



STUDIJŲ KOKYBĖS VERTINIMO CENTRAS

KAUNO TECHNOLOGIJOS UNIVERSITETO  
**PROGRAMOS *TAIKOMOJI CHEMIJA* (621F10003)  
VERTINIMO IŠVADOS**

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**EVALUATION REPORT  
OF *APPLIED CHEMISTRY* (621F10003)  
STUDY PROGRAMME  
AT KAUNAS UNIVERSITY OF TECHNOLOGY**

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## DUOMENYS APIE ĮVERTINTĄ PROGRAMĄ

Studijų programos pavadinimas	<b>Taikomoji chemija</b>
Valstybinis kodas	621F10003
Studijų sritis	Fiziniai mokslai
Studijų kryptis	Chemija
Studijų programos rūšis	Universitetinės studijos
Studijų pakopa	Antroji
Studijų forma (trukmė metais)	Nuolatinė (2)
Studijų programos apimtis kreditais	120
Suteikiamas laipsnis ir (ar) profesinė kvalifikacija	Chemijos magistras
Studijų programos įregistravimo data	2009-08-17

## INFORMATION ON ASSESSED STUDY PROGRAMME

Name of the study programme	<b>Applied Chemistry</b>
State code	621F10003
Study area	Physical Sciences
Study field	Chemistry
Kind of the study programme	University studies
Level of studies	Second
Study mode (length in years)	Full-time (2)
Scope of the study programme in credits	120
Degree and (or) professional qualifications awarded	Master of Chemistry
Date of registration of the study programme	2009-08-17

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## I. INTRODUCTION

The external assessment of the study programme *Applied Chemistry* (state code - 621F10003) 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* (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 second 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. The study programme also relates to the European initiative of Chemistry Master highlighting the European level views of future scientific needs and skills.

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 19 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 25-th 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.

The evaluation of the second cycle study programme of *Applied Chemistry* targets a start-up in the academic year of 2014-2015, whereas the programme has been functional since autumn 2009. The programme is clearly 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 new research and education programme, 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 conclusions and recommendations made by the expert team have been discussed and agreed upon in common discussions, and the insights included in this evaluation report represents the members' consensual views.

## II. PROGRAMME ANALYSIS

### *1. Programme aims and learning outcomes*

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. Moreover, the aims quoted in the SER as subjective targets include personal research skills ("problem-solving, adaptation to new in-field environment"), chemical content-knowledge ("able to produce new materials"), and develop a personal attribution to proceed to third level studies. 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 centers like the Santaka Valley, will improve the need of motivated and skillful specialists in chemistry and chemical methodology as outlined in the programme. With respect to this the programme, aims

are well defined and future-oriented. Moreover, the aims reflect the programme content and represent well the skills and competencies of students passing the programme with respect to the general expectancy.

The aims of the programme also correspond to the requirements of institutional, state and international requirements, as well as conjunct with the KTU values of Master level studies offered. The programme is well defined in its outcome and reflects in a broad sense to the overall pedagogical motivation of training skilful and self-sufficient experts in the programme's field.

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 (*Master of Chemistry*), it appears to be less obvious for employers with respect to the actual skills, knowledge and capabilities of the graduates. 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 study programme is heavily research-oriented, which has been adopted because of the aims of the programme, also by the employment profiles of students. Indeed, 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 are divided into knowledge and its applications, research skills, subject-specific skills, social skills and personal skills. The learning outcomes listed in the Self-Evaluation Report (Table 3.) appears exhaustive with a total of 20 different learning outcomes, which are divided into categories of Knowledge and its Applications, Research skills, Subject-specific skills, Social skills, and Personal skills. Nevertheless the numerous learning outcomes, these reflect a programme development based on all possible areas of expertise a research scientist needs on the labour market. It shows a balance between specific and generic competences. The content of the learning outcomes related to the Knowledge and its application (A1-A6, See Table A below) cover very broad subject areas in different content-knowledge

subfields of chemistry and methodological skills. However, some of the learning outcomes (i.e. A2 and A3) indicate a very deep localization of a specific content-knowledge, which most likely

Table A. Knowledge and Its applications according to the SER

- A1 Chemistry-related theoretical knowledge, including advanced organic, inorganic and medicinal chemistry
- A2 Deep knowledge of the kinetics of chemical reactions
- A3 Deep understanding of instrumental analysis methods
- A4 Knowledges on nanotechnologies
- A5 Application of computer programmes in chemistry
- A6 Knowledges of smart, functional and composite materials.

reflect the research profiles of the research groups. Looking from the point of view of the social partners, too highly specialization at this level is disfavoured compared to more profound generic research and laboratory skills. A more focused methodological approach and training instead of much focused content-knowledge would benefit the students in the labour market.

