, parents, businesses, the state, society and al., the suitability of the graduate to work effectively.

The process of managing the quality of education at the University is quite effective, because it is supported by the auxiliary processes such as receiving, selection, training; research, market research and development of educational services, maintaining organizational relationships, etc.

The university, in its everyday activities is not confined to the learning process, emphasizing market research and engineering work reasonable definition of technical requirements for the training of specialists.

Ranking is determined by the university education quality indicators, which are dependent on many factors and is calculated under conditions of uncertainty of the initial information. The main conditions of the normal

functioning of the university are to maintain a given level of performance in the quality of education.

The annual evaluation of the University shows that the introduction of quality management system of education at the University can improve its rating.

If one or more indicators are starting to deviate from the specified level, it is necessary to identify and eliminate the cause of the deviation. The challenge is the continuous monitoring of quality indicators and their deterioration - cause isolation and troubleshooting.

These issues are directly related to the problem of international accreditation of educational programs, ie, the recognition of a sufficient provision of quality educational programs.

Launched by the University activities to improve the quality of engineering education is directly related to the objectives of the project QUEECA - «The quality of engineering education in Central Asia», work on which is carried out from 2012.

It is necessary to discuss and make decisions on the part of project participants the following questions:

- The role and prospects of development of the Association to improve the quality of engineering education in the country;
- Ways and means to achieve the quality of engineering education;
- Raising the level of pedagogical skills of teaching staff of the University, as well as the knowledge and skills of students;
- Conducting laboratory and practical classes, course projects and the organization of professional practice at a new qualitative level;
- Studying requirements and ensure customer needs.

International accreditation of educational programs help to attract the attention of foreign experts to staff of technical university and the quality of the educational process, simplify the organization of scientific and academic exchanges, expanding the experience and influence of the university promoting the advertising and promotion of its leading positions in the field of education. As a form of social control, international accreditation can precede the state accreditation.

The need exists for formal international recognition of educational programs both on the academic and professional level, no one doubts about it. At the same time the question of whether this work be carried out by specific universities, remains open.

In our view, the feasibility of an international accreditation of educational programs stems from:

- Trends spreading educational services provided higher education institutions;
- increasing the role of the country in the international market of educational services;
- image of higher technical education in the community.

All these determine the urgency of an independent international assessment level of educational services provided by the Technical University.

Accreditation of educational programs allows the university:

- to ensure the quality and relevance of education specialists;
- train qualified professionals in accordance with international standards;
- demonstrate a commitment to the quality of educational services and training;
- obtain an independent assessment of the quality of educational programs and training;
- Get recommendations for improving educational programs;
- **public** declare a high level of quality of training;
- increase the competitiveness of the market of educational services;
- to gain and consolidate its position in the international market of educational services;
- conclude international agreements on cooperation;

- ensure and enhance the employability of graduates.
- protect geopolitical interests.

Public and professional accreditation of educational programs in engineering and technology - is the result of the recognition of the quality of education and training on the part of the professional community of Technical University and last but not least - is a process aimed at improving the quality of engineering education.

Experience gained during the passage of the Technical University of public and professional international accreditation on the basis of the project QUEECA Tempus program can be extended to other technical universities of the Republic.

On the content the accreditation is reduced mainly to test whether the university training, material, scientific, human and other resources necessary for educational activities. At the same time the individual accreditation of educational programs are made by public - professional agencies and aims to verify compliance with the scope, level and quality of the education requirements of the accreditation criteria. One such requirement is the availability of accreditation at the respective university as a whole.

Thus, public and professional accreditation of educational programs of individual engineering is not opposed to the state accreditation of the university (department) technical profile, but naturally complement it.

Uzbekistan has a national testing center that deals with the certification and accreditation of educational institutions.

On the basis of the established rules higher education institutions in Uzbekistan are certified 5 years once.

State Testing Center in conjunction with the Ministry of Higher and Secondary Special Education and the technology develops measures of certification of higher educational institutions, which will be held on certification.

The certification process focuses on a comprehensive analysis of the educational institution in the last 3 years, as follows:

- implementation of state educational standards in the educational process;
- students' knowledge of the program disciplines
- scientific-pedagogical intellect of faculty members
- carrying out scientific research based on customer requirements
- the degree of security of students with textbooks (including electronic books) and manuals
- logistical, educational and laboratory equipment, the degree of computerization, the addition of modern instruments and equipment they use, as well as providing the necessary degree of usable area.
- introduction of modern pedagogical and information technologies
- integration of education with production, science and technology;
- activities for the preparation of the teaching staff through a doctorate;
- cooperation with specialized secondary and vocational educational institutions;
- Socio - spiritual activities
- employability of graduates to the next level of study or work;
- the establishment of international relations;

Certification of educational institutions will be carried out on the basis of objectivity, full disclosure, transparency, and teaching ethics.

For the accreditation of higher educational institutions the State testing center created the Commission on Accreditation.

State accreditation is based on the conclusions of certification of higher educational institutions. The Commission on Accreditation verifies the compliance of higher education with state educational standards and level (meson) state requirements at the same time defines its mission.

In addition, for the accreditation of the university Attestation committee submits to the Commission on Accreditation the following documents:

- The concept of learning. Curricula and programs
- Finally, on certification of educational institutions

On the basis of these documents and the analysis of the departments of the institution, the Commission takes a decision on accreditation and issue a certificate of higher education institutions.

Taking into consideration all above given as a pioneering work there is selected educational program “Electronics and Instrumentation (instrument making)” project partner QUEECA - Tashkent State Technical University in Uzbekistan. For the accreditation of educational programs meeting the draft decision QUEECA, was selected at the Accreditation Center of the Association of Engineering Education of Russia. Taking into account the established accreditation criteria and requirements with participants of TSTU, were prepared reports in three volumes.

- To prepare reports of MSU, international accreditation of the educational program “Electronics and Instrumentation (instrument making)” through ENAEE, TSTU there have been approved orders on the organization of the coordination, expert and working groups
- International accreditation of the educational program “Electronics and Instrumentation (instrument)” promotes:
 - o drawing the attention of foreign experts and students;
 - o Staff development of TSTU;
 - o simplify management of scientific and academic exchanges;
 - o extensive experience and area of influence of TSTU;
 - o facilitate the advancement of the teaching staff at the forefront of science and education;
 - o Protection of geopolitical interests
- Tashkent State Technical University prepared and submitted a report on the MSU, in AEER for international accreditation of the educational program “Electronics and Instrumentation (instrument)” through ENAEE in 3 volumes:
 - o 03/27/2015: Volume 1, Program Description, 76
 - o 02/04/2015: Volume 2, and a summary description of disciplines teachers, 332.
 - o 04/03/2015: Volume 3, Description and TSTU faculty “Electronics and Automatics” 39.

Guidelines for the preparation of reports in TSTU are implemented by the coordinating group (6 people).

In the period 26-29 May 2015 held an international socio-professional accreditation and audit expert committee ENAEE educational program of bachelor in “Electronics and Instrumentation”, the profile “Instrumentation”. This examination is made of 45 disciplines in line with the curriculum, involved 18 departments and 61 teachers.

As a result of examination received certificates of quality mark of the European accreditation of engineering programs, EUR-ACE European Network for Engineering Education and Accreditation Association for Engineering Education of Russia on 09.29.2015 for five years.

Thus, in the country, the first time the Tashkent State Technical University achieved international recognition of engineering education program.

Thus, combining the experience of accreditation of universities of Uzbekistan and the European experience in accreditation of educational programs should provide high-quality results in ensuring the quality of training for science, engineering and technology in all spheres of human activity.

We hope that the use of international experience in the creation of quality assurance systems of higher engineering education, taking into account the traditions of the training of engineers in Uzbekistan will contribute to the development and strengthening of the prestige of educational programs in the country and abroad.

Abbreviations used in the text:

QUEECA - Quality of Engineering Education in Central Asia
SEFI - Societe Europeenne pour la Formation des Ingenieurs
IFEES - International Federation of Engineering Education Societies
CAEAS - Central Asia Engineering Accreditation Standards
EUR-ACE - European Accredited Engineering
EAFSG - EUR-ACE Framework Standards
ENAE - European Network for Accreditation of Engineering Education
RAEE - Association for Engineering Education of Russia
ASIIN - Fachakkreditierungsagentur für Studiengänge der Ingenieurwissenschaften, der Informatik, der Naturwissenschaften und der Mathematik
KazSEE - Kazakhstan Society of Engineering Education
FEANI - Federation Europeenne d'Associations Nationales d'Ingenieurs

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Series of Trial Accreditations

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1. Quality Assurance System in Engineering Education in Central Asia: Status quo

At present, the Central Asian states are experiencing a serious economic growth, which is, to a considerable extent, based on dynamic industrialization process in the region. However, there exists a significant problem of shortage of qualified engineering personnel for the full and integrated development. Apparently, this set of problems comprises the following several constituent fundamental issues.

Priority among them is given to accreditation of engineering degree programs for training engineering specialists, followed by certification of engineering staff in compliance with international standards. Last but not the least is engineering educators' professional development skills.

1.1 Accreditation of engineering programs

Accreditation as the main aspect of quality assurance system has come into view recently in the entire region. Initially, the attitude towards the accreditation system in the region was not unique. Existing alternative approaches and views which are fundamentally different from each other have generated the problem.

The first approach is about the accreditation being as a system complementary to government control, the so-called state certification. This scheme is being promoted in countries such as Uzbekistan¹ and Tajikistan². Although here, accreditation is considered to be as the formal framework for ensuring quality it is limited by the legislation rules that reserve the right to accredit educational programs and institutions of higher education only for the State. Under the current legal framework, accreditation is another state mechanism that increases the influence of the State in the field of quality assurance.

In these conditions it is a matter-of-course that the basic standards in the field of accreditation becomes the State Compulsory Education Standards SCES approved by the Ministry of Education rather than those international standards which would facilitate approaching the issue more systematically from the perspectives of compliance.

The second approach views the accreditation as alternative to the government control in the field of education. In the course of reforms taking place in the Republic of Kazakhstan³ and the Republic of Kyrgyzstan⁴ accreditation is expected to replace the state attestation. The concept of the accreditation here is that non-governmental sector represented by Accreditation agencies will contribute to advancement of quality assurance system in the country. Therefore, an issue of setting up the system of national registries had been under constant

¹ Law on Education of the Republic of Uzbekistan /Ведомости Олий Мажлиса Республикаси Узбекистан, 1997 г., № 9, ст. 225; 2013 г., № 41, ст. 543

² Law on Education of the Republic of Tajikistan of July 22, 2013 №1004 (As amended by the Laws of the Republic of Tajikistan from 14.03.2014 г. №1081, 26.07.2014 г. №1125)

consideration in these countries last years. Today, this very system has already been launched in Kazakhstan⁵ whereas in Kyrgyzstan it is under formation. The rules governing the activities of the national registry in Kazakhstan do not restrict the universities on the choice of where to pass the accreditation. However, the State recognizes only the accreditation carried out by the Accreditation agency included in the National Register №1. Systematic preparation for the introduction of up-to-date approaches to quality assurance and accreditation in the education system in Kyrgyzstan had been conducted since 2007 within a number of projects such as TEMPUS CANQA Central Asian Network for Quality Assurance “Soros Foundation - Kyrgyzstan», TEMPUS, GIZ and others. After the adoption of the Law in 2013 on replacement of the state certification with independent accreditation legal acts regulating the independent accreditation had been drafted.

In February 24, 2015 at the Meeting of the Committee on Education, Culture and Sport of Zhogorku Kenesh (Parliament) accreditation legal acts were forwarded to new revision and possible approval by June 1, 2015 and the introduction of an independent accreditation from September, 2016.

In both cases there are significant drawbacks. In the first case the accreditation is considered only as a part of state control in education while in the second case the rules of national registries do not provide any kind of specifics related to engineering education. The National Register of the Republic of Kazakhstan №1 includes only two internationally recognized agencies ABET and ASIIN. However, at the moment, there is practically no single national accreditation agency which could be focused on engineering education. This issue has given rise to a number of difficulties, for instance, the national and local context in the process of training engineers is might not be taken into account by the major world agencies. In case of Kyrgyzstan although there have been done efforts to introduce new approaches into quality assurance system, create necessary infrastructure for independent accreditation and even held series of pilot accreditations statutory instruments and mechanisms are still under approval.

1.2 Academic freedom

1.2.1 Classifier of specialties

An important and, from our point of view, a necessary factor in the development of engineering education is academic autonomy. By the initiative of the Minister of Education and Science there had been set up a Consortium of 10 leading technical universities for training engineers in the frame of the State Program on Industrial and Innovative Development of Kazakhstan.

This is an initiative of high priority, nevertheless, it will not function efficiently under conditions of so-called classifier of specialties approved by the Ministry of Education and Science of the Republic of Kazakhstan where it is even hard to find clearly represented list of engineering specialties. In today's rapidly changing environment concentration of all specialties in the one classifier is not appropriate. Taking into consideration expanding interdisciplinary nature of the training and a significant number of new educational programs being developed in an ongoing way it is rationale to provide universities with more empowerment in this issue.

1.2.2 The state compulsory education standards SCES

In majority countries of the Region the State Compulsory Education Standards SCES still dominate and, to some extent, set bounds to design educational programs. This also deprives the educational program of flexibility and hinders the preparation of competitive staff. Thereupon, expansion of universities academic freedom in

³ Law on Education of the Republic of Kazakhstan (as amended on 19.05.2015.)

⁴ Law on Education of the Republic of Kyrgyzstan of April 30, 2003, №92

⁵ Order of the Minister of Education and Science of the Republic of Kazakhstan of December 30, 2011 № 556 “Establishment of a national registry of accreditation bodies, accredited organizations and educational programs (as amended on 04.07.2014)

SCES of higher and postgraduate education envisioned by the State Program on Education Development of the Republic of Kazakhstan for 2011-2020 is considered to be one of the effective mechanisms of enhancing quality of teaching and learning.

1.3 Lack of close links with employers

Unfortunately, today the countries do not have explicit policies aimed at the involvement of employers in the curricula development process. This issue is of concern to the expert community as the institutional reforms such as the state program on industrial and innovative development is not possible without a close relationship with employers. Employment of graduates majored in technical specialties is less than 50 percent as of today's statistics, which indicates poor level of integration of education and industry. Results of pilot accreditations in Kyrgyzstan also revealed lack of constructive interaction between academy and employers as well as with other social partners.

1.4 Engineering certification

Certification of qualifications - is the mechanism that determines compliance with the requirements of the professional standards of experts and a process of assigning the status of experts according to their knowledge gained during the training and professional activities.

There is still lack of clear cut concept of engineering personnel in the Region. This reflects on classifier of specialties where there is no clear distinction between engineering specialties and unavailability of precise system of engineering certification.

In case of Kazakhstan the engineering certification issue stays complicated due to the fact that the State does not yet have unified general policies, processes and methodology, thus the work is carried out locally and provided certification is partially recognized by the labor market or just some enterprises. For further implementation of the system of certification it is necessary to develop and set legal regulations as well as organizational and institutional solutions. Throughout last 10 years the government has been making every effort to form national qualification frameworks based on European experience. However such attempts still have not led to positive results as there is no well-established experience of cooperation between government and business in this field. Of course there are certain attempts of such public organizations as Kazakhstan Society of Engineering Education (KazSEE) to develop the system based on the international certification principles in compliance with criteria of international networks including FEANI, APEC Engineer.

But all this does not have enough effect due to the lack of precise legal regulation on this activity from the government side. That is the question of the legitimacy and the legal recognition of this kind of certification. Nevertheless, countries in the Region need some experience in engineering certification, because without it engineering education of the region will be out of qualification recognition system.

1.5 Engineering educators' professional skills development

Currently, one of the most serious problems the region is encountering is engineering educators' professional skills development. In a number of countries in the Region there is a liberal system of teachers' professional skills development whereas in the Republic of Kazakhstan the recent reforms placed restrictions on the capacity of universities in the organization of further training courses. Instead of existing professional skills development institutes the National giant "Orleu" appeared on the market reserving the right to carry out activities in this field for Nazarbayev University. No specific justification of this limitation was provided. At the end of the day, this reform set bounds for university faculty to undertake career development trainings at the top universities of the country. It was particularly hard hit within the engineering education.

Nevertheless, despite these limitations set by legislation in force the formation of a modern further training system is under way. For instance, in Kazakhstan their functions KazNU IGIP Center which operates on the

base of the accredited educational program. A new Kazakh-Indo-US platform for faculty staff professional training and skills maintenance on natural sciences and technical disciplines KIUCEE has been set up as a result of joint IUCEE and Al-Farabi KazNU programs.

Formation and development problems of engineering education are closely intertwined with the solution of the three main objectives. This is firstly, about quality assurance of engineering education programs by building a balanced system of accreditation and the expansion of universities academic freedom; secondly, engineering certification and building capacity to adequately respond to the changes in the engineering services market by establishing a national qualifications framework and gradual implementation of the international certification; and thirdly, is to build effective and transparent system of engineering educators' further training.

2. Development of accreditation in the region: problems and prospects

Today, issues of quality assurance in engineering education represent a rather complicated tangle of forming processes. Basically, accreditation issues in the Region have mostly been worked out to a greater extent in Kazakhstan. The legislation of Kazakhstan considers accreditation from the perspective of quality assurance by a non-governmental sector. The role of state control and quality assurance in education are gradually descending, giving the priority to non-governmental sector. Since 2009 Kyrgyzstan has also been working on developing accreditation of programs by independent professional agencies, thus minimizing participation of the Government body in quality assurance process. However, the fundamental difference between the two countries in accreditation lies in the fact that Kyrgyz accreditation is a voluntary act on the part of higher education while in Kazakhstan the government sets strict conditions for accreditation though it was approved by the voluntary principle. For instance, according to the legislation in force public funding is granted only to the educational programs passed specialized accreditation and a university must undergo institutional accreditation to receive State funding.

In other words, in case of Kazakhstan, quality assurance issues are necessary prerequisite for obtaining public funding. The other countries of the region do not have such requirement. Moreover, in comparison to its neighbors Kazakhstan has the system of national registries already built in the country. Therefore, it is worth to be noted that, thanks to this system Kazakhstan universities have fairly significant experience in the EUR-ACE system. So far more than 75 engineering education programs of Kazakhstan universities have already been or at the stage of being awarded with European EUR-ACE quality label.

As for Uzbekistan and Tajikistan the system of State accreditation is being introduced. This system provides accreditation as another form of state control in addition to state certification.

3. TEMPUS QUEECA: Impact of the Project on Advancement of Accreditation System in Engineering Education

As the EU Strategy for a New Partnership “European Union and Central Asia: The New Partnership in Action” states origin of mutual relations between EU and Central Asia goes back to 90-ies the period of getting independence by each country of the Region. Sustainability and dynamic development of these bilateral relations led to the necessity of developing an integrated common approach to further streamline the partnership. It was how EU-Central Asia Strategy which includes a set of goals and values came into being. One of these goals set forth in European initiative on education is enhancement of cooperation in higher education and bilateral student and staff exchange within TEMPUS, Erasmus Mundus programs.

In the 20-year history of the independence of the region have been implemented hundreds of projects for the development of higher education including in engineering profile. However, in the context of quality assurance TEMPUS QUEECA is a unique project for both Central Asian region and European Union. European Union experience in the field of quality assurance is considered to be among the best practices in the world which can create stable foundation for the enhancement of this institution in the neighboring regions.

3.1. TEMPUS QUEECA implementation challenges

TEMPUS QUEECA is aimed at establishing and strengthening engineering societies in Central Asia and enhancing quality assurance system in engineering education in the region by setting up accreditation centers in the framework of those societies. The whole infrastructure for quality assurance starting from training experts in accreditation of engineering programs, developing Central Asian frameworks for accreditation and ending with trial and actual accreditations of engineering programs in the countries of the Region, is covered by the Project.

The Consortium of the Project consists of Central Asian and European partners. And it is equally important that European Network for Accreditation of Engineering Education ENAEE and a number of highly profiled agencies authorized by ENAEE were involved in the Project.

On the basis of analysis of the Project implementation process the following challenges that have emerged in the course of the project can be mentioned.

Firstly, it is a clear-cut complexity of the regional legislation in force in regard to the non-governmental sector. As it was mentioned above, the Project targeted at setting up a Network of Engineering Education Societies as well as Accreditation centers. As far as it was declared only Society for Engineering Education of Kyrgyzstan could manage timely registration in the Institution of Justice. Association Engineering Education Tashkent City also encountered some obstacles which lead to late registration. Partners from Tajikistan did not have a registration of an independent legal entity, instead, established engineering society within Alumni Association of Tajik Technical University. And that might cause serious legal problems in the process of application as being non affiliated with the State is one of the main requirements of ENAEE for an Accreditation Agency, applying for authorization. Kazakhstan Association of Engineering Education was established before the start of the project and now looking into questions of further development though its Accreditation center is still encountering some obstacles in being nationally recognized and included into the National Register №1.

Secondly, another requirement for an Applicant Agency to join European Network for Accreditation in Engineering Education ENAEE is presence of the country of registration in the European Higher Education Area. Among Central Asian countries only Kazakhstan can conform to this requirement while others do not. However it does not prevent them to apply ENAEE standards in their activities.

Thirdly, the presence of state regulation on educational activities and the lack of the concept of professional accreditation in several countries do not allow the establishment of accreditation centers in these countries as the state might discard necessity and legal recognition of this accreditation. This issue might put the post project sustainability in jeopardy.

3.2. Project outcomes and its impact on engineering education quality in Central Asia

When it comes to the results of the Project the following advantages must be placed on records:

1. Establishment of engineering societies in participating countries which will focus on the development of engineering education despite challenges encountered in the course of Project implementation regarding laws and statutory instruments in force at each country. These newly established engineering societies are expected to bridge the gap between institutions of higher education with engineering profile, industry and engineering communities. Foundation of engineering societies in the region will definitely stimulate development of the quality assurance system. They will bring together engineering personnel in the Region to network, share best expertise, knowledge and join efforts to work out and find the effective ways of enhancing engineering education quality. One must confess that the Project certainly gave a serious push to rethink on the content of educational programs of engineering profile and consider the possibility of an alternative control on quality assurance process;

2. New horizons for cooperation opened for existing engineering societies, in particular, Kazakhstan Society of Engineering Education. KazSEE became full member of European Federation of National Engineering Associations FEANI and European Network for Accreditation of Engineering Education. Cooperation ties were set up with the *Ordem dos Engenheiros in Portugal and Conference of Italian University Rectors*. More than that, understanding of the need to strengthen cooperation in this field between countries in the Region and with European partners increased;
3. Establishment of new and further development of existing accreditation agencies engaged in accreditation of engineering programs. Moreover, the Project contributed to creating experts panel in each participating country. The involvement of experts from Central Asia to the accreditation procedure within the Project will indeed promote a new look at the problems of educational program design;
4. Accreditation of 8 engineering programs in the Region with award of EUR-ACE Label.
5. Accreditation showed higher education institutions their weaknesses and strengths, mobilized them to improve the quality of education, attract employers, social partners to cooperate in defining competencies of graduates needed in the labor market.

Participation in this project FEANI affiliated ENAEE allows countries in the Region in general, to have a picture of development dynamics of not only the quality assurance and accreditation but engineers' certification as well. Certainly, ENAEE standards for accreditation of engineering education programs are based on the criteria of including educational programs of different countries into the FEANI Index which of course has a positive effect on the mobility of engineers in the Region. In this context, the actualization of the project and implementation of its results into practice will contribute to the development of engineering education.

European Union project TEMPUS QUEECA is a unique program of cooperation between neighboring regions. One should admit the significant contributions of European partners in the development of this project. This project was an important step in the integration of quality assurance systems of the European Union and the Central Asian region. Participation and cooperation in such projects will certainly give new impetus to the development of engineering education.

By the end of the Project we expect formation of the national accreditation centers in the Region within Central Asian Federation of Engineering Societies integrated with the *European Network for Accreditation of Engineering Education* ENAEE, with the right to issue EUR-ACE label.

It is indispensable to get these Societies involved into the design and implementation of further training programs for academic staff with engineering profile. Furthermore, there are some plans and intentions to work on engineering certification to obtain a certificate of European Engineers (EurEng) according to the requirements of the European Federation of National Engineering Associations FEANI.

4. Accreditation within TEMPUS QUEECA: problems and solutions

Accreditation of educational programs in the context of assisting Central Asian Societies to establish an independent quality assurance system is planned as part of the Tempus QUEECA Project. It should be noted that all the necessary measures in the initial stages were carried out. In particular, technical English language courses and trainings for experts, and developing Central Asian standards were conducted. Trainings were provided by ASIIN and AEER experts at least for 25-30 accreditation experts in each Central Asian partner countries. Workshops mostly focused on *writing a self-assessment report*, criteria and procedure for accreditation of educational programs, correspondence of educational program objectives and learning outcomes, as well as providing practical sessions for auditing educational programs of the universities and analyzing sample accreditation reports. Therewith, the necessary infrastructure for carrying out accreditation was created.

4.1. Accreditation agency

Among the main objectives of the Project set forth in Work Packages 4 and 5 of the Project Implementation Plan there was conduct of trial and actual accreditations of engineering programs in Central Asia with award of EUR-ACE Label. In the course of Project implementation Management Board and Project Board after some discussion on availability of Central Asian partner universities program for accreditation as well as effective use of project budget came to an agreement to couple these two accreditation activities and encourage ENAEE agencies to be in charge as authorized bodies with the right to issue EUR-ACE Label. It was unanimously agreed that Association for Engineering Education of Russia (AEER) would conduct accreditation in Kyrgyzstan, Uzbekistan and Tajikistan whereas in Kazakhstan the choice fell on ASIIN due to the legislation in force. According to accreditation requirements in Kazakhstan in line with being an authorized agency of ENAEE Accreditation agency should be included into the National Register №1. Consequently, it is legitimate that accreditation in Kazakhstan carried out by ASIIN the only ENAEE authorized agency gained its foothold in National quality assurance system of the country.

