



STUDIJŲ KOKYBĖS VERTINIMO CENTRAS

KAUNO TECHNOLOGIJOS UNIVERSITETO
PROGRAMOS *TAIKOMOJI CHEMIJA* (612F10002)
VERTINIMO IŠVADOS

EVALUATION REPORT
OF *APPLIED CHEMISTRY* (612F10002)
STUDY PROGRAMME
AT KAUNAS UNIVERSITY OF TECHNOLOGY

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Išvados parengtos anglų kalba
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DUOMENYS APIE ĮVERTINTĄ PROGRAMĄ

Studijų programos pavadinimas	Taikomoji chemija
Valstybinis kodas	612F10002
Studijų sritis	Fiziniai mokslai
Studijų kryptis	Chemija
Studijų programos rūšis	Universitetinės studijos
Studijų pakopa	Pirmoji
Studijų forma (trukmė metais)	Nuolatinė (4), iššęstinė (6)
Studijų programos apimtis kreditais	240
Suteikiamas laipsnis ir (ar) profesinė kvalifikacija	Chemijos bakalauras
Studijų programos įregistravimo data	1997-05-19

INFORMATION ON ASSESSED STUDY PROGRAMME

Name of the study programme	Applied Chemistry
State code	612F10002
Study area	Physical Sciences
Study field	Chemistry
Kind of the study programme	University studies
Level of studies	First
Study mode (length in years)	Full-time (4), Part-time (6)
Scope of the study programme in credits	240
Degree and (or) professional qualifications awarded	Bachelor of Chemistry
Date of registration of the study programme	1997-05-19

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The Centre for Quality Assessment in Higher Education

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I. INTRODUCTION

The external assessment of the study programme *Applied Chemistry* (state code - 621F10002) of Kaunas University of Technology was initiated by the Centre for Quality Assessment in Higher Education of Lithuania (SKVC) nominating the external assessment expert group formed by Professor Michel Troquet (Blaise Pascal University of Clermont-Ferrand, France - team leader), Professor Jan Lundell (University of Jyväskylä, Finland), Professor Carlos Nieto de Castro (University of Lisbon, Portugal), stakeholder representative Mr. Giedrius Mažūnaitis (The Association of Lithuanian Chemical Industry Enterprises, Lithuania) and student representative Ms. Kristina Daniūnaitė (PhD student at Vilnius University, Department of Botany and Genetics, Lithuania).

The evaluation of the study programme *Applied Chemistry* (state code - 621F10003) made use of the legal and regulatory information, and methodological guidelines provided to the Expert Team by the SKVC, as well as the Self-Evaluation-Report (SER) prepared by the assessed unit.

The first cycle study programme of *Applied Chemistry* is provided by Kaunas University of Technology (KTU) and run by the Faculty of Chemical Technology consisting of six Departments. The study programme conforms to all the legal acts of the country, to the regulations of the study programmes of Kaunas University of Technology, and also to the scientific requirements of European higher education area and its progress tendencies.

It has been self-evaluated by a team composed of five teachers and one student involved with the study programme, as well as one social partner from company *Aconitum Inc* representing one of the typical industrial collaborators in the programme. Altogether 25 teachers are involved in this study programme representing the staff of four different Departments in the Faculty. The self-evaluation report (SER) with annexes, produced by the self-evaluation team was made available to the expert team, visiting Kaunas University of Technology on 25th February, 2014. The expert team also had access to other material necessary for the evaluation of the programme, i.e. the legal documents describing the educational system and their requirements in Lithuania and Kaunas University of Technology (KTU), as well as the Methodological guidelines for experts by the Centre for Quality Assessment in Higher Education of Lithuania. The visit incorporated meetings with different groups: the administrative staff of the Faculty of Chemical Technology, staff responsible for preparing the self-assessment documents, teaching staff, students involved

with the study programme, program alumni and social partners connected with the activities and fields of interests of the study programme. The expert group was also introduced to various support services (classrooms and lecture rooms, laboratories, library, computer facilities), and examined students' final works.

KTU distinguishes itself by deep traditions of university studies in the area of technological sciences. The vision of the university is to be “...a leading European university with knowledge and technology development and transfer based activities...” (SER).

