



**ACCESSIBILITY AND HARMONIZATION OF HIGHER
EDUCATION IN CENTRAL ASIA THROUGH CURRICULUM
MODERNIZATION AND DEVELOPMENT**

Project № 561553-EPP-1-2015-1-BG-EPPKA2-CBHE-JP

**ERASMUS+ Programme
KA2 - Capacity-building in the Field of Higher Education**

Coordinated by Burgas Free University

**WP1 Research
Dev. 1.1
App. 8.13 Institutional Report – TUIT, Uzbekistan**



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Language	English

INSTITUTIONAL SUMMARY REPORT – P13 TUIT, Uzbekistan**A. General Information****COUNTRY: Uzbekistan****INSTITUTION (Full name and abbreviation): Tashkent University of Information Technologies, TUIT****ADDRESS: 108, Amir Temur Street, Tashkent, 100202, Uzbekistan****FACULTIES:**

1. Computer Engineering
2. Software Engineering
3. Telecommunication Technologies
4. Television Technologies
5. Economy and Management in ICT
6. Professional Education in ICT

B. Information related to Engineering and Engineering Trade Subject Area**I. Academic Programs in Engineering and Engineering Trade Subject Area**

Please, specify only Bachelor's and/or Master's Degree Programs which the university is expected to provide education in over the period of the Project (the next three academic years: 2015-18)¹, with indication of the Area (see table) where the academic program should be considered.

Engineering	Area 1
Engineering Trade	Area 2

Table 1. Description of Academic Programs in the field of Engineering and Engineering Trade

Area	Name of the Academic Program	Educational degree provided (<i>Bachelor, Master</i>)	Form of study (<i>part-time, full-time, distant education</i>)	Approximate total number of students	Total number of academic staff
Area 1	Information Security (within ' <i>Computer Engineering</i> ' specialty)	Bachelor	full-time	140	12
Area 1	Software Engineering	Bachelor	full-time	360	21
Area 1	Telecommunications (within ' <i>Telecommunications technology</i> ' specialty)	Bachelor	full-time	60	34
Area 1	Information Security, Cryptography and	Master	full-time	24	12

¹If the university does not offer academic programs in Engineering and Engineering Trade subject area, please, in Table 1 fill in academic programs whose program's curriculum includes courses/subjects related to Engineering Sciences.

	Cryptanalysis(within 'Computer Engineering' specialty)				
Area 1	Software Engineering	Master	full-time	36	21
Area 1	Telecommunications Networks(within 'Telecommunications Engineering' specialty)	Master	full-time	30	34

II. Current State of Education

Please, provide the following information for your university.

II.1. Quality of the Program's Curriculum and the Teaching Programs. Provide the information for each general type of Bachelor Degree and Master Degree.

a) The indicators in this section refer to the Program's Curriculum. They aim to assess the consistency of the academic program with the requirements of the European higher education (please write down just the total length and the number of ECTS of each type).

Share of core (required), Compulsory Specialized subjects, specialized subjects, common and optional subjects, and elective courses included in the Program's curriculum. In the following table:

- **Type:** may refer to (bachelor/master/professional bachelor/academic bachelor, and similar categories in case you have such types of degrees at your university)
- **Area:** may refer to Area 1 or Area 2 as defined in B.1

Table 2. Number of ECTS within each Type/area Degree

TYPE/AREA	SUBJECT TYPE	Share of subjects		AVERAGE NUMBER of ECTS*
		Hours	%	
Bachelor, Information Security/Area 1	CORE (humanitarian and social-economic subjects)	1248	17%	41
	BASIC COMPULSORY (mathematic and natural sciences)	1836	25%	60
Bachelor, Software Engineering /Area 1	COMPULSORY SPECIALIZED (general specialty)	661	9%	21.6
	SPECIALIZED (specialty)	1909	26%	62.4
Bachelor, Telecommunications/ Area 1	OPTIONAL (SPECIALISED FOR INFORMATION SECURITY))	1690	23%	55
	TOTAL PER TYPE OF DEGREE	7344	100%	240
	Internship or training activities	702		
	Final qualifying work	216		
	Attestation	1026		
	TOTAL	9288		
TYPE/AREA	SUBJECT TYPE	Share of subjects		AVERAGE NUMBER

