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STUDIJŲ KOKYBĖS VERTINIMO CENTRAS

Vilniaus universiteto

STUDIJŲ PROGRAMOS *CHEMIJA (621F10001)* VERTINIMO IŠVADOS

EVALUATION REPORT OF *CHEMISTRY (621F10001)* STUDY PROGRAMME at Vilnius University

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Išvados parengtos anglų kalba
Report language - English

Vilnius
2016

DUOMENYS APIE ĮVERTINTĄ PROGRAMĄ

Studijų programos pavadinimas	Chemija
Valstybinis kodas	621F10001
Studijų sritis	Fiziniai mokslai
Studijų kryptis	Chemija
Studijų programos rūšis	Universitetinės studijos
Studijų pakopa	Antra
Studijų forma (trukmė metais)	Nuolatinė (2)
Studijų programos apimtis kreditais	120
Suteikiamas laipsnis ir (ar) profesinė kvalifikacija	Chemijos magistro laipsnis
Studijų programos įregistravimo data	1997-05-19 Nr. 565

INFORMATION ON EVALUATED STUDY PROGRAMME

Title of the study programme	*Chemistry*
State code	621F10001
Study area	Physical sciences
Study field	Chemistry
Type of the study programme	University studies
Study cycle	Second
Study mode (length in years)	Full time (2)
Volume of the study programme in credits	120
Degree and (or) professional qualifications awarded	Master's Degree in Chemistry
Date of registration of the study programme	19/05/1997 Order No. 565

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The Centre for Quality Assessment in Higher Education

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I. INTRODUCTION

1.1. Background of the evaluation process

The evaluation of on-going study programmes is based on the **Methodology for evaluation of Higher Education study programmes,** approved by Order No 1-01-162 of 20 December 2010 of the Director of the Centre for Quality Assessment in Higher Education (hereafter – SKVC).

The evaluation is intended to help higher education institutions to constantly improve their study programmes and to inform the public about the quality of studies.

The evaluation process consists of the main following stages: *1) self-evaluation and self-evaluation report prepared by Higher Education Institution (hereafter – HEI); 2) visit of the review team at the higher education institution; 3) production of the evaluation report by the review team and its publication; 4) follow-up activities.*

On the basis of external evaluation report of the study programme SKVC takes a decision to accredit study programme either for 6 years or for 3 years. If the programme evaluation is negative such a programme is not accredited.

The programme is **accredited for 6 years** if all evaluation areas are evaluated as "very good" (4 points) or "good" (3 points).

The programme is **accredited for 3 years** if none of the areas was evaluated as "unsatisfactory" (1 point) and at least one evaluation area was evaluated as "satisfactory" (2 points).

The programme **is not accredited** if at least one of evaluation areas was evaluated as "unsatisfactory" (1 point).

1.2. General

The Application documentation submitted by the HEI follows the outline recommended by the SKVC. Along with the self-evaluation report and annexes, the following additional documents have been provided by the HEI before, during and/or after the site-visit:

No.	Name of the document
1.	Action plan for enhancement 2011
2.	Action plan for enhancement 2013

1.3. Background of the HEI/Faculty/Study field/ Additional information

Vilnius University has a long history as a higher education institution in Lithuania, established in 1579. In 2016, there are about 3634 University employees, of which 1334 are teaching staff and 448 research workers. There are 20487 students studying at the University of which 11257 were first cycle, 2864 integrated studies students, 3600 second cycle students, 863 doctoral students and 803 residents. The Faculty of Chemistry was established in 1944, consisting of six departments (Analytical and Environmental Chemistry; Inorganic Chemistry; Physical Chemistry; Organic Chemistry; Polymer Chemistry; Applied Chemistry), which have specific scientific research interests and groups. Research areas include: instrumental methods of analysis, electrochemical adsorption, interfacial processes, synthesis and investigation of inorganic and organic compounds, hydrophilic polymers, and biopolymers. The Faculty of Chemistry staff consists of 19 professors, 17 associate professors, 10 lecturers. The number of students in the Faculty in all cycles (BA, MA, and Doctorate) is about 600. Currently there are about 60 MA students in their first and second years of study. The Faculty offers three first cycle study programs (Biochemistry, Chemistry, Nanomaterials Chemistry), three second cycle study programs (Biochemistry, Chemistry, Nanomaterials Chemistry) and one third cycle study program (Chemistry). The pedagogical work of the teaching staff is directly related to the area of their scientific research.