The first cycle study programme of *Applied Chemistry* is being implemented at the Faculty of Chemical Technology since 1997. The first self-assessment of the study programme *Applied Chemistry* was performed in 1999 and presented to the Centre for Quality Assessment in Higher Education for external assessment. The experts of external evaluation evaluated the programme positively. The programme has been accredited by the order of the Minister of the Ministry of Science and Education of LR on August 17, 2000, the order No.1-73 to December 31, 2011. The second self-assessment of the study programme *Applied Chemistry* was performed in 2011 and the programme was evaluated by international group of experts. The recommendations were:

- A better justification for the name ‘*Applied Chemistry*’ is advisable, and the aim of the programme ought to be clarified – either the emphasis could be shifted to the employment in the industry as explained in chapter 2.1.1 of the self-evaluation report or to specific application of chemical theories like instrumental investigation and analysis of chemical objects or else the name, the aim and the learning outcomes of the programme oriented consistently towards future further studies and research.
- It is necessary to compare all the course descriptions with the planned learning outcomes for the whole programme and make sure that all the learning outcomes are reflected at least in one course each. It is advisable to make some coordination among the courses in a horizontal way to develop an optimum distribution of learning outcomes in terms of knowledge, practical skills and transferable skills among the courses and between contact hours and independent work.
- The industrial practice needs to be longer to make it consistent with the formal requirements. The arrangements for practice should be improved: although there are employers who refer to high need for graduates and opportunities for practical placements, students are not getting enough practical placements in the industry.
- In order to make the teaching staff better connected to industry it would be advisable to strengthen cooperation with industry, e.g. with joint research or project work or involving the industrial employers in providing specific bits of training to students and staff.

- It would be advisable to improve the infrastructure and facilities necessary to students for development of practical skills and transferrable skills through independent individual or group work outside the contact hours.
- Students should be more actively encouraged to participate in international mobility.
- It can be advised to further develop the assessment methodology of students as concerns the checking of progress in attainment of practical skills and transferable skills.
- Additional effort could be advised to raise awareness of all the actors towards the best practices of quality management and make internal quality assurance fully in line with Standards and Guidelines for Quality Assurance in the European Higher Education Area.

The evaluation of the first cycle study programme of *Applied Chemistry* targets a start-up in the academic year of 2014-2015. In the period of 2011–2013 the study programme was reviewed and renewed, particularly considering the recommendations of the experts after the second self-assessment in 2011. The programme is research-oriented, and reflects the general principles and strategic priorities of Kaunas University of Technology. However, the evaluation is shadowed by the drastic changes taking currently place at the University. Last year the Senate of KTU approved a new research and education program, new rules for improvement of management, financial aspects, and human resources. During preparation of the self-assessment the structures for quality assessment within KTU changed to a large extent. These on-going changes do affect the outcome of this external evaluation since many of the top level changes are yet to change the practices and activities at the Faculty and Department levels. These facts have been considered by the expert team while assessing the study programme.

The organization of the study programme is implemented by two Departments of the Faculty of Chemical Technology, i.e. the Department of Organic Technology and the Department of Organic Chemistry.

The conclusions and recommendations made by the Expert Team have been discussed and agreed upon in common discussions, and the insight included in this evaluation report represents the members' consensual views.

II. PROGRAMME ANALYSIS

1. Programme aims and learning outcomes

The study programme *Applied Chemistry* is related with the priorities of Lithuanian science and technology. Over 10 thousand employees work in this chemical industry sector and manufacturing of chemical product is one of the fastest growing industries in the country. With the traditional industries of fertilizers the new materials (nanomaterials, catalysts, binders, biopolymers) and biopharmacy are rapidly developing branch.

The study programme's main target is to educate scholars with in-depth competence in chemistry. As stated in the Self-Evaluation Report, such specialists are needed both in academia and industry. The aims quoted in the SER as targets “*to educate bachelors with a deep and broad competence in chemistry with basic knowledge of biosciences able to apply theory and principles of chemistry to practical purposes; able to solve the problems within their field of study*”. These programme aims reflect the current developments and capacity-building visions in the European Research Area. Also, they reflect the needs of Lithuanian employers, as highlighted in the discussions with social partners during the expert team visit. Moreover, the progress of building national integrated science, studies and business centres like the Santaka Valley, will improve the need of motivated and skilful specialists in chemistry and chemical methodology as outlined in the programme. With respect to this, the programme aims are well defined and future-oriented.

Even though the aims are clearly stated, communicated on University webpage, and communicated to stakeholders, the name of the study programme *Applied chemistry* and the degree obtained *Bachelor of Chemistry* appears to be less obvious for employers with respect to the actual skills, knowledge and capabilities of the graduates (similar remark in the previous evaluation). The social partners indicted this during the discussions, and stated that they focus on the methodological capabilities of graduates beyond anything. This strengthens the focus of the programme but also underlines the programme development more closely with the industrial partners. Alas, there is an increasing silent request for dynamic programme development with insight on industrial needs and skills looked for.

The programme aims and learning outcomes are essentially based on the academic requirement for Master student's attraction. The public needs and the needs of the labour market are not identified. This is evident from the comments made by the industrial partners, whom indicate the content and methodologies trailing industrial views and developments by a substantial time gap.

The social partners confirmed their wish getting involved more in the definition of the programme.