Master, Information Security, Cryptography and Cryptanalysis/Area 1	BASIC COMPULSORY	528	35%	15
	SPECIALIZED	668	45%	19
	OPTIONAL OR ELECTIVE	316	20%	9
	TOTAL PER MASTER	1512	100%	43
Master, Software Engineering /Area 1	Final dissertation	1890		54
	Scientific-pedagogical work	378		10.7
	Internship or training activities	432		12.3
Master, Telecommunications Network/Area 1	Total for Scientific activity	2700		77
	TOTAL	4212		120

*comments: for estimation of ECTS following considerations are taken into account:

- for bachelor degree: 4 years = 240 credits; 240 credits=7344 academic hours;
- for master degree: 2 years=120 credits; 120 credits=4212 hours (including scientific activity).

(repeat the table for each type of degree or master)

b. Do you collect information on Program's curriculum, teaching programs, learning materials related to similar academic programs at European higher academic institutions (HEIs)?

Yes

Please, provide information about the ways to collect such data and give specific examples.

In general, the TUIT academic staff members refer to the information related to specific curriculum available on official web sites of adjacent higher education institution of EU. This mainly relates to comparative analysis of curricula/teaching program, whether and how it corresponds to worldwide requirements.

As to the 'Learning materials' there is almost the same set of bibliography as in foreign university for disciplines taught within specific curriculum.

As a participant of different educational programs and projects of local and international scale

TUIT has modernized significantly the courseware and content of syllabi, both in line with trends in world academic community.

For the last 4-5 years, the comparative share of such newly introduced disciplines and course content may be evaluated as more than 60% for technical/engineering specialties.

In particular, new curricula have been developed within TEMPUS Project HEICA «Higher Education Initiative for Informatics in Central Asia» for the specialty «Software Engineering» (involved both levels: bachelor and master).

c. Share of the teaching staff with a doctoral degree/PhD (% of the full-time academic staff providing education at university or Faculty level) (average)

35%

d. Policy toward usage of modern approaches and methods of teaching

Please, give evidence on the usage of modern approaches and methods of teaching. Describe the policy for upgrading academic staff qualification. Mention specific actions taken such as seminars, workshops, training courses, etc. which aim to raise teachers' awareness of contemporary methods in higher education.

To ensure the quality of the teaching staff the certification is performed regularly from the customer's side and/or Ministry of Higher and Secondary Specialized Education (MinHSSE), the frequency of which is determined by the approved and relevant basis (including within the framework of the 5-year attestation).

The personnel training courses are organized, staff knowledge is tested periodically using test exams. TUIT implements various programs of additional training and skills development through its training centers (established at TUIT, namely these are CISCO, Uzbek-Korean IT Center, Uzbek-Indian Center of IT named after Jawaharlal Nehru centers).

It is worth to note in this regard that there is a special degree by the Government of Uzbekistan (Decision of the Cabinet of Ministers of the Republic of Uzbekistan ‘On measures on organization of retraining and advanced training of administrative and teaching staff of higher education institutions’ (# 442, 2015) defines the conditions for the continuous improvement of the professional level of administrative and teaching staff of higher education institutions and regulations on arrangement of refreshing courses and advanced training, coordinate work on the organization of training processes) issued recently as a challenge to upgrade the qualification level of teaching staff. Regular based courses are envisioned to be provided for different groups of faculty (depending on plans and perspectives of each department) in actual directions (e.g. pedagogical mastering, information-communication technologies, specialty disciplines etc.) and certified on successful completion of 2-month training.

As practice shows, these measures are not yet fully adequate to evaluate the qualifications and level of competence of the teacher. Additional organizational efforts are required to enhance the knowledge and involvement in the educational process of new innovative ideas and educational technologies.

e. Existence of a Quality Assurance System at National level or International QAS followed. Please explain QAS, if any, to recognize degrees nationwide and follow up system, if any, to reaccredit degrees after being implemented for a given number of years.

In Uzbekistan the definition of education policy and monitor of its quality is carried out by the Ministry of Higher and Secondary Special 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.

Educational standards in Uzbekistan are formed in four main areas, reflecting the processes of learning, namely, the direction of education, or general description of specialties; requirements to the level of bachelor’s and master’s degrees from the directions of education - these requirements include quality criteria for branches of knowledge; content of the curriculum, reflecting the components of the blocks of disciplines and the weekly distribution of educational process; monitoring and evaluation of the quality of bachelor’s and master’s degrees.