4.2. Accreditation procedure

Selection of Central Asian partner universities programs for accreditation within the QUEECA Project was thoroughly discussed during the Management Board held at Kyrgyz State University of Construction, Transportation and Architecture in Bishkek on March 28, 2014. The Board unanimously agreed on selecting two programs from each participating country of Central Asian Region, thus two programs from Kazakhstan, Kyrgyzstan, Uzbekistan and Tajikistan. Furthermore, the concept of training visit to ENAEE was revised from the perspective of Central Asian partner universities capacity building in internal and external quality assurance through providing appropriate trainings in each country.

Thereby 4 workshops on training potential experts preceded trial/actual accreditation as scheduled during the Board Meeting:

- 24-26.03.2014 Trainings for KG experts (Bishkek, KG)
- 26-28.05.2014 Trainings for UZ experts (Tashkent, UZ)
- 30.06-02.07.14 Training for KZ experts (Almaty, KZ)
- 20-22.10.2014 Training for TJ experts (Dushanbe, TJ)

Workshops facilitated enhancement of expert's panel in Central Asian partner universities who were actively involved in accreditation procedures later taken place within the framework of the Project.

It is worth outlining that the workshop practical sessions for auditing educational programs during training visits revealed the fact that there were some partner universities where the structure of programs with engineering profile were different and still required enhancement measures to be taken to ensure their readiness for accreditation. It thus seemed reasonable to actively involve representatives of those universities in the accreditation procedures held in other partner universities within the Project, particularly, in accreditation of programs of Tashkent State Technical University named after A.R. Beruni. After some discussion on availability of Central Asian partner universities programs for accreditation in the agenda of Management Board Meetings two programs from each country were selected by partner universities. Selected CA Programs are presented in the Table №1.

Table 1. Central Asian partner universities selected programs for accreditation

KZ	Al-Farabi Kazakh National University	<i>Thermal Power Engineering</i>	1 st cycle
KZ	Al-Farabi Kazakh National University	<i>Thermal Power Engineering</i>	2 nd cycle
KG	Kyrgyz State Technical University named after I. Razzakov	<i>Communication Networks and Switching Systems</i>	1 st cycle
KG	Kyrgyz State University of Construction, Transportation and Architecture named after N. Isanov	<i>Industrial and Civil Engineering</i>	1 st cycle
TJ	Tajik Technical University named after Academician M.S. Osimi	<i>Design of buildings and Constructions</i>	1 st cycle
TJ	Tajik Technical University named after Academician M.S. Osimi	<i>Electrical Stations</i>	2 nd cycle
UZ	Tashkent State Technical University	<i>Electronics and Instrumentation</i>	1 st cycle

As for accreditation procedure itself in most agencies it is almost identical and comprises the following stages:

- Application submission by HEI
- HEI self-evaluation
- On- site visit to the HEI
- Accreditation Committee Decision

As it was unanimously agreed during the Management Board Meetings Accreditation Center of AEER was involved in accreditation as an authorized Agency to issue EUR-ACE Label on behalf of ENAEE.

Therefore, according to AEER accreditation standards and procedures, accreditation in **Kyrgyzstan**, **Uzbekistan** and **Tajikistan** carried out in the following sequence:

1. Application forms for professional accreditation dully filled in by Central Asian partner universities according to criteria set by Accreditation Center of AEER submitted in time as scheduled in the Project agenda.
Preparation for accreditation approved on the base of internal orders of the Universities:
Uzbekistan – TSTU Order of 13.11.2014 № 01/9-05-431 on preparation for accreditation.
Kyrgyzstan – KSUCTA Order of 13.03.2015 № 01/20 on setting up Working Group for preparation of self-assessment reports.
Tajikistan – Order of 25.11.2014 № 989 – 3/4 of the rector of the Tajik Technical University – Odinaev Kh.O on Establishment of the Commission.
2. A contract on professional accreditation of the partner universities educational programs were agreed upon and signed with AEER.
3. Partner universities were provided with the accreditation criteria and a manual for self-evaluation by the Accreditation Center of AEER.
4. Group of Coordinators, Experts and Working group for preparation of self-assessment reports were set up.

Uzbekistan – TSTU Order of 15.02.2015 № 01/05-09-22 on preparation of self-assessment reports 1-3 Parts.

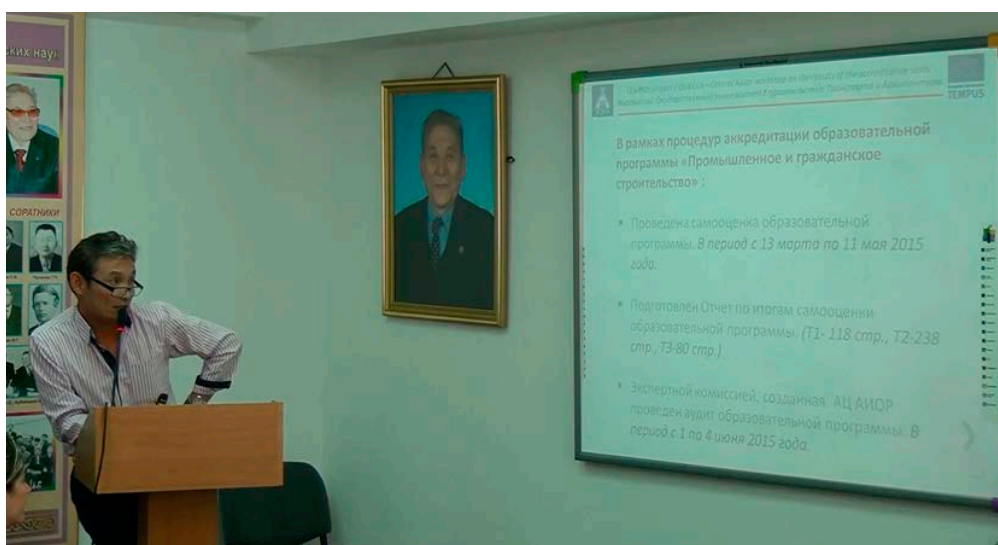
Guidelines for the preparation of reports in TSTU implemented by the coordinating group (6 people). 19 departments and 17 experts who underwent trainings within the QUEECA Project involved in compiling self-assessment report on Electronics and Instrumentation Program.



Kyrgyzstan– KSUCTA Order of 13.03.2015 № 01/20 on preparation of self-assessment reports on Industrial and Civil Engineering

Complex work on preparation for the accreditation was carried out including series of round tables with representatives of construction companies, state organizations, engaged in designing industrial buildings and civil housing as well as staff meetings aimed at working out mechanisms of collecting information and data, meetings with graduates and students. To conduct self-assessment reports by 9 AEER criteria was very difficult as it coincided with examination period and time shortage caused some obstacles.

Regardless of that mechanisms and formation of goals and learning outcomes of educational programs had been set by KSUCTA staff who participated in trainings held by AEER representatives. More than that, along with methodology for designing discipline specific learning outcomes a system of interaction of all structural divisions of the university had been developed. In the accreditation process held within the Project participated around 45 departments involved in training students majored in **Industrial and Civil Engineering**. These attempts of KSUCTA staff resulted in setting up the system necessary for mobilization and coordination of this interaction. Preparation for accreditation also facilitated process of identifying the form of cooperation with employers and alumni. Certain methodology for self-assessment of educational program were developed.



Kyrgyzstan– KSTU named after I. Razzakov, Preparation of self-assessment reports on Communication Networks and Switching Systems



In March 2014 at the Institute of Electronics and Telecommunications of KSTU named after I. Razzakova was set up the Working Group of academic staff, administrative staff of the Institute and employers. The Working Group was headed by Baktybek Ismailov, Ex-counselor of the Minister of Education and science of Kyrgyz Republic. Taking into consideration the fact that **Information and Communication Technologies and Systems** comprises 4 areas of specialization quite significant number of stakeholders involved in Working group. The First Working group meeting held in March 2014 where group members were introduced with accreditation procedure,

the QUEECA standards developed by Prof. Sqaurzoni and approved the work plan and assigned tasks of each participant. The Meetings were held monthly and preparation for self-assessment report carried out.

In the course of preparation of self-assessment report the Working Group encountered difficulties in terms of insufficient knowledge and shortage of experience of the Institution staff as well as employers. They needed hands-on instructions for collecting necessary data and materials for the report within each standards and criteria. The first draft of self-assessment report in compliance with QUEECA standards were compiled in March 2015. However, it was agreed that Accreditation Center of AEER would conduct the accreditation and the Working group had to prepare again the self-assessment report on March 25, 2015, after being provided by AEER their own standards and criteria for accreditation. AEER standards were considerably different from QUEECA standards. Self-assessment report was submitted to AC AEER on April 18, 2015. On May 18-19 Prof. Gerasimov paid visit to KSTU named after I. Razzakov to have a look at The Institute of Electronics and Telecommunications as well as to provide consultations on report improvements.

Tajikistan – Order of 25.11.2014 № 989 – 3/4 of the rector of the Tajik Technical University – Odinaev Kh.O on Establishment of the Commission.

In accordance with the regulations of accreditation, working group for conducting an internal audit of applied educational programs for accreditation was established, by order of the rector of the Tajik Technical University – Odinaev Kh.O. (order is enclosed). The working group members were experts, who successfully completed training in October 2014.

Self-assessment reports compiled by partner universities on selected educational programs and submitted to Accreditation Center of AEER.

Uzbekistan – TSTU – Electronics and Instrumentation:

- 27.03.2015 -Part 1 – Program description – 76 pp.
- 02.04.2015 - Part 2 – Description of disciplines and staff resume – 332 pp. (6 Coordinator group members, 61 heads of departments and academic staff, and 17 experts, trained within the Project participated).
- 03.04. 2015 - Part 3 – University and unit’s description – 39 pp.

Kyrgyzstan – KSUCTA – Industrial and Civil Engineering:

- 13.03. – 11.05. 2015 – Part 1– 118 pp.; Part 2 – 238 pp.; Part 3 – 80 pp. (45 departments participated).
- 23.05.2015 – KSTU – Communication Networks and Switching Systems

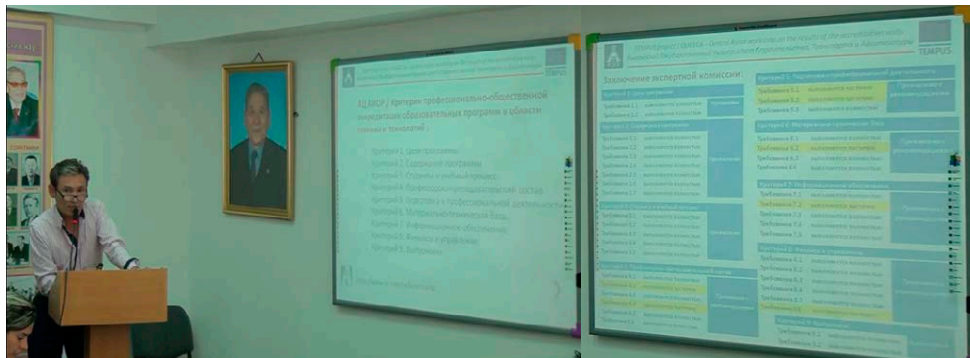
Tajikistan –TTU – Design of buildings and Constructions;– Electrical Stations:

- AEER had set up experts team in each case of accreditation and agreed with partner universities. Furthermore program and work schedule for site visit were also agreed upon. On-site visits to partner countries:

*Kyrgyzstan – KSUCTA – Industrial and Civil Engineering:
June 1– 4, 2015*

Accreditation at KSUCTA was carried out in compliance with AEER AC 9 criteria:

1. Purpose of the program
2. The content of the Program
3. Students and learning process
4. Faculty staff
5. Preparation for professional activities
6. Facilities and resources
7. Information support
8. Finance and management
9. Graduates



Preliminary evaluation report of AEER AC outlined some points of the program which not fully corresponded to the requirements and could be a question for improvement. However it was reported that the program in line with requirements up to 80%.

*Kyrgyzstan – KSTU – 690300.01 “Communication Networks and Switching Systems”:
June 2– 4, 2015*

External evaluation of educational program 690300.01- “Communication networks and switching systems” in accordance with the program of 3-day on-site visit of Accreditation Center experts was held on June 2-4, 2015. The Experts Committee included: Shaposhnikov Sergey Olegovich - Chairman, Victor M. fagot, Mosin Sergey G., Yatkina Elena (Accreditation Center).

The Experts Committee made some comments on the work of general education departments and minor remarks on activities of the Institution. Committee members outlined high level of the Institution staff preparation for accreditation and the level of organization of the accreditation process.

*Tajikistan – TTU – Design of buildings and Constructions;– Electrical Stations:
June 8-13, 2015*

The Expert Commission of the Accreditation Board of the Association for Engineering Education of Russia consisted of

- Chairman:
 - o Yazikov Yegor Grigorevich - National Research Tomsk Polytechnic University, doctor of geological and mineralogical sciences, professor, head of department.
- Experts:
 - o Melkozerov Maxim Gennadevich - Siberian State Aerospace University named after Reshetnev M.F., Candidate of Technical Sciences, Associate Professor;
 - o Gaptar Svetlana Leonidovna - Novosibirsk State Agrarian University, candidate of technical sciences, associate professor, head of department
- Representative of the construction industry of the Republic of Tajikistan
 - o Negmatov Temur Olimovich - Committee on Architecture and Construction under the Government of Tajikistan, head of science and innovation department, candidate of technical sciences, associate professor;
- Representative of an energy company of the Republic of Tajikistan
 - o Khodjaeva Uguloy Tilloevna, head of Open Joint Stock Holding Company “Barki Tojik”, candidate of technical sciences.
- Accreditation center AEER
 - o Smirnova Alexandra Vladimirovna

conducted audit on two educational programs during 8.06. 2015 to 13.06.2015 at the Tajik Technical University. The members of working group of the Tajik Technical University directly worked with the expert commission. During the visit to the Tajik Technical University expert commission reviewed the submissions, met with faculty members engaged in the implementation of educational programs presented for accreditation, students, employers, representatives of the Association of Graduates of technical colleges of Tajikistan, employees of auxiliary services and the management of the university, visited the base enterprise, where housed laboratories and students have practice, laboratories in educational buildings, libraries, including electronic.

The Commission examined the regulatory, organizational and methodical documents on educational program, including curriculum programs and work programs of courses, samples of students’ and graduates’ final qualifying works, educational and methodological complexes of disciplines and other materials provided by the university during the audit.

All materials requested by the expert commission, were given by university fully and on time. The plan of the commission at the university fully implemented, on results of the audit signed protocol by chairman of the expert commission and rector of the university Odinaev Kh.O.



According to the preliminary conclusion of the audit conducted by the expert commission declared accreditation programs meet the criteria of AEER.

The screenshot displays the website of the Association for Engineering Education of Russia (AEER). The main content area shows a list of accredited programs for various universities in Kazakhstan, categorized by region and university name. The list includes program codes, names, and accreditation cycles.

Program Code	Program Name	Accreditation Cycle
050713	Transport, Transport Facilities and Technology	AEER (EIR-ACEB) 2013-2016
050713	Information Systems	AEER (EIR-ACEB) 2013-2016
050712	Automation and Control	AEER (EIR-ACEB) 2013-2016
050712	Standardization, Metrology and Certification	AEER (EIR-ACEB) 2013-2016
050911	Organization of Transportation, Traffic and Operation	AEER (EIR-ACEB) 2013-2016
050702	Automation and Control	AEER (EIR-ACEB) 2013-2016
050712	Standardization, Metrology and Certification	AEER (EIR-ACEB) 2013-2016
050911	Organization of Transportation, Traffic and Operation	AEER (EIR-ACEB) 2013-2016
050727	Food Technology	AEER (EIR-ACEB) 2010-2013
050724	Processing Machinery and Equipment	AEER (EIR-ACEB) 2010-2013
050330	Communication Networks and Switching Systems	AEER (EIR-ACEB) 2010-2013
750300	Industrial and Civil Engineering	AEER (EIR-ACEB) 2010-2013
702201	Design of Buildings and Constructions	AEER (EIR-ACEB) 2013-2016
430301	Electrical Systems	AEER (EIR-ACEB) 2013-2016
511800	Electronics and Instrumentation	AEER (EIR-ACEB) 2010-2013

Accreditation in Al-Farabi Kazakh National University by ASIIN Thermal Power Engineering - 1st and 2nd cycle

The procedure of accreditation in the ASIIN looks about the same as in AEER, and covers the following three phases:

1. Preparation and application for accreditation

Accreditation is carried out on the base of Agreement between ASIIN and KazNU signed on December 25, 2012. All the necessary arrangements had been done for the accreditation including consulting work with faculty, departments and faculties.

2. Self-assessment and evaluation

Self-assessment report compiled and submitted to ASIIN.

Part 1 - Program Description

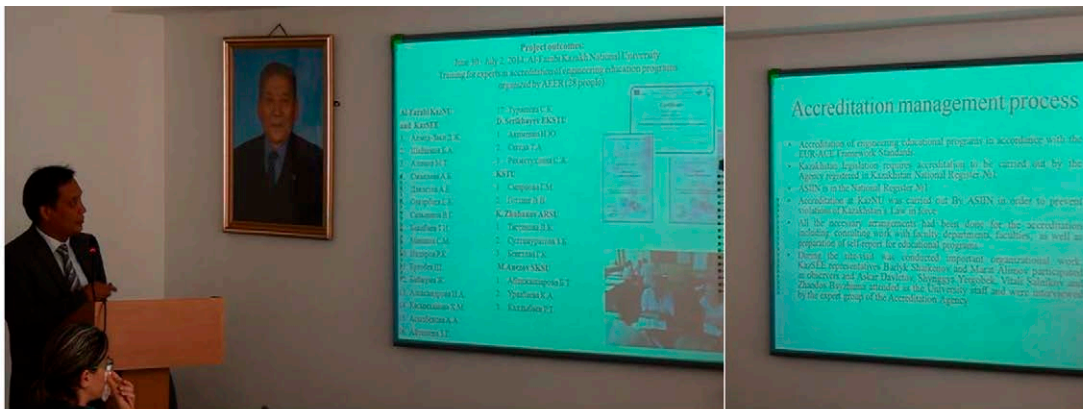
Part 2 - Module Handbook (Bachelor / Master) Core Curriculum - 132 pp.

Part 3 - Staff Handbook - 257 pp.

After study of self-assessment reports submitted by KazNU and agreement on On-site visits panel of 4 experts:

- o Prof. Dr. rer.nat. Madhukar Chandra, Technische Universität Chemnitz
- o Prof. Dr. rer. nat. Frank Obermeier, Bergakademie TU Freiberg
- o Dr. Klaus Pasemann, former Volkswagen
- o Ms. Anastasiya Krasnyuk (student peer), Technical State University Karaganda

ASIIN peer panel visited KazNU on May 19-20, 2014. During the site-visit was conducted important organizational work. KazSEE representatives Barlyk Shaikenov and Marat Alimov participated as observers and Askar Davletov (dean), Shynggys Yergobek (head of the center), Vitali Salnikov (dean) and Zhandos Bayzhuma attended as the University staff and were interviewed by the expert group of the Accreditation Agency.




3. Accreditation Agency Decision

Accreditation is carried out within the frame of following ASIIN criteria:

1. General criteria
2. Degree program: concept, content and implementation
3. Degree program: structure, methods and implementation
4. Exams: systems, concept and organization
5. Resources
6. Quality Management: quality assessment and development
7. Transparency and Documentation

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Studiengang/Hochschule	Abschluss	Siegel
Informatics Academy of Information Technology and Skills Łódź	Bachelor	ASIIN
Biotechnology al-Farabi Kazakh National University	Bachelor	ASIIN
Technical Physics al-Farabi Kazakh National University	Master	ASIIN
Thermal Power Engineering al-Farabi Kazakh National University	Bachelor	ASIIN
Thermal Power Engineering al-Farabi Kazakh National University	Master	ASIIN
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5. Main outcomes of the accreditation:

The main outcome of the accreditation was experience gained by project participants from Central Asia. It was with considerable regret that newly-qualified experts did not have an opportunity to be involved in the accreditation as an expert, but only observers. Nevertheless the experience of writing self-assessment report and participating in the site visits is an essential step in gaining practical experience.

In Kyrgyzstan accreditation aroused great interest on the part of students, graduates and employers. They all pointed out the usefulness of the accreditation process, and expressed the wish that there had been a constant periodic accreditation procedure.

Along with that, accreditation standards had been developed on the base of EUR-ACE standards taking in mind Central Asian regional characteristics and points of view. It is understandable that these standards were not used by the Accreditation Agencies as they were not tested under trial accreditation due to the issue of coupling trial and actual accreditation. Provided there would have been approbation of the standards it could let have a look into weaknesses and strengths of the project.

And the most important outcome of the accreditation can be considered the fact that almost all the announced programs have successfully been accredited and awarded with EUR-ACE Label that indicates the high quality of engineering education in general.

Finally, it was declared by the Institution of Electronics and Telecommunications that getting the international «EUR-ACE» label significantly increased the prestige of the Institution which was evident during the

recruitment of students in last summer. Competition for the accredited program has increased significantly.



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How to implement an accreditation system: The QUEECA experience

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1. Goals, objectives and principles of public-professional accreditation of educational programs

1.1. Concept of public-professional accreditation of educational programs

Higher education is the most important social institution that functions in order to meet social demands and as such it reacts fast to all social changes and processes. Global civilization development tendencies and increase of international opening up of national cultures is directly or indirectly reflected in educational system. Global economic cooperation constantly grows and becomes more diverse forming the demand in universally skilled specialists professionally trained at universities.

Higher education internationalization trend that is based on universal knowledge patterns and extensive use of international scientific society teamwork becomes more and more significant. It shows both in increasing role of international cooperation with regard to activities of national educational institutions and organizations and in establishing of supranational institutions, programs and funds. Higher education sphere demonstrates strong convergence and often even community of problems, trends, goals and objectives that decreases the importance of national and regional differences and specifics. Educational content becomes universal and this process cannot be stopped in the times of information revolution and due to current global universal communication systems represented by Internet.

Hence the contents of higher education national systems naturally tend to embrace the so called “global standards” developed by world scientific and technical community. Public-professional accreditation of higher professional educational programs (EPs) is one of the most efficient tools used to reach such standards and evaluate conformity to them. [1].

EP public-professional accreditation is the process of assessing the quality of educational institutions’ activities in the sphere of provision of certain EPs by applying the rules and criteria developed by professional communities (institutions) and experts-volunteers. In other words, EP public-professional accreditation is an independent (non-state) system of assessing the quality of certain EPs as well as an institution’s activity in training of certain professionals involving voluntary participation of professional experts, industry representatives (employers) and universities’ representatives. This accreditation is considered to be the means to secure confidence of all stakeholders (applicants and their parents, students, and employers).

Various countries have their own systems of state accreditation (performed by authorized state bodies) and public accreditation in the sphere of high education. It shall be noted that a global current trend is to prioritize development of EPs public-professional accreditation provided by higher educational institutions. Much attention is paid to development of such EPs accreditation system and criteria. In particular, the principle of preferential development of EPs public-professional (non-state) accreditation is one of the most important principles of the Bologna declaration.

EP public-professional accreditation system using its criteria of EP quality assessment allows for efficient reaction to changes and problems in business and labor market demands and stimulation of engineering education development and improvement in conformity with the society demands.

1.2. Goals and objectives of EP public-professional accreditation

What are the specific goals and objections of EP public-professional accreditation and why Higher Education Institutions (HIE) are interested in such accreditation?

Performance of such EP accreditation, first of all, allows the society in general and professional communities, employers, government bodies and other stakeholders (including, of course, applicants and their parents) in particular to identify HIEs and their EPs that meet accreditation criteria. It means that such EPs quality is assured by positive external independent assessment performed by experts of public-professional organization independent from education system administrative bodies. Certificate of positive results of public-professional accreditation, in its turn, provides EP with particular value: in several countries (the USA, Canada, Japan, the Great Britain, etc.) an accredited program graduate can further aspire for “professional engineer” status that provides great opportunities for future career advancement. Students of such EPs may also receive certain benefits as in several countries they may apply for government or state grants. All this provides such EPs with “market value”.

Public-professional accreditation system also allows HIEs and stakeholder organizations to get professional advice, methodological support and assistance in improvement of current engineering education programs and their implementation conditions as well as in development of new engineering programs and specialty occupations. The first step in accreditation process is known to be a HIE self-assessment of its EPs. A “fresh glance” at its own programs allows switching off from daily routine, revealing any current weaknesses and possible improvement areas, and reassessing achieved methodological and educational outcomes.

Many HIEs consider accreditation as an important opportunity to profess their ambitions and claim their leadership in a certain area. It can be achieved by demonstrating their commitment to quality of educational services and professionals’ training. In a market economy environment HIEs may find it important to publicly profess their ambitions by obtaining of independent external assessment of their EPs quality. A documentary proof of such leadership includes entering of HIE accredited programs’ names in a relevant register of accredited engineering programs (national or international).

It shall also be noted that in the course of public-professional accreditation HIEs are given recommendations on how to improve their EPs. Such recommendations are always based on experts’ studies of many national HIEs and reflect the best practice and experience of such HIEs. The above mentioned provides HIEs with further opportunity to improve their competitive power in national and international education and labor markets.

Another important objective of any national system of public-professional accreditation is securing of national HIEs EPs quality recognition at an international level. This objective can be achieved by harmonization of criteria base and regulatory and organizational provisions used by HIE with similar provisions of accrediting bodies of other countries as well as international associations of such bodies. Facts of affiliation of National Accrediting Organizations with the Washington Accord (association of accrediting bodies of Asia-Pacific Region) and the European Network for Accreditation of Engineering Education (ENAE) are the examples of such recognition of “essential similarity of criteria and procedures”. Such affiliation, in its turn, efficiently improves image and authority of national system of higher education and helps developing international cooperation of HIEs with regard to engineering specialists’ training [2,3].

Totality of all factors mentioned above ensures important stimulating impact of public-professional accreditation on the processes of development and improvement of engineering specialists’ training in any country.