The training provided reflects, indeed, the academic ambitions of the Faculty more than reflect the surrounding society and fastly evolving chemistry-related industry in Lithuania. The study programme is research-oriented, which has been adopted because of the academic aims of the programme, with a lesser impact from the employment profiles of students. On the other hand, nearly all of the alumni the Expert Team met stated that the broad skills and variety of knowledge has been very beneficial in locating personal employment careers. The strength of the programme is clearly in training professionals capable of problem solving especially finding jobs in product chemical industry.

The learning outcomes listed in the Self-Evaluation Report (Table 3.) appears exhaustive with a total of 38 different learning outcomes, which are divided into categories of Knowledge and Understanding, Intellectual abilities, Practical abilities and skills, and Transferable abilities and skills. Especially, the numerous learning outcomes reflect a programme development based on all possible areas of expertise a research scientist is imagined to need on the labour market. On the other hand, the exhaustive list of learning outcomes of Knowledge and Understanding list very general chemistry contents like properties of elements, classes of compounds, polymer and colloid chemistry, basic of chemical kinetics and basic states of materials. Based on the communicated list of learning outcomes it is hard to see how a student can realize the key competences he or she is required to master after a particular study content.

At the same time it needs to be abbreviated that the categorized learning outcomes do reflect a balance between specific and generic competences. With respect to the stated aims of the study programme, it appears that the learning outcomes reflect in too large extent content knowledge than practical hands-on trained skills. This will have an impact also on the use and adaptation of learning and teaching methods, and could create obstacles for efficient and dynamic development of the study programme with respect to the needs of the industry.

In general, the list of the learning outcomes is too wide (38). It is not easy to assess so much large number of learning outcomes, as some are not well defined (“basics of chemical technology...”, “basics of biosciences and biotechnology”, “creatively and innovatively apply their subject knowledge in dealing with the chemistry related, theoretical and practical problems”, “skills in use of instrumentation in synthesis and analytical work”), related only to

electives (“skills in safe handling of chemicals”, ability to conduct risk assessment concerning the use of chemical substances and laboratory procedures”) when a more common ground for these skill practices is requested by industrial partners; or of the level Master's degree (to analyse new problems and plan strategies of solution”). A work of simplification and rationalization is imperative.

Evidently, the curriculum design is based on student-centered research activities, especially in the last three years. As the students are focusing on a specific interest area based on the research group they join, there is a special need to ensure the achievement of stated learning outcomes throughout the programme. In this respect, learning outcome B3 stating “*to follow, analyse and critically estimate innovations in the field of chemistry*” might be a challenge. As such, the learning outcome B3 possesses a challenge for the current programme development and quality assurance.

2. Curriculum design

The programme is designed in accordance with the laws and directives applicable in Lithuania and European Union (EU) and it formally meets these requirements. The duration of the programme is 4 years for full-time and 6 years for part-time studies with the total volume of 240 ECTS credits (30 credits for full-time and 20 credits for part-time studies per semester). During the last 5 years, 158 students were enrolled in this programme. Not more than 6 subjects are taught during the semester.

The aims of the programme are highlighted. The SER specifies: “*the programme is clearly separated from the programme Chemical Technology and Engineering*”, but there is more of 90 credits of identical modules. On a Bachelor level, the overlap is substantial, but one needs to understand that this is related to basic content knowledge as well as skill and competence build-up. However, the indicated difference between programmes appears according to interviews and SER to be mainly because of the research activities of students in the final stages of their studies. From an administrative point of view, the two Bachelor programmes (i.e. “*Applied Chemistry*” and “*Chemical Technology and Engineering*”) represent added administration effort and cause confusion outside the University. This is especially evident, since the Bachelor degrees appear as a stepping stone for further studies or specialisation training in industry. In the view of the previously stated note in this report on visible and profitable skills of graduates, it appears that building generic and especially problem solving skills is a major strength of the programmes,

whereas the deep content knowledge and specialized research profiles of students are well established on the Master level studies. Therefore, it would be beneficial from the administrative, timetable and resource point of views to investigate the possibility of broader unification and profiling the curricula and content of programmes.

The curriculum leads to professional education subjects focusing on hands-on research training in research laboratory and covering many areas (cosmetics, applied electrochemistry, functional silicon compounds and other.).

Based on SER, course module descriptions and the stated learning outcomes, there appear to be a very narrow range of learning and teaching methods employed. This was confirmed by the interviews with students, alumni and teachers as well. Regarding the skills and capabilities required by future scientist and researcher, personal and social skills are becoming more desirable. Therefore, in a strongly research-focused study and learning environment adaptation of student-centered, inquiry-based approaches would ensure the stated learning outcomes more efficiently. This is also reflected in comments from various stakeholders in the evaluation suggesting that training of Bachelor level chemists require more practical and broad methodological skills to meet the criteria of the labour market. Based on the discussions with social partners, the design of the study curriculum should reflect the fast-progressing developments in the Lithuanian industrial profile, and to be dynamically adapting problem-solving of industrial cases as learning objects in the programme. This would improve placement of the graduates since 10 out of 28 graduates in 2013, according to SER, are working outside their field of study speciality.