The following structural components of the system of quality control and review of programs are envisioned in TUIT: Administration of TUIT (rector); Scientific Council of TUIT; Teaching – methodical department; Department of internal control and monitoring; Scientific advisory Council; Graduate departments;

which carry out the development, approval, review and monitoring of the programs.

Along with direct responsibilities related to the educational process, these structural units require strengthening the role of the Teaching methodical department of TUIT as the main methodological center, providing quality of education and the Department of internal control and monitoring, in quality control. It is necessary to improve the content of documents regulating the activity of providing high quality training, as well as develop and implement into the educational process relevant methodological and regulatory statements.

f. Share of new courses (subjects) which have been introduced in the Program’s curricula for the last 3 years (% of the total number of courses/subjects in the Program’s curriculum)

Name of the Academic Program	Degree	Share of new courses, %
Information Security (within ‘Computer Engineering’)	Bachelor	25-30

<i>specialty)</i>		
Software Engineering	Bachelor	40
Telecommunications (within 'Telecommunications technology' specialty)	Bachelor	40
Information Security, Cryptography and Cryptanalysis (within 'Computer Engineering' specialty)	Master	35-40
Software Engineering	Master	40-45
Telecommunications Networks (within 'Telecommunications Engineering' specialty)	Master	25-30

g. Usage of contemporary references or bibliography recommended to students

Please, specify the approximate average number per University/Faculty/Department according with the data used at your university, specify which one.

Share of core readings (references) issued over the last five (0-5) years (% of the total number of core readings)	Share of core readings (references) issued over the last ten (0 - 10) years (% of the total number of core readings)	Share of the digital references in e-format (% of the total number of references)
25%	65%	80% (all readings are scanned)

II.2. ICT facilities and ICT based education

II.2.a *This section aims to shed light on the usage of ICT-based facilities and teaching methods as well as the digital competencies of the teaching staff.*

Table 4. ICT facilities

Indicator	Value
Teaching e-platform accessible to support general teaching activities	Yes
On-line platform for non-presential education courses	Yes
ICT lab facilities for students and percentage of students that access to them	100%
Number of software products used for educational purposes	There are several software (SW) products available for being used at TUIT on/during the educational process (both from the teacher and student perspective): 1. Depending on specific purposes and courseware of discipline the depth of using the SW varies and can cover the usage of proprietary software and open-source software systems and

	<p>products, e.g. virtual laboratory complexes for physics (currently almost full range of practices and laboratory works), CISCO company educational SW tools for telecommunications disciplines, open-source SW kits for software and computer engineering disciplines: roughly 8 SW products can be identified.</p> <p>2. The SW for distributing materials, collecting the results and displaying progress (including testing): several attempts have been demonstrated to launch information system and on-line tools to facilitate the educational process (e.g. Moodle based system developed, special SW for departments et.): 4 SW products can be identified.</p> <p>3. Specific purposes SW (research/development, simulation/ emulation, design/testing etc.): 10 SW products can be identified (e.g. MatLab, AutoCad, SkyLab, Oracle, Java, VMWare, Tomcat, VisualStudio etc.).</p>
Access to Wi-Fi at the university campus	Yes
Average share of academic hours per course/subject requiring usage of ICT- based teaching methods (i.e. computers and software, multimedia devices)	80%
Average share of academic hours per course/subject held in a computer lab	50%
Average share of the teaching staff who regularly use ICT-based methods of teaching	90%
Type of e-learning devices used by teaching staff (i.e. personal computer, smartphones, tablets, etc.)	personal computer, laptop, smartphones, tablets
Devices used by students in classrooms (type of personal devices: i.e. laptop, smartphones, tablets, etc.)	laptops, smartphones, tablets

