STUDIJŲ KOKYBĖS VERTINIMO CENTRAS

VILNIAUS UNIVERSITETO

PROGRAMOS *NANOMEDŽIAGŲ CHEMIJA* (621F10005) VERTINIMO IŠVADOS

EVALUATION REPORT OF *NANOMATERIALS CHEMISTRY* (621F10005) STUDY PROGRAMME

AT VILNIUS UNIVERSITY

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Išvados parengtos anglų kalba
Report language - English

Vilnius
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DUOMENYS APIE ĮVERTINTĄ PROGRAMĄ

Studijų programos pavadinimas	**Nanomedžiagų chemija**
Valstybinis kodas	621F10005
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	2011-07-11

INFORMATION ON ASSESSED STUDY PROGRAMME

Name of the study programme	**Nanomaterials Chemistry**
State code	621F10005
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’s degree in Chemistry
Date of registration of the study programme	2011-07-11

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I. INTRODUCTION

The external assessment of the study programme *Nanomaterials Chemistry* (621F10005) of Vilnius University 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 Mr. Andrius Platakis (Vilnius Gediminas Technical University, Lithuania).

For the evaluation of the study programme *Nanomaterials Chemistry* (621F10005) SKVC provided legal and regulatory information and methodological guidelines. The basis for the evaluation of the study programme (hereafter, the programme) is the Self-Assessment Report, written in September 2013, its annexes and the site visit of the expert group to Vilnius University (hereafter, the University) on 27th of February 2014. The visit incorporated all required meetings with different groups: the administrative staff of the Faculty of Chemistry, staff responsible for preparing the Self-Assessment Report (hereafter the SER), teaching staff, students representing all years of programme action, alumni, and social partners. The expert group inspected various support services (classrooms, laboratories, library, computer facilities), examined students' final works, and various other materials.

After discussions and preparations of conclusions and remarks, the expert group presented introductory general conclusions of the visit to the administration and self-assessment team. After the visit, the group met to discuss and agree upon the content of the report, which represents a consensus of the views of the team members'.

Faculty of Chemistry of Vilnius University manages the *Nanomaterials Chemistry* Master study programme which was started in 2011. This study programme passed external evaluation during its registration year of 2011. Evaluation was done by the Centre for Quality Assessment in Higher Education of Lithuania.

The Faculty of Chemistry consists of 6 Departments (Analytical and Environmental Chemistry; Inorganic Chemistry; Physical Chemistry; Organic Chemistry; Polymer Chemistry; Applied Chemistry), and each Department has its own area of scientific subspecialization within the field of chemistry. The Faculty of Chemistry manages 7 study programmess: *Chemistry* (I, II and III cycle), *Biochemistry* (I and II cycle), *Nanotechnologies and Materials Science* (I cycle), *Nanomaterials Chemistry* (II cycle). This assessment and the written report involve only the Master programme of *Nanomaterials Chemistry* of all the existing programmes.

It is necessary to underline that the SER has tried to analyze the key points and the weak points in a real spirit of self-assessment, and forms a solid corner stone of information for the current assessment.

II. PROGRAMME ANALYSIS

1. Programme aims and learning outcomes

The aims and learning outcomes of the study programme were formulated in 2011 in compliance with the Budapest chemistry descriptors prepared by the "Tuning" project. Till now the aims and learning outcomes have not been revised. On the web site of Vilnius University we can read only this principal ability: "*to solve problems, connected with synthesis, analysis and application of nanomaterials"*. This description is way too general, and it does not appear as a good source of information for a larger public as which is the actual motivation and target of the study programme. Moreover, the lack of a clear justification of the programme based on societal needs would require a clear and profound analysis of social needs. At the time being, with respect to the information available during the assessment procedure from various written and online resources, the objectives of the programme are essentially directed to the scientific research. Consequently, a major justification for the programme is to attract Ph.D. students for the participating laboratories. This is evidenced by the weak industrial and technological aspects of the study programme and the scientific profiles of teaching staff. Both of these attributes are yield unfocusing of the programme in order to benefit the national industrial environment and to train particular specialists in a highly competitive – on the European and global level – labour market.