The MA in Chemistry programme was registered 19/05/1997 Order No 565, was subject to external evaluation in 2011 and was accredited in 1 August 2012. The programme was evaluated positively and received accreditation for 6 years. The Faculty subsequently introduced a new course in Biotechnology to increase the industrial and technological direction of the programme. Information about the functions and accreditation of chemical laboratories is now included in the course on Quality Assurance in Chemical Analysis.

The new National Centre of Physical and Technological Sciences opened in 2016 is a state of the art research facility, containing six dedicated laboratories for specialist research groups in the Faculty of Chemistry. These add substantially to the infrastructure for Masters' thesis preparation together with laboratories in the Main building. There has also been considerable recent investment in new instrumentation and equipment for research activities, extending the range of techniques available to MA students.

1.4 The Review Team

The review team was completed according *Description of experts' recruitment*, approved by order No. 1-01-151 of Acting Director of the Centre for Quality Assessment in Higher Education. The Review Visit to HEI was conducted by the team on 10th. November 2016.

1. **Prof. Laurent Counillon (team leader)** Professor in University Nice Sophia Antipolis (France);
2. **Prof. Dr. Domingo Cantero Moreno,** Professor in University of Cadiz, Science Faculty (Spain);
3. **Dr. Elizabeth Briggs,** Retired Head of the School of Chemical and Life Sciences, University of Greenwich (United Kingdom);
4. **Prof. Jan Lundell,** Professor, Head of the Department of Chemistry, Director of the Central Finland LUMA (STEM) Center (Finland);
5. **Dr. Šarūnas Zigmantas,** Head of QC Sector, Quality control in *Teva pharmaceuticals* (Lithuania);
6. **Mr. Benas Balandis,** Student of Master programme in Chemistry at Lithuanian university of health and sciences (Lithuania).

II. PROGRAMME ANALYSIS

2.1. Programme aims and learning outcomes

The programme aims and learning outcomes of the MA in Chemistry programme are well defined, clear and publicly accessible. The programme builds upon the chemical knowledge and skills developed by the Bachelor level programme for students to proceed to specialized taught M-level courses and to undertake original research. On completion of the MA in Chemistry award, students should have achieved higher level knowledge, skills, and competences applicable to employment as professional chemists or for progression to a doctorate programme.

The programme aims and learning outcomes are based on the academic and professional requirements, public needs, and the needs of the labour market. The recent addition of both Biotechnology and Quality Assurance in Chemical Analysis electives responds to the previous recommendation to increase applied industrial and technological direction of the programme. There is a comprehensive range of elective courses available each semester which enables students to specialise in conservation and restoration, in addition to the main traditional chemistry subjects. The Faculty considered the introduction of a separate Masters' programme in Conservation and Restoration Chemistry, but decided that it not seen as viable based on current student numbers.

The programme aims and learning outcomes are consistent with the type and level of studies and the level of qualifications offered. They are specifically relevant for a research based M level qualification.

The name of the programme (Chemistry), its learning outcomes, content, and the qualifications offered are compatible with each other. The Faculty of Chemistry has produced a comprehensive map of programme aims and learning outcomes to course and subject learning outcomes. The key competences and attributes are clearly articulated, and demonstrate the development of the scientific theoretical and practical research skills required for students to

become autonomous researchers at M level. Overall learning outcomes are well formulated and the standards achieved reflect those of comparable research-based Masters programmes.

2.2. Curriculum design

The curriculum design of the VU Masters' in Chemistry meets legal requirements. The two- year programme has 120 ECTS credits, of which 65 credits are for taught courses and 25 credits for electives, and 30 credits for thesis workload. The independent workload is 60% and four to five courses are delivered each semester.

Study subjects and/or courses are spread evenly: their themes are not repetitive. Students may choose electives from a broad range of chemistry specialisms, and more widely from other subject areas such as physics. Examples of the wide variety of electives include biotechnology, various modern instrumental methods of analysis, polymer chemistry, metal corrosion, environmental chemistry, drug design, immunoanalysis, and quality assurance in chemical analysis, among others. All courses are electives which gives students the freedom to design individual programmes, including in Conservation and Restoration Chemistry. A small number of electives are delivered in alternate years (either semester one or semester three) to optimise numbers.

The content of the subjects and courses is consistent with the type and level of the studies. The balance between contact teaching, independent studies and research work is appropriate for an M level programme. Contact teaching hours (lectures, seminars, practical laboratory, and research work) are approximately 40%, with the remaining 60% allocated to independent research and study. The outcomes of some student research lead to Faculty of Science scientific publications and presentations at conferences.