<p>E-learning materials (e-based content) based on e-platform (i.e. Moodle, Sakai, Caroline, etc.)</p>	<p>Please, specify type only if you use an e-platform (ie chat, blog...)</p> <p>The possibility exists to use e-platform based learning/teaching (including Moodle-based), however the ratio of those who use this tool(s) periodically is not enough (appr. one-quarter of teaching staff and one-fifths of students' number).</p>
<p>Web based learning-MOOCs</p>	<p>This type of learning for TUIT requires attentive and separate consideration and clarifying of some positions, namely:</p> <ul style="list-style-type: none"> -if there the legislation is set for within the MinHSSEdefining e-education/distance education statements, e.g. licensing of this activity, recognition of documents received, payment issues etc. <p>Although there are no obvious evidences of using MOOC at TUIT the possibility exist within separate course which are already ready to be 'set' on e-platform or in the form of distance learning for separate disciplines with preliminary administrative compliance.</p>
<p>Students evaluation methods</p>	<p>(Traditional exam, online tests, portfolio, one-minute questions, multiple choice tests, etc.)</p> <p>Students in the directions of bachelor and master degrees are assessed according to following types of evaluation:</p> <ul style="list-style-type: none"> - Internal control: is performed by the university, in accordance with the rating system of evaluation; - Final state control: includes the defense of final qualifying work and state attestation on the disciplines within the standard of education; - State-public control: is conducted in the manner specified by the customer of personnel, social organizations, accredited public institutions; - External control: is performed by

	the Office of Certification and Accreditation of State Testing Centre under the Cabinet of Ministers of the Republic of Uzbekistan, which conducts certification of high school in every 5 years.
Other non-traditional evaluation methods for transversal competences	No

III Digital Framework

1. Is your university following a strategic plan for Digital implementation? YES/NO. Describe it in max 700 words.

In general, the main goal of digital strategy of University is to use *digital media* to improve the study process and occupational perspectives, enhance educational quality, develop of self-competence, providing opportunities for individual capabilities.

University should ensure that the resources available to support student learning are adequate and appropriate for each program offered.

Technical equipment (material base) of TUIT is based on a fairly modern equipment and tools. There are computer classes (in a ratio of 1/4 of, all 42 classes at the university), multimedia classes (33 classes at the university), an information resource center with access to both electronic (about 80000), and printed (over 310000) sources. There is Internet access in library rooms and teaching staff rooms.

Research laboratories, educational laboratories with special equipment are constantly being improved and upgraded. Basically, for all 347 subjects and disciplines there are educational-methodical complexes containing lecture notes, textbooks, methodological support for practical and laboratory work, including virtual work on specific subjects.

An important part of information support of the educational process is the availability of distance learning opportunities and access to media education portal of university.

Another tool in terms of improving the management and control of the quality of education is an electronic information system of the University. Automation of the learning process is one of the key components of the "e-university", and aims at the creation and implementation of learning management system for the rapid provision of information for each participant in the learning process and to ensure transparency in the management of a university. Nowadays several elements of TUIT information system are developed and implemented on the level of departments, deans, and administration.

2. Describe how your university develops its Digital Strategy in terms of Concerns and Key Actions during the last 2 years (i.e. training courses, sessions, workshops, financial assistance offered to academics for qualification upgrading, etc.):

Table 5. Digital Framework

	CONCERNS	KEY ACTIONS
Technology use by faculties, schools and University Services units CSUs of plans for technology use	Online communications as an essential tool for educational process and organizational activity of university; Web-based strategy for	To be developed (TBD);

	creating open courseware;	
Student experience and support in ICT use	Social media;	Encourage students for being 'social networking' active in education purpose.
Administrative Staff training and support in ICT use to improve the digital competence	Comprehension of ICT for educational development; Institutional Digital Policy;	Training for administration of university needs to be provided periodically, with taking into account modern trends in pedagogic and ICT; TBD
Faculty Staff training and support in ICT use to improve the digital competence	Improvement of ICT skills of faculty members	Training courses on temporal basis on ICT competence and language for faculty and administrative staff
Library services. Research tools	On-line access; Resources availability;	Services and resources are mostly available;
Technological support for assessment activities	Transparency of exams SW to support the assessment activities (testing, evaluation, rating etc.)	Special computer rooms for multiple choice tests of midterm and final exams TBD
MOOCs or online courses	Internal and external resources availability	TBD
On-line services addressed to the students (class timetable, exam timetable, courses history, grades, digital library and etc.)	E-University Concept; Digital Media Concept; Management system for internal and external communications;	Class timetable, courses, downloadable reading materials, exam results, e-library TBD

3. Describe the digital methodology used in your **Learning Environment, giving examples in different types of subjects related with the type of subjects described in B.1.**

You should include a small explanation with the following information:

- **Type of ICT methodology used:** (i.e. Blended learning, flipped learning, face-to-face learning, gamming learning, partnering learning, etc.)
- **Type of learning:** independent, collaborative, formally scheduled.
- **Feedback:** student, faculty and administrative staff
- **Digital facilities:** i.e. Meetings, seminars, conferences, exhibitions, social and community activities

Learning Environment of Tashkent University of Information Technologies consists of traditional lectures, seminars, laboratory and practical classes. At lecture classes, traditional lectures with ICT tools like computers, beamers are in use.