The aims of the programme highlight four main objectives: knowledge in nanomaterials, research methods, resolution of problem, and continuous study, i.e. life-long learning. Each of them is distributed into 3 or 4 learning outcomes, but this classification could be revised to eliminate the incoherence. For example, the learning outcomes C1 (ability to plan and conduct research in the field of nanochemistry) is more a matter of the category B (research) than C (resolution of problem).

A presentation of the skills and abilities in three classes - general, specific and transverse - would allow clarifying the aims of the programme in a more profound manner which would benefit the development and focusing of the programme.

The name of the programme is very generic, thus there is no possibility of confusion. On the other hand, the field of nanomaterials chemistry is a bit narrow considering the competition in the fields using the prefix "nano" in scientific research today. Many of the important and industrially essential research targets are widely interdisciplinary and many-faceted in methods and approaches.

2. Curriculum design

The SER illustrates how the study programme complies with general requirements approved by Ministerial order No. V-826 (3 June 2010) of the Ministry of Education and Science of Lithuania. Extent of the study programme is 120 credits. Length of studies is 2 years (4 semesters). Applicants must have at least Bachelor degree in Chemistry, Biochemistry, Bioengineering or Chemical Engineering. This provides a risk as well as a positive challenge for the programme development. The risk could be accumulated in the way one certifies that the basic knowledge and skills of students enrolling in the programme are of an adequate level to commence successful studies within the programme. This would require a standardised approach to place all new students on the same line for the studies in question. The positive challenge is that students from different scholar backgrounds could be used as an asset for multidisciplinary learning and research initiatives.

The programme has the ambition to cover a wide range of nanomaterials: organic, inorganic and biological. There is a risk of making an encyclopaedic teaching to the detriment of a conceptualization of the subject. On the other hand, students can have repetitions in the courses, for example: Characterization, Instrumental Methods, Organic Analysis, Chromatography could easily turn out to be repetition from Bachelor level chemistry studies instead of being focused programme-related skill-building learning modules.

Most of the themes are relevant but the progress of the teaching appears to be slower. At the time they are very specialized and more general lectures, for example respectively: *Surface Modification by Polymeric Nanostructures* and *Organic Analysis in Materials Science* which cast doubts that they would actually serve the aims of the programme nor support the achievement of learning outcomes. The interaction with research modules for Thesis preparation is strong, which is seen by the Expert team as a positive feature of the programme. Theory and practice go in parallel, and this connection was also highlighted by graduates as a factor that affected their employment positively. Certain teaching courses focusing on topics like Chromatography and f-elements could be considered more as Bachelor level knowledge contents instead of learning contents of Master of Science studies, especially in the field of nanomaterials. On the other hand, the course on X-Ray Diffraction Analysis should not be elective but to be a part of a teaching and practical hands-on training related strongly to the characterization of nanomaterials as one of the main research tools in the field.

A positive point of view is that the personal work of the students has been incorporated into the total working time as recommended in the Bologna process. In the same way, the balance between lectures, tutorials/seminars and laboratory work is highly acceptable.

Some contents are missing (identified by social partners and similar Master programmes across Europe), i.e. Risk Assessment and Management, and Chemical Legislation. A specific study module on Hygiene and Safety is absolutely necessary in this specialization to provide the students with insights of problems and practises involved in the field from the human resource and final user point of view.

The learning outcomes B4 (*ability to work in the interdisciplinary areas and use the knowledge of different scientific fields in practical work*) and D1 (*ability to identify scientific and professional interest in the context of chemistry and related science*) are not enforced by the programme and in general way the plan of the programme is lacking structuring. The programme might be organized considering the students and social needs. The clarification of the plan is imperative, for example: definition, properties and synthesis, characterization and analysis, the different applications (electronic, energy, medicine…). The learning outcomes and their assessment could benefit from a more deep insight on the skills and capabilities graduating students possess now and what they are required of by the social partners. The international existing study programmes provide a good reference for the development of the programme contents and learning outcomes. At the same time, international programmes provide a platform for focusing the study programme beyond the current status where Department practises and research interests override programme policies, learning targets and emerging knowledge, skill and capability requirements outside academic context.

Latest research reports used as teaching and learning tools is a very positive approach to introduce the students to the latest research findings and approaches undertaken in nanoscience research. The same material could be used to improve the research based modules, namely in practice to expose the students into real-life challenges and research approaches.