1.3. Regulatory framework of EPs public-professional accreditation

Regulatory framework of public-professional accreditation of engineering education programs consists of three components:

- National legislation regulating higher education;
- Standards and rules framed by international associations and organizations in the sphere of higher education quality;

- Regulatory documentation of accrediting bodies.

Basic document regulating accrediting bodies activity at the European level is “The Standards and Guidelines for Quality Assurance in the European Higher Education Area” developed in 2005 by the European Association for Quality Assurance in Higher Education (ENQA). The third part of this document titled “European standards and guidelines for quality assurance agencies” provides a comprehensive set of rules and requirements to be observed by accrediting bodies. This set of rules and regulations contains the following:

- In part of public-professional EPs accrediting bodies status (Standard 3.2) – these bodies or agencies (as they are called in the document) should have an official status, that is they should be formally recognized by competent public authorities in the sphere of European Higher Education as agencies responsible for external quality assurance and thus they should have an established legal basis. They should be in compliance with all requirements of legislative jurisdiction in the frames of which they perform their activity.
- In part of regularity of their activities (Standard 3.3) – agencies should regularly carry out a variety of external quality assurance activities (both at the level of educational institutions and education programs). Agencies’ activities may include evaluation, review, audit, assessment and other similar activities and should be a part of major fields of agency’s work.
- In part of resources (Standard 3.4) – agencies should have adequate and appropriate resources, both human and financial, to organize and run their external quality assurance activities in an effective and efficient manner being appropriately funded for development of their processes and procedures.
- In part of goals definition (Standard 3.5) – agencies should have clear and explicit goals and objectives that are part of their publicly available mission statement. The Standard guidelines specify that definition of goals should include goals and objectives of processes applied by agencies, differentiation of duties between process participants (especially in HIEs), cultural and historical aspect of operation. Definition should clearly state that external quality assurance process is the main field of agency’s operation and that there is a comprehensive approach to the achievement of goals and objectives. Agencies should also have documentation that demonstrates the integration of goals definition into agencies’ internal policy and management plan.
- In part of independency (Standard 3.6) – agencies should be independent. They should have autonomous responsibility for their operations, conclusions and recommendations in their reports and shall not be influenced by third parties, such as higher education institutions, government bodies and other stakeholder organizations. This Standard guidelines specify that an agency should demonstrate its independence by applying the following measures:
 - Operational independence from HIEs and government bodies is guaranteed by appropriate official documents (legislative acts).
 - Definition and operation of procedures and methods, nomination and appointment of external experts and definition of outcomes of the quality assurance shall be carried out autonomously and independently from government bodies, HIEs and political leverage bodies.
 - Participants of the process in HIE, especially students, may receive information on the course of assurance process, however the final outcomes of the process remain the responsibility of the agency.
- In part of criteria and processes of external quality assurance applied by agencies (Standard 3.7) – processes, criteria and procedures applied by agencies should be pre-defined and publicly available. These processes presumably include:
 - A self-assessment (or equivalent procedure) of the quality assurance process subject;
 - An external assessment by group of experts that may include students (depending on circumstances) and an assessment site visit (upon agency consideration);
 - A publication of the report that includes all decisions, recommendations or other official results;
 - Consistent follow-up procedures for evaluation of activities carried out by quality assurance process subject with account of all recommendations in the report.

The Standard guidelines specify that:

- Agencies may develop and apply other processes and procedures for practical purposes.
- Agencies should pay increased attention to their established principles and guarantee that their goals and objectives are achieved in the professional way, and that their conclusions are made in coordination even if decisions are taken by groups of various people.
- Agencies that make official decisions followed by official consequences should develop appeals procedures. Nature and form of appeals procedures should be defined with account of each agency's charter.
- In part of reporting (Standard 3.8) – agencies should develop procedures to report on their activities. This Standard guidelines specify that these procedures should include the following:
 - Published internal policy that guarantees quality of the agency and is available on website guarantees;
 - Documentation showing that:
 - Processes and results of agency's activities reflect its goals and objectives in the sphere of quality assurance;
 - Agency has and applies a mechanism that prevents conflict of interest in the course of their external experts' work;
 - Agency should have reliable mechanisms to secure quality of any activities carried out and material produced by subcontractors if some or all elements of the elements in its quality assurance activities are subcontracted to other parties;
 - Agency has internal quality assurance procedures at its disposal that include mechanism of internal interaction (obtaining feedback from its employees, directors/management); internal criticism mechanism (reaction to internal or external comments); and mechanism of external interaction (obtaining feedback from experts and educational institutions that were assessed) in order to create an information database for operation development and improvement.
- Compulsory external review of agency activity at least once every five years.

Additionally this document contains recommendations on the system of expert cross check of quality assurance agencies for the purpose of ensuring of high quality of their operation and sustainable trust of all stakeholders in obtained outcomes and conclusions. In particular, an offer has been made to establish a register of recognized agencies operating in the field of external quality assurance of higher education in Europe. This offer was caused by an assumption that the future will see an increase in the number of quality assurance organizations that will carry out assessment for the purpose of profiting from educational institutions. Experience has shown that such organizations cannot be efficiently controlled, thus establishment of a register will provide a unique opportunity to apply methods of practical management of this market not for protection of the interests of existing agencies but for making stakeholders confident that quality assurance process effect is not diminished by activity of unworthy organizations. This offer was later implemented in the form of the European Quality Assurance Register (EQAR).

Let us consider regulatory documents of accrediting bodies. The set of such documents will naturally differ in various countries and for various bodies. At the same time in most cases these documents ensure itemization of basic rules and procedures set in national legislation and international rules and standards, such as Standards and Guidelines of ENQA described above. An example of such set will be regulatory documents of Accrediting Center of AEER. This set includes [1]:

- Regulation on the Accrediting Center of AEER;
- Procedure for public-professional accreditation;
- Criteria and procedure for accreditation of the first cycle educational programs (bachelor degree course)
- Criteria and procedure for accreditation of the second cycle educational programs (master degree course);
- Criteria and procedure for accreditation of the second cycle educational programs training certified specialists in the field of engineering and technologies;
- Guidelines for assessment of educational programs in the field of engineering and technologies;

- Instructions on filling in of expert assessment forms (this document on the Accrediting Center website is protected by password since it is designed for the Center experts);
- HIEs application form for public-professional accreditation of educational programs;
- Instructions for HIEs on preparation of materials for educational programs self-assessment.

“Regulation on the Accrediting Center of AEER” describes its place within the structure of a major public organization (AEER), Center’s goals and objectives, its structure and functions, as well as goals and objectives of the Accrediting Board of the Center and its composition.

“Procedure for public-professional accreditation” is a major “procedural” document that describes the accreditation order starting from HIE application for its programs audit up to decision-making and issue of a certificate confirming positive accreditation outcome.

Next three documents describe criteria base used by the Accrediting Center experts in the course of assessment of engineering training programs for various level (cycles) – bachelor degree course, master degree course, and specialist degree course. These documents are vitally important and useful both for experts participating in EPs assessment and for HIEs planning to present their EPs for accreditation as they set the “game rules”. It shall be noted that the criteria base and the procedure for EPs accreditation are harmonized with similar standards applies in the European Union countries and Asia-Pacific region.

Next document – “Guidelines for assessment of educational programs in the field of engineering and technologies” contains detailed explanation on planning and organization of EPs external independent assessment process and on documents that experts shall work with. This document is also important and useful both for expert commission and the accredited HIE as it provides a unified concept of EPs accreditation processes.

“Instructions on filling in of expert assessment forms” is an internal document designed for experts who use special forms in the course of EPs assessment allowing them to record their opinions and conclusion with regard to each day of accrediting visit.

“HIEs application form for public-professional accreditation of educational programs” is a formal document that shall aid HIE in completion of EP accreditation form that contains minimal but essential information on HIE and EPs.

The last document – “Instructions for HIEs on preparation of materials for educational programs self-assessment” is of methodological nature. This document aids HIEs in preparation of EPs self-assessment materials that shall be presented to accrediting experts in comprehensive and easy-to-use form. This document can surely be used by HIEs outside the frames of accreditation for self-assessment of their programs so that they can “keep things in order” and improve their EPs on a regular basis.

1.4. Implementation principles of public-professional accreditation of educational programs

Thus, in general, we can say that public-professional accreditation of university degree programs in engineering is based on the following principles [4]:

1. Voluntary principle

Universities participate in UDP accreditation of their own accord. There are no laws or regulations making them take part in this quite a labor-intensive and stressful process. The only thing that encourages universities to have their degree programs independently evaluated is a number of stimuli. These stimuli arise from the environment (often quite competitive one) where universities carry on their educational activity. The stimuli can be different in different countries. Thus, in Canada, only graduates of accredited degree programs can further apply for “Professional Engineer” status. That means that nonaccredited degree programs are not in demand on the Canadian educational market.

2. Recurrence principle.

University degree programs (UDPs) are not accredited “forever and ever”. As a rule, the programs are accredited for 4-5 years, after that the program is supposed to be accredited again. Some UDPs are accredited for a shorter time period, which is caused by a number of unsatisfactory features defined by the expert group. It is natural that the accredited program can progress according to the principle of “continuous improvement”, as well as the accreditation criteria can be updated as time goes by.

3. Principle of experts' independence.

In all the countries where EP public-professional accreditation system exists it is based on independent evaluation conducted by independent experts. As a rule, these are industry and academic representatives, and the latter constitutes the majority of the examination team. Sometimes international monitors (representatives of international accreditation agencies) can be included in the examination team. In some countries, for example Lithuania, the examination teams consist only of foreign specialists. The important point is that before the accreditation procedure each expert signs the statement for no-conflict of interests that states no personal interest in the program accreditation and no relations with the higher educational institution (HEI) or the UDP being accredited. During the accreditation procedure all the decisions on compliance or noncompliance of the program with the accreditation criteria are taken on a collegiate basis. Nevertheless, every expert has the right to attach his/her special opinion to the evaluation report if he/she disagrees with the colleges' opinion on this or that UDP aspect.

4. Principle of accrediting agency's independence.

An accrediting body should be independent on state and municipal authorities and political structures, as well as sponsors. This condition is strictly controlled by international associations of accrediting agencies (and national accrediting bodies are interested in their international recognition through membership in such associations). A good example is European Quality Assurance Register for Higher Education (EQAR) that requires all agencies to comply substantially with the European Standards and Guidelines for Quality Assurance (ESG) to be admitted to the Register. Accreditation criteria design and change, accreditation procedure and decision-making on accrediting/nonaccrediting particular UDPs – all this is the right and responsibility of the accrediting body and shouldn't be coordinated or approved by any other organizations including sponsors. All the decisions on accrediting procedure and criteria as well as on the results of particular program evaluation are taken by an elected board of accrediting agencies. Besides, an accrediting body, being a legal body, should manage its funds.

5. Principle of the declared accrediting subject area.

Accrediting bodies can carry out independent evaluation of the UDPs that belong to the declared subject area (for example, engineering education, that is the field of technologies and technique) and declared types of degree programs (for example, professional education programs awarding Bachelor's, Master's and Specialist's Degrees). Obviously the accrediting subject area can and should be enlarged, for example it is necessary to develop accrediting procedure and criteria for advanced educational programs. In any case the UDPs submitted by HEIs should correspond to the declared accrediting subject area. It is not mere chance that the international accrediting associations are restricted by particular subject areas.

6. Transparency principle.

To comply with this principle means that all information about accrediting criteria, procedure, rules of decision-making and other methodical materials should be available for a wide interested public. But it doesn't mean that

the self-study materials submitted to the Accrediting Board by the HEI, as well as evaluation report made by the examination team should be at the disposal. As a rule, such sort of information is confidential one and can be available for interested parties when approved by all parties involved (first of all, HEI and Accrediting body).

7. Principle of common goal of UDP accrediting procedure.

Any activity involving social interests (in our case, academic society) should set goals and be guided by them in practical activities. These goals should be common for all participants of the process; otherwise there might be a conflict of the parties involved. The common goals of accrediting UDPs (or being accredited) are:

- to promote (in professional and academic society) the best educational technologies for professional training of UDP graduates by developing and implementing high quality educational standards;
- to inform all interested parties and the society as a whole about UDP public recognition that proves its compliance with standard quality requirements;
- to encourage HEI top managers to monitor UDP quality and to improve them constantly.

8. Principle of respect, partnership and mutual interests.

UDP accreditation procedure and criteria should recognize particular features and diversity of HEIs and the degree programs they implement as well as encourage academic creativity and innovation in educational process. After all, the term “accreditation” comes from Latin “credo” (trust). It is natural that HEIs differ in their possibilities, ambitions, aims and potential. High level of the accreditation requirements does not mean that one size should fit all universities interested in degree program accreditation. Accreditation criteria should be mostly of qualitative character. They should evaluate the degree of program goal achievement taking into account particular features of HEIs, their missions, development strategies, strengths and weaknesses. Besides, the accreditation criteria should be quite flexible, they should not have restrictive and regulatory character. Moreover, they should take into account possible diversity in approaches, methodologies and ideas used by HEIs while implementing educational programs and ensure possibilities of EP changes and continuous improvement. The interaction between the accreditation body and HEI submitting DPs should be based on the principle of mutual interest in fair and objective evaluation of UDPs. Only such partner character of the stakeholders’ interaction can result in effective work and mutual benefits, which contribute to the development of the educational system as a whole.

1.5. Procedure for EPs public-professional accreditation

Generally the procedure for EPs public-professional accreditation consists of the following stages [1,5]:

- HIE submits an application for EPs public-professional accreditation to a national or international accrediting body (AB); AB decides on accreditation procedure start and concludes a relevant agreement with HIT; AB provides HIE with methodological materials for self-assessment and preparation of an appropriate report;
- HIE carries out self-assessment in accordance with AB requirements. For the purpose of self-assessment HIE, as a rule, establish working groups that collect and analyze data, prepare report and make those reports available to public. Self-assessment allows evaluating of strengths of HIE and a specific educational program and outlining problems solving ways. Special attention is paid to provision of conditions allowing students to successfully master this specific EP, conformity of EP and HIE educational services, its goals and AB requirements.
- Prepared report is sent to AB;
- AB analyzes HIE self-assessment materials and makes a decision whether external audit is possible or not possible;

- In cases of critical non-compliance with established requirements audit is not carried out and AB provides HIE with an opinion on self-assessment documents improvement necessity and (or) on non-compliance of presented materials with criteria and consequently impossibility of EP accreditation; if AB makes a decision on possibility of audit, it shall coordinate audit times with HIE;
- AB establishes a group of experts who will visit HIE and carry out an audit of this HIE educational program;
- Experts' group visit to HIE is organized (usually no longer than 4 days);
- Experts' group prepares a report and a project of opinion on public-professional accreditation and presents it to HIE management body;
- Report is sent to AB and HIE. Upon receipt of audit report HIE may provide AB with its comments with regard to the report;
- AB studies experts' group report and HIE response and prepares an opinion on EP accreditation;
- AB board studies the presented materials and makes decision on accreditation or non-accreditation of HIE EP.

2. Preparation of educational programs for public-professional accreditation

2.1. Organizational aspects of preparation of educational programs for public-professional accreditation

Public-professional accreditation procedure involves carrying out of educational programs self-assessment thus a working group shall be established to prepare such self-assessment materials. A head of graduate department or department that teaches major program disciplines is usually appointed the chairman of this working group. A head of master or bachelor degree program can also be appointed the chairman, however, it is advisable that such person has access to certain administration resources, thus we believe that a department head is preferable. Working group may include HIE teachers and administrators with knowledge of specific educational program contents, that is employees who can complete the report using comprehensive (and beneficial for HIE!) information on specific educational programs and HIE general information. Composition of working group established for preparation of self-assessment materials is announced in HIE directive [6]. HIE directive approves of working group composition and time schedule for preparation of self-assessment materials. This directive also orders that all HIE departments shall assist members of working group in selection and preparation of materials.

Time schedule for preparation of self-assessment materials shall include the list of all activities required for collection and preparation of materials, these activities' check dates and persons responsible for specific activities. An accountability matrix may be created for members of working group that shall be useful for collection and preparation of all information required for self-assessment report (general information on HIE, on teachers of specific program subjects, educational subjects, conditions of their implementation, etc.)

One of the objectives of self-assessment of educational program is revealing its strengths and weaknesses. This objective is very important for HIE itself, for improvement of its educational process quality, improvement of image and stakeholders' attraction. A HIE, naturally, desires to take measures to elimination of all shortcomings and flaws revealed at this stage. This is where the degree of influence of working group chairman becomes extremely important as he shall be capable of initiating prompt activities and taking measures that will eliminate such weaknesses or, at least, mitigate its negative influence on educational program implementation quality.

2.2. Structure of educational program self-assessment report

Educational program self-assessment report shall include information on specific educational program presented for accreditation and general information on HIE and its divisions (department, center, institution, subdivision, etc.) that are involved in preparation of accredited program. In case several educational programs are presented for accreditation, a separate report shall be made for each program. Program self-assessment task is to demonstrate and confirm its maximum compliance with accrediting body requirements using

factual information. Naturally, the more detailed information on educational program and its implementation conditions is given in the report, the fewer questions will experts' group have while visiting HIE within the frames of accreditation [7].

Information on HIE and accredited educational program provided in self-assessment report is meant to be used solely by the Accrediting body and its authorized personnel and cannot be disseminated or transferred to third parties without HIE's consent.

As a rule, educational program self-assessment report is prepared in the form of a document consisting of three volumes. In case there are lots of additional materials related to accredited educational program and useful for its description, these materials form a separate Attachment volume.

Standard structure of the first volume of educational program self-assessment report consists of the following parts:

- Part 1. General information on HIE. This part shall contain information on degrees awarded to HIE graduates, study modes and duration of each mode, changes and major achievements with regard to educational program and HIE in general since the last experts' visit, and activities on preparation of educational program for public-professional accreditation.
- Part 2. Information on educational program presented for accreditation. This part shall contain detailed information on:
 - o Educational program goals,
 - o Educational program contents,
 - o Students and educational process,
 - o Academic staff participating in educational program implementation,
 - o Preparation of students for professional activities,
 - o Facilities and resources of educational program,
 - o Information support of educational program,
 - o Financing and management of educational program,
 - o Educational program graduates.

Texts in this part are usually supported by the following tables as attachments:

- Educational program curriculum subjects;
- Academic load per subject;
- Coordination between educational program outcomes and goals
- Academic staff teaching load within the frames of educational program;
- Academic staff participating in educational program implementation (brief resumes of all teaching staff);
- Evaluation of learning outcomes;
- Laboratory rooms' characteristics

The second volume of educational program self-assessment report contains descriptions of program subjects and resumes of teaching staff participating in its implementation.

Description of each program subject shall include:

- Subject name.
- Semester (semesters) when this subject is taught within the program frames.
- Brief description of subject.
- Credits allocated to subject in ECTS points.
- Subject goal, for example: "Establishment of engineering training framework, theoretical and practical training in the field of applied mechanics of deformable solid body, development of engineering thinking,

acquisition of knowledge required for study of subsequent subjects”.

- Subject planned learning outcomes.
- Subject contents in the form of the list of topics specifying number and types of classes (lectures, practical studies, laboratory classes) per each topic (hour).
- List of laboratory works and projects performed during subject materials studies.
- Pre-requisites, i.e the list of subjects a described subject is based upon.
- List of principal and additional recommended literature in described subject, as well as the list of online information sources on the Internet or HIE network.

Besides descriptions of subjects the 2nd volume of self-assessment report shall contain resumes of teachers participating in implementation of the program.

The 3rd volume of self-assessment report shall contain information on HIE and department implementing educational program.

Part “General HIE information” shall contain the following information:

- HIE founders.
- State accreditation.
- Public-professional accreditation carried out in HIE.
- HIE mission and goals.
- Analysis of HIE strengths.
- Analysis of HIE shortcomings and weaknesses.
- Qualitative characteristics and statistical information on academic staff and students.
- Characteristics of HIE educational programs in the field of engineering and technologies.
- HIE financing sources.
- HIE auxiliary departments.

Part “General information on department implementing educational program” shall contain the following information:

- Department structure.
- Offered programs and degrees awarded after graduation.
- Information on department management.
- Supporting training departments.
- Department’s financing means.
- Department’s personnel and personnel policy.
- Information on acceptance of students for accredited program studies and on program graduates.
- Requirements to acceptance and graduates (for educational programs of both first and second cycles of studies).

2. 3. *Information on educational program*

This part of self-assessment report is considered to be the most difficult and time-taking. Standard structure of materials in this part suggests coverage of the following issues:

- Educational program goals.
- Educational program structure and contents.
- Students and teaching and learning process.
- Academic staff participating in educational program implementation.
- Career training of students.

- Material and technical resources of educational program.
- Information support of educational program.
- Financing and management of educational program.
- Educational program graduates.

Described below is the information to be presented in this part.

2.3.1. Educational program goals

Educational program goals are an “aggregate of knowledge, skills and methodological culture that graduates of this educational program shall possess in some time after graduation. Some of these goals may be achieved by all graduates, and others – by some graduates”. Educational program goals shall not be too general; however, it is not advisable to provide too many details. Usually an educational program has 4-5 goals.

Educational program goals are supposed to be coordinated with employers – potential users of program graduates’ skills and approved by the Academic board or methodological commission of the department implementing this program.

It is assumed that a university or a department implementing an educational program establishes and uses a specific mechanism for definition and revision of goals. This mechanism is an important part of educational process quality management system providing for consistent improvement of educational program.

Self-assessment report shall specify documentation that confirms regular assessment of program goals achievement. An experts’ commission might like to check this documentation while visiting HIE for accreditation purposes.

2.3.2. Program contents

An educational program, first of all, shall have “clearly formulated and documented *learning outcomes* compliant with educational program goals.

Materials in this part may be presented in the form of learning outcomes results as shown in the following example.

P 1. Acquisition of skills to use traditional and new engineering processes, operations, equipment, regulatory and methodological materials in pre-production engineering, quality, standardization and certification of products and processes with elements of economic analysis and with account of safety regulations, industrial hygiene, fire safety and occupational safety and health.

P 2. Willingness to cooperate with colleagues and to participate in team work; knowledge of principles of organization and management of small-scale groups; ability to make organizational-management decisions in non-standard situations and be ready to take responsibility for such decisions.

P 3. Readiness for social interaction on the basis of socially accepted moral and legal standards, showing respect to other people, tolerance to other culture; willingness to be responsible for maintaining of partnership and trust relations.

P 4. Ability to select materials for certain operation conditions with account of production effectiveness, efficiency, reliability and durability of products, understand regularities of structure formation and influence of structural characteristics on material properties.

P 5. Working knowledge of methods of planning and performing measuring experiments, selection and use of methods of experimental data processing and experiments’ results evaluation.

P 6. Knowledge of major production engineering processes and materials processing, peculiarities of various life cycle phases of materials and products made out of them.

P 7. Ability to organize production process at individual or small-scale production facility.

P 8. Ability to continuously improve qualification.

P 9. Ability to use modern information technologies and global information resources in the course of analytical and process engineering activity.

P 10. Knowledge of principles of thinking, ability to summarize, perceive information, set goals and select ways to achieve them.

P 11. Ability to apply knowledge in the field of natural, social, economic and humanitarian sciences for professional tasks' solutions.

P 12. Ability to combine scientific, experimental and creative approach to achieve set goals.

P 13. Ability to speak a foreign language at a conversational level.

P 14. Ability to grasp scientific nature of problems occurring in the course of professional activity and use appropriate physics and mathematics skills.

Description of an educational program contents shall, first of all, characterize this program at the level of subject cycles (segments) – humanitarian and social-economic, natural-scientific, general professional, specialist, and extracurricular.

Segment of natural-scientific and mathematics subjects shall “ensure intensive fundamental training of a specialist, provide basis for general professional and specialist subjects studies and consist of basic and advanced levels” (parts of subjects). This segment for the second cycle of specialists' training programs shall be at least 60 ECTS points, including at least 24 ECTS points allocated to advanced courses (parts of subjects). Similar qualitative and quantitative requirements are imposed to all other parts of subjects.

University shall pay constant attention to coordination between work programs of specific subjects and specific branches of educational programs. Consistency of material presented in the course of each subject study shall be defined by its logical place in total volume of learning material in a relevant part of subject and by knowledge continuously acquired by students in the course of subjects' study.

2.3.3. Educational program curriculum

Accreditation criteria state that “curriculum and work program of each subject shall be in compliance with educational program goals and ensure achievement of learning outcomes by all program graduates” [1].

This part of self-assessment materials shall describe the following:

- Curriculum subjects – the list of curriculum subjects, number of credits allocated in ECTS point and distribution of material by topics.
- Subjects' academic load – amount and type of activities per each subject and number of students studying them.
- Coordination between educational program outcomes and goals – demonstration of how curriculum elements (subjects, course papers, practical studies, etc.) ensure achievement of learning outcomes and how they comply with accredited educational program goals.

Students study general professional and specialist subjects on the basis of natural-scientific and mathematics knowledge acquired earlier which is achieved, first of all, by coordination between subject study programs of different courses and cycles.

Students' ability to apply natural-scientific and mathematics knowledge in engineering practices is developed and consolidated during practical and laboratory studies as well as in the course of individual tasks within the frame of each subject.

2.3.4. Design engineering

Students learn design engineering during performance of course projects (course papers) in several subjects. Self-assessment report materials shall provide the list of such subjects and their distribution throughout the semesters. The following part can serve as an example of this section material presentation.

Design engineering tasks shall also be performed during on-the-job training programs (specify credits allocated).

When bachelors and masters training programs are self-assessed, their curriculum shall include scientific-research works and credits allocated in ECTS point. Scientific-research work of a student shall necessarily include: analysis of scientific information on existing methods of set objective solution; substantiation of goals and criteria of the selected solution method; design and research part (theoretical evaluation and/or experimental research); analysis of obtained outcomes and evaluation of their compliance with set goals.