The content and methods of the subjects and courses are appropriate for the achievement of the intended learning outcomes. However**, students would value electives in business and management, more group work, and better English language skills, to prepare them specifically for employment as chemists in industry or related scientific institutions.** Social partners are involved in the delivery of the Masters' programme, through occasional lectures and assessment of the MA thesis. The Faculty of Chemistry uses largely informal feedback on the content of the programme from these external partners. Since the Faculty has a wide range of external partners, there is potential for external representatives to contribute to more guest lectures and workshops, and to offer students opportunities to visit industrial laboratories.

The scope of the programme is sufficient to ensure learning outcomes. There is a comprehensive map of courses which demonstrates where learning outcomes are achieved, including skills and competences. These include: performing scientific research and solving problems, together with other competences which develop the high-level attributes of an autonomous researcher.

The content of the programme generally reflects the latest achievements in science and related technologies. Research-active lecturers deliver courses, with content directly related to their special scientific interests and by social partners with specific expertise. Courses are updated to ensure alignment with research and development in different fields of study.

2.3. Teaching staff

The MA study programme is provided by the staff meeting legal requirements. There are 28 staff delivering the programme: 15 professors, 9 associate professors, 3 lecturers (holders of PhD degree), and one lecturer without degree. They are research active across all six departments.

The qualifications of the teaching staff are entirely adequate to ensure learning outcomes. The comprehensive CV's and the information obtained during the visit confirms it. Recruitment of staff by the Rector's Attestation Commission is based on the number of papers published in scientific journals, participation in scientific conferences, preparation of scientific monographs, elaboration of patents, participation in research projects, and publication of study material. Appointments are competitive and have appropriate length of service and age restrictions. Evidence from staff CVs shows that most are highly qualified with strong research records.

The number of the teaching staff is adequate to ensure learning outcomes. Each student has an individual research supervisor to oversee the work to prepare for the final thesis and to provide academic consultations. The teaching staff workload on average is about 300 contact hours per year across all study programmes. Teachers supervise students' work on the final (graduation) paper and mark written assignments, so the real workload is higher. In addition to pedagogical work, all teachers conduct scientific research and participate in various scientific research projects. High workload is an issue and only small numbers of staff use the virtual learning environment to deliver courses. The Faculty of Chemistry needs to ensure that there is a training programme for those staff who do not already make use of the virtual learning environment. Students confirmed their positive experience of teaching and research supervision by staff members.

Teaching staff turnover is able to ensure an adequate provision of the programme. The age distribution is balanced between experienced older staff and a satisfactory number of eight younger scientists. Newly appointed faculty receive an introductory training programme of newly admitted employees (teaching staff). This programme, held twice a year, introduces staff to the VU administrative structure, useful general information about the operation of programmes, and VU rules and regulations. The University Lecturer Manual also provides written information to newly-recruited lecturers on work at the University.

Vilnius University and the Faculty of Chemistry create conditions for the professional development of the teaching staff necessary for the provision of the programme. Some pedagogical skills development is available, but **not all teachers use interactive methods and further staff development is needed using an educational training programme.** VU has not been able to increase the use of English in teaching for financial reasons.Teaching staff participate in scientific and pedagogical internships that are funded by Erasmus program and by scientific projects .In 2015, seven faculty undertook internships abroad.

The teaching faculty are involved in research directly related to the study programme being reviewed. Research output by staff demonstrates a high quality of research achievements across a broad range of studies and specialisms.

2.4. Facilities and learning resources

The premises for MA studies are adequate both in their size and quality. The rolling programme of refurbishment and the new Centre of Physical and Technological Sciences contribute to the modernisation of facilities. Students have access to the computer facilities in the Digital Science and Computing Centre of the Faculty of Mathematics and Informatics.

The teaching and learning equipment (laboratory and computer equipment, consumables) are adequate both in size and quality. Recent acquisitions of many new instruments improve the range and quality of modern teaching and research equipment. The infrastructure for research activities meets the requirements of the broad range of experimental techniques used by students. **However, in some laboratories there was insufficient adherence to safety and health protocols and clear signage is needed to reinforce verbal and written requirements in all laboratories.**

VU has adequate arrangements for students' laboratory work, including for preparation towards the final MA thesis. New laboratories for organic chemistry, polymer

chemistry, inorganic functional materials, chemical analysis and sensors, electrochemical material science and active coatings are available in the Centre of Physical and Technological Sciences.

Teaching materials (textbooks, books, periodical publications, databases) are adequate and accessible. Generally, students are satisfied with book stock in the Library. They have 24- hour access to the library and borrowing rights. There is an annual budget for the purchase of textbooks, and staff may make requests for specific new books for the collection. Students are satisfied with library support, and a list of recent acquisitions shows that textbooks are relevant and up to date. Scientific databases are available on University computers, providing access to an extensive range of relevant journals and publications. Access is also provided from home or the student dormitories.