3. Staff

According to the general requirements, no less than 80% of the academic staff teaching in the study field is scientific researchers. In this programme all the teachers have scientific and pedagogical experience in chemistry, directed to the nanotechnologies, with respective average of 22 and 17 years. The University selects persons for the academic and research positions by way of public competitions for a five-year term of office.

The teaching staff consists of 17 teachers with average age of 49 years. This can be considered adequate to ensure the learning outcomes of the programme, and to provide a continuum of development and activity beyond the accreditation periods. Moreover, in the upcoming years the staff and its turnover appear adequate and sufficient to carry out the programme activities. However, a medium to long-term needs strategies and measures to be implemented in order to optimize the human resources according to the educational and research objectives for the faculty.

The teaching staff of the programme is involved in research, directly related to the study programme: carbon nanostructures, nanoparticules and coatings, tribology and surface science, films and powders, ceramics, bionanotechnology, biocatalysis. Alas, a more profound examination of the CVs of the professors suggests that the programme design reflects and demonstrates the close connection with group-wise interests and needs instead of societal needs or views of student competencies and skills to promote post-graduate activities and employment. It is now necessary to invert paradigm and to reconstruct the programme according to the social needs, and this will also have an effect on the current research profiles of the research laboratories. In fact, the developing industrial needs and evolving local research infrastructure provide a fertile ground for focusing of the programme as well as the research activities within the Faculty alike.

According to the SER, more active teaching methods beyond the traditional teacher-centered activities could be beneficial for the programme and its impact. For example, pedagogy involving project-based learning can easily be implemented with profit considering the available laboratory resources. However, based on the interviews conducted with staff and students, there appear to be several good practices, i.e. group learning activities, problem-based learning with large scale research equipment, student-centered learning activities during the classes like oral presentations as part of the studies, which are employed within the programme. The dissemination of such practices throughout the programme and from one teacher to another, would enhance the quality of the programme and integrate the students more into the existing scientific community.

4. Facilities and learning resources

The general premises for studies are old as the faculty resides in a century-old building. Only some laboratories have been recently renovated. The faculty was recently endowed with modern and programme-wise adequate scientific equipment, but outdated premises (power supply, building layout) imposes restrictions and challenges to operate this research environment vital for the programme.

The SER gives a table of the classrooms and the number of students the lecture rooms can accommodate. The capacity of the premises is more than adequate as compared to the number of students enrolled in the programme. A 32 workplace library is located in the Faculty of Chemistry where students can perform their literature research. There are 4 computers, where students can access online databases. Wireless internet access is provided in the Faculty. Computer access is also provided in the Digital Science and Computing Centre of the Faculty of Mathematics and Informatics. There 9 computerized workplace are provided for the Faculty of Chemistry. The Scientific Communication Center Library, located in Saulėtekis campus, can be used 24/7.

Most experimental work performed by Master programme students takes place not in educational laboratories but in the scientific laboratories of their supervisors. Annually Heads of the Departments approve the topics of Theses and the number of students who can be admitted to work in the each lab. The laboratory equipment is very well suited for experimental research and Thesis preparation. However, lack of educational equipment in some of courses, with which students could perform hands-on work, was raised during the visit. This especially concerns the sophisticated, large scale research equipment, where the tasks are performed in large groups or by nominated technicians. Also, the lack of consumables forces students to work in groups. The improved research facilities would contribute to programme and student skills development, but the constraints to the old building remain strong.

In-house implementation of educational equipment for individual student use and practices in companies could help to mitigate some of problems concerning the lack of materials and equipment.

5. Study process and student assessment

Admission to the second cycle studies is carried out on a competitive basis. The number of admitted students is relatively low. On average, there are 7-10 students in each year. The small number of students could be seen as strength of the programme, if student-centered inquiry-based learning tasks are implemented. The same factor could also be seen as a difficulty or a source of inefficiency if teacher-centered classroom-focused teaching is the main source of knowledge dissemination. On the other hand, the number of applications as a first priority for this programme is weak, and it should be analysed in order to develop the attractiveness and interest of the programme.

The programme is structured on 20 weeks per semester, two semesters per study year. 20 weeks are distributed in the following way: 16 weeks of classes and 4 weeks for exams. The time allocated to self-studies is about 60 %. Masters of different departments in the