While visiting HIE within the frames of accreditation process experts' commission members will most certainly require the samples of design and scientific-research works of students. University shall be ready for it and prepare samples of students' reports on practical and laboratory studies, course evaluations and projects, reports on on-the-job training and scientific-research works, graduation thesis.

One of the most advantageous aspects of educational program implementation is stable connection between learning process and production process. Self-assessment report shall detail how this connection is ensured and reveal what production enterprises conclude agreements with university to provide students with practical and on-the-job training as well as assistance with scientific-research and graduation thesis.

2.3.5. Graduation thesis

This part of self-assessment report shall contain comprehensive and detailed information on preparation of graduation theses by students, requirements and structure of such theses, etc.

2.3.6. Students and teaching and learning process

This part, first of all, shall describe HIE requirements to applicants or requirements to admission into an educational level relevant to accredited educational program. It is obvious that students admitted into such program shall have an appropriate educational level. Moreover, such students shall have sufficient knowledge in natural sciences and mathematics required for studies of specific subjects. Self-assessment report shall provide information on how HIE organizes application process for accredited program, specify requirements to applicants and how applicants' knowledge is tested for compliancy with these requirements.

Report materials shall preferably characterize (analyze) knowledge level of students admitted into the program. Accreditation criteria require that "a system that ensures positive learning outcomes of educational program shall be designed for students with insufficient knowledge level". These criteria note that "teaching and learning process shall ensure positive learning outcomes for all students".

As it was noted earlier, teaching and learning process organization shall ensure that all students achieve positive learning outcomes of program. This can be provided by various learning methods (lectures, laboratory classes, seminars and tests, computer classes, practical training and on-the-job training); various methods of teaching program theory and practice to students (studies of lectures materials, preparation for laboratory classes, preparation of laboratory classes reports, designs and projects defense, preparation of essays and speeches at students conferences); various methods of evaluation of students' knowledge: written tests, discussions, examinations, etc.

Besides that accreditation criteria stress the necessity of "mechanism ensuring continuous monitoring of curriculum performance and feedback required for its development".

System of continuous monitoring of curriculum performance implemented in HIE can be described in the following way.

Accreditation criteria also note that students shall have practical training in scientific laboratories and production facilities. Self-assessment report shall cover the issues of organization of such practical training in the frames of educational program and demonstrate their influence on achievement of goals and set program learning outcomes.

Another important aspect to be covered in this part of self-assessment report is academic mobility that allows students to study educational subjects and participate in practical training in other national or international HIE.

It is obvious that academic mobility of the Central Asia HIE at international level (which is the most attractive) is significantly lower than that of HIE in the European Union countries. At the same time there are many national HIE that actively develop conditions to allow students to participate in exchange.

Self-assessment report shall demonstrate abilities of HIE in general and department (faculty, chair) in particular to develop academic mobility, which will, first of all, include system of partnership and cooperation of HIE and national and international universities in the form of concluded agreements. Secondly, HIE shall provide organizational and methodological mobility support, namely methodological and administrative documents describing the process of selection of students to participate in mobility activities, explaining their absence in their HIE during studies or practical training in HIE-partner, and regulating recognition of their performance within curriculum in HIE-partner. This support shall also include documents regulating studies of students from HIE-partners. Thirdly this process covers the system of provision of students with information on academic mobility at HIE level and at the level of department implementing the program. Self-assessment report shall naturally provide specific examples, numbers and facts when illustrating academic mobility results.

2.3.7. *Career training of students*

Accreditation criteria require that “engineering career training shall be carried out during the whole period of the program”. This part of self-assessment report shall demonstrate that students’ experience in design and engineering is formed “in the process of performance of course papers and projects that compulsory include economic, ethical, social-political and environmental aspects, issues of sustainable development and occupational health and safety”. Accredited educational program shall ensure that all students achieve learning outcomes required for their professional activity. For example, according to accreditation criteria students of the second cycle programs for specialists training shall:

- “demonstrate comprehensive natural-scientific, mathematical and engineering knowledge and detailed understanding of scientific principles of their professional activity;
- Possess critical familiarity with advanced knowledge in professional sphere;
- Apply obtained knowledge to solution of specific engineering tasks as well as tasks in new spheres of their specialization;
- Use creative approach to development of new original design ideas and methods for engineering tasks solution;
- Define, organize and obtain required information;
- Be able to plan and carry out analytical, imitational and experimental research;
- Be able to critically evaluate information and make conclusions;
- Be able to apply new and advanced technologies in the sphere of their specialization;
- Be able to integrate knowledge from various spheres and solve tasks requiring abstract thinking and originality of analysis;
- Possess comprehensive understanding of used methods and spheres of their application;
- Be able to work efficiently as an individual and as a member of the team in interdisciplinary subject, as well as to lead such a team;
- Possess extensive knowledge in all spheres including knowledge and understanding of social and political problems;
- Be able to speak a foreign language at the level that allows international cooperation with understanding of cultural, language and social-economic differences;
- Demonstrate understanding of health and safety, legal aspects, responsibility for engineering activity, influence of engineering decisions on social context and environment;
- Observe the professional ethics code, responsibility code and engineering activity regulations;
- Understand necessity and be able to learn and improve their qualification independently during the course of their professional activity”.

The objective of self-assessment report authors is to conclusively prove that an educational program ensures for achievement of all these results. At the same time achieved results shall not be glamorized. It shall be remembered that experts' group members while visiting HIE and studying self-assessment materials will also meet representatives of students who participate in this program. During this meeting experts will receive students' feedback on actual achievement of these results. Naturally, essential difference between students' feedback and self-assessment report authors' presentation will negatively influence the final opinion of experts' group.

Accreditation criteria also require the establishment of a mechanism of learning outcomes evaluation for the program in general and for its specific subjects and documents confirming their achievement. Information received with the help of such mechanism shall be used for improvement of educational program and teaching and learning process.

Evaluation of learning outcomes results usually consists of evaluation of learning outcomes in various spheres, i.e. for each subject, engineering practices, final attestation (defense of graduation thesis).

Evaluation process may differ for each component of final result. For example, evaluation of learning outcomes for specific subjects may be carried out in two ways:

- 4 points evaluation (according to which they may be evaluated as: excellent, good, fair, bad);
- Rating knowledge evaluation (usually using a hundred points system with transfer of acquired points into 4 points system).

In both cases learning outcomes evaluation is a combination of interim outcomes evaluation (test papers, discussions, defense of design-graphical works, course paper). At this, interim outcomes evaluation data is collected and saved during the semester and then it is analyzed and subject final evaluation is performed.

Learning outcomes evaluation process during engineering practical training consists of analysis of quality of the report presented for defense upon training completion, opinions of training heads (department and production facility) on engineering skills revealed during this training and the outcomes of the report defense. Evaluation of learning outcomes following the results of graduation thesis defense usually uses a 4 points system with excellent, good, fair and bad grades.

Documented evaluation results are presented as records of exams, credits, and course papers defense and are kept in the dean's office of a relevant department.

Some HIEs use electronic systems of students' performance accounting. Results of performance analysis are used for further development and improvement of programs (subjects) and documented as minutes of department and department board meetings, academic seminars, etc.

2.3.8. *Material and technical resources*

According accreditation criteria there are following requirements to material and technical resources used for implementation of educational programs:

- "Material resources shall be at least at the level of license standards.
- Classrooms, laboratories and their equipment shall be modern and meet program goals.
- Students shall have sufficient opportunities for self-learning and self-research.
- HIE/department shall constantly upgrade, modernize and improve material and technical resources".

The objective of self-assessment report authors is to provide a comprehensive description of material and technical resources used for program goals. A temptation shall be avoided to demonstrate the newest and often unique prototypes of equipment and tools used for scientific research but not provided for teaching and learning process. During their visit to HIE experts will be interested in technical support of teaching and learning process and the use of specific equipment for laboratory classes may be confirmed by its description

in guidelines to a relevant laboratory cycle.

Another aspect to pay attention to is continuous development and upgrade of material and technical resources.

2.3.9 *Information support*

Accreditation criteria include the following requirements to information support of educational program:

- “Information support shall be appropriate to program goals.
- HIE/department shall have a library with all materials required for learning: course books, technical and reference literature, various periodicals, etc.
- Students and teachers shall be able to use computer classes and terminals with access to information resources (local network, Internet). HIE/department shall monitor accessibility and use of these resources.
- Free access of students and teachers to information resources is an important factor.
- HIE/department shall constantly upgrade, modernize and improve information support means”.

2.3.10 *Financing and management*

Accreditation criteria include certain requirements to programs financial support and management as follows:

- “Program financial support shall be at least at the level of license standards.
- Financial and management policy of HIE/department shall be focused on improvement of educational program quality.
- HIE/department human resources policy shall be focused on maintenance and assurance of continuous professional development of academic staff.
- HIE/department auxiliary educational staff and administration and maintenance activity shall meet educational program needs.
- HIE/department management shall efficient and ensure educational program development.
- Establishment of quality management system in HIE/department certified by independent bodies is an important factor.”

Naturally, financial support of state educational institutions complies with license standards. Another issue is financial policy of department and HIE in general. The objective of self-assessment report authors is to demonstrate and provide facts proving that financial and administration policy is focused on improvement of educational program quality, continuous professional development of academic staff participating in this program, and development of technical and information support for teaching and learning process.

Self-assessment report shall pay special attention to support of academic staff professional development and engage young scientists as teachers. Accreditation criteria with regard to academic staff require their participation in scientific researches, publications, regular qualification improvement courses. Self-assessment report shall specify implementation of policy aimed at support of academic staff continuous professional development.

Generalities shall be avoided when answering a question about HIE/department management efficiency. The report shall provide factual information on HIE/department management organization and demonstrate how this management ensures educational program development.

2.3.11. *Graduates*

Before providing explanations on this part of self-assessment report we shall note requirements of “Graduates” accreditation criterion. This criterion requires the following:

- “HIE/department shall systematically study employment, professional demand, career follow-up and continuous professional development of HIE graduates.
- Information received from this systematic study shall use for further improvement of educational programs”.

Materials presented in this part of the report shall, first of all, specify the duration of this educational program and the number of students who successfully graduated from this program. If the program lasts for many years, statistical information on the last 4-5 years will be enough.

The issue of HIE systematic study of demand and employment of graduates and their career follow-up is more complicated. Various HIEs have different approach to this issue. However, the key word here is “systematic”. All activities in this field shall be systematic and regular and be integrated into HIE management system and cycle of continuous development of educational program. That means that HIE established systematic activities analyzing demand for graduates (obtaining opinions and needs of major employers, analysis of their satisfaction), gathering information on graduates being satisfied with their education and its analysis, making appropriate management decisions aimed at improvement of educational program and consequently increase of all stakeholders’ satisfaction.

Analysis of compliance of graduates with production facilities’ requirements allows objective evaluation of educational program outcomes and adjustment of work programs of a qualified specialist training curriculum. Lectures materials and practical and laboratory works are adjusted annually”.

2.4. Information on curriculum subjected

Educational program self-assessment materials shall include information on all subjects taught within the frames of this program. Usually those materials are included in the 2nd volume of self-assessment materials. There is no need in providing a detailed work program for each subject, as experts’ commission members may get familiarized with work programs during their visit to HIE. Description of a subject in self-assessment report is usually a brief introduction (2-3 pages) that provides key information on each subject.

Description of each subject of educational program presented for public-professional accreditation shall include:

- Name of subject.
- Semester (semesters) during which it is taught within the frames of the program.
- Brief description of subject.
- Credit value of subject in ECTS points.
- Goal of subject teaching, for example
- Planned learning outcomes for subject.
- Contents of subjects presented as a list of taught topics stating quantity and types of classes (lectures, practical classes, laboratory classes) per each topic (hour).
- List of laboratory works and projects performed during subject materials study.
- Pre-requisites, i.d. list of subjects that teaching of this particular subject material is based on.
- List of basic and auxiliary recommended literature in the subject, as well as the list of electronic information sources on the Internet and HIE local network. At this, basic recommended literature shall be published not later than within last five years and university library shall have the appropriate number of books in compliance with established standards regulating provision with books in HIE, or this literature shall be accessible in electronic form. List of recommended literature shall also include methodological guidelines to laboratory classes, practical classes, course papers and projects stipulated by subject work program. Provision with such academic materials prepared by program staff and published by HIE itself is always considered as an accredited program strength.
- Last name of lead teacher in this subject.

2.5. Information on educational program teachers

Information on subject teachers participating in educational program presented for public-professional accreditation allows experts to form an opinion on conditions and quality of this program implementation, stability and planned nature of its implementation. Information on teachers is usually included in the 1st volume of self-assessment materials that describe characteristics of educational program and its implementation conditions, as well as in the 2nd volume in the form of resumes of all program subjects' teachers.

Academic staff participating in educational program implementation "shall consist of specialists in all fields of knowledge covered by educational program". [1].

Educational programs accreditation criteria impose a set of requirements to academic staff participating in their implementation. For example, requirements for specialists' training educational programs include the following [1]:

- "Academic staff shall have appropriate education and continuously improve qualification by means of extended education, study placements, etc.
- Academic staff experience in a relevant production sphere and their participation in research projects is an important factor.
- Academic staff shall be engaged in development of educational program in general and its specific subjects.
- Academic staff membership in professional associations and their award with grants is an important factor.
- Another important factor is engagement of academies' members and holders of various awards as teachers.
- Teachers shall actively participate in scientific-research, design and scientific-methodological work which shall be proved by reports on scientific-research and scientific-methodological activity, their participation in scientific conferences and at least two scientific publications a year for each teacher within last five years.
- Each teacher shall know and be able to prove importance of his/her subject in curriculum, its interrelation with previous and consequent subjects and understand the role of this subject in the process of a specialist development.
- Turnover of academic staff shall not be higher than 40% during accreditation period."

Besides quantitative characteristic of academic staff self-assessment materials shall also provide qualitative characteristics of teachers demonstrating compliance with accreditation criteria requirements.

Self-assessment materials shall provide such qualitative characteristic of academic staff together with the following information on each teacher participating in implementation of educational program presented for public-professional accreditation (individual resumes of teachers):

- Last name, name, patronymic name and date of birth.
- Number of contact phone, e-mail address, link to Internet page (if available).
- Position and department (specifying full or part-time job, and in case of part-time job – major occupation and time (in percentage) allocated to it). For example, "*Assistant professor, department of theoretical economics, full time*".
- Name of HIE a teacher graduated from and graduation year. Academic degree, academic rank. Work in department including date of employment and positions held.
- Work in other departments and organizations (dates of employment and positions held).
- Major scientific interests.
- Major publications within last five years in the form of publications list including teaching and methodological publications. In case of a large number of publications only the major ones shall be included. At the same time attention shall be paid to the fact that accreditation criteria require annual publishing activity of teachers.
- Membership in scientific and professional associations. It shall be noted that participation in activity of professional and scientific associations, boards, editorial boards of scientific and technical magazines is

an important tool connecting HIE with professional association and society in general promoting HIE recognition and its authority enhancement.

- Awards and prizes. This list shall include all state and official awards and prizes as well as in-house rewards.
- Subjects and courses during current academic year (per each semester), hours of lectures (per week), seminars and laboratory classes.
- Other duties performed by a teacher during academic year and hours allocated per week. It shall be noted whether they are paid separately. This description shall also include participation in thesis board activities, etc.
- Professional advancement. This is a very important issue that characterizes planned nature of human resources potential development at the level of department and HIE in general. Information shall be given on all forms of professional advancement in-house and outside (name of professional advancement course, location, and year).

2.6. Information on department implementing program

Self-assessment materials shall contain a detailed description of department implementing educational program. This may be a chair or a department if a program is implemented by various chairs. A decision on what to describe shall be made by self-assessment report authors; however, these materials shall provide a comprehensive picture of organization and resources used for program teaching and learning process.

2.6.1. Department structure

Organization chart of department implementing a program is usually described in the 3rd volume. Self-assessment report shall include both such chart and qualitative (text) characteristic of department structure.

2.6.2. Department financing

The objective of self-assessment report authors in this part is to demonstrate that financial and administration policy of the department is aimed at continuous improvement of quality of implemented educational programs. Text and quantitative information shall prove that this policy and activities are aimed at methodological and organizational improvement of program, maintenance and upgrade of facilities and resources, purchase and publication of new literature, professional advancement of teachers, purchase of new equipment, and maintenance of department infrastructure.

2.6.3. Department personnel and human resources policy

This part of the report shall provide information on department staff numbers. If a department implementing educational program is a chair, the report may contain information on department staff numbers showing a “strong chair of a strong department”.

2.6.4. Teachers' academic load

This part shall contain information on academic load of curriculum subjects' teachers and on load of all departments participating in its implementation.

2.6.5. Information on department admission and graduates

This part contains information on admission of students to department programs and graduates for last five years.

This part may also contain a trend forecast related to change of rules of admission to department programs and responsive actions of department management in case of increase or decrease of potential applicants.

2.6.6. Other information on department

In this part self-assessment report authors can provide additional information on department which, in their opinion, can characterize this department better and add to description of department potential and conditions in which teaching and learning process is carried out. This may include information on scientific outcome of department chairs' activity, their publishing activity, participation in conferences and seminar, various achievements and awards to their employers, etc.

2.6.7. Strengths of department (chair) implementing educational program

This part shall describe strength of department implementing educational program and influence of these strengths on quality of engineering personnel training.

2.6.8. Weaknesses of department (chair) implementing educational program

This part shall contain objective analysis of shortcomings or weaknesses of department implementing educational program. It is advisable to describe ways and measures to elimination of these weaknesses and show planned nature of this department development and informed activity aimed at elimination of current weaknesses and shortcomings.

2.7. HIE general information. Changes and major achievements implemented after experts' last visit.

2.7.1. HIE general information

General information usually includes the following:

- - official name of educational institution,
- - official address of educational institution,
- - last name, name and patronymic name of its head,
- - last name, name and patronymic name of a person responsible for preparation of educational program self-assessment materials,
- - name of HIE founder.

This part shall also note that public-professional accreditation of a particular educational program is carried out for the first time or provide the date of the last public-professional accreditation and name of accrediting body that carried out an assessment of this educational program.

If public-professional accreditation of this educational program has already been carried out, this part shall describe changes (improvements) that have been implemented within the frames of this program for the last period. Information of implemented changes may also be provided as a separate part.

2.7.2. HIE mission

Statement of HIE mission essentially depends on HIE position (regional, national, etc. center of education and scientific research) and its strategic goals.

This part shall necessarily contain the date of HIE mission approval and the name of the body that approved of it (Academic board, HIE personnel conference), as well as the link to Internet web-site where this mission

is published. The latter is very important since publication of HIE mission on the Internet ensures its public access and allows all stakeholders to get familiarized with it.

2.7.3. HIE long-term goals

This part describes HIE long-term goals from the point of view of its educational, scientific-research and other activities as well as approximated time during which these goals can be achieved.

Complete text of HIE strategic development program may be provided as an addendum to the report on educational program self-assessment or as a link to Internet web-site where this program text is published.

2.7.4. HIE short-term goals

Self-assessment report shall include both long-term goals and short-term goals of HIE development and activities. Information on short-term goals shall help experts to correctly evaluate connections of goals and outcomes of particular educational programs with HIE general strategy and activities.

For each specific HIE these goals are naturally implied by its specifics, missions and development strategy.

It shall also be noted when this HIE short-term activity program was approved of and by which HIE management body.

2.7.5. HIE merits

This part shall provide a detailed description of HIE merits, its strengths and achieved outcomes. It shall be noted that HIE strengths shall be demonstrated in its educational programs, teaching and learning process organization, academic staff and management. It is also important that students and teachers participating in educational programs presented for public-professional accreditation shall be familiarized with HIE strengths and share its goals and development strategy.

2.7.6. HIE shortcomings (weaknesses)

This part shall contain an objective analysis of HIE shortcomings or weaknesses. It is advisable to at least outline ways and measures to elimination of these weaknesses and show planned nature of this department development based on analysis and knowledge of these shortcomings and weaknesses.

2.7.7. Statistical information on HIE

This part shall contain major statistical information on HIE implementing educational program. This information shall be provided for the purpose of quantitative illustration of HIE text characteristic given earlier and, if possible, it shall fully unveil its strengths.

3. Training of experts for public-professional accreditation of engineering education EPs. QUEECA EXPERIENCE.

3.1. Selection of experts for public-professional accreditation of EPs

Quality of external independent assessment of educational programs vastly depends on the following three technical issues:

- Selection of experts;

- Training of experts;
- Motivation of experts.

Success of external independent assessment substantially depends on correct selection of experts – future participants of educational programs' assessments. Potential experts shall tentatively comply with the following requirements:

- Show interest in engineering education improvement,
- Have higher education and recognition in a certain field of activity,
- Have an academic degree in a corresponding field,
- Be able to use the Internet, e-mail, word processing programs (Microsoft Word) and PDF files.

When talking about a specific field of activity it shall be noted that experts have to deal with various educational programs in the field of engineering and technology [8].

Experts may be selected from representatives of various HIEs and HIE structures and they may have various statuses, functional abilities and work experience in their respective HIEs. Selection depends on the type of expert information we would like to obtain from future member of expert group during an accreditation visit.

According to HIE status potential experts may form the following groups:

- Administrators – HIE specialists who are well aware of organization of administrative and financial-economic aspects of HIE activities;
- Methodologists – specialists with methodological work experience in the field of creation, implementation and development of educational programs. Such candidates, obviously, shall possess methodological perspective that exceeds the limitations of their own HIE, having knowledge of methodological rules, regulations and materials at the federal level and aware of trends and approaches to methodological work implemented by international academic society;
- Specialists – teacher with a comprehensive experience of teaching and knowledge in the fields relevant to educational programs presented for accreditation.

Any expert group is supposed to be a combination of representatives from three groups mentioned above. Besides, as practice shows, quality of experts group's work increases when it consists of experts of different ages, temperaments, occupational statuses, production and life experience.

Let us consider major principles applied to selection of experts and limitations that shall be noted during selection of potential experts.

First of all, an expert shall not be a person to provide final opinion on the basis of received information even if he/she is a recognized specialist who can contribute a lot to educational program assessment. An expert may only be an equal member of expert group with the right to express his/her opinion (even if this opinion is a dissenting one). Otherwise it may lead to a situation when opinions of other members of experts group will depend on opinion of this specialist and an assessment outcome will be provided on the subjective basis.

Secondly, not every specialist even the most recognized in his field can become a member of an expert group. Some of them, even those with comprehensive knowledge, do not have qualities required for a member of an expert group and are not able to provide adequate opinion which may disrupt assessment especially during meetings with representatives of students and teachers participating in accredited program.

That is why the first criterion for experts' selection is the degree of their competence. There is of course an issue with evaluation of such competence. Usually competence is evaluated on the basis of obvious factors such academic degree and title and length of work in HIE. However, a more thorough selection of potential experts may be carried out with account of their occupational status, number of published works in the subject's field, public recognition of such potential expert as a professional in the field.

Second criterion is the degree of candidate's actual knowledge of the latest scientific and practical achievements in relevant fields, in methodology and management of development and implementation of engineering education programs. It is also very important to carry out a qualitative analysis of scientific-methodological and practical activity of an expert over the last years.

The third criterion is a reasonable of candidate's niche expertise and his general knowledge. Evaluation of candidates in this area required assessment of their methodological and scientific works.

Finally, the fourth criterion is an optimal combination of candidates' individual qualities as high education employees. This shall include ability to work in a team, tolerance to opinions that differ from their own, ability to provide comprehensive and objective evaluation of problems without being too optimistic or too pessimistic, patience, friendliness and tactfulness.

Expert commission shall consist of specialists in the field of HIE administrative-methodological activities and in specific subject areas that include engineering education programs. Thus, it is logically assumed that opinions of specialists shall be taken into account mostly in the sphere that is related to evaluated criterion. For example, in order to provide a relevant opinion in human resources part of the program experts shall possess work experience in a teaching group, knowledge of HIE fundamentals of department's activities financing, etc. At the same opinions of other members of experts group shall not be underestimated even if such experts are not highly competent in this sphere as no aspect of educational programs implementation shall be considered separately but only in connection with other aspects.

In some cases selection of potential experts may be substituted by their appointment by management. Technically it is a simple way of selection in the form of the head's order of participation in experts' training. However, it is obvious that this practice defies a principle of voluntary participation of experts in public-professional accreditation of educational programs. Even though cost of experts' selection is minimal in this case, there is a strong possibility that this experts' group will consist of people loyal to management and their future opinions may become similar to a private opinion of management. As a result opinions of experts' group in the process of educational program assessment may shift to opinions of specialists who are not conflict prone which may also lead to open critics of HIE administration and educational program management. Another extreme possibility of such appointment is selection of specialists with increased social activity but not always competent which is not beneficial for the process either.

As it was noted earlier it is important that potential experts voluntarily participate in further training and expert visits to HIEs. This voluntary participation and interest of experts are important components of their successful expert activity in future.

When a necessity of expert activity evaluation is mentioned, it, first of all, includes two parameters:

- how expert's professionalism (education, qualification, experience) promotes efficiency of activity;
- personal features – whether an expert is smart, ambitious, responsible, etc. (so called personal-professional qualities).

As practice shows, possession of only high qualification, comprehensive experience and spacious mind does not guarantee efficient expert's work in the course of educational program audit.

There is an example of how experts are selected in the Accreditation Center of the Association of Engineering Education of Russia (AC AEER).

AC AEER experts form the efficiency basis of AC and to a large extent (due to AEER developed international contacts) they personify modern engineering education in Russia. Over 200 certified professionals including deans, department heads, department managers, professors, associate professors, representatives of production facilities and administrative bodies contribute to success of their professions by finding time and efforts to participate in AEER activities on a regular basis. Most of AC AEER experts start as such by joining educational program assessment groups and visiting educational institutions. Minimal qualification requirements to potential experts are listed below.

AC AEER potential experts shall meet the following requirements:

- Be interested in engineering education development.
- Be AEER member or express a wish to become AEER member before starting activity as an expert.
- Have higher education and be recognized in a specific field of activity.
- Have academic degree in a specific field.
- Be able to use the Internet, e-mail, word processing programs (Microsoft Word) and PDF files.