2.5. Study process and students' performance assessment

The admission requirements are well-founded. Students possessing BA degrees in Chemistry, Biochemistry, Materials Science, and Chemical Engineering are eligible for the MA programme. The process is competitive, and dropout rates are low because of high student motivation, and appropriate levels of knowledge and skills developed through previous BA studies. In 2015, two of the thirty-two students (6.25%) admitted dropped out from the MA programme.

The organisation of the study process ensures an adequate provision of the programme and the achievement of the learning outcomes. Programme information is available on the VU and Faculty of Chemistry websites. Students have an individual supervisor for research activities and consultations. The students value one-to-one supervision and support, particularly when conducting research.

Students are encouraged to participate in research activities to prepare for the MA thesis. Research work is a major component of the programme. Project titles for the last two cohorts of students demonstrate the diverse range of research activities promoted by the Faculty. Examples taken from sixty projects include: 'Radical Synthesis of Benzomorpholines'; 'Investigation of Biopolyol Synthesis'; 'Synthesis and Investigation of New Iron-Based Ceramic Pigments'; and many studies using modern instrumental methods of analysis.

Students have opportunities to participate in student mobility programmes. A few MA students use the Erasmus mobility scheme, although some have previously benefitted from the Erasmus+ BA programme. From 2011-2015 there were fifteen MA students taking internships abroad.

VU and the Faculty of Chemistry ensure an adequate level of academic and social support. The University and the Students' Union provide access to financial and support services, opportunities for students to experience cultural events and to take part in sports. Scholarships and student loans afford some financial support, particularly for students from deprived backgrounds. Some of the students receive scholarships based on their academic performance. High performing students can apply for special scholarships funded by external sponsors. The States Study Foundation offers special loans for students. Students living outside Vilnius may seek dormitory accommodation. There is helpful access through the VU Health and Sports Centre for health and wellness issues, with further opportunities to receive professional psychological consultations at the Centre of Psychological Innovation. Students are permitted to interrupt their studies for personal reasons. Provision is made to ensure that student debt is controlled. Academic support is provided through student consultations with the designated supervisor.

The assessment system of students' performance is clear, adequate, and publicly available. The assessment of achievements in electives is planned and performed by the lecturer

of the subject in accordance with the information provided in the description of the course. Course contents, assessment requirements, and the timetable, are discussed by the lecturer during the first lecture. There is a cumulative assessment scheme applied for taught courses, with a final exam weighting of 60-70% of the course mark. Research reports and theses are checked for academic integrity using plagiarism detection software. There is a clear Appeals procedure when a student disagrees with an awarded grade. Assessment of the MA thesis involves oral defence of the research work to a Thesis Examination Committee appointed by the Rector and a reviewer. The Chairman is an external member from another institution. The review team scrutinized a sample of recent marked theses which showed high academic standards, but it was not possible to determine the criteria and weightings given to individual components. **Students also commented that they receive no feedback on how the final thesis mark is aggregated, and in future the review team agreed that clarification on grading criteria and feedback should be improved.**

Professional activities of the majority of graduates meet the programme expectations. Employment and/or further study progression data are collected and confirm that the programme aims and achievements prepare students for their future careers. Data is routinely collected sis months and 3years following graduation. Since 2011, on average about 80% of MA graduates were employed, and notably over the five-year period variable numbers of students also continue with their studies while working. Employers and alumni who met the team were satisfied with the employability skills resulting from the MA programme.

2.6. Programme management

Responsibilities for decisions and monitoring of the implementation of the programme are clearly allocated. The VU Quality Manual describes responsibilities for implementation and regulations of the programme. The Study Program Committee (SPC) is responsible for programme design, monitoring the quality of the programme and initiating changes. The MA programme is well embedded, and both student satisfaction and achievement rates are high. There is evidence that some major enhancements were planned and implemented, for example, revisions to the curriculum, additional new research laboratories and instrumentation, and increased book purchases.

Information and data on the implementation of the programme are regularly collected and analysed. VU management information system ensures that all students have an agreed programme of studies following enrolment, with access to student assessment grades and facility to register electives.

The outcomes of internal and external evaluations of the programme are used for the improvement of the programme. Representatives of the Student Union are members of the Faculty Council, the Study Programme Committee, and the Appeals Commission. Each semester Student Union representatives and Faculty administration organize a meeting where problems relating to the programme are discussed. Feedback from students is also obtained from student surveys using an e-questionnaire. The response rate for student surveys and levels of student satisfaction with the programme are high, and confirm that the MA programme is generally well managed. However, a small number of recommendations from the previous external evaluation report have not been fully addressed. These are re-stated in the recommendations of this report.