Strength of the current curriculum design is that the students are joining active research groups, which provide a motivating learning environment. Especially alumni located in the fields of fertilizers, textile, cosmetics, and pharmaceuticals indicate that the programme is able to give them a broad education useful in their everyday activities. On the other hand, they do see handicaps in the fields of Safety, especially stressed Legislation, which appear as key contents in an industrial environment. Therefore, the scope of the programme reflects the academic research environment to a greater extent than the industrial market. Increasing discussion with stakeholders and enhanced feedback mechanisms from industry would help to develop the programme to support the competitiveness of future graduates on the labour market.

3. Staff

The number and qualifications of the staff involved in the study programme meet the applicable legal requirements. The programme is taught by 23 teachers of the Faculty, whom are assessed every five years (12 of them are professors and they insure 52% of the teaching). The pedagogical experience is between 4 and 40 years. Some natural turnover of the teaching staff of the Department has been observed in the past years (retirement, arrival of young teachers), which has ensured the stability of the programme contents. As the turnover of the staff continues, it needs special attention in the changing operational landscape both of the programme and the Faculty.

The staff involved in teaching has good scientific output. All teachers have been publishing scientific papers in the last five years, and they are connected with the supervision of the programme students' research activities. The programme electives especially reflect the specialization areas of the teachers. Compared with the number of teachers involved with the programme, the student/teacher ratio is very adequate; i.e. SER lists 24 teachers involved in the programme, and there are on average about 23 students enrolled in the programme annually. This indicates a 1:4 ration between teachers and student – a number that is imperative to provide a high level of interaction and mentoring capabilities within the programme. On the other hand, it was learned by the Expert team during interviews that same teachers participate in several educational programmes, which decrease the validity of the above statement. Alas, it is concerning that the teachers are involved in several study programmes at the same time, which increases their teaching loads and strain their possibilities for upscale research work. The working loads of up to 500-600 and even 900 contact hours altogether (according to teaching hours listed in SER) present a clear and present danger for the continuation of the programme with respect to the existing staff.

Staff mobility is moderate even though almost all programme staff teachers are reported to be able to visit foreign countries. However, numerous of these visits seem to be connected with conference attendance. About one half of the teachers are involved in international projects which evidently increase visits abroad and also activities thereby beyond conference attendances. Teaching loads and lack of finance are indicated as major reasons for this. However, there seems to be a small appetite to step up engagement in exchange programs according to the documents provided to the Expert Team and the interviews, even though SER lists a significant number of collaboration institutions and state that there exist joint scientific projects. As such collaboration initiatives are bound to exist in well-established research activities; it may well be a higher

threshold to overcome for younger faculty members with large teaching loads. It is well recognised that participation in conferences act as efficient stepping stones for international networking and collaboration.

Staff development activity is low, especially in terms of teaching skills. Almost no staff interviewed by the expert team had participated in teaching skills courses organised by the University, even though new teachers have to take courses for pedagogical training, as indicated by the staff members in the interviews. No faculty-wide dissemination strategy for good practises was found by the expert group based on the SER or the interviews.

The research carried out by the teachers is reflected in the students' final Bachelor. Thesis projects and their quality are, in general, very good, as can be seen in the topics selected, methods chosen and up to date bibliographies. Many of the topics researched by students recently also reflect industrial views.

4. Facilities and learning resources

Faculty physical provision for the programme is adequate, although some of the lecture rooms and laboratories are in need of refurbishment – a process which is currently underway using efforts from the University, industrial partners and EU structural funding. Also, the research infrastructure has recently received a revival with EU support in form of new research laboratory, large scale research equipment. This has a positive impact on the research projects associated with the programme, and provides new opportunities in student training. The improvement on equipment provides a good asset for programme development. However, there are still old facilities employed, that appear small and crowded. The latter represents a challenge on development of more student-centered learning activities.

Library provision is adequate, and is good with respect to electronic sources and databases. IT resources are basic, but adequate for the programme and are showing steady improvement. The Faculty members actively develop new teaching material, which is widely used throughout the study programme modules. Students can also use the Central Library. Students have access to a number of databases which are available from the library computers. Most of the literature needed for the programme is available at the library or methodological rooms of the coordinating departments. Students also use the methodological material prepared by the teachers, which is also available in electronic format. Internet connection is available in the premises.

Auditoriums and computer classes are all equipped with modern multimedia and necessary software used for teaching and studies. The teaching materials are adequate and easily available to the students.

The Faculty has adequate arrangements for students' practical placements. The requirements and implementation of practical training are discussed among supervisors and social partners as confirmed during the meetings. It is rather common that students are employed at the enterprise after their practice period. Therefore, practice outside the teaching premises should be further enhanced.