When a necessity to evaluate expert's activity is mentioned, there are two most important parameters: how his/her professionalism (education, qualification, experience) promotes efficiency of this activity and what kind of a person he/she is – smart, ambitious, responsible, etc. (personal-professional qualities). As practice shows, possession of only high qualification, comprehensive experience and spacious mind does not guarantee efficient expert's work in the course of educational program audit [9].

When experts-auditors are selected in European and American accrediting bodies a concept of “competence” is used. There are many definitions of competence since various organizations and experts prefer their own understanding of this concept. Most definitions as a result become a variation of two approaches to competence – English and American. English approach interprets competence as an activity standard or expected activity outcomes that help to evaluate an expert ability to act accordingly. American approach to competence describes behavior required for efficient work where actual behavior of an expert complies with description.

AC AEER experts' community defined a set of requirements to an expert's competency model meeting which makes application of this model practical and efficient [8]. These competences are listed in Table 1

AC AEER experts' competencies*Table 1*

Competence	Desired skills	Application during on-site visit to the university
1. Ad-hoc expert background	<ul style="list-style-type: none"> • Demonstrates awareness as an expert in accordance with the position held • Interested in lifelong learning in his/her professional field 	<ul style="list-style-type: none"> • Able to apply expert knowledge to define how the educational program meet accreditation requirements • Aware of all updates of accreditation procedure and criteria
2. Effective communication	<ul style="list-style-type: none"> • Easily holds face to face interviews • Writes reports clearly and concisely • Holds focused briefings 	<ul style="list-style-type: none"> • Interviews university staff to evaluate program efficiency • Writes short, criteria-based reports on the strengths and weaknesses of the program • Provides a thesis for the final interview hold by evaluation team • Inform the Chairman of all unavailable for evaluation team information (including from a self-study report), the prior and within the on-site visit
3. Interpersonal communication skills	<ul style="list-style-type: none"> • Friendly and naturally interacts with others • Listens actively and is interested in the topic • Unbiased and avoids personal prejudices • Decisive, not restrained his opinion out aloud • An expert in highlighting strengths and weaknesses of the educational program in a non-confrontational manner 	<ul style="list-style-type: none"> • During interview have a strong willing to accept information from staff, administration, industry representatives and students • Evaluates the program in accordance with the accreditation criteria within a particular institution • Evaluates and expresses constructive opinion about strengths and weaknesses of the program
4. Teamwork oriented	<ul style="list-style-type: none"> • The willingness to accept information from members of the experts' team • Works with team members to reach consensus • Evaluates the success of the team higher than of an individual 	<ul style="list-style-type: none"> • Compares his data with information collected by other team members for better understanding • Catches and listens carefully in order to achieve general result on the program • If necessary helps other team members within on-site visit
5. Professionalism	<ul style="list-style-type: none"> • Observes professional behavior and has proper appearance • Improves the process of program evaluation • Evaluates people honestly, and in accordance with the ethical standards 	<ul style="list-style-type: none"> • Represents AEER and his engineering profession as a practicing professional • Tries to make suggestions on how to stimulate innovation and other efforts for continuous educational program improvement • Demonstrates respect to the university and its employees • Always observes the code of ethics of AEER expert

6. Self-discipline	<ul style="list-style-type: none"> • Keeps within the meeting time limit • Focuses on the major critical issues and avoids details • Ready to take the initiative • Responsible at work with minimal supervision 	<ul style="list-style-type: none"> • Formulates preliminary strengths and weaknesses of the educational program on the basis of the review materials provided prior to the visit • Focuses on the important results, effectively attracts additional data relevant to the used criteria and offers possible solutions • His distinctive feature is timely and high quality reporting to the experts team chairman • Makes critical recommendations where necessary
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There are many opportunities to assess the achievement of competencies by experts:

1. *Binary scale*

- satisfactory
- unsatisfactory

1. *Three-level scale*

- Below Expectations
- Meets Expectations
- Exceeds Expectations

2. *Four-level scale*

O competence is not developed and expert does not seek to develop it

A need and possible to develop competence

B competence meets standard requirements

C expert demonstrates higher level than it is set by standard

Note: For A it is necessary to explain the choice.

Below there is Table 2 with a four-level competence scale. A chairman of the expert team can evaluate expert's work using this scale. This kind of information is important for AC AEER analytics. In case expert gets a significant number of A scores, he/she is invited to undergo additional training in AC AEER seminars.

Evaluation of experts' competencies by commission chairman*Table 2*

	Requires improvement A	Satisfactory B	Exceeds expectations C
1. Ad-hoc expert background			
1.1. Knowledge of applying accreditation criteria	Demonstrated wrong understanding of accreditation criteria	Demonstrated awareness of accreditation criteria	Demonstrated an exceptional ability to explain accreditation criteria to others
1.2. Knowledge of accreditation procedure	Demonstrated wrong understanding of accreditation procedure	Demonstrated awareness of accreditation procedure	Demonstrated an exceptional ability to explain accreditation procedure to others
1.3. Leadership	Failed to provide adequate leadership	Provided the team with additional resources by managing within the on-site visit	Demonstrated a high level of team management, that provided good results of the visit
2. Effective communication			
2.1. Information transfer	Chairman of the experts' team is not informed about the activities and contacts with university representatives	Provided the chairman with the new information in accordance with the new data	Was an active supporter of the chairman informing
2.2. Final report	Written final report required significant editing	Written final report was effective. Key points were highlighted	Outstanding written report. Slight editing by the chairman was /was not required
2.3. Interview	The interview was not conducted carefully enough and did not provide suggestions for program improvement	Effective interview allowed to determine the key points	Demonstrated exceptional personal qualities when conducting the interview in a confidential manner
2.4. Suggestions	Made suggestions were too biased	Made suggestions for continuous improvement of educational programs and promotion of innovations	Was creative when making suggestions for continuous improvement of educational programs and promotion of innovations
3. Interpersonal communication skills			
3.1. Communication	Not demonstrated effective communication	Was effective in communication with the program, students, teachers	Demonstrated an exceptional ability to prevent actual or potential conflict when discussing strengths and weaknesses of the program
3.2. Prejudice	Was biased when evaluating the program	Demonstrated an unbiased approach when evaluating the program	Demonstrated an unbiased approach when evaluating the program
3.3. Diplomacy	Was rude and aggressive towards team members or university representatives	Demonstrated ability to articulate in a diplomatic manner in difficult cases	Was decisive and spirited when making final conclusions
4. Teamwork oriented			
4.1. Willingness to listen	Interrupt others, and tended to monopolize the conversation	Demonstrated a willingness to listen to other points of view during a meeting of the expert team	Encouraged others to express their point of view

4.2. Willingness to help	Was focused only on his/her own tasks without voluntary will for assistance	Demonstrated a willingness to help other team members during the visit	If necessary, consistently offered assistance to other team members
4.3. Cooperation	Demonstrated a limited ability to see different perspectives, or to seek a common point of view	Worked in collaboration with other experts to reach consensus	Demonstrated an exceptional ability to help the experts to find a common point of view and resolve the conflict, reaching a general consensus
5. Self-discipline			
5.1. Prior to the visit	Was not prepared when he arrived in the university	Demonstrated timely performance of all tasks before visit to the university	Demonstrated performance of tasks prior to the visit and actively interacted with the expert's team chairman and / or team members
5.2. Ability to "keep track of time"	Did not provide program enough time to prepare for additional requests	Demonstrated effective time management at university	Demonstrated an exceptional self-discipline and efficiency during on-site visit to the university
5.3. Ability to respond	Delayed materials and did not respond to the comments of the expert's team chairman	Timely reported to the experts team chairman	Documentation was submitted ahead of time
5.4. Self-discipline	Was disorganized in all aspects of the accreditation process	Demonstrated an effective organization in the evaluation process from first contact to final report	Was extremely effective, completed all tasks timely
6. Professionalism			
6.1. Respect	Showed little respect in relation to the university	Showed respect for the university	Demonstrated a high level of respect for the representatives of the university during the meetings with them
6.2. Behavior	Did not represent AC AEER in a proper manner within expert's team activities and final meeting	Showed respect for the university within expert's team activities and final meeting	Demonstrated superior ability to express respect for the university within expert's team activities and final meeting at uncomplimentary conclusion
6.3. Ethics	Demonstrated misplaced arrogance in respect of other experts	Constantly observed the Code of Ethics of AEER expert	Set an example to other experts in the application of the Code of Ethics
6.4. Decision making	When evaluating the program, based on his/ her own opinion and not on the AEER criteria	Demonstrated expertise in making decisions when evaluating the program	Showed a brilliant professional decision making in the interpretation of criteria and characteristics of the program

3.2. Training of experts within the frames of QUEECA project for carrying out of public-professional accreditation of engineering education EPs

Previous paragraph described qualities and characteristics considered during selection of potential experts and evaluation of experts' activity at the stage of their familiarization with educational program self-assessment materials and during accreditation visit to HIE. Now let us see how experts are trained as it is, obviously, not enough to just be a professional in his/her field and have methodological experience to assess EP quality. Potential experts shall have special knowledge of accreditation procedure and criteria. Besides, it is advisable that they shall have some perspective in this field of activity and understand how these processes are implemented in other countries. A sample program for initial training of experts is given below in Table 3.

Sample program for initial training of AC AEER experts

Table 3

Evaluators training. Day 1

Activity	Participation	Start	Duration
Development of the system of professional accreditation of educational programmes	All	10:00	1:30
Coffee break	All	11:30	0:15
Criteria and procedure for accreditation of educational programmes	All	11:45	1:30
Lunch	All	13:15	1:00
Educational programmes self-study procedure	All	14:15	1:30
Coffee break	All	15:45	0:15
Audit of educational programmes in university	All	16:00	1:30
Handing of materials for independent familiarization	All	17:30	

Evaluators training. Day 2

Exercise 1 (objectives of educational programme)	In groups	09:00	Step 10:20 Step 20:20
Exercise 2 (learning outcomes)	In groups	09:40	Step 10:20 Step 20:20
Discussion of group work results	All	10:35	0:40
Exercise 3 (alignment of objectives and learning outcomes)	In groups	11:15	0:30
Exercise 4 (alignment of learning outcomes with the Accreditation Centre requirements)	In groups	11:45	0:40
Discussion of group work results	All	12:25	0:40
Exercise 5 (relationship of learning outcomes and courses)	In groups	14:05	0:40
Exercise 6 (evaluation methods)	In groups	14:45	0:40
Discussion of group work results	All	15:40	0:40
Summing up. Handing of individual tasks	All	16:20	0:45

Evaluators training. Day 3

Activity	Participation	Start	Duration
Presentation of homework	All	9:00	18:00

As this sample program shows training of experts start with studies of a general situation in educational programs accreditation sphere, its influence on engineering education development in the country, promotion of its quality improvement and assurance of international recognition of the system of EPs quality assessment in general and its specific accredited EPs. Further on experts study particular features of public-professional accreditation of engineering education programs in various countries. Despite the fact that accreditation procedure and criteria applied to activities of all national accrediting bodies are “essentially equivalent”, it is important to note specifics and traditions of countries where these programs are implemented and assessed. Successful work of expert is practically impossible without comprehensive knowledge in this sphere.

Upon consideration of these basic issues experts are engaged in special training which includes detailed study of criteria applied to accreditation of programs of the first and second educational cycles and to specialists’ programs. An expert shall be familiar with all criteria requirements and methods of EPs qualitative analysis in accordance with criteria basis, as well as with quantitative requirements to EPs of various cycles (content of EPs in general and per subject in ECTS points, number of program subjects’ teachers with PhD and ScD, etc.) A substantial part of experts’ training is allocated to practical classes. During these classes experts learn to analyze EPs goals and outcomes, their compliance with HIE mission and strategy and employers’ requirements, efficiency of mechanisms used for adjustment of EP goals and outcomes.

During the final part of their studies experts become familiar with accreditation visit report forms, order and procedure of their preparation. Moreover, experts study the professional ethics code and requirements related

to conflict of interest between HIE and experts.

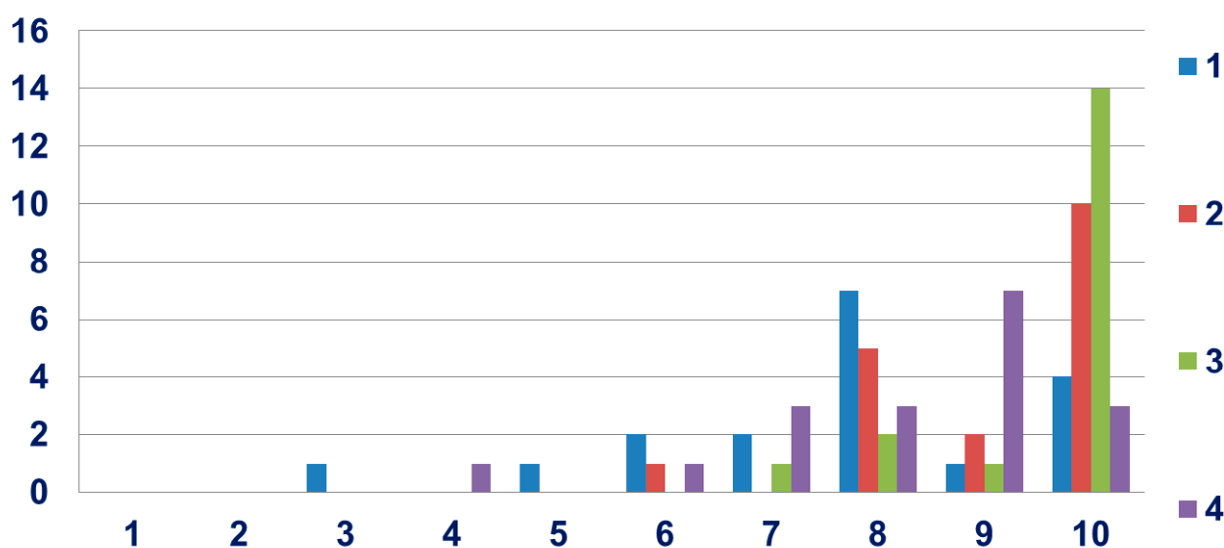
Seminars-trainings were carried out in all four member-countries within the frames of QUEECA project:

- Tashkent (Uzbekistan) - 25-30.05.2014
- Almaty (Kazakhstan) - 30.06.- 2.07.2014
- Dushanbe (Tajikistan) - 20-22.10.2014
- Bishkek (Kirghizia) - 1-3.03.2015

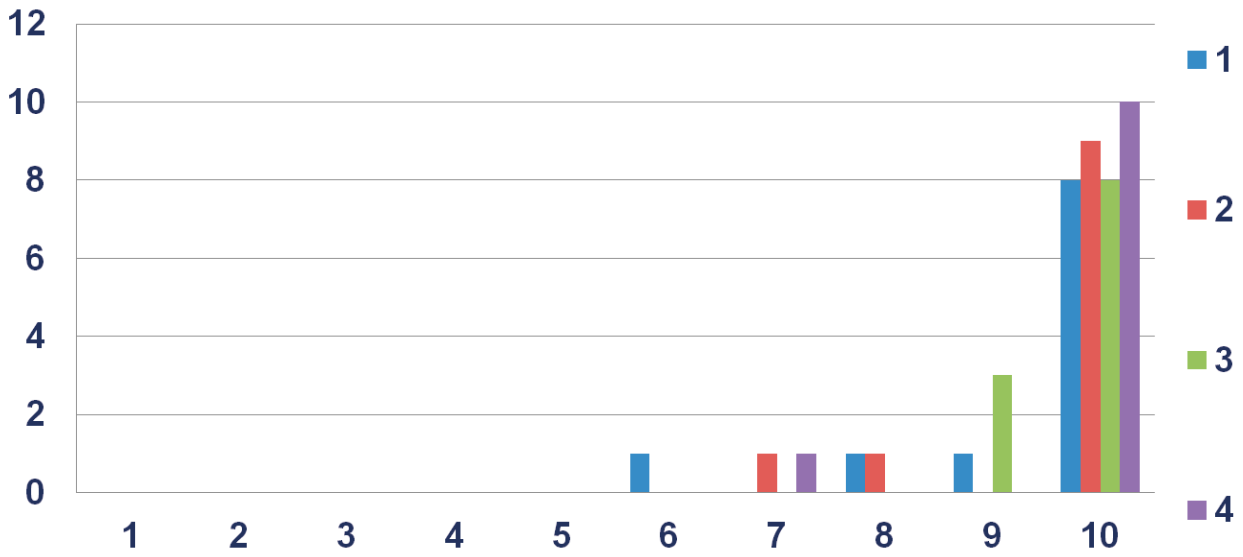
Number of participants varied from 25 to 30 people. Usually after the seminars participants were given a questionnaire to get their feedback on classes' quality. It included the following questions:

1. Seminar duration
2. Seminar content (themes, sections)
3. Teaching level (method, style, a presentation materials)
4. Level of the organisation of a seminar (lecture-room, equipment, distributed materials, etc.)

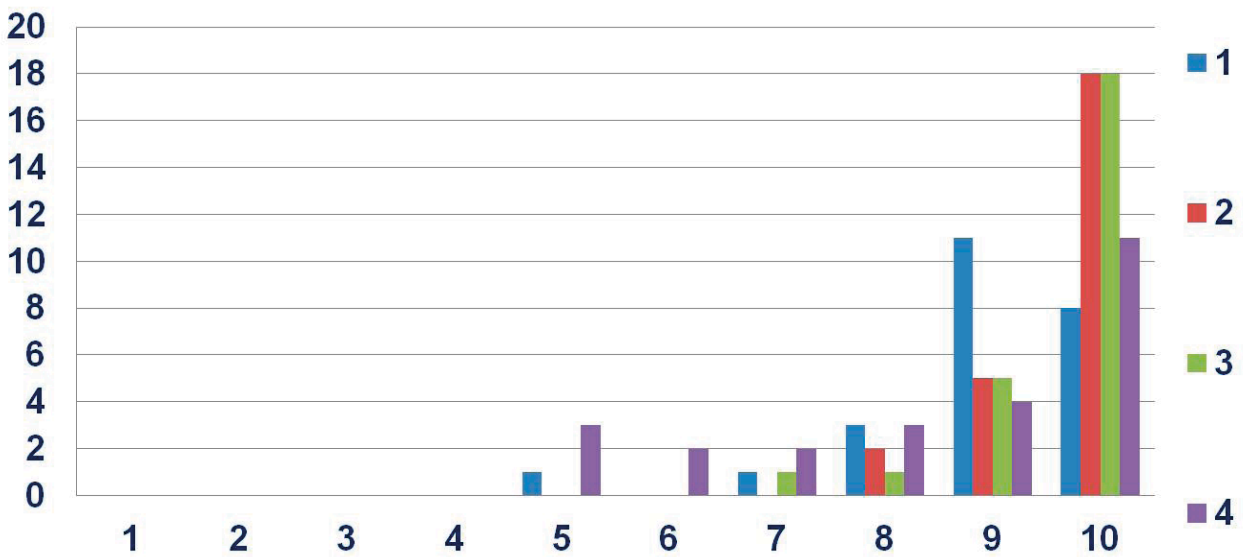
Maximum grade was 10 and minimum grade was 1. Below answers' options are given:



Distribution of experts' grades in Dushanbe



Distribution of experts' grades in Tashkent



Distribution of experts' grades in Almaty

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Part II.
**Contributions by academic, governmental
and industrial stakeholders**

Defining Qualification Framework for Engineering Education: in line with QUEECA experience

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1. Introduction

All around the world ensuring the quality of higher education has become the dominant issue, while the international processes (including globalization and technological convergence) play an important role in both interpretation and implementation in practice the quality assurance. So far any higher education institution is (should be) strongly engaged with sustainable technological development and aimed to be recognized worldwide for its production of knowledge, research, innovation and technological advances. In this regard we can refer to Humboldt and Newman who set for higher education ambitious and long-term goals: to achieve excellence in the pursuit of knowledge. Although it could be argued that instead of such ‘academic’ goals more ‘instrumental’ approach came onto agenda, when knowledge (even when it is becoming ‘uncatchable’ due to innovative nature of technical and technological transformations, especially in engineering sector) still underlies the mission of higher education, and is directly and indirectly reflected in key documents to ensure education quality whereas it is getting more and more difficult to formalize requirements for education quality. With fast and incredible development achievements and trends in science and technologies during the last decade the role of teaching and training became crucial with strengthening requirements of current education standards and appropriate adaptation of education program to changing needs and challenges, especially in the field of engineering education. Besides, to provide training of highly qualified personnel who are able to think independently and to ensure progressive scientific, technical, social and economic development of the society is one of the most important tasks of education community.

Engineering education worldwide is primarily related with technological development whereas result-based, competency-based like approaches define the necessity of considering requirements to quality of training in the field of engineering and technology at institutional level and quality of engineering education itself. Engineering activities in the post-industrial society are becoming more integrated, comprehensive and innovative. Thus improving the quality of higher education in engineering and technologies should be based on the studying and developing the best educational practices, traditions and culture.

From other hand the quality of educational activity’ results depend mainly on the quality of knowledge and skills of graduates: good quality of the results can only be achieved with good quality of the educational process, defined on its content, but also on availability of different resources. At the same time the high quality of the educational process can be achieved only with the proper functioning of the whole system of the university, including quality of management at all levels of the organization and the quality of supporting processes.

Herewith we provide some considerations regarding the qualification framework definition within engineering education and propose an approach to formulate requirements to educational program so far envisioning the mission of engineering education to be dedicated to educating the high quality engineering professionals and leaders. The specific aim of this framework is to serve as a methodology for quality management tools to improve the overall educational process by partially correlating with Total Quality Management concept for education [1,2] (and envisioning its productivity and competitiveness). Based on the experience of QUEECA

project (www.queeca.eu) we are being involved for the last three years, and addressing priorities raised in the project we more than assume that our proposal will allow to set the grounds for graduates will be prepared for solving engineering problems creatively, through the use of analytical skills, being self-confident citizens with ability to grow intellectually and able to solve challenging problems.

2. Analytical considerations for quality of engineering education in Uzbekistan (TUIT case)

In Uzbekistan the definition of education policy and monitor of its quality is carried out by the Ministry of Higher and Secondary Specialized Education of the Republic (MinHSSE). MinHSSE, considering the needs and requirements of the labor market, is guided by uniform regulations, in particular, by “the requirements to the necessary content of knowledge and training of bachelors in the directions of education” and “the requirements to the necessary content of knowledge and training of masters”, developed under the standards of continuing education system (Education Standards), and coordinates the requirements for the quality of training. It is obvious that ensuring the quality of specialists’ training requires direct participation of stakeholders (business leaders, ministries, departments, organizations and firms as direct customers), to attract them to participate in scientific and educational processes in all stages, using customer feedback through the assessment of their satisfaction.

Nowadays the higher education in Uzbekistan is characterized by the further deepening of the reform process and implementation of the National Program for Personnel Training (www.edu.uz); the experience gained is being analyzed and generalized, the development of the labor market and specific socio-economic conditions are being taken into account. All necessary legal, personnel, scientific and methodological, and financial conditions are set to ensure the reform of the higher education system. Structural reforming and modernization of higher education content is continued. Today, the main goal of the modernization of higher education is to ensure quality through the further development of state educational standards, strengthening structures for evaluation and accreditation, as well as through continuous process of capacity building of the teaching staff of universities.

Educational standards in Uzbekistan are formed in four main areas, reflecting the processes of learning, namely:

- Areas of education, or general description of specialties;
- Requirements to the level of bachelor’s and master’s degrees in areas of education; these requirements include quality criteria for industry knowledge;
- The content of the curriculum, reflecting the components of blocks of disciplines and weekly distribution of the educational process;
- Monitoring and evaluation of the training quality of bachelors and masters.

Guided by the missions of overall higher education (governed by the Ministry of higher and secondary specialized education of the Republic of Uzbekistan) Tashkent University of Information Technologies (TUIT, www.tuit.uz) is a leading technical university of the Republic of Uzbekistan specialized in professional training in the field of information and communication technologies (ICT). Nowadays TUIT is a modern university possessing high scientific and pedagogical potential, wide range of educational programs, developed network of international contacts, highly appreciated level of professional training. There are five regional branches of TUIT located at different cities of Uzbekistan (important aspect for project results dissemination). TUIT’ graduates are actively participating in the implementation of the programs on the development of national information and communication networks and systems of the Republic of Uzbekistan.

Being the leader in the sector, TUIT is to be active in improving education quality: all nation-wide requirements of higher education are on place; a number of documents related to internal quality assurance are being accepted on yearly basis. TUIT participates in international programs on quality in education (e.g. Tempus projects like QUEECA, UNIQTUOL and others).

But still there is lack of organizational efforts for having general/system view of quality providing and ensuring within TUIT (we would note this in general for national technical education). At least we could not refer to appropriate documents attracting the quality management system for national education entities (this is also resulted from several discussions with TUIT Educational Methodical Administration representatives: they agree that there should be a Vision or Strategic Plan implemented in technical education establishment(s) so the qualified professionals will be seen as 'obvious' result of quality education services). In addition, it is actual issue due to technical nature of our university: we always face to technological trends so the associated ICT policy and technical considerations should be taken into account. It is within these challenges we propose to demonstrate what TQM together with QUEECA principles can bring for overall institutional development.

An overview of current practice of working on tasks and activity of QUEECA shows that in Uzbekistan there is still not enough experience exist on the procedures and implementation of accreditation via internationally recognized agencies, or such organizations and approaches used and criteria for accreditation are little known in our country. In this regard, it is advisable to specify following challenging issues:

- the level of closeness/similarity of established in our country criteria to the criteria used in the accreditation of internationally recognized agencies;
- feasibility/possibility of accreditation of engineering education programs (subject to proper registration) at the current condition of state educational standards;
- whether the programs, passed accreditation at the accreditation center to be established within the project will be recognized by the adjacent foreign universities and whether educational programs will be equivalent to world universities' programs.