The evaluation and improvement processes involve stakeholders. Social partners take part in the development of the study programme in several ways. These include membership of the Study Programme Committee, chairing the Thesis Examination Committee and as guest lecturers on courses.

The internal quality assurance measures are currently not sufficiently effective and efficient. However, the review team found the programme to be generally effectively managed in terms of student satisfaction and student retention and achievement data. Students studying the

MA programme benefit substantially from one-to-one supervision and small classes. The research component of the programme ensures that they are working closely with faculty, and are able to discuss individual academic problems informally. While there are many positive aspects, the review team recommends that **the SPC needs to fulfil the requirement to meet twice per year with student participation, and formal committee minutes. Formal annual programme monitoring of action plans for enhancement, based on student data and feedback would greatly assist the internal quality assurance process within the Faculty.**

III. RECOMMENDATIONS

1. Students should be able to access electives in business and management, more group work, and better English language skills, to prepare them specifically for employment as chemists in industry or related scientific institutions.

2. The Faculty should provide further staff development to promote interactive teaching methods using an educational training programme.

3. The Faculty should ensure strict adherence to safety and health protocols, with clear signage to reinforce verbal and written requirements in all laboratories.

4. Students should receive feedback on how the final thesis mark is aggregated, and clarification on grading criteria and weightings of the assessed.

5. The Faculty should fulfil the requirement for the Study Programme Committee to meet twice per year with student participation, and formal committee minutes. Formal annual programme monitoring of action plans for enhancement, based on student data and feedback should take place. assist the internal quality assurance process within the Faculty.

IV. SUMMARY

The MA in Chemistry programme is well embedded and provides a wide range of electives for students to gain specialist knowledge and skills for PhD studies or future employment. Programme aims and learning outcomes are commensurate with M level studies.

The curriculum design provides students with high level knowledge across a range of subjects. Students may choose electives that enable them to specialize in a variety of advanced specialisms, including specific electives in Conservation and Restoration Chemistry. There is a comprehensive map of courses which demonstrates where learning outcomes are achieved, including high level skills and competences.

Faculty staff are highly qualified and research-active. They encourage students to develop research methods and skills resulting in MA theses which demonstrate high academic standards across a broad range of chemistry specialisms. Students benefit from the academic support through one-to-one supervision.

Recent major improvements to research laboratory infrastructure, including modern instrumentation, have enhanced the student learning experience. Students are able to use a wide range of laboratory anf instrumental techniques to conduct research work.Students also value the lirary and learning resources available to them.

Admissions requirements, coupled with high motivation to succeed, contribute to a low dropout rate. Students are well supported for their academic studies, and with comprehensive central social advice and welfare consultations. Asseement processes for electives areclear and applied in a consistent manner.

The programme is generally well managed as judged by the recorded high student satisfaction levels. Student employment or progression rates to a third cycle programme are highly satisfactory.

While the MA programme is implemented in a satisfactory manner, there are some weaknesses that have been indentified for improvement. The curriculum design is sound, with many positive features, but students would value more opportunities to study business and management related to directly to the chemical industry. To further enhance employment skills, students would like to have more group work activities and development of English language competences.

The quality of teahing by some staff could be improved by further staff devlopment to promote interactive teaching methods using an educational training programme. The Faculty of Chemistry student course evaluation surveys should provide insight into where such training is required.

There is a need to ensure that all laboratories enforce safety and health protocols, with clear signage to reinforce verbal and written requirements.

In order to improve internal quality assurance processes year on year, the Faculty should formalise the work of the Study Programme Committee meetings (twice per year). It should undertake annual programme monitoring of action plans, including student data analysis,

feedback from course surveys and comments. These processes should be fully documented to report on progress.

V. GENERAL ASSESSMENT

The study programme *Chemistry* (state code – 621F10001) at Vilnius University is given **positive** evaluation.

Study programme assessment in points by evaluation areas.

No.	Evaluation Area	Evaluation of an area in points*
1.	Programme aims and learning outcomes	4
2.	Curriculum design	3
3.	Teaching staff	3
4.	Facilities and learning resources	3
5.	Study process and students' performance assessment	3
6.	Programme management	3
	Total:	**19**

*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. Dr. Laurent Counillon (team leader)
Grupės nariai: Team members:	Prof. Dr. Domingo Cantero Moreno
	Dr. Elizabeth Margaret Briggs
	Prof. Dr. Jan Lundell
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