5. Study process and student assessment

The admission requirements are well-founded and organized according to General Regulations for General Admission to the first cycle and continuous studies at Lithuanian Higher Education Institutions. The admission requirements are clearly formulated and accessible on the internet page of KTU (<http://ktu.edu>). Entrants to the first-cycle study programme are admitted by competition to state funded places or places of paying the entire tuition fee themselves. The drop-out rate from the programme in the last years is small, which indicate that the programme is able to attract students that are motivated to in such studies.

The study process is organized in autumn and spring semesters and the Dean's office assures even distribution of workload during the semester, considering individual study plans. Practical work attendance is compulsory, which ensures sufficient provision of the study process. The achievement of the learning outcomes is taken into account by varying study methods (lectures, practical works, seminars, individual tasks, group assignments, research projects) as indicated by the self-assessment documents. On the other hand, based on the interviews, there seems to be a tendency to resort in traditional teaching and learning methods, like teacher guided laboratory exercises and theoretical lecture courses. Apparently there exists an unawareness of the demands of a shift from teacher driven provision to student-centered learning, which need to be tackled by common efforts of the staff, students and administrative bodies of the Faculty, in conjunction with social partners.

Based on the interviews, students do get information about mobility possibilities, and this is also ensured by Faculty engaging in bilateral exchange programs within the Erasmus program. However, based on the student interviews, there is no clear view by the students how courses

taken abroad would benefit their advancement in the programme. Even though the studies abroad are checked and accepted by the University, there is no transparent policy to substitute KTU courses with courses taken abroad. This discourages international exchange visits and is reflected in that only a few students within the programme actually complete international exchange. Even in interviews it appeared that a more practical and vivid opportunity for exchange is during Master level studies, which are more research-oriented and easier to connect with exchange period activities.

The programme providers ensure constant academic and social support to the students. At the beginning of a semester teachers introduce new subjects and discuss individual assignments and evaluation criteria. A good practice was revealed by the teacher interviews: Alterations in a teaching module are described at the beginning of the course, and thereby making the quality assurance and meaningfulness of student feedback more transparent.

Essential information on all student issues is regularly updated on University's website. Student Affair Office provides students with social support in collaboration with student representatives and the Dean. Psychological support is ensured by the Academic Progress Centre of the University. Students are encouraged with incentive and/ or social scholarships. Allocation of incentive scholarships is regulated by the documents approved by the Senate and confirmed by the Rector's order, while social scholarships are appointed according to the Decree of the Government of the Republic of Lithuania. During the studies, students can apply for the accommodation in the University's hostels. As stated in SER , the need of hostel rooms for the study programme students is fully satisfied. Only a fraction of interviewed students employed this option.

Assessment of students through essays, practicums, examinations and final thesis are varied, timely and the quantities of assessment are broadly appropriate to the programme. Assessment feedback appears to be varied between courses. Moreover, feedback seems to be always retrospective (electronic assessment form after the courses), with the student only becoming aware of problems/potential improvements after the event.

The assessment system of students' performance is clear, adequate to the programme and publicly available. However, faculty wide evaluation criteria for the Bachelor thesis are not clearly defined. The grades rewarded are strongly polarized to the top grades. This reflects a lack of any rigorous formative training in how to write and present theses in general.

Criteria-based ten-point scale is applied for the evaluation of learning outcomes, which is clear and adequate. All the relevant information is presented on the University's website. Self-study assignments possess weighted coefficients, which are used to calculate the final cumulative score.

Most of graduates are employed according to the speciality, which indicates that students are satisfied with their education at KTU. This was supported by the interviewed students as well. Alumni interviewed indicated that the training they received have been adequate and useful for their employment in industry. This was confirmed by social partners as well, even though they expressed some concerns on missing skills related to industrial research and development environment, like safety, stressing legislation.

The overall impression is that the study process and student assessment are on a good level. The self-evaluation report and the meeting with the students confirm that the admission requirements to the study programme are clear and transparent; there is provision of social, informational and financial support for students provided by the university and faculty administration staff.

6. Programme management

Study programme is managed by the Study Programme Committee (SPC), but the relations with the diverse levels of responsibilities of the Faculty (Head of Department, Vice Dean of Academic Affairs, Coordinator of studies) is not very clear for the expert panel after SER and the interviews. Based on initiatives from staff, the course activities may be changed up to 20% of the previous without recourse to SPC or Faculty level and above. This number was communicated to the Expert team during the teacher interview. However, if learning outcomes or requirements are changed, it needs approval from SPC and above. Interviewed teachers also indicated that even though the teacher can make changes in a particular teaching module, this is usually discussed with programme coordinator, the SPC and the Head of Department in an informal manner. There is no evidence for assessment of the changes decided by the teachers on the SPC or Faculty level.