IV. Competitiveness of Education

The goal is to assess the competitiveness of your university and the academic program at a national, regional and EU-wide level as well as its conformity with the labor market requirements.

1. Do you receive a feedback from students – current and former ones – about the quality of education in the academic programs? Please answer at university level, Faculties or by areas described in Table 1, according with the characteristics and data of your institution giving information about the ways for collecting such information (i.e. questionnaires, surveys; regular meetings with graduates; alumni associations, etc.). Present specific documents, if applicable. Summarize the results.

Usually at the end of the term each student has to fill in online questionnaires to evaluate the teaching process, quality of facilities, the content of the course, training methods etc. Moreover, each instructor is evaluated at the end of each year at the Contract commission, with the presentation of the report on activities, all results of educational and scientific work during the academic year.

2. Do you collect information from employers of your students about the quality of education and students' professional qualification and preparation? Please, give information about the ways for collecting such information (i.e. questionnaires, surveys; regular meetings with employers, employers' associations, labor market institutions, etc.). Present specific documents, if applicable. Summarize the results.

TUIT uses the practice for professional qualification assessment from the industry via discussions at regular meetings of stakeholders. Usually the representatives from the Ministry, related companies and organizations express the opinion on the level of graduates. In other cases the private companies send recommendations on particular course quality. The university also practices "post-graduation support", helping the graduates to find job. The employers, being the university partners, are invited to contribute to the educational programs. They are involved into practical training advisory, reviewing graduation papers and lecturers' educational-methodical work; in arranging "Job Fair" event. They provide the university with the assessment of educational programs, the quality of training.

3. Student and teaching staff mobility per University/Faculty/Area described in table 1

<p>Total number of students per year over the last 2 years who have <u>studied</u> abroad (excluding the EU countries)</p>	<p>25 students, Korea, China, Russia (16 exchange programs, 9 research grants) (Please, specify the total number of students and the countries which students prefer. Take into account students' mobility programs, students' exchange programs, research grants, etc.)</p>
<p>Total number of student per year over the last 2 years who have <u>studied</u> in the EU</p>	<p>12 students France, Sweden, Austria, Germany (5 mobility programs, 7 research grants) (Please, specify the total number and the EU countries which students prefer. Take into account students' mobility programs, students' exchange programs, research grants, etc.)</p>

Total number of teachers per year over the last 2 years who have visited foreign academic institutions (excluding the EU countries) for the purposes of delivering lectures/seminars, conducting scientific research, project participation	52 teachers Korea, India, Russia (Please, specify the total number and the share in the full-time faculty staff and the most visited EU member states.)
Total number of teachers per year over the last 2 years who have visited academic institutions in the EU for the purposes of delivering lectures/seminars, conducting scientific research, project participation.	23 teachers France, Sweden, Germany, Italy, United Kingdom (Please, specify the total number and the share in the full-time faculty staff and the most visited EU member states.)

4. *Employability of graduates. (Please provide information by University/Faculty/Areas as described in Table 1 if such data is known and available.)*

The next two indicators estimate the degree of qualification mismatch for your graduates. Please, provide data on:

- *Share of graduates (% of the average total number of graduates per year) who over the last 5 years have started a job which require professional qualification and theoretical knowledge in the field of Engineering and Engineering Trade. These are students who work in accordance with their field of study/specialty (this indicator is related to the extent of horizontal qualification mismatch).*
- *Share of graduates (% of the average total number of graduates per year) who over the last 5 years have taken working positions which require the same educational degree (i.e. bachelor or master) as that they possess. These are students who work in accordance with the educational degree acquired (this indicator is related to the extent of vertical qualification mismatch).*

.....
(Please, provide an analysis of the results and discuss the reasons in case of low shares)

This item can be characterized by the estimate number of graduates who find job after the university – about 55-60% for the first year are employed at different organizations and companies.
No separate (horizontal/vertical) estimation applicable at this stage.