The SER links very accurately all the learning outcomes listed in Table 3 with each subject and course taught during the two years of the programme. Evidently the curriculum design is based on student centered research activities especially in the second year. As the students are focusing on a specific interest area based on the research group they join early in their Master studies, there is special need to ensure the achievement of stated learning outcomes throughout the programme. In this respect, learning outcome B3 stating “critically evaluate the significance of new and emerging technologies to their areas of expertise” present a clear challenge, which is hard to encompass even for a specialist working in the field for a long time or a Ph.D. student. As such, the learning outcome B3 possess a challenge for the current programme development and quality assurance, in which case it should be downsized to the level of Master programme.

## ***2. Curriculum design***

The programme meets legal requirements and general University requirements covering obligatory and optional study fields in basic and expanded subject knowledge and specialized professional education. The curriculum design is broadly based at the first year of studies, followed by progressive complexity in the second year of study programme. Finally the curriculum leads to specialized professional education subjects like Technology in

Nanomaterials or method-driven research projects with medicinal, analytical or pharmaceutical bias, especially focusing on hands-on research training in research laboratory.

The programme appears a continuation from previous first level university education (Bachelor degree) with the same study programme name (*Applied chemistry*). Therefore, it is quite surprising that there are study modules like *Chemical Kinetics* or *Analytical and Preparative Chromatography*, which, based on the course descriptions and course contents, reflect European standard Bachelor level training of chemists. However, these courses can be upgraded with respect to the specialisation fields met during the research projects. Especially *Chemical kinetics* in light of catalysis would benefit the development of the programme in a broader sense, i.e. to support future employment of the students in a growing field of industry.

There is a clear coherence consistency of the whole curriculum, even though it is not always clear if all teachers have collaborated together to define the outcomes of the programme. The method seems more based on a research group-centered approach and directed from top to down. The programme does achieve capacity building throughout the programme, but in the upcoming years when the local university-related developments progresses and when there is more data collected on graduate study and learning paths, with respect to their employment, the curriculum design and focusing of learning outcomes to reflect both industrial and Ph.D. study needs can be highlighted. It is also envisaged that the developing research infrastructure and research staff profile have a strategic impact on the programme design.

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 Master 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. Here the interplay between the curriculum design, learning modules, learning methods and stakeholders is a key to a successful and meaningful programme development.

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 handicapness in the fields of safety, legislation and standards, 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 and the well-being of Lithuanian industry, as envisaged by the KTU principles: “Creating of innovations by developing internationally acknowledged technology and knowledge and by enabling its transfer into industry and business.” The Santaka Valley is a good initiative also for the curriculum development and enhancement of research-focused chemistry specialists, as well as dissemination of new innovations and knowledge.

### *3. Staff*

The number and qualifications of the staff involved in the study programme meet the applicable legal requirements. The programme is taught by 19 teachers of the Faculty, whom are assessed every five 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 reasonable scientific output. All teachers have been publishing scientific papers in the last five year time, and they are connected with the supervision of the programme students’ research activities. The programme electives especially reflect the specialization areas of the teachers.

The average annual intake number of students in the program is less than 20, which means a total of ca. 35 students in the programme every year. Compared with the number of teachers involved with the programme, the student/teacher ratio is very adequate and suitable for research-intensive programme (42,5 % of study volume is research work). On the other hand, 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 contact hours altogether (Table 8 in SER) present a clear and present danger for the

continuation of the programme with respect to the existing staff. Especially this could affect the 5-year assessment, which is mainly focused on scientific achievements, and could lead to unwanted turn-over of the staff needed to ensure the programme.

Staff mobility is moderate with almost all programme staff teachers being 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 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 (p. 21) 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 worryingly 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 interviews. On the other hand, the some of the faculty members have been chosen as the best University teachers by students (p. 21, #64), which testifies for good teaching practises and skills among the teachers' of the programme. However, 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 Master thesis projects and their quality is, 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 provide new opportunities in student training. The improvement on equipment provides a good asset for programme development. However, based on the site visit, many of the training activities within the programme resort to older scientific facilities, while the novel infrastructure is taken over by research project activities.