Employers interviewed during the review confirmed that they had informal input via personal contacts with the Faculty members and into the study programme via a member on the SPC. Based on the interviewed employers, there is no systematic way of communication of assessment

requirements of the Bachelor Thesis projects – even though they often involve industrial partners. According to the industrial partners engaged earlier in such co-operation, the stakeholders are left to rely on the involved academic staff on the assessment particulars. Such an approach is undermining the competence of the industrial partners, and represents a very poor quality assurance approach.

There is no evidence of systematic data collection, except the student feedback – and even then the return percentage of answers is, as described to the Expert Team in interview, “generally low”. Data on continuous improvement must base the implementation and correction of non-conformities in the study process that were found necessary. There is progress going on at the University level Quality Assurance (QA), and the outcomes are not yet well implemented at the Faculty level. There is not a complete awareness by the administrative or teaching staff about its utility, since the KTU general QA system is brand new. Implementations of the general QA requirements and practices are still to be implemented on the Faculty and Department levels. The requirements of the previous evaluation have been partially implemented in conjunction with feedback from students and social partners. The programme has been improved during by re-timetabling, module and content-knowledge alterations, and targeting of staff appointment. However, in the current state of changing operational environment, outcome of already implemented changes are hard to assess on a programme level.

III. RECOMMENDATIONS

The following recommendations of the previous assessment have been taken into account, according to the assessed Unit:

- the name “Applied chemistry” is justified by with a deep and broad competence in chemistry;
- the learning outcomes are reflected at least in one course each;
- the industrial practice has been raised to 15 credit points instead of previous 6;
- Infrastructure and facilities are developed.

Other points quoted in the previous assessment can still be improved. Such things include strengthening of the industrial and national relations, the competencies assessment methodologies of students, and the internal quality assurance system for the degree.

After reading SER and based on the various meetings with assessment partners at KTU, the Expert Team also have the following recommendations:

1. The curriculum needs to be revised. Focus the aim, learning outcomes and skills and capabilities acquired in a broader, context-based learning environment, and assess the outcome on Faculty level in comparison with market needs and international actors in the field. Actively and dynamically involve new equipment and facilities in teaching. Actively seek study modules which enhance competitiveness of students in the labour market.

2. Enhance the transparency of QA. Develop a mechanism for raising staff teaching skills to include, amongst other things, peer evaluation of staff teaching and annual evaluation of staff teaching. Implement a transparent assessment system for Bachelor Thesis projects.

3. Enhance the student-centered, research-based programme at the Bachelor level, and employ the stakeholders in the decisions making, assessment and curriculum design activities to a greater extent.

4. Enhance cross-research group activities in order to broaden the skills and capabilities of students. The enhancement of practical skills was highlighted by all participants of the evaluation, and laboratory-related, inquiry-based with more industrial and novel research can be used to step up the training program efficiency with respect to the employer’s needs.

IV. SUMMARY

Applied chemistry is *de facto* an important field of chemistry research and chemistry education. It represents a field which is bound to be closely connected with real life applications and industrial viewpoints. Additionally, it has a profound role in forwarding chemical research and its methodologies based on the newest and most important developments in the field. The Bachelor level programme of Applied Chemistry at KTU has been undertaken in an attempt to answer the national demand of educated people for various scientific tasks within industry and academia. The main asset of the programme is the highly motivated, forward-leaning students, which have a high motivation to obtain skills and capabilities valuable on the broad scientific labour market. Moreover, the number and the quality of teaching staff and technical facilities have to be seen as positive factors for the programme success.

The stated programme aims rely heavily on existing research-oriented profile of the staff members and Departments in the Faculty. As inquiry-based education is essential for the growth of scientific expertise, relying too much on outdated conceptions of education and students as practitioners instead of creators of novelty could increase risks of training narrow-field specialists not appreciated by the labour market. Student-centered education, close connection and mutual discourse with industry in developing curriculum, knowledge and capabilities needed. As well as up-to-date study contents and methods would assure production of scientists with competitive skills even throughout the European Research Area. Especially, the rearranging and developing academic environment at KTU could be benefitted from when long-term strategies could be collaborated throughout the Faculty. Here, strategic unification of both of the Bachelor of Chemical technology and engineering and Bachelor of Applied chemistry have a common ground which has not been fully explored. Such a unification could have a very positive impact on focusing, supporting and elaborating the study programme capitalising on staff turnover, new research infrastructures and increasing collaboration between teachers, Departments in the Faculty. This would also increase quality assurance throughout the whole programme, between the various programmes in the Faculty, and enhance the role of Faculty administrators and Study Programme Committee as facilitators of learning in a motivating and result-orienting study learning environment. Here the activity and visions from current students, alumni and social partners are also valuable.

The Expert Team draws the attention of the authorities on the duration of the studies of Bachelor (four years) which is not in sync with most of the European countries (three years). This disjunction could be disfavor the international exchange programmes and could introduce a misunderstanding on the profile of skills of the graduates, as well as causing the programme graduates an inpecable time lag compared with their European peers. However, the Expert Team acknowledges that this is due to National regulations in Lithuania, and thereby it can't be affected by KTU alone. Additionally, the Expert Team stresses that this fact has had no effect on the overall assessment of the programme in question. This is merely an observation of foreign members of the Expert Team coming from academia employing the Bologna 3+2 model for Bachelor and Master studies, respectively.