So far, in order to be in accordance with the project (i.e. QUEECA 'aims at setting up and implementing a system of Quality Assurance of Engineering Education in Central Asia', to promote the process of raising the quality of education in higher education institution through the implementation of an accreditation system) a prerequisite for the successful implementation/positive outcomes of the project is to develop a qualification framework to ensure the quality and learning outcomes in selected areas of training. This directly takes into account that in the core of project - the experience of creating the framework of the European system of standards and accreditation of engineering programs - EUR-ACE [3].

An important element is also the formation at institutional level the systematic understanding of learning outcomes and competences (educational programs of disciplines), which requires the involvement of key stakeholders (Ministry, sector, employers, public and/or private companies etc.) in the development and evaluation of training programs.

We denote the idea of TQM as a logical background for defining qualification framework and mirroring this onto the QUEECA idea thus interesting approach described below came as necessity on agenda.

3. Methodology

The necessity to provide high-quality education based on modern educational programs is in line with the process of improving the efficiency of education, requiring continuous assessment of quality. There are several prerequisites of supporting education process, e.g. learning conditions (availability and condition of classrooms, provision of textbooks, electronic library, etc.), the organization of educational process (training schedule, amount of daily and weekly hours, the possibility of self-study, knowledge assessment system, evaluation criteria, etc.), the educational program (curriculum, list of subjects, content and scope of courses, the amount of course work, the organization and ratio of the theoretical and practical lessons, etc.), the level of teaching (teacher's qualification and competence, fairness, etc.) to name a few. But there should be something more to cover different aspects of education process: in our experience of teaching of technical subjects for more than 20 years and some research activity within a number of Tempus academic projects, the feeling to

create specific framework allowing to combine different aspects of education becomes stronger so overall 'picture' could be seen through comprehensive and structured system of TQM.

By the widely known definition, 'TQM is a comprehensive and structured approach to organizational management that seeks to improve the quality of products and services through ongoing refinements in response to continuous feedback'. In addition, 'TQM effort builds on the pioneering work of Dr.W.E. Deming, Dr. J. H. Juran, and others, and benefits from both private and public sector experience with continuous process improvement'.

Looking back to the history of this concept, very important aspects to note are: quality is defined by customers' requirements; top management has direct responsibility for quality improvement; increased quality comes from systematic analysis and improvement of work processes; quality improvement is a continuous effort and conducted throughout the organization. On our opinion, these are key elements to take into account for higher education institution.

Based on the goals, directions and intentions of its activity the Higher education institution must take into account special procedures and measures developed and defined for quality. These measures are regulated by the quality assurance policy as a system focused to meet the requirements of all stakeholders - applicants, students and their parents, post graduate students, doctoral students and students of the program of additional education, personnel, policy makers, business leaders and heads of organizations. Realization of the quality assurance system reflects the overall strategy of the university in the field of quality, organization of quality guaranties, the relationship between learning and research/innovation activity of institution, as well as measures and procedures by which the system is applied, monitored and verified. This is the place where TQM should work and this is the main reason why this is important.

Methodology is based on the statements of organizational excellence and comprises three level of TQM developing (we suggest having such levels in order to combine different expectations of what TQM can give for technical institution and stakeholders):

1. Organizational level: the main idea behind this level is that TQM defines and designs the environment of quality organization. Structured approach to organizational management by which it is possible to improve the quality of institution (including educational products and services) makes it possible to satisfy the customers' expectations. Appropriate techniques and methods to be used at institution/university.
2. Logical level: knowledge management concept serves as basis for this level. Linkage between professional responsibility and quality accountability as the main factor to define the role of social and cultural context within educational process: it is seen here to track the relationship between elements of TQM (e.g. fact-based decision making, integrated system etc.) and knowledge management experience.
3. Implementation level: educational institutions, especially in technical/engineering education are pursuing quality improvement, so strategic planning measures should be envisioned and TQM implementation prerequisites should be clearly defined, and appropriate criteria and indicators for successfully implemented TQM be elaborated.

These principles are interrelated harmonically with the 'QUEECA standards for internal quality assurance of study programs in engineering': as it is noted, the QUEECA approach to internal quality assurance of study programs in engineering assumes that a 'study program may be said 'of quality' when it complies with the national standards and requirements and among others, establishes educational objectives consistent with the mission of the institution which the study program belongs to and the educational needs of the labor market of reference, and learning outcomes consistent with the educational objectives; teaching staff, facilities, financial resources, student support services and partnerships with businesses, research institutions and other Higher Education Institutions are adequate to accomplish the learning outcomes and are taken under control; it monitors the results of the educational process; it adopts an adequate and effective management system for quality and guarantees the publicity of the information on the study program'.

The success of a competitive and well-structured education system within institution rests on quality management tools used effectively and productively. In this regard it is worth to note that well-performed education system is to have correlation with qualification profile for which there is a comprehensive definition within QUEECA: ‘the degree profile must clearly define the aims and purposes of the program, in terms of educational objectives, i.e. what can be expected of the graduates in terms of the kinds of tasks they are equipped to undertake, their level of expertise and the responsibilities they can assume, and learning outcomes, i.e. what graduates will know, understand and be able to do by the time they have successfully completed the program’. So far the degree profile ‘is determined by the academic staff and endorsed by the responsible authorities and should be based on the identified and recognized needs by stakeholders’ serving as an essential tool for communication, transparency and recognition of education program.

Our approach deals with qualification framework concept while the interested side (stakeholder) can assign the required level of competence within criteria to be assessed for educational program (an example is given further in).

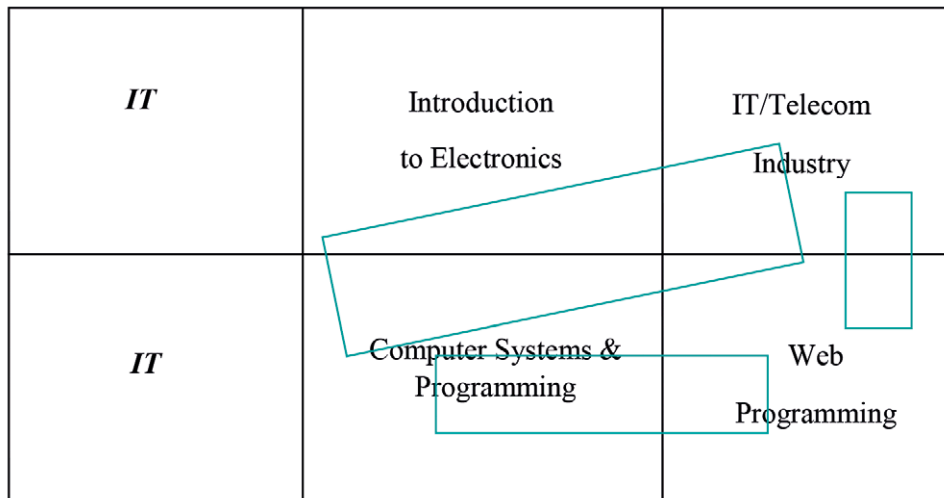
4. *Setting up the qualification framework: an example*


The diagram 1 below shows the matrix how qualification framework relates with defining the criteria (a) and course modules (b) for educational program. The competence frame depicted as colored rectangle can ‘change’ its size and angle depending on the scope of considered issues. The competence frame, as it is seen can cover different scope within requirements/courses and thus depicts how specific requirement/modules relate to the matrix. E.g. for the case a) if it is required to define the scope of criteria for appropriate qualification the respective degree (area in figure) of competences needs will be covered in required depth; for the case b) different modules might consist of 1) courses falling entirely in either the general or specific part of one of the subject matter areas, such as the module in the middle down of the diagram; 2) courses from both the general and specific types in one subject matter area, such as the vertical module on the right side of the diagram; or 3) courses that cut across two or more subject matter areas, potentially including general and specific courses in different subject matter areas, such as the diagonal module shown in the middle of the diagram.

*Diagram 1. Qualification Framework presentation
a) for defining the scope of criteria*

QUEECA standards and requirements	Needs, Objectives and Outcomes	Educational Process	Resources and Partnerships	Assessment of Educational Process	Management System for Quality
EUR-ACE Criteria	Needs of the Interested Parties, Educational Objectives, Program Outcomes	Planning, Delivery, Learning Assessment	Academic and Support Staff, Facilities, Financial Resources, Partnerships	Students, graduates	Organization and decision-making processes, Quality Assurance System

b) for defining the scope of courses within educational program



 Competence Frame

We can apply such approach for defining more concrete requirements within one type of criteria and/or for criteria for program courses to be assessed, having somehow the way qualification requirements can be clarified or classified according to the above matrix.

5. Acknowledgments and concluding remarks

Benefits of QUEECA project underline the importance of providing quality of higher education for economic, political and social development. The project significance in perspective is directly related with the generating knowledge and to giving economic value to technology; they can be seen also as common and useful mean for any technology-related or system implementation strategic planning with impact on different areas of engineering education.

Some observations (as we did for qualification framework) and comments (while working with accreditation documents) in the course of implementation and tasks of QUEECA project brought to discussing some specific issues. In order to align the goals and objectives of QUEECA project with possible measures feasible under the competence of the National authorities (e.g. Testing Center under the Cabinet of Ministers, www.dtm.uz which has the right 'to establish within its power the relations to the ministries and departments, international and foreign organizations') the TUIT project team finds it appropriate to propose to the Ministry of Higher and Secondary Specialized Education of the Republic of Uzbekistan (relevant officials) in negotiation with the Testing Center an acceptance/approval of the regulatory document governing the process of accreditation of educational programs in the context of the requirements of the project and, if so, submit the relevant documents. The adoption of such documents at the national level will enhance the importance of the activities carried out under the project, and serve as justified dissemination of project results.

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The main directions of engineering graduates training

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One of the basic requirements of the current stage of development of our country - the reform on the basis of accelerated scientific and technological progress, one can find the search for the most effective forms of connection between science and production. This is a promotion on the strategic directions, the restructuring of production, the transition to intensive rails, a more complete solution of social problems.

The objectives of science enter a decisive turn to the needs of production, and production - to a science. Today, science acts as a generator of ideas, it opens new breakthroughs in the field, rising to a new level. Increases the responsibility of the science behind the creation of the theoretical foundations of new types of engineering and technology.

If one considers the acceleration of scientific and technological progress, reforms are impossible without qualified personnel with deep and solid knowledge in the chosen specialty, information from related fields of science, the ability to improve their own acquired knowledge, organizational skills and creativity, be skilled in scientific research, etc. These qualities are intended to form the Graduate School.

The main task of the higher education system at the moment is to improve the quality of education. The traditional understanding of the quality of education include the level of training of graduates capable of effective professional activity, to adapt quickly to different conditions, which are able to use the acquired knowledge and skills into practice, and able to educate themselves throughout their lives.

The scope and depth of future scientific and technological changes make especially attention to quality training of engineers. It is necessary to implement the restructuring on the basis of scientific and technological progress so as to raise this issue today, we must seriously raise the status of the engineering profession. Currently, engineers believe demand, evidenced by increasing both competitions at the Technical University, and the possibility of employment of graduates.

In this first of all, you need a comprehensive solution to the problem of education. Here are two important tasks. Firstly, improving the quality of education. Taking into consideration the current level of production, it must be flexible and versatile enough to be continually updated; secondly, it is necessary to differentiate the entire system of training, so that it becomes adequate social and productive structure of professional knowledge of qualified engineers.

Education must be combined with the solution of practical problems, the needs of social development. It should be advancing towards him, constantly improved. But the demands that society places today in science and production, are talking about the need for significant improvements in higher education. The search for such ways to identify possible options for further movement in this area is now very important. It is directly related to the search of innovative ideas, guided by which we can move forward in the development of the economy.

Improving the system of higher education should be carried out continuously, regardless of the forms in which it manifests itself, whether it's the birth of new departments, universities or the introduction of new disciplines and specializations, and the elimination of outdated specialties.

Improving education is determined by three components: the creative people, the accelerated development of the concept of technology education, financial, economic and legal components. The result is a system of

education that can prepare professionals ready for change and risk, generating ideas, to work effectively in production and other spheres of public life.

Training of engineers includes the following methodological components: the goals, principles, educational content, methods, forms and means of instruction.

Clear and precise objectives determine the overall orientation of the system of training and bind together all the other components that focus on high efficiency of the educational process. Moreover, the purpose of training, as it is known, is defined and shaped by the general, socio-economic and national objectives, not by the education system

The methodological component in the training of engineers, in addition to the target are common didactical principles: scientific, motivation, system, continuity and consistency, communication theory and practice, consciousness and activity, and others. Moreover, each of them specifically manifests in high school. This applies especially to the principle of science, since all the new things that appear in Science and Technology, works on technology, equipment, and so - on the content of vocational education and training technology.

There are also specific principles in engineering pedagogy. These include:

- Mobility - a vision of a modern and new trends and prospects of the development of science, technology, production and education;
- System, allowing holistically to present and projected constructed technical object, see its relation to other objects, the environment and at the design stage to exclude possible negative phenomena and their effects;
- Integrity - reflected in the content and process of training engineers to professional work and adequate its holistic content of the training;
- Integration and differentiation of training of specialists - focus on integrated broad professions with homogeneous mixed and even disparate fields of professional activity and narrow specialization;
- Professional orientation - the orientation of educational content, methods and forms of education on the ultimate goal of specialist training;
- Continuity - a reflection of the past, present and future of the educational content and forms of the organization of training, educational communication and educational process of the upcoming professional activities, and other principles.

Training of engineers in a technical high school is carried out both in theoretical and practical terms - the formation of professional skills. Specificity of methods of theoretical and practical training due to the peculiarities of the studied natural sciences, general professional and special disciplines and the world of the upcoming engineering. As a result, the future engineers purchased: Engineering, design and Gnostic skills. Moreover, the use of theoretical methods contributes to the training of qualified engineering personnel are able to find new ideas, to create a theory to solve situational production problems, and so on. These personnel will largely contribute to the development and efficient operation of research and development, engineering and design agencies, scientific and industrial complexes, knowledge-intensive industries.

With regard to the practical training of engineers, then it should be very closely linked to science and industry. Therefore, to improve the practical training it is necessary, as it was before, to better use of the production, where future professionals can take practice. It is necessary to create a training, research and production facilities, experimental sites, research laboratories, industry training centers. All this, of course, require large material costs and professional development of teachers of special subjects. However, it's worth doing, because the true criterion is the practice of training specialists.

In the process of training engineers there is need to make extensive use of active forms and methods of teaching, innovative educational technology. These learning methods may be both standard and non-standard containing the initiative of students, a critical assessment of the perceived information, as well as widespread use of training. It could be exercise, practical tasks, the method of "brainstorming" method of time constraints, the absurd, training algorithm, tests, debates, discussions, heuristic conversation, and so on. Teaching methods, i.e. ways to enable future engineers to the joint activity with the teacher and other students, can be used in

various forms of educational process: lectures, workshops and seminars, laboratory and independent work of students. It should be noted that it is time to change the structure of mandatory classroom. We need active forms and teaching methods, decisive transition from school to the school of thought of memory - school, work, school, high professionalism. May have to press the lectures and laboratory courses to increase sharply, to ensure the widespread use of business games, complex-of course and diploma projects, where students in their academic work collectively to solve real problems of science and industry. It must also obtain extensive development of independent work of students.

Today is an issue not only “how to teach”, but “what to teach?”

Meanwhile, it is obvious (and the experience of world culture confirms it), you need to change the content of education. Now it is focused mainly on narrow vocational training at an extensive approach to its formation. But modern society needs a new type of graduate, which would combine the functions of a scientist, designer, constructor, inventor, engineer, systems analyst, capable of interdisciplinary holistic represent the object under study, to see his system due to other objects. Such a specialist is needed to work in the scientific-industrial complex, scientific and industrial institutions. These are highly qualified graduates with good fundamental scientific, technical, social and technological preparation, will define the social and technological development of the country.

Generalist engineer must obtain economic and environmental training and particularly practical to know what lives and “breathes” a modern production, at least in part of his future profession. Must be able to work not only his head, but his hands, entrusted to him a thorough knowledge of the technique. It seems that the higher the qualification, the breadth of knowledge and expertise and impact on the prestige of the profession. Future engineers must go through the school of entrepreneurship and initiative, labor and civic maturity.

Today it is especially important fundamentalization of education. To keep up with the fast-flowing life, higher education must be fundamental. Fundamental training at the same time should be provided on all vertical learning, not only in the initial courses. It is known that a fundamental knowledge of aging slowly. So if we want to have people really educated, then the preparation of programs should be based on the principles of fundamental knowledge. The graduate should know, understand and be able to brainstorm. And only “knowing” and to be encyclopedic - is one thing, but you need to be able to apply knowledge. Therefore, one must know the basics of fundamental sciences, and at the same time understand and know how to apply.

Education does not exclude the fundamental nature of university, but rather requires a certain specialization. In a sense, the optimal ratio of fundamental and special training promotes a two-tier system: Bachelor - Master. These levels of training specialists meet the requirements of a market economy.

Undergraduate provides training to a massive range of professionals, and master fundamental training has directly linked with the target specialization, the master’s program attached. At this level of specialization and is provided in basic disciplines. This creates the opportunity to prepare the Master of Engineering - systems analytic - not for the country or the economy as a whole and for specific areas in accordance with the forecast market demand for professionals at this level. The same pattern is observed at the level of (even higher) doctorate.

Without fundamental nature of education students are not formed in one’s head the whole picture of the world, it seems to them piecemeal, not entirely understandable and inexplicable. That is why the “High School should provide a holistic view of the modern natural-scientific picture of the world, basing on the scientific foundation for the assessment of the effects of professional activities, contribute to the creative development of the person and the right choice of the individual program of life based on knowledge characteristics, needs and possibilities of man” [3].

The fundamental approach to education - is an essential approach, which involves the synthesis of natural, humanitarian and technical sciences. To know the essence, the essence of a variety of disciplines and the abundance of information in each discipline - is the goal of the modern student. It is also the impetus for teachers to revise the education system. “Hence the increasing role of inter-subject relationship, the work of all the teachers in the same direction, namely towards the development of abilities of students on the basis of the formation of essential system knowledge, creating them a holistic view not only of scientific theory and its

structure, but also about each element of the theory: concepts, basic laws and regulations, or investigation “. [4] The most important component in the essential knowledge in the preparation of future engineer is a liberal arts education. Education can be considered complete only when it includes both the actual scientific knowledge and spiritual values, that is, information and technocratic and humanistic character. The study of the humanities creates a way of thinking that makes the full realization of creative potential of the individual.

The task of humanistic training requires extensive study of the theoretical content of the basic humanities, understanding of the diversity and unity of the development of these sciences, mastering their laws, principles and conceptual methods. This teaching should be carried out with the key alternative humanitarian ideas, concepts and theories. Ultimately, this will enable the future of arts education specialist understanding of humanitarian values and move to the rational-theoretical and scientific perception, that is, for professional work with them, their professional use.

The teachers of the humanities have to “invest” in the student not only specific knowledge but also give them the opportunity to stop, to think, to enjoy their own process of thinking, philosophizing. The beauty of the academic humanities is that it allows students to develop interests, including in the field of their specialty, their preferences and inclinations. It would be better to study the humanities, the students experienced excitement and at the same time experienced difficulties in working with the deep ideas and believes inherent in them. Their science in order to help them to express, clarify and practice on their own, highly personal values related to the values of society.

They are needed as well as special courses in training of engineers. That’s why the humanities continue to be invaluable to a more careful, thoughtful, more professional than it ever was before, generations of students.

The concept of humanization of education involves two interrelated aspects. Firstly, it is humanistic knowledge in the broadest sense, that is, all the human sciences, as well as such important for each individual spheres of cultural life, such as art and literature. Secondly, it is humanistic education, stating the ethics of humanism.

Particularly important problem of humanization of education today gives a conversion factor of technological activity in planetary scale. The modern productive forces not only create, but also destroy. That is why in the student’s desk a future specialist must realize the social, civil liability for immediate and long-term consequences of those or other technical and economic decisions. This is one of the primary aspects of humanistic education. Required knowledge of students in the field of protection of the environment suggest their understanding of the inherent value of nature and all life on Earth, is guided by respect for nature, its resources and minerals, flora and fauna.

One cannot exclaim the role of the complex of measures on humanization of education in secondary level.

It should be given to the development of a common culture of future engineers - the culture of thinking and behavior, aesthetic and moral. And here it is necessary to take care of creation in each institution proper spiritual atmosphere. It forms the high culture of teaching, communication, leisure and everyday life. It should go primarily to education of future specialists’ genuine intelligence as the cornerstone of their citizenship and professionalism.

Significant role in the training of engineers is knowledge of general terms of the economy.

Economy - a very important and necessary subject for a modern technical college. Knowing economy - a system of measures aimed to the development of economic thinking of the future engineer. This process involves not only the formation of human qualities such as thriftiness, thoughtfulness, enterprise, but also to the accumulation of knowledge concerning issues of ownership, economic profitability, taxation, etc. Awareness in the economy should be at each expert, allowing him to be prepared for today’s challenges at various levels of management - corporate, personal, national, international.

Today employers are looking for qualified professionals. In these circumstances, it is crucial to an understanding of faith and the desire to change the situation of the education system, the ability to choose adequate means to acquire professionalism, inclusion of students in a learning environment where knowledge is absorbed, fixed creative. Among the many challenges facing the education system, which determines the formation of a creative potential of future specialists, those qualities are especially in demand today, the creation of conditions for the personal development of his creative abilities, general cultural and professional level. The creative potential of

the future engineer in the process of developing human and professional training. Education provides for the formation of his special qualities of the mind, observation, ability to compare and analyze, to combine, to find relationships and dependencies - all that together and makes the creative process. Creativity contributes to the formation of new knowledge, which are acquired during the development of skills. The problem lies in the fact that the specific conditions of a technical college to find effective forms and methods of realization of creative potential of the future engineer, taking into account the diversity, multi-level and complexity of the process. The most important component in the training of engineers is a psychological and pedagogical. Future specialist to be successful, must first know yourself as well as others. Be sociable, contact in various social groups; be able to work together in different areas and in different situations, easily able to avoid or get out of any conflict. The future engineer must also work on the formation of its image, the components of which are represented in the external characteristics of a person: his behavior, manner of speaking, the style of clothing, interior design office, etc. Thus, the central, pivotal task of high school - to raise the quality of the training of engineers. Current students - professionals of tomorrow must be armed with the latest knowledge, to master advanced techniques and technology of high scientific culture, a new type of economic thinking, initiative and enterprise.

Role of the system of training of young engineering graduates in providing qualities of educational process

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Students have to prepare for engineering activity during the entire period of training in higher education institution, reaching the most advanced stage of the preparation in the directions of education and specialties based on the knowledge, skills created during all educational process of all types as to a lecture and practical training, laboratory works, term papers and projects, work practice, including questions of social and economic development of the republic.

As a result, of development of an educational program graduates have to get:

- ability to apply the knowledge in the solution of natural-science, mathematical and engineering tasks;
- ability to plan and make experiment, to fix and interpret the obtained data;
- ability to project processes or systems according to objectives;
- readiness to work in collective;
- ability to formulate and solve engineering problems;
- ability to realize professional and ethical duties;
- skills of effective interaction in collective;
- wide erudition necessary for understanding of global and social consequences of engineering decisions;
- understanding of need and ability to study constantly;
- knowledge of modern public, political and scientific and technical problems;
- ability to apply skills and the studied methods in engineering practice.

The main lack of training of young specialists in our opinion are:

- isolation of educational process from realities of modern production;
- the content of many disciplines poorly correlates with real operating conditions of the enterprises;
- work practice often takes place formally, in the form of production excursions since don't provide to students' workplaces;
- to heads of practice from higher education institution practically don't happen on production owing to various, including, the objective reasons.
- By preparation of engineering shots it is necessary to pay much attention on studying of disciplines of the practical-directed character.

For successful performance of the professional functions, the graduate has to be guided by labor market conditions and therefore in the program of training of specialists for the «Electronics and Instrument engineering» directions, the considerable volume of school hours has to be allowed to studying of the corresponding disciplines (digital electronics, microprocessor equipment, applied programming, etc.).

Assimilation of the specified disciplines, in turn, is possible only based on good knowledge in the field of physics, mathematics, information technology, electronics, etc.

A formation of social and personal competence is carried out within a social and humanities bases cycle of disciplines.

Thus, in ensuring professional competences in large part university graduates plays all-professional and special disciplines large role. Thus the student has a system formation of knowledge, skills in the field of the electronic engineer and instrument making.

«Electronics and Instrument engineering» graduates according to fundamental and special preparation can be engaged in the following types of professional activity:

- the design – to carry out design works in the field of development of electronic schemes and systems of different function, in particular for branches of health care, means of medical equipment and technology;
- the research – to conduct researches in the field of development of new equipment, technologies and the equipment in the «Electronics and Instrument engineering» directions, to carry out development of new methods of increase of reliability and stability of medical equipment and technology;
- the production and technological – to organize technological processes and productions on production of electronic equipment;
- the organizational and administrative – to participate in organizational and administrative activity of the industry and application of new methods of the organization of work in production;
- operation and service – to carry out works on repair, adjustments, test and operation of devices, the equipment and systems of electronic equipment.

In our opinion the main aspects of improvement of quality of training and formation of professional competences consist:

- in increase of a role of independent work of students;
- in use of modern information technologies for training and independent work;
- in increase of a role of training of students in the field of the right, formation of skills of work with industry normative and legislative documents;
- in improvement of quality of carrying out work practice;
- in involvement of students to participation in scientific work.

It is importanta to point out that work practice is the most important element of formation of professional and social and personal competences, in modern economic conditions significantly it is necessary to raise its role. As the conclusion it is possible to note the following:

- formation of professional competences is the most important in training of the young specialists allowing adaptation and integration of the young specialist at production, increases of prestige of a profession and motivation of employment in the specialty.
- strengthening of motivation of students to independent work and self-training, including by attraction in SRWS (Scientific-Research Work of the Student);
- providing system of work practice due to legislative ensuring interest of the enterprises in the qualitative organization of student's practice on workplaces;
- formations of long-term contracts with the leading industrial enterprises and scientific-research organizations for the organization of work practice and to employment of graduates.