As one of the main goals of training future applied chemistry specialists is the deep command of methodology, the student access to modern equipment with problem-solving orientation would provide further value for the training and enhance the competitiveness of the graduates on the labour market.

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.

### ***5. Study process and student assessment***

The admission requirements are well-founded and organized according to General Regulations for General Admission to the second 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>). Students can be admitted to state funded or paid places by competition with Bachelor level degree as a minimum requirement. Also, a minimum of 45 ECTS of chemical disciplines in Bachelor's diploma supplement is requested to ensure selection of students with sufficient knowledge and skills to complete the programme. This is also supported by the very small drop-out rate of only a few students from the programme in the last years.

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 interviews, there seems to be a tendency to resort in teacher-led traditional teaching and learning methods. 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.

According to SER, during the academic year 2012-2013, 22 students of the Faculty participated in student mobility programmes, however, upon asking this specifically during the Site Visit, no specific information was obtained on how many of them were previously students of the programme in question. Therefore, it is not clear whether the rate of programme student mobility is high or low. 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.

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, practicals, 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. Unfortunately all assessment also appears to be summative (i.e. marked and graded) with minimal formative assessment (i.e. not graded and used more flexibly to train and develop skills and techniques). Therefore, it is not straightforward to see how a student has the opportunity to practice and develop transferable skill techniques such as writing, analytical or advocacy skills so that the student recognises these as skills learned. This issue was raised by employers during the visit who expressed their concern, for example, of communication and presentational skills of graduates.

The assessment system of students' performance is clear, adequate to the programme and publicly available. The rules are very clear. However it seems very heavy, asking for a continuous and exigent assessment. The student is always under test and the teachers and students spend high percentage of their time in these tasks, leaving less time to student self-work, restricting their learning freedom. Faculty wide evaluation criteria especially for the Master Thesis would enhance transparency of the Quality Assurance system since based on interviews of all stakeholders, there do not exist clear assessment criteria for Master Thesis. Despite the fact that results reported in final thesis have often been presented at conferences, 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. Studies end with Master thesis defence procedure at a public meeting of the Qualification Commission. Requirements for the final works preparation and defence procedure is determined by the Decree of KTU Rector (No. A-879, Dec 29, 2006).

Most of graduates are employed according to the speciality or choose to study at the third level programmes at the Faculty of Chemical Technology, 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, legislation and standards.

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 program are clear and transparent; there is provision of social, informational and financial support for students provided by the university and faculty administration staff. The students have also opportunity to participate other activities, like arts and sport, outside their scientific programme, and according to present students and graduates interviewed during the visit these opportunities are well utilised.

### ***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 crystal 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 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 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. The Master Thesis projects often involve industrial partners. These forms of interaction productively enhance this dialogue with employers. Based on the interviewed employers there is no systematic way of communication of assessment requirements of Master Thesis projects.

There is no evidence of systematic data collection, except the student feedback – and even then the return percentage of answers is generally low, as indicated by the teachers during interviews. 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). 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 of the Bachelor level have had an impact also on the Master level programme development 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. However, in general, comparing the Master level programme, which appears as a continuum to the Bachelor level programme, the programme management benefit from less strict teaching module administration and more flexible student-oriented research project management, the latter which is more easily and traditionally adopted within a research environment.

### III. RECOMMENDATIONS

1. The curriculum needs to be revised. Align the study program as a continuation of the existing Bachelor level program. 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 Quality Assurance. 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 Master Thesis projects. Align assessment methods in general to reflect the learning outcomes, teaching and learning methods in order to develop a more profound feedback on all aspects of the study programme.

3. Enhance the student-centered, research-based program at the Master level, and employ the stakeholders in the decisions making, assessment and curriculum design activities to a greater extent. Revise and create common practices for collaboration and involvement. Upscale information delivery and outreach towards employers and stakeholders on the programme values, aims, practices and outcomes.

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 Second level programme of Applied Chemistry at KTU has been undertaken in an attempt to answer the national demands of broad-skill specialists 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.

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. This 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 second-level programme of Applied Chemistry has the potential to become an important route for the skilled individuals capable of group work envisioned by industrial partners from employees-to-be. The same skills and open-mindedness will profit also the third level academic training. Small steps developed in collaboration taking into account all stakeholders will end with large leaps in the fields of education and research. The future of

Applied Chemistry is in collaboration, practical skills and capabilities in learning new in the sense of life-long learning.