V. GENERAL ASSESSMENT

The study programme Applied chemistry (state code – 612F10002) at Kaunas University of Technology is given **positive** evaluation.

Study programme assessment in points by evaluation areas.

No.	Evaluation Area	Evaluation Area in Points*
1.	Programme aims and learning outcomes	2
2.	Curriculum design	3
3.	Staff	3
4.	Material resources	3
5.	Study process and assessment (student admission, study process student support, achievement assessment)	2
6.	Programme management (programme administration, internal quality assurance)	2
	Total:	15

*1 (unsatisfactory) - there are essential shortcomings that must be eliminated;

2 (satisfactory) - meets the established minimum requirements, needs improvement;

3 (good) - the field develops systematically, has distinctive features;

4 (very good) - the field is exceptionally good.

Grupės vadovas:
Team Leader:

Prof. Michel Andre Troquet

Prof. Jan Lundell

Grupės nariai:
Team members:

Prof. Carlos Nieto de Castro

Giedrius Mažūnaitis

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**KAUNO TECHNOLOGIJOS UNIVERSITETO PIRMOSIOS PAKOPOS STUDIJŲ
PROGRAMOS *TAIKOMOJI CHEMIJA* (VALSTYBINIS KODAS – 612F10002) 2014-06-
16 EKSPERTINIO VERTINIMO IŠVADŲ NR. SV4-341-1 IŠRAŠAS**

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V. APIBENDRINAMASIS ĮVERTINIMAS

Kauno technologijos universiteto studijų programa Taikomoji chemija (valstybinis kodas – 612F10002) vertinama **teigiamai**.

Eil. Nr.	Vertinimo sritis	Srities įvertinimas, balais*
1.	Programos tikslai ir numatomi studijų rezultatai	2
2.	Programos sandara	3
3.	Personalas	3
4.	Materialieji ištekliai	3
5.	Studijų eiga ir jos vertinimas	2
6.	Programos vadyba	2
	Iš viso:	15

* 1 - Nepatenkinamai (yra esminių trūkumų, kuriuos būtina pašalinti)

2 - Patenkinamai (tenkina minimalius reikalavimus, reikia tobulinti)

3 - Gerai (sistemiškai plėtojama sritis, turi savitų bruožų)

4 - Labai gerai (sritis yra išskirtinė)

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IV. SANTRAUKA

Taikomoji chemija yra *de facto* svarbi chemijos mokslinių tyrimų ir chemijos mokymo sritis. Ji atstovauja sričiai, kuri privalo būti pritaikoma realiame gyvenime ir pramonėje. Be to, ji atlieka svarbų vaidmenį vykdant chemijos srities mokslinius tyrimus, o jos metodologijos remiasi naujausiais ir svarbiausiais šios srities pasiekimais. Bakalauro studijų programa Taikomoji chemija buvo pradėta vykdyti KTU siekiant reaguoti į plataus spektro įgūdžių turinčių specialistų poreikį šalyje, kurie vykdytų įvairius mokslinius darbus pramonės srityje ir akademinėje bendruomenėje. Pagrindinė su programa siejama vertybė – itin motyvuoti, žvelgiantys į ateitį ir stropiai besimokantys studentai, kurie pasižymi didele motyvacija ir siekia įgyti įgūdžių ir gebėjimų, vertinamų plačioje mokslinio darbo rinkoje. Be to, personalo ir

techninės materialiosios bazės apimtis ir kokybė yra teigiamas veiksnys, siekiant garantuoti programos sėkmę.

Nurodyti programos tikslai labai priklauso nuo personalo narių esamo, į mokslinius tyrimus orientuoto, profilio ir fakulteto katedrų. Kadangi tyrimais grindžiamas mokymas yra labai svarbus siekiant užtikrinti mokslinės kompetencijos augimą, pernelyg didelis pasitikėjimas pasenusiomis ugdymo koncepcijomis ir studentais, kaip praktikantais, o ne naujovių kūrėjais, gali didinti riziką, kad bus rengiami siauro profilio specialistai, kurie nebus vertinami darbo rinkoje. Į studentą orientuotas ugdymas, glaudus ryšys ir abipusis bendradarbiavimas su pramone, kuriant programos sandarą, reikalauja žinių ir gebėjimų. Šiuolaikiškas studijų turinys ir metodai užtikrintų mokslininkų rengimą, kurie pasižymėtų konkurencingais įgūdžiais net visoje Europos mokslinių tyrimų erdvėje Parengta ilgalaikė strategija, sukurta bendradarbiaujant viso fakulteto mastu, ypač padėtų pertvarkyti ir plėtoti akademinę KTU aplinką. Strategiškai sujungus Cheminės technologijos ir inžinerijos bei Taikomosios chemijos bakalauro studijų programas, būtų sukurtas bendras pagrindas, kuris dar nėra visiškai išnaudotas. Toks sujungimas galėtų turėti itin teigiamą poveikį sutelkiant, remiant ir tobulinant studijų programą vykstant dėstytojų kaitai, kuriant naują mokslinių tyrimų infrastruktūrą ir didinant dėstytojų bei fakulteto katedrų bendradarbiavimą. Tai leistų pagerinti visos programos, taip pat įvairių fakultete vykdomų programų kokybės užtikrinimą ir sustiprinti fakulteto vadovybės ir Studijų programos komiteto vaidmenį, kurie skatintų mokymąsi motyvuotoje ir į rezultatus orientuotoje studijų aplinkoje. Šiuo klausimu labai vertinga dabartinių studentų, absolventų ir socialinių dalininkų veikla ir vizijos.