Work of the student has to consist in a higher educational institution in the solution of the following tasks.

1. It is necessary to be able to study.

Process of training has three components: understanding, knowledge, ability and competences.

It is necessary to acquire the principles of development of branch for years of study, to gain fundamental knowledge, to seize methodology of researches that subsequently it was possible quickly, on "course" to be connected to development of technology.

2. To study all life.

Strong knowledge assumes deep understanding of the studied material, but not learning (cramming).

3. Independent work during the entire period of training.

Student involvement in the independent accreditation process as one of the key aspects to achieve the quality education in Kyrgyzstan

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*The man cannot be really improved in case
he does not assist the other to improve
themselves.*

Charles Dickens

With introduction and development of system of the quality assurance and independent accreditation in Europe and America, it becomes necessary to involve students in the process of external quality assessment or, in other words, the independent accreditation. This is an efficient instrument intended to achieve the quality education. In other European countries, such as Germany, France, Belgium, Austria, Holland etc., “the participation and involvement of students in the higher education quality assurance system becomes an indispensable component of such assessment” (ENQA, 2006). As of today, the result is evident: the subject process has attained the great educational success in Europe, and should be also applied in other countries of the world. This was the objective of the CANQA project (i.e. ‘Central Asian quality assurance and accreditation network’) implementation on the basis of the TEMPUS program under the sponsorship of the European Union. Results of this project have greatly influenced the development of education system in Kyrgyzstan: so the law “On introduction of an independent accreditation system in the field of higher education” has been approved, and the first accreditation agency related to the education quality assurance “EdNet” was opened. In addition to the CANQA a number of other international projects have been implemented in Kyrgyzstan and also achieved good results in the field of development of quality assurance in education and quality culture among the students of national higher education institutions. One of such projects was QUEECA, i.e. Quality of Engineering Education in Central Asia.

The issue of involvement and participation of students in implementation of the quality assurance system requires additional attention. However, students, as primary recipients of educational services, must be involved by the independent agencies and higher education institutions in process of assessment of the education quality. Indeed, the students are key persons interested in gaining of quality education; availability of highly educated young people is an indispensable condition of building of the prosperous society.

With a reference to the relevant European experience, it seems expedient to mention that the role of students in implementation of the quality assurance system needs to be considered from the points of view of both external and internal quality assurance systems.

Participation of students in implementation of the *external* quality assurance system: a student as a *member of an expert group* properly involved in the education process (as far as he knows the situation from within). In the course of external assessment (i.e. accreditation) the student is included into the expert group as a representative of the student community, takes part in the assessment process along with other members of the expert commission.

The Kyrgyzstan experience (for instance the operation of “EdNet” agency) has shown that academic society sometimes demonstrates misunderstanding and expresses complaints when it comes to the question of student participation in independent accreditation. They say alumnus are not able to assess the education quality, but adequately understands the management and the structure of his higher education institution. That is why his assessment would negatively affect the final decision taken by the assessment committee.

However, it is necessary to note that the student, as a member of the expert group, is more interested in assessment of student satisfaction with training process of the accredited program by means of as follows:

- analysis of materials for self-assessment of the training programs provided by higher education institutions;
- assessment of training program in the course of accreditation;
- interviewing of management of higher education institutions, students/*graduates*, *employers* and other interested parties;
- consideration of issue of student satisfaction with the training process.

Moreover, the quality of education is assessed through the knowledge level of students, while students themselves are the only indicator of the education level provided by this higher education institution. As an expert, the student is capable to draw attention to issues that other members would fail to notice. Therefore,

"EdNet" agency requirements for students	
1.	Students of the third or fourth course;
2.	Ability to work with large information flows within the limited timeframes, i.e. to analyze, compare and process thereof;
3.	Ability to adequately outline the thoughts (both in writing and orally);
4.	Analytical habit of mind, attentiveness and logical manner of thinking;
5.	Activity, responsibility and communicativeness;
6.	Adequate knowledge of the assessed subject.

during the interview he, as an expert, may gather information on the current state of the assessed program (or the higher education institution that provides it) from a student's point of view who sees the interviewer as an equal talk partner. They easily understand each other, because they both have been facing the similar challenges, but managed to overcome them in different ways. That is why the expert may recommend the most effective way to solve the problems and thus improve the quality of education.

Participation of students in implementation of the *internal system of the quality assurance*, when the student is the primary recipient of the educational services and spends his money and time for acquisition of quality education, because, as soon as he receives it, he will become a desirable player on the labor market. As an internal expert of the higher education institution, the student may become

a respondent in the course of the internal assessment (self-assessment). His opinion must be duly considered in the course of accreditation. Moreover, it seems expedient to develop students' capability to request quality education from their higher education institution. Therefore, students' participation in internal and external assessment of the education quality is an indispensable part of process aimed to achieve the quality. For example, due to the QUEECA project, on the basis of which the plot accreditation took place in Kyrgyz State University of construction, transport and architecture (KSUCTA), as well as in Kyrgyz State Technical University named after I. Razzakov (KSTU), the great impact of students to the process of the accreditation was noted. For instance, this have been exposed in process of interviewing of students, in the course of which they began to recognize their real participation in the process of establishment of quality education via the exposure of their requirements and demands to the individual components of training process. The questions that have been asked to students during the interviews have moved them to reassess their attitude to the training/study, to the quality of training, as it can be seen by both the student themselves and their higher education institution. Besides, in process of the external assessment in KSUCTA the observers have noted that the subject higher education institution has managed to engage students to accreditation and writing the relevant self-assessment reports. Therefore the accreditation has induced the closer cooperation in between

the higher education institution, professors and students, for instance in form of running the quality inquires among the students and revealing their opinion of the quality of educational services. The QUEECA criteria the special accent on issues of the involvement of students and their satisfaction with the training process; and in the process of pilot accreditation the positive influence of the project on organization of works with students has been revealed.

Proceeding from the experience of “EdNet” in carrying out the pilot program accreditations with involvement of students in Kyrgyzstan, it is possible to make a brief review of the involvement level and reveal the interest to participation in the present assessments. When running the program accreditation in four state Kyrgyz universities the agency has been involving students from AIESEC student organization. The volunteer students have passed the relevant training provided by international experts and took part in accreditation of four educational programs. In the course of the last program accreditation, the agency has involved one student who was not a member of the student/youth organization to assess the degree of student satisfaction in the program subject to accreditation: he has passed all the processes and training stages, and has successfully participated in the assessment. Here it is necessary to mention some difficulties the agency faced in the course of involvement of students from student organizations. In spite of the fact that students are interested in taking part in the assessment process, the student/youth organizations not always are willing to participate; so they did not inform students and did not take part in the assessment. Hence, the agency was forced to recruit students on individual basis, which made the process more complicated and time-consuming. Upon making the analysis of the student involvement from the student/ youth organizations and the independent students, representatives of the agency have come to the conclusion that it seems efficient to involve only the member students. Therefore, the student/ youth organizations are the key aspect to attain the quality education, because they are simultaneously joining the student/young men of various ages, from different universities and programs, with different knowledge and skills levels. However, their targets and expectancies coincide with the organization objectives; that is why the relevant motivation of the student/ youth organizations in process of raising the education quality seems to be necessary.

However, it is important to specify that not any student/ youth organization may be a partner of the accreditation agency and participate in the process of independent accreditation. The “EdNet” agency requirements for members of youth organizations presume that they cannot be members of any political or religious associations and cannot operate within the framework of Kyrgyzstan law. The objectives pursued by the student/ youth organizations (excluding the political, religious and legislative ones) may be different; meanwhile they should directly operate with the Kyrgyzstan youth and support thereof in the various aspects.

In 2004 “EdNet” agency organized several information meetings and workshops for representatives of student/ youth organizations, at which the problems of the higher education system were discussed, issues of assistance and involvement of students in solving the education quality problems were considered. The meetings were held with representatives of organizations operating with youth. The meetings pursued two purposes. First, they should attract and train the members of student/ youth organizations to act as quality experts of the agency and represent the students in the course of accreditations. Second, because student/ youth organizations consist of young people from both capital and regions, they may serve as mass informing tools to notify the students on independent accreditations, and they may be adequately heard. They have the right to request not just knowledge, but quality education with the engagement of experienced, properly qualified and competent professors, because the system of quality assurance and independent accreditation is aimed at creation of the best conditions the students need to become duly qualified specialists that will be in demand at the labor market. It is necessary to note that the actual purpose of “EdNet” accreditation agency and the youth organizations is to support the Kyrgyzstan youth, because they are the future of the nation. During such information meetings the student/ youth organizations have shown their keen interest and expressed their readiness to support the quality assurance and accreditation system, because they recognize the importance and necessity of their role in the new education system. They want to be the active participants of this process i.e. they recognize that today the accreditation is the only official site for being heard and exert the real influence on the education quality. It is necessary to note the special activity and interest of

some youth organizations to solve the important problems. For instance, the youth organization called OO “Institute of youth development” was the first to respond to the cooperation appeal and take part in all such information meetings and teaching workshops arranged by the agency; therefore they have supported the agency activity and showed the interest to the national quality education as a whole. Besides the activity of EdNet agency targeted to operation with students that gains its results, the QUEECA project also positively impacts on the student involvement in both internal and external accreditation within the frameworks of KSUCTA; the present experience is applicable also in the other Kyrgyz higher education institutions. As of today, the accreditation is the only legally approved tool that induces the close cooperation of management and students of higher education institutions, reveals their requirements and the degree of satisfaction, as well as the changes in their awareness of quality of the education they gained.

If in Kyrgyzstan the students and the student/ youth organizations are only in process of involvement in the quality assurance system, in the European countries the youth organizations are already taking their active part thereon. For instance, European Students’ Union (ESU) is joining 47 national students unions from 39 countries (European Students’ Union, www.esu-online.org); one of its objectives is to support and strengthen the quality of European education. If European students and student/ youth organizations are interested in gaining the quality education, then the relevant accreditation agencies and such associations as ENQA (European association of quality higher education assurance) system are interested in involvement of such students and student organizations in implementation of accreditation processes. For instance, in the results of ENQA teaching workshop “Participation of students in operation of European association of quality higher education assurance” a report was issued, in which accreditation agencies from different European countries outlined their achievements and the difficulties they faced in the course of involvement of students and working with them. For instance, representatives of Norway deem that the special provisions must be drawn regarding the involvement of students in assessment of agencies in charge of the quality assurance. In their opinion, “the search on students possessing the requisite competences must not be a more complicated task than the search of the other specialists we need to perform this process “ (accreditation in education, www.akvobr.ru). According to the director of Norwegian quality assurance agency Blit Holman, “Our belief in that the student involvement is playing the important role in the course of external assessment of higher education institutions and the agencies in charge of the quality assurance must serve as evidence of their importance. Why not to trust in it?” (ENQA, 2006). And we, the youth of Kyrgyzstan must try to be involved and take active part in the new education system in such a manner so to influence the education quality and support its improvement.

Proceeding from the current situation and the number of students involved in process of independent accreditation, we came to the following conclusion: in spite of the fact that the students and student organizations are willing to take part in operation of the quality assurance system, their overall involvement in the process is insufficient due to the low information level and unwillingness of society to accept the new system. It seems expedient to note that as of today there is great interest and willingness to become a part of this process, because the objectives of independent accreditation and students coincide and it is necessary to give only the relevant detailed information. Owing to information, such projects as QUEECA play the important role in involving of interested parties and development of involvement of students in accreditation processes. That is why the role of the student/ youth organizations is so great, and they are used to be the key factors promoting the involvement of students in the independent accreditation process to ensure the quality education.

In words of English writer Ch. Dickens “*The man cannot be really improved in case he does not assist the other to improve themselves*” you may see the truth. In our opinion, the education system cannot be improved without active participation of the main consumer of educational services, i.e. the student.

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The quality of educational services and social and professional accreditation

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Preparation of professionally competent engineering personnel for industries depends primarily on the quality of educational processes to meet the requirements of the labor market. This is primarily determined by the relevant requirements of the vocational education system to the needs of employers.

Currently, the initial state is the issue of attracting public and professional organizations in the process of formation and implementation of educational activities, allowing to provide the required level of quality of education. On the basis of this form should be developed independent evaluation of the quality of education, and mechanisms for determining, support and distribution of the best examples of innovative educational activities.

In our view, in this regard, work performed on the project «QUEECA -The quality of engineering education in Central Asia» is the first step in ensuring the quality of engineering education programs and the implementation of professional accreditation in Uzbekistan.

The strategic objective to ensure the quality of education in our view is achieved by solving the fundamental activities in the following areas:

- Implementation of an independent social and professional evaluation of the educational programs of higher education institutions in order to develop a modern system of engineering education, taking into account factors including the issues of information and methodological support procedures for licensing, certification and state accreditation of educational programs;
- Development of new forms and mechanisms of evaluation and quality control of higher education institutions for the implementation of engineering education programs to ensure objectivity, credibility and transparency of procedures for the evaluation of educational institutions;
- Improving the mechanisms for the recognition of equivalence of documents on education to improve academic mobility of students and teachers, the development of cooperation in the field of educational services that will facilitate the integration of the educational system of Uzbekistan in the world educational space;
- Improving the competitiveness of vocational education, the direct involvement of leading experts of the industry of engineering training and leading universities, have passed the examination of educational programs through public and professional accreditation, as well as universities, with experience of training in educational standards of new generation that are designed with the participation of employers', social and professional associations;
- The creation of mechanisms aimed not only to the domestic socio-economic needs of the country, but also to ensure the competitiveness of Uzbekistan in the global labor market;
- Creation of a system of professional accreditation of training, allowing to identify the universities, where the quality of training in a particular field of engineering is at the right level and meets the requirements of the labor market.

So accredited educational program “Electronics and Instrumentation” the profile “Instrument” at the Tashkent State Technical University received notification in the accreditation center of the European Union - “European

Network for Accreditation of Engineering Education (ENAE - European Network for Accreditation of Engineering Education)” and quality mark EUR-ACE.

Social and professional accreditation allows:

- Promote improvement and development in Uzbekistan engineering education and engineering activities in all their forms, relating to the educational, scientific and technological fields;
- Increase the quality of the educational process, consulting, research, development, engineering solutions, technology transfer,
- Rendering a wide range of educational services, providing public relations, production, science;
- Creation of conditions for the most effective implementation of the creative potential of the engineering company for the development of scientific and technological progress and innovation development;
- Development of international contacts and relations in the field of engineering education;
- Promote the integration of scientists, teachers of technical universities and professionals with engineering education in the international scientific and educational space.
- improving the educational system in the ranking of countries that are competitive on the international market of educational services.

Thus, it achieved close cooperation of the education system of the republic with the international system of education, which can significantly improve the educational system in the ranking of countries that are competitive on the international market of educational services.

The procedures of professional accreditation should be simplified and standardized as a whole in all areas of education, of course taking into account the specificity of each area, and are focused on the labor market and should be adjusted to the training, based on fundamental and universal education, personality development and the formation of social responsibility. The educational system should focus on the labor market ahead of the system requirements of the labor market and to be at the present level of development of science, engineering and technology.

Development of High Professional Education in the frame of National Education: Development Strategy of the Republic of Tajikistan by 2020

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The issues related to employment and unemployment, poverty reduction, human resource development and management based on using sound market mechanisms are in major focus in the draft National Development Strategy of the Republic of Tajikistan for the period up to 2030.

The government considers the education not only as a process of knowledge transfer and development of competencies, but also as a core institution for social reproduction, and the quality of education should be sufficient to implement socially defined development strategy. In the transition period, it is difficult to determine the labor market requirements to train graduates. The government and educational institutions assess the quality of education based on compliance of the training contents and level of graduates' preparedness to certain requirements - State Education Standards. However, the employers have own specific requirements to the high education graduates. While selecting graduates the employers are mostly interested not in their compliance with national education standards, but their professional competencies, workplace skills and soft skills, such as to solve non-standard problems, make decisions within their competence and take responsibility, act as a team player. This is especially important in the industry.

The analysis shows that those universities that do not apply continuous monitoring of changes in the labor market and employers' requirements, and are not able assess appropriately and define what training areas must be developed, and what professional competencies are essential to enable graduates for future job. As the result, the graduates of these high education institutions are not often relevant in the labor market.

The experience of developed countries shows that the employer becomes the main customer and evaluator of the high education quality. While developing and implementing the education programs the high education institutions should focus on the employers and students' demands, and create mechanisms for continuous to monitor changes in the labor market and the requirements of consumers to quality education.

In order to introduce effect professional development standards and redirect professional education system to the labor market needs, thereby improving the quality of training of graduates a specific mechanism that will support the implementation of actual professional standards in the education system. Nowadays, we need to set up an independent qualification certification - public and professional recognition of relevance of graduates' qualifications to the professional standards.

It should be noted that the objective is set by National Education Development Strategy of the Republic of Tajikistan until 2020 for universities and secondary vocational institutions.

According to this strategy there is a need to "shift the focus high education institutions' activities toward participation in the regional and national development initiatives; development and maintenance of programs; consulting, research and engineering developments. The high education institutions are the most important intellectual resource development areas, the use of this resource allows to strengthen activities of the institution and create relevance of the curriculum and practice".

It is expected that establishment of integrated structures of educational institutions at various levels based on network models of educational process that allows to maintain large complex projects, facilitate the organization of in-service trainings and implementation industry area development and solve challenges associated with the

research, design, capacity development in strategic sectors of the national economy, such as energy, mining, non-ferrous metallurgy and other.

According to this Strategy, to maintain the relevance of the educational programs to the labor market demands it is expected to introduce an independent professional certification and accreditation of specialties training programs. For this, the licensing requirements will be aligned with the new objectives where high education instructions will be involved to create these alignments. It is assumed to move toward final external evaluation of the quality of program graduates at all levels of education, including short term courses with the involvement of employers. By implementation of this strategy, training is conducted in accordance with the state order, formed based on the study of the labor market needs; new generation of educational standards will be developed and introduced; the educational, research and development processes will be aligned accordingly; the universities will maintain small businesses, business incubators, implement scientific and technical development project. It should be noted that since 2016 the Ministry of Education and Science of the Republic of Tajikistan is launching a new investment project aimed at training national experts on assessing the quality of education aligned with international educational standards. The Investment Project involves international accreditation of the most demanded educational services and labor training programs. It is expected to allocate grants to higher education institutions to address the above problems.

Adaptation of graduates – the main component educational process

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The main consumers of graduates of higher educational institutions are the enterprises, the organizations and institutions of various character and subordination which employ as university graduates and expect from them possession of a complex of the professional competences conforming to requirements of development of innovative model of economy and society.

Now from employers, the low level of special preparation and narrow professionalism of graduates are noted. Thus the main claim to higher education institutions - isolation of knowledge, graduates from practice, inability to work with the modern hi-tech equipment. The way out is deepening of the content of work practice, involvement of specialists of the enterprises to conducting occupations, adaptation of disciplines to real life. Thus employers consider that for training improvement of quality, the organization of practice in specific conditions is necessary.

In general the problem of high-quality training of specialists is caused by high efficiency of interaction of higher education institution with employers. In this regard participation of employers in preparation of professional shots is a condition training of the competent graduates.

The solution of this task assumes new forms of social partnership, precepts of law and types of contracts, which would assist higher education institutions in training of specialists, and to the enterprises - in ensuring the personnel requirements.

From the most widespread directions of joint activity of representatives of higher education institutions and employers are distinguished.

- practical training of students at the real enterprises;
- expansion of a range of educational services of the higher education institutions demanded in labor market;
- definition of requirements to quality of training of specialists;
- development and reviewing of educational and program documentation;
- carrying out employers by representatives - experts - studies, master classes;
- participation of employers in total state certification of graduates;
- training of teachers on real workplaces;
- participation of employers in scientific and practical conferences, educational projects, scientific seminars, etc.;
- design integration (joint scientific researches, opening of basic chairs of higher education institution at the enterprises, creation of the joint small centers, etc.);
- employment of graduates;

The closest and interpenetrating character interaction of higher education institutions and employers is gained in the course of passing by students various by the practicing, which are components of the main educational programs and represent one of forms of the organization of educational process consisting in professional and practical training of students in the conditions of real professional activity. Practice provides acquisition by

students of the first professional experience of work and, thereby, act as “the leading factor providing effective formation of high level of professional competence of future experts”.

Respectively, programs educational, production and others the practicing, provided by the corresponding state standards, have to be guided by continuous increase of a professional level of development of students, first of all, by means of integration of their theoretical and professional and practical, educational and research activity.

Higher education institutions and employers have to be interested in creation of the system combining their efforts on formation of professional competences of students. This circumstance sharply raises a role of the letting-out chairs performing the organization and educational and methodical management of a concrete type of practice for the directions (specialties) in realization of social partnership of higher education institutions with employers. They become the catalyst of social dialogue with consumers of educational services of higher education institution and provide formation and strengthening of partnership with them.

Treat number of the main objectives facing higher education institutions and employers, on formation demanded by labor market of shots with professional competences:

- interface of the competences mastered within OP, and the content of practice; determination of compliance of the set competences to the types of professional activity which are carried out by students on workplaces in time the practicing;
- drawing up the list of professional competences which will be acquired or developed by students in the course of practice; the maximum rapprochement of the competences mastered when passing OP, to competences requested by specific employers - partners of higher education institution;
- coordination of optimum set of pedagogical and working conditions of effective formation of professional competences of students of process the practical taking into account their individual creative abilities, professional interests and prospects;
- receiving feedback by higher education institutions from employers about levels of formation of professional competences for the purpose of the subsequent adjustment and improvement of OP, increase of efficiency of programs of training of higher education institution, in general;
- search of new forms educational and the work practice providing acquisition by students of significant experience of practical activities and promoting their guaranteed employment in the specialty (for example, by alternation with theoretical occupations for all academic year);
- stimulation of creative activity and research activity of students, creations of situations of professional tests for them and self-testing for successful mastering students technologies of self-advance and creation of own career, etc.

In our opinion partner communications of higher education institutions and employers are effective means of improvement of quality of higher education, creation of additional conditions for formation of the competences included in education programs, expansions and deepening's of practical knowledge of students.

As a result it is possible to note that efficiency of interaction of higher education institutions and employers considerably increases in interests of improvement of quality of preparation of professional shots.

Realization of this problem it is possible to consider in the international public and professional accreditation of an engineering educational program “Electronics and instrument making” on the Instrument making profile, which received the quality mark of EUR-ACE and it, is awarded recognitions of ENAEE - European Network for Accreditation of Engineering Education.

Appendices

Appendix 1: CAEAS&G Standards, Quality Requirements and Required Documentation

Standard A - Needs and Objectives	
<p>The study programme should identify the educational needs of the labour market of reference, establish educational objectives coherent with the mission of the institution the study programme belongs to and the identified educational needs, and learning outcomes coherent with the established educational objectives.</p>	
<p>Quality Requirement A1 - Educational needs of the labour market The study programme should identify the educational needs of the labour market of reference. The educational needs should be identified in terms of professional profiles and/or functions/roles/activities expected for the graduates and associated required competences.</p>	<p>Required Documentation Organisations/employers consulted and Methods and schedule of consultation Identified educational needs of the labour market</p>
<p>Quality Requirement A2 - Educational objectives The study programme should define educational objectives in terms of professional profiles of the graduates and/or functions/roles/activities students are to be prepared for and associated key competences to be developed and obtained by the students during the learning process, consistent with the mission of the institution the study programme belongs to and the identified educational needs.</p>	<p>Required Documentation Educational objectives</p>
<p>Quality Requirement A3 - Learning outcomes The study programme should define learning outcomes in terms of what students are expected to know, understand and/or be able to demonstrate after completion of the educational process consistent with the national qualification framework, if any, and the established educational objectives. <i>Furthermore, for the study programmes that are going to be accredited by an agency authorised to award the EUR-ACE label, the learning outcomes should be consistent with the EUR-ACE programme outcomes for accreditation as published in the EUR-ACE Framework Standards on the ENAEE website.</i></p>	<p>Required Documentation Learning outcomes Coherence of SP learning outcomes with EUR-ACE programme outcomes (for EUR-ACE accreditation)</p>

Standard B - Educational Process
<p>The study programme should assure students educational activities consistent with the national standards, if any, and able to achieve the established learning outcomes through contents, methods, workload and times adequately designed and planned, promote a student-centred teaching and learning approach, assure a correct assessment of students' learning through suitable assessment methods and criteria.</p> <p>The study programme should also define appropriate rules covering student admission, recognition, progression and attestation and keep under control the development of the educational process.</p>

<p>Quality Requirement B1 - Design and planning of the educational process The study programme should design a curriculum and characteristics of the course units and of the graduation exam consistent with the national standards, if any, and the established learning outcomes.</p> <p>The curriculum should embed a student-centred learning and teaching approach.</p> <p>The study programme should also define assessment methods and criteria able to ensure a correct assessment of the students' learning.</p> <p>Furthermore, the study programme should plan the development of the educational process in such a way that students are able to achieve the learning outcomes in the expected time, according to a gradual process and through coherent and coordinated didactic activities.</p>	<p>Required Documentation</p> <p>Curriculum</p> <p>Characteristics of the course units</p> <p>Characteristics of the graduation exam</p> <p>Suitability of the curriculum to the achievement of the learning outcomes</p> <p>Calendar and timetable of course units and exams</p>
<p>Quality Requirement B2 - Admission, recognition, progression and attestation</p> <p>The study programme should establish rules covering all phases of the student 'life cycle', and in particular student admission, recognition, progression and attestation.</p>	<p>Required Documentation</p> <p>Admission</p> <p>Recognition</p> <p>Progression</p> <p>Attestation</p>
<p>Quality Requirement B3 - Realization of the educational process The study programme should realise the educational process coherently with the designed and planned development and keep under control its development, in order to resolve any urgent and immediate problem and to check the adequacy of the assessment tests and of the final work/thesis to the learning outcomes and the correctness of the evaluation of the students' learning.</p>	<p>Required Documentation</p> <p>Control of the development of the educational process</p> <p>Control of the assessment tests and of the final work/thesis</p>

<p>Standard C - Resources</p>	
<p>The study programme should have at disposal teaching staff, facilities, student support services, partnerships and financial resources adequate for the achievement of the learning outcomes and able to make easier the students' progression in their studies.</p>	
<p>Quality Requirement C1 - Teaching staff The study programme should have at disposal teaching staff, including teaching support staff, quantitatively and qualitatively adequate for the achievement of the established learning outcomes by students. The teaching staff should be assigned according to pre-definite criteria of choice or selection and the programme should offer the teaching staff the opportunity to improve their teaching skills and the use of new technologies.</p>	<p>Required Documentation</p> <p>Teaching staff</p> <p>Teaching support staff</p>
<p>Quality Requirement C2 - Facilities and support staff The study programme should have at disposal ... technical-administrative staff quantitatively and qualitatively adequate for the development of the established educational activities as designed and planned and able to allow the application of the established didactic methods.</p>	<p>Required Documentation</p> <p>Lecture rooms</p> <p>Study rooms</p> <p>Laboratories</p> <p>Libraries</p>
<p>Quality Requirement C3 - Student support services The study programme should have at disposal student support (orienting, tutoring and assistance) services relevant to the educational process and able to make easier students' learning and progression in their studies.</p>	<p>Required Documentation</p> <p>Student administrative office</p>

	<p>Orienteering service for students in entrance</p> <p>Tutoring service</p> <p>Service for carrying out training periods outside the University</p> <p>Mobility service</p> <p>Job placement service</p>
<p>Quality Requirement C4 - Partnerships</p> <p>The study programme should have partnerships with national and international businesses, research institutions and other Higher Education Institutions quantitatively and qualitatively adequate for carrying out students' external education and mobility.</p>	<p>Required Documentation</p> <p>Partnerships for carrying out training periods outside the University</p> <p>Partnerships for carrying out mobility periods</p>
<p>Quality Requirement C5 - Financial resources</p> <p>The study programme should have at disposal financial resources adequate for the development of the educational process according to the designed and planned activities.</p>	<p>Required Documentation</p> <p>Needs of financial resources</p> <p>Availability of financial resources</p>

Standard D - Monitoring and Results

The study programme should monitor the results of the educational process, at least with respect to entrance students, students' learning, students' progression in their studies, students' opinion on the educational process, graduates' placement, employed graduates' opinion on the education received and employers' opinion on the graduates' education, in order to check the adequacy and effectiveness of the educational service provided.