## V. GENERAL ASSESSMENT

The study programme Applied chemistry (state code – 621F10003) 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	3
2.	Curriculum design	2
3.	Staff	3
4.	Material resources	3
5.	Study process and assessment (student admission, study process student support, achievement assessment)	3
6.	Programme management (programme administration, internal quality assurance)	3
	<b>Total:</b>	<b>17</b>

\*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:  
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Prof. Jan Lundell

Grupės nariai:  
Team members:

Prof. Carlos Nieto de Castro

Giedrius Mažūnaitis

Kristina Daniūnaitė

**KAUNO TECHNOLOGIJOS UNIVERSITETO ANTROSIOS PAKOPOS STUDIJŲ  
PROGRAMOS TAIKOMOJI CHEMIJA (VALSTYBINIS KODAS – 621F10003) 2014-06-  
16 EKSPERTINIO VERTINIMO IŠVADŲ NR. SV4-341-2 IŠRAŠAS**

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## V. APIBENDRINAMASIS ĮVERTINIMAS

Kauno technologijos universiteto studijų programa Taikomoji chemija (valstybinis kodas – 621F10003) vertinama **teigiamai**.

Eil. Nr.	Vertinimo sritis	Srities įvertinimas, balais*
1.	Programos tikslai ir numatomi studijų rezultatai	3
2.	Programos sandara	2
3.	Personalas	3
4.	Materialieji ištekliai	3
5.	Studijų eiga ir jos vertinimas	3
6.	Programos vadyba	3
	<b>Iš viso:</b>	<b>17</b>

\* 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)

&lt;...&gt;

## IV. SANTRAUKA

Taikomoji chemija *de facto* yra 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. Antrosios pakopos 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.

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 padidinti riziką, kad bus rengiami siauro profilio specialistai, kurie nebus vertinami darbo rinkoje. Į studentą orientuotas ugdymas, glaudus ryšys ir abipusis bendravimas su pramone, kuriant studijų 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. Tai turėtų 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. Antrosios pakopos studijų programa Taikomoji chemija turi potencialą tapti svarbia kvalifikuotų specialistų, galinčių dirbti grupėje, programa, ko ir tikisi pramonės atstovai iš būsimų darbuotojų. Šie gebėjimai ir imlumas taip pat bus naudingi tęsiant studijas trečiojoje pakopoje. Maži žingsneliai, pasiekti bendradarbiaujant su socialiniais dalininkais, garantuoja didelius šuolius ugdymo ir mokslinių tyrimų srityse. Taikomosios chemijos ateitis – bendradarbiavimas, praktinių įgūdžių ir naujų gebėjimų įgijimas mokymosi visą gyvenimą prasme.

### III. REKOMENDACIJOS

1. Persvarstyti programos sandarą. Suderinti studijų programą, kad ji tęstų esamą bakalauro lygio studijų programą. Tikslus, studijų rezultatus ir įgytus įgūdžius ir 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. Dėstytojų metu aktyviai ir dinamiškai naudoti naują įrangą ir materialiąją bazę. Nuolat ieškoti studijų modulių, galinčių padidinti studentų konkurencingumą darbo rinkoje.

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

metodus apskritai, kad būtų atspindėti studijų rezultatai, mokymo ir mokymosi metodai, siekiant sukurti išvalgesnę visų studijų programos aspektų grįžtamojo ryšio sistemą.

3. Didinti į studentą orientuotą, tyrimais grindžiamą praktinį mokymą magistro lygmeniu, socialinius dalininkus labiau įtraukti į sprendimų priėmimo, vertinimo ir programos sandaros rengimo procesus. Persvarstyti ir sukurti bendrą bendradarbiavimo ir dalyvavimo tvarką. Pagerinti informacijos pateikimą ir informuoti darbdavius ir socialinius dalininkus apie programos vertybes, tikslus, praktikas ir rezultatus.

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

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Paslaugos teikėja patvirtina, jog yra susipažinusi su Lietuvos Respublikos baudžiamojo kodekso<sup>1</sup> 235 straipsnio, numatančio atsakomybę už melagingą ar žinomai neteisingai atliktą vertimą, reikalavimais.

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<sup>1</sup> Žin., 2002, Nr.37-1341.