Ekspertai nori atkreipti valdžios institucijų dėmesį į bakalauro studijų trukmę (ketveri metai), kuri skiriasi nuo daugumos Europos šalių studijų trukmės (treji metai). Šis neatitikimas neigiamai veikia tarptautines mainų programas ir gali lemti nesusipratimus dėl absolventų įgūdžių profilio. Dėl tokios situacijos programos absolventai gali prarasti laiko, lyginant su kolegomis Europoje. Tačiau ekspertai supranta, kad tokią situaciją lemia Lietuvos nacionaliniai teisės aktai, todėl vien KTU šio klausimo išspręsti negali. Ekspertai pabrėžia, kad šis faktas neturėjo įtakos bendram šios programos vertinimui. Tai tik užsienio ekspertų, atstovaujančių akademinę bendruomenei, kurioje taikomas Bolonijos 3+2 modelis atitinkamai bakalauro ir magistrantūros studijoms, pastebėjimas.

III. REKOMENDACIJOS

Atsižvelgta į šias ankstesnio vertinimo metu pateiktas rekomendacijas:

- pavadinimą „Taikomoji chemija“ pagrindžia didelė kompetencija chemijos srityje;
- kiekvieno kurso aprašymas atspindi studijų rezultatus;
- gamybinės praktikos kreditai nuo ankstesnių 6 padidinti iki 15;
- išplėta infrastruktūra ir materialioji bazė.

Kiti per ankstesnį vertinimą nurodyti dalykai vis dar gali būti tobulinami. Tai pramonės ir šalies bendradarbiavimo stiprinimas, studentų kompetencijų vertinimo metodologijos, šios studijų pakopos vidinės kokybės užtikrinimo sistema.

Susipažinę su savianalizės suvestine ir remdamiesi įvairiais susitikimais KTU, ekspertai pateikia šias rekomendacijas:

1. Persvarstyti programos sandarą. Tikslus, studijų rezultatus ir įgytus įgūdžius bei gebėjimus sutelkti į platesnę, praktiniu mokymu pagrįstą, mokymosi aplinką, rezultatus įvertinti fakulteto lygmeniu ir palyginti juos atsižvelgiant į rinkos poreikius ir tarptautinius pasiekimus šioje srityje. Dėstymo metu aktyviai ir dinamiškai naudoti naują įrangą ir materialiąją bazę. Nuolat ieškoti studijų modulių, galinčių padidinti studentų konkurencingumą darbo rinkoje.

2. Gerinti kokybės užtikrinimo skaidrumą. Parengti personalo dėstymo įgūdžių tobulinimo mechanizmą ir, be kitų dalykų, įtraukti dėstytojų kolegų įvertinimą ir personalo metinį vertinimą. Įgyvendinti skaidrią bakalauro baigiamųjų darbų vertinimo sistemą.

3. Didinti į studentą orientuotą tyrimais grindžiamą praktinį mokymą bakalauro lygiu, socialinius dalininkus labiau įtraukti į sprendimų priėmimo, vertinimo ir programos sandaros rengimo procesus.

4. Skatinti skirtingų mokslinių tyrimų grupių veiklą, siekiant gerinti studentų įgūdžius ir gebėjimus. Visi vertinimo dalyviai akcentavo, kad būtina tobulinti praktinius įgūdžius, skatinti laboratorijoje atliekamus ir tyrimais grindžiamus pramonės ir naujus mokslinius tyrimus, galinčius didinti studijų programos veiksmingumą, atsižvelgiant į darbdavio poreikius.

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Paslaugos teikėja patvirtina, jog yra susipažinusi su Lietuvos Respublikos baudžiamojo kodekso¹ 235 straipsnio, numatančio atsakomybę už melagingą ar žinomai neteisingai atliktą vertimą, reikalavimais.

¹ Žin., 2002, Nr.37-1341.