<p>Quality Requirement D1 - Entrance students</p> <p>The study programme should monitor the entrance students in order to check its attractiveness.</p>	<p>Required Documentation</p> <p>Assessment of the possession of the admission requirements (<i>only first cycle and integrated second cycle SPs</i>)</p> <p>Enrolments in the first course year</p>
<p>Quality Requirement D2 - Students' learning</p> <p>The study programme should monitor the students' learning in order to check the effectiveness of the course units.</p>	<p>Required Documentation</p> <p>Students' learning</p>
<p>Quality Requirement D3 - Students' progression in their studies</p> <p>The study programme should monitor the students' progression in their studies (in particular: dropouts, number of credits acquired at the end of each course year, time to graduation) in order to check the effectiveness of the educational process.</p>	<p>Required Documentation</p> <p>Enrolments in the different course years</p> <p>Dropouts</p> <p>Credits acquired by the students</p> <p>Graduation time</p>
<p>Quality Requirement D4 - Students' opinion on the educational process</p> <p>The study programme should monitor the students' opinion on the educational process in order to check the perceived adequacy and effectiveness.</p>	<p>Required Documentation</p> <p>Students' opinion on the course units</p>

	<p>Students' opinion on the training periods outside the</p> <p>Students' opinion on the periods of mobility</p> <p>Opinion of the final year students on educational process and support services</p>
<p>Quality Requirement D5 - Graduates' placement</p> <p>The study programme should monitor the graduates' placement in order to check the demand of the granted qualification and the correspondence of the educational objectives and learning outcomes of the study programme to the educational needs of the labour market.</p>	<p>Required Documentation</p> <p>Graduates' job placement</p> <p>Prosecution of the studies in the second cycle programmes (<i>only for first cycle programmes</i>)</p> <p>Prosecution of the studies in PhD programmes (<i>only for second cycle graduates</i>)</p>
<p>Quality Requirement D6 - Employed graduates' opinion on the education received</p> <p>The study programme should monitor the employed graduates' opinion on the education received in order to check the correspondence of the educational objectives and learning outcomes of the study programme to the educational needs of the labour market.</p>	<p>Required Documentation</p> <p>Employed graduates' opinion on the education received</p>
<p>Quality Requirement D7 - Employers' opinion on the graduates' education</p> <p>The study programme should monitor the employers' opinion on the graduates' education in order to check the correspondence of the educational objectives and learning outcomes of the study programme to the educational needs of the labour market.</p>	<p>Required Documentation</p> <p>Employers' opinion on the graduates' education</p>

<p>Standard E - Management System</p>	
<p>The institution the study programme belongs to should have a public quality assurance policy and an effective organization for the quality assurance of study programmes. The policy should be put into practice through the definition and adoption of an adequate and effective management system, able to assure the quality of the study programme and the continual improvement of the effectiveness of the processes for the study programme management and of the associated results.</p>	
<p>Quality Requirement E1 - Policy and organization for quality assurance</p> <p>The institution the study programmes belongs to should have a public policy and an effective organization for the quality assurance of study programmes, and effective decision-making processes.</p>	<p>Required Documentation</p> <p>Policy for quality assurance</p> <p>Organization for quality assurance</p>
<p>Quality Requirement E2 - Management system of the study programme</p> <p>The study programme should implement an appropriate and effective management system, through the identification of the quality assurance processes and the definition of a relevant organisational structure.</p>	<p>Required Documentation</p> <p>Management system of the study programme</p>
<p>Quality Requirement E3 - Review</p> <p>The study programme should periodically revise needs and objectives, educational process, resources, results and management system, in order to guarantee their constant adequacy and effectiveness and promote the improvement of the effectiveness of the processes for the study programme management and of the</p>	<p>Required Documentation</p> <p>Management of the review process</p> <p>Results of the review process</p>

associated results. Students and representatives of the labour market of reference should be involved in the review process.	
Quality Requirement E4 - Publicly availability of information The study programme should make publicly available full, up to date, easily acquired information, both quantitative and qualitative, on study programme objectives, educational process, resources, results and management system.	Required Documentation Publicity of the documentation for the QA of the SP

Appendix 2: The Khujand accord

KHUDJAND ACCORD

BETWEEN

KAZAKHSTAN SOCIETY OF ENGINEERING EDUCATION (KAZSEE)
(REPUBLIC OF KAZAKHSTAN)

AND

ASSOCIATION OF ENGINEERING EDUCATION TASHKENT CITY
(REPUBLIC OF UZBEKISTAN)

AND

ASSOCIATION OF ENGINEERING EDUCATION OF KYRGYZ REPUBLIC
(KYRGYZ REPUBLIC)

AND

ALUMNI ASSOCIATION OF TAJIK TECHNICAL UNIVERSITY
(REPUBLIC OF TADJIKISTAN)

Kazakhstan Society of Engineering Education (KazSEE), represented by its Vice-President Darkhan Akhmed-Zaki,

Association of Engineering Education Tashkent city, represented by Chairman Talat Magrupov,

Association of Engineering Education of Kyrgyzstan (AEEK), represented by the Vice President Saidulla Abdil Abylov,

Alumni Association of Tajik Technical University represented by the Chairman of Accreditation Council Alpha Akhrorova,

hereinafter referred to as the Parties, have entered into this Agreement in the idea of Creating the Central Asian Federation of Engineering Education Societies without creating a legal entity as follows,

Article 1

This agreement is established between the Parties to help each other accomplish mutual beneficial objectives as follows:

- To cooperate in the higher education of students specializing in engineering and technology, including professional engineers;
- To promote the development of the accreditation of engineering and science education programs;
- To develop the international relations and contacts of universities of the parties in the engineering and scientific education areas.

Article 2

In consideration of the above premises, all Parties agree as follows:

- To support the design of engineering programs in the universities of the Central Asian Area in compliance with international standards;
- To collaborate, to establish and to update the standards of Central Asian engineering education, as laid down by the parties, in compliance with the EUR-ACE Standards and Guidelines (EAFSG);

- To organize joint seminars, panel discussions, conferences and other events on the development of engineering education and engineering activities in the Central Asian Area.

Article 3

Within the framework of this Agreement, the Parties assume the following obligations:

- Recommend experts to participate in events organized by the each of the parties to prepare professional engineers and to develop accreditation of engineering and science education programs;
- Assist in the training of experts for the accreditation of engineering and science education programs;
- Participate in the organization of joint seminars, round tables, conferences and other events aimed at developing the quality of engineering education and the engineering profession;
- Provide scientific and methodological support to the activities carried out by the parties;
- Support the participation of their staff in seminars, round tables and conferences organized by each parties;
- Appoint trained experts from their staff to participate in the accreditation process managed by each of the parties;
- Support the accreditation processes carried out by each of the parties;
- Provide information, at the request of the parties, for the preparation of professional engineers, engineering development in the states participants of the Memorandum and science education programs;
- Involve experts, recommended by the Parties, to participate in events held by the parties to prepare professional engineers and to develop accreditation of engineering and science education programs;
- Organise joint seminars, round tables, conferences and other events on issues concerning the development of engineering education and its quality assurance;

Article 4

The Parties shall organize a meeting of the parties under this Agreement for at least 1 time per year;

At each meeting, shall be appointed the host country of the next meeting, appointed Chairman responsible for the activity and the agenda;

Decisions made during the meeting are obligatory for execution.

Article 5

The Parties shall determine the persons responsible for the execution of this Agreement.

Article 6

Under this Agreement, the Parties may sign separate agreements, protocols, agreements and memoranda on issues not covered by this agreement.

Article 7

At one Party's request, this Agreement may be amended and supplemented by written agreement of all the Parties.

Article 8

The Parties undertake not to disclose confidential information, which became known in the course of joint activity, except as required by applicable law.

Article 9

This agreement is concluded for an indefinite period and shall enter into force upon signature.

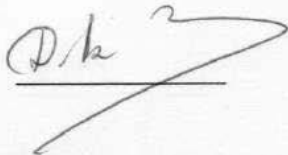
Any Party may withdraw from this Agreement by written notice to the other Parties not less than three months before the planned withdrawal.

It is made in Khudjand in duplicate in the Russian and English languages, which are equally authoritative.

Signatures of the Parties:

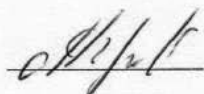
**Kazakhstan Society
of Engineering
Education
(KazSEE)**

Vice-President
Darkhan Akhmed-
Zaki



**Association of
Engineering
Education
Tashkent city**

Chairman Talat
Magrupov



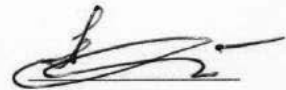
**Association of
Engineering
Education of
Kyrgyzstan (AEEK)**

Vice President
Saidulla Abdil Abylov


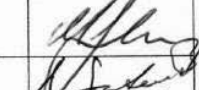
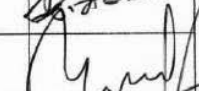
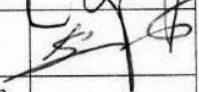
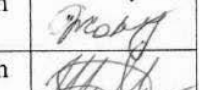
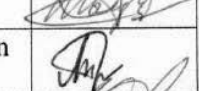




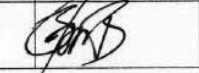






**Alumni
Association of
Tajik Technical
University**

Chairman of
Accreditation
Council Alfiya
Akhrova



IN THE WITNESS OF:

<i>Nº</i>	<i>Name</i>	<i>University</i>	<i>Country</i>	<i>Signature</i>
1.	Prof. Jose Carlos Quadrado	Instituto Superior de Engenharia de Lisboa, Lisboa	Portugal	
2.	Prof. Mehmet Karamanoglu	Middlesex University, London	United Kingdom	
3.	Prof. Yuriy Petrovich Pokholkov	Association for Engineering Education of Russia (ENAE)	Russia	
4.	Prof. Gerasimov Sergey Ivanovich	Association for Engineering Education of Russia (ENAE)	Russia	
5.	Tolkacheva Kseniya Konstantinovna	Association for Engineering Education of Russia (ENAE)	Russia	
6.	Zholdybekova Anar Ergeshovna	Al Farabi Kazakh National University -	Kazakhstan	
7.	Yergobek Shynggys Kulbekuly	Kazakhstan Society of Engineering Education	Kazakhstan	
8.	Tastanova Lyazzat Knashevna	Aktobe Regional State University after K. Zhubanov ARSU	Kazakhstan	
9.	Fayzullaev Ubaydulla	Tashkent State Technical University named after Abu Raikhon Beruni – TSTU, Tashkent	Uzbekistan	
10.	Ramatov Kubanich Sadinovich	Kyrgyzstan State Technical University named after I. Razzakov	Kyrgyzstan	
11.	Gadoev Safaraly Ainidinovich	Tajik Technical University named after academician M.S. Osimi – TTU, Dushanbe	Tajikistan	
12.	Prof. Razykov Zafar Abdukahorovich	Mining metallurgical institute of Tajikistan	Tajikistan	
13.	Mukhamadiev Akbar	Mining metallurgical institute of Tajikistan	Tajikistan	
14.	Khojiboev Daler	Mining metallurgical institute of Tajikistan	Tajikistan	
15.	Nasriddinov Zamoniddin	Mining metallurgical institute of Tajikistan	Tajikistan	

**ХУДЖАНДСКОЕ СОГЛАШЕНИЕ
МЕЖДУ**

**ОЮЛ «КАЗАХСТАНСКАЯ АССОЦИАЦИЯ ИНЖЕНЕРНОГО ОБРАЗОВАНИЯ,
KAZSEE»
(РЕСПУБЛИКА КАЗАХСТАН)**

**ОО «АССОЦИАЦИЯ ИНЖЕНЕРНОГО ОБРАЗОВАНИЯ ГОРОДА ТАШКЕНТА,
АИОТ»
(РЕСПУБЛИКА УЗБЕКИСТАН)**

**ОО «АССОЦИАЦИЯ ИНЖЕНЕРНОГО ОБРАЗОВАНИЯ КЫРГЫЗСТАНА,
АИОК»
(КЫРГЫЗСКАЯ РЕСПУБЛИКА)**

**ОО «АССОЦИАЦИЯ ВЫПУСКНИКОВ ТАДЖИКСКОГО ТЕХНИЧЕСКОГО
УНИВЕРСИТЕТА-ТПИ»
(РЕСПУБЛИКА ТАДЖИКИСТАН)**

г. Худжанд

«12» октября 2015 г.

ОЮЛ «Казахстанская ассоциация инженерного образования, KazSEE», в лице вице-президента Ахмед-Заки Дархана Жумакановича,

и

ОО «Ассоциация инженерного образования города Ташкента, АИОТ», в лице председателя Магрупова Талата Мадиевича,

и

ОО «Ассоциация инженерного образования Кыргызстана, АИОК», в лице вице-президента Абылова Сайдуллы Абдил Алишеровича,

и

ОО «Ассоциация выпускников Таджикского технического университета-ТПИ», в лице председателя Аккредитационного Совета Ахроровой Альфии Дадахановны,

именуемые далее Сторонами, заключили настоящее Соглашение о нижеследующем:

Статья 1

Настоящее Соглашение устанавливается между Сторонами, с целью создания Центрально-Азиатской Федерации сообществ инженерного образования для достижения взаимовыгодных целей:

- Осуществлять сотрудничество по вопросам подготовки в Центрально-Азиатском регионе кадров с высшим образованием, специализирующихся в области техники и технологий, в том числе профессиональных инженеров;
- Способствовать развитию аккредитации инженерных и естественно-научных образовательных программ;
- Развивать международные связи и контакты вузов Центрально-Азиатского региона в инженерных и научно образовательных областях;

Статья 2

Стороны определили основные пути реализации настоящего Соглашения:

- Оказывать поддержку в формировании образовательных программ в области инженерного образования в университетах Центрально-Азиатского региона в соответствии с международными стандартами;
- Сотрудничать в целях установления и обновления стандартов технического образования, в соответствии со стандартами EUR-ACE (EAFSG);
- Проведение совместных семинаров, круглых столов, конференций и других мероприятий по актуальным проблемам развития инженерного образования и инженерной деятельности в Центрально-Азиатском регионе.

Статья 3

В рамках настоящего Соглашения Стороны принимают на себя следующие обязательства:

- Рекомендовать специалистов для участия в мероприятиях, проводимых сторонами в целях подготовки профессиональных инженеров, развития аккредитации инженерных и естественно-научных образовательных программ;
- Оказывать содействие в подготовке экспертов по аккредитации инженерных и естественно-научных образовательных программ;
- Принимать участие в организации совместных семинаров, круглых столов, конференций и других мероприятий по актуальным проблемам развития инженерного образования и инженерной деятельности.
- Оказывать научную, методическую поддержку сторонам в их деятельности;
- Направлять специалистов для участия в семинарах, круглых столах, конференциях организуемых сторонами;
- Поддерживать проведение аккредитации в странах участниках;
- Предоставлять подготовленных экспертов из своих сотрудников для участия в процессе аккредитации образовательных программ ;
- Предоставлять по запросу сторон информацию по вопросам подготовки профессиональных инженеров, развития в странах участниках данного соглашения инженерных и естественно-научных образовательных программ;
- Привлекать специалистов, рекомендованных сторонами для участия в мероприятиях, проводимых сторонами в целях подготовки профессиональных инженеров в целях развития аккредитации инженерных и естественно-научных образовательных программ;
- Организация совместных семинаров, круглых столов, конференций и других мероприятий по актуальным проблемам развития и обеспечения качества технического образования.

Статья 4

Стороны организуют встречи сторон в рамках настоящего Соглашения как минимум 1 раз в год;

На каждой встрече назначается принимающая сторона следующей встречи, назначается Председатель ответственный за проведение мероприятия и повестка дня;

Решения, принятые в ходе встреч являются обязательными для исполнения.

Статья 5

Стороны определяют лиц, ответственных за выполнение условий настоящего соглашения;

Статья 6

В рамках настоящего Соглашения Стороны могут подписывать отдельные договоры, протоколы, соглашения и меморандумы по вопросам, не урегулированным настоящим соглашением.

Статья 7

По мере необходимости в настоящее Соглашение могут быть внесены изменения и дополнения по письменному соглашению Сторон.

Статья 8

Стороны обязуются не разглашать конфиденциальные сведения, которые стали известны в процессе совместной деятельности, за исключением случаев, предусмотренных действующим законодательством.

Статья 9

Настоящее Соглашение заключено на неопределенный срок и вступает в силу с момента его подписания.

Любая сторона может выйти из настоящего соглашения, письменно уведомив об этом другие Стороны не менее чем за три месяца до предполагаемого выхода.

Совершено в г. Худжанд в двух экземплярах на русском и английском языках имеющих одинаковую силу.

Подписи Сторон:

ОЮЛ
«Казахстанская
ассоциация
инженерного
образования,
KazSEE»

Вице-президент
Ахмед-Заки Д.Ж.

ОО «Ассоциация
инженерного
образования
города
Ташкента,
АИОТ»

Председатель
Магрупов Т. М.

ОО «Ассоциация
инженерного
образования
Кыргызстана,
АИОК»

Вице-президент
Абылов С. А.

ОО «Ассоциация
выпускников
Таджикского
технического
университета –
ТПИ»

Председатель
Аккредитационного
Совета Ахророва А. Д.

Соглашение подписано в присутствии:

№	Ф.И.О	Университет/Должность	Страна	Подпись
1.	проф. Хосе Карлос Квадрадо	Высшая инженерная школа Лиссабона	Португалия	
2.	проф. Мехмет Караманоглу	Мидлсекский университет - Лондон,	Великобритания	
3.	проф. Похолков Юрий Петрович	Ассоциация инженерного образования России (ЕНАЕЕ)	Россия	
4.	проф. Герасимов Сергей Иванович	Ассоциация инженерного образования России (ЕНАЕЕ)	Россия	
5.	Толкачева Ксения Константиновна	Ассоциация инженерного образования России (ЕНАЕЕ)	Россия	
6.	Жолдыбекова Анар Ергешовна	Казахский национальный университет им. аль-Фараби	Казахстан	
7.	Ергобек Шынгыс Кулбекулы	Казахстанская ассоциация инженерного образования	Казахстан	
8.	Тастанова Ляззат Кнашевна	Актюбинский региональный государственный университет им. К. Жубанова	Казахстан	
9.	Файзуллаев Убайдулла	Ташкентский государственный технический университет	Узбекистан	
10.	Раматов Кубаныч Садинович	Кыргызский государственный технический университет им. И.Раззакова	Кыргызстан	
11.	Гадоев Сафарали Айнидинович	Таджикский технический университет им. акад. М.С. Осими	Таджикистан	
12.	Разыков Зафар Абдукадорович	Горно-металлургический институт Таджикистана	Таджикистан	
13.	Мухамадиев Акбар	Горно-металлургический институт Таджикистана	Таджикистан	
14.	Хожобаев Далер	Горно-металлургический институт Таджикистана	Таджикистан	
15.	Насриддинов Замониддин	Горно-металлургический институт Таджикистана	Таджикистан	

Appendix 3: STANDARD INTERVIEW QUESTIONS WITHIN EP AUDIT FRAMES

A. Head of the department which offers the educational program under consideration

- Is there a plan of the program improving? (Ask a copy if it was not included in the self-study documents or given materials).
- What are the program objectives and do they differ from the objectives stated in the self-study documents?
- What are the learning outcomes and do they differ from those stated in the self-study documents?
- Do the learning outcomes meet the AEER criteria?
- Are there any changes with regard to the self-study materials?
- What is your role in program goal setting and definition of learning outcomes?
- What is your involvement in the evaluation of the goal and learning outcomes achievement?
- Does the program curriculum ensure the learning outcomes achievement?
- How do the learning outcomes ensure the achievement of the program objectives?
- What changes have been made in the program as a result of your evaluation?
- How do you know that the graduates have achieved the required learning outcomes?
- In what way are you involved in the program changes?
- How can the faculty (teaching staff) ensure the goal and learning outcomes achievement?
- How successful are your graduates: job positions, starting salary, job career, etc.?
- How active are your employers?
- What program changes have been made to meet their requirements and suggestions?
- What are strengths and weaknesses of your and supporting departments?
- Are you planning any global changes in the curriculum? What and when?
- What needs and requirements should be ensured for the curriculum development?
- Do you manage the budget? In what way?
- Do you recommend on salaries of your department faculty and their job promotion?
- How much time is available for your faculty for their professional development?
- What does your faculty do during summer months?
- Who is responsible for confirming that the graduates fulfilled all the requirements before being awarded with the diplomas?
- What is the procedure of ECTS credits recognition in case of academic mobility, discipline change, etc.?

B. Faculty

- What program objectives and learning outcomes are developed or achieved by means of your subject?
- Are you involved in evaluating and updating of program objectives and learning outcomes? What way?
- Is any help in professional development available for you?
- How much time do you spend on professional development?
- What professional associations do you belong to?

- Are you really an active member of professional associations?
- Do you support professional society or are you an official establishment?
- What do you do for obtaining necessary laboratory equipment?
- Are lectures and laboratory classes taught by one instructor? If not how do they interact?
- Is the salary structure really satisfying? What bonuses and benefits are included?
- What unique or unusual teaching methods are used in your department?
- How do employers influence the educational program?
- What is the procedure of the curriculum change?
- Do you have regular contacts with the industry /employers? What way?
- What changes should be done to improve the program?
- Do the supporting departments ensure the required education level for your students?
- Is office and technical service at your full disposal?
- How much time do you spend in class? In lectures? In laboratories?
- What is the average number of teaching hours per week for your position (full time)?
- What is your teaching qualification level in the program? Evaluate yourself.
- What is your experience in the industry related to the program?
- Are you involved in planning constant improvement of the program?
- How does this improvement plan influence the curriculum?
- Do you have and use this plan in your work? How?

C. Employers/Industry representatives

- How often do the employers meet with the head of the department?
- What do they meet for?
- Do the employers give advice to the department on program objective development, the ways to achieve and evaluate them?
- Do the employers consider current and potential technical requirements that the program graduates are to face? Are the employers involved in the development of the program objectives? How do they do it if involved?
- Are you involved in evaluation of the program results?
- Have there been any changes in the educational program due to employers' participation in program improvement? If yes, what were these changes?
- Is there a written plan for continuous improvement of the educational program?
- What is the employers' role in that plan?
- Are the curricula of the educational program available for the employers? If yes, how often do they study them?
- In what way do the learning outcomes ensure the achievement of the educational program objectives?
- What are the strengths and weaknesses of the educational programs?
- What are the basic conditions that ensure the curriculum development?
- What changes should be done to improve the educational program?
- How important is your experience as an industry representative for this educational program?
- Has your company employed the graduates of this program lately? Do the graduates meet your requirements?

D. Students – in group or individually

- Do you know what skills you will acquire by the end of the University course?
- How were you informed about the expected learning outcomes?
- Are you developing the required skills?
- Are the instructors really competent in the subjects they teach?

- Are they available and useful for you in any session time?
- Why did you choose this University and this program?
- Are the labs well equipped?
- Is the laboratory equipment in good condition?
- Does the program allow you to acquire sufficient practical experience?
- Are you going to continue your study after finishing the program? Where? When?
- Are you going to start working after the program? Where? When?
- What kind of job can you get as a graduate of this program? What will be the starting salary?
- What is your general concept of the program?
- Would you recommend this program to your friend?
- If you (or you parents) pay for your education, can you say that this program is worth paying?