5. *Education and training provided in a real-life working environment*

5.1. *Per areas described in table 1, please share the courses/subjects type for which part or all classes are conducted in a real-life working environment (i.e. companies, banks, factories, etc.)*

Name of the Academic Program	Degree	Share of courses whereas lectures/practices/laboratory are conducted in real-life working environment, %
Information Security (within 'Computer Engineering' specialty)	Bachelor	12-15
Software Engineering	Bachelor	8-10
Telecommunications (within 'Telecommunications technology' specialty)	Bachelor	10

Information Security, Cryptography and Cryptanalysis (within 'Computer Engineering' specialty)	Master	12-15
Software Engineering	Master	12
Telecommunications Networks (within 'Telecommunications Engineering' specialty)	Master	10-12

(Please, give a specific number and examples.)

5.2. The average number of academic hours per course/subject conducted in a real-life environment

8-10

5.3. Additional evidence on the practical orientation of the study and the practical training of students (i.e. internships during study, etc.).

16 weeks of internship after 2,4,6,8 semesters are foreseen by curricula. Internship after 2nd semester provided at experimental laboratories, after 4, 6, 8 semesters at companies of profile industry
University have agreements on internship with a number of companies. Students should fulfill an internship diary during internship. After internship students should provide and defend detailed report. Most of the final projects' titles are provided by companies.

6. University – Business links

Please, provide information on participation of specialists, experts, entrepreneurs, etc. in the educational process and/or curricula development, if any. Specify the average share of lectures/seminars delivered by them (% of total academic hours per course/subject.)

Following activities are within university-business links strengthening:

1. Invited lecturers from industry, companies, organizations (almost all organization within the Ministry for the development of information technologies and communications (www.ccitt.uz), namely:
 - Scientific-engineering and Marketing researches center UNICON.UZ
 - The center of a radio communication, broadcasting and television the State unitary enterprise
 - "Uzbektelecom" Joint Stock Company
 - The Monitoring center for mass communications
 - Center for Electromagnetic Compatibility
 - "Republican telecommunications management center of Uzbekistan" government unitary enterprise
 - UZINFOCOM computerization and information technologies developing Center
 - "Electronic government" system development center
2. Different projects are jointly initiated and conducted wherein teachers and students involved.

Specialists of profile industries (Engineering companies) providing limited number of classes as guest lecturers. According to the Agreements with ICT companies, where the students have internship, the representatives of them are the experts of educational programs and curricula.

7. Does your university study the current tendencies and requirements of the labor market?

Every year, under coordination of academic department, deans office and specialized departments collect demand data about content and number of specialties and directions.

(Please, provide specific information about the ways to collect labor market data. Describe records, databases, analysis you prepare, if any.)

8. Does your university/faculty offer or plan to offer joint degree programs with partner universities?

(Please, provide general information about joint degree programs per area described in 1 with other universities in your home country or abroad, if any.)

No

9. Please, discuss the Lifelong Learning (LLL) policy of your institution such as students, alumni, company members, retired citizens, other actions.

Lifelong learning at TUIT can be characterized mainly by the self-motivated qualification retooling and upgrading, both for personal and professional reasons.

TUIT supports knowledge enhancement and personal development (incl. for the terms of competitiveness and employability).

10. Future teaching methodologies and their implementation

Thinking about future students, current learning strategies followed by many of them before entering university, and ICT technologies:

Which key competences, skills and practices do you think that will be needed at university level to enhance students learning experience? Explain briefly under faculty staff, student and stakeholders' point of view.

The students need to have the core engineering qualification competences, namely:

- to be aware with current trends of technological development in the field;
- to know the ways and approaches of solving engineering problems (e.g. engineering design);
- to recognize the research topics in actual and state-of-the-art directions (in line with world-wide research community);
- to understand the impact of engineering activities, as well as legal, financial and other aspects of engineering activities on the economy and social sphere;

Facing with real-world situation there should be 'internal self-satisfaction' of student, that he/she is able to overcome the problem or have decision making ability.

From institutional side there should be solid technical basis provided for education, so-called 'educational engineering' be on place as an important factor of tooling the technological knowledge of the student (modern techno-parks of hardware/software, equipment test beds, laboratory chains, mobile robots etc. should be in class).

From stakeholder' side it would be useful to arrange special sessions, short-term seminars etc. for permanentretraining of teachers (e.g. when new technology is being introduced in the market), organization of on-site practices for students, current or final projects on high-tech enterprises and others.

This approach enhances significantly the 'technical know-how' both for faculty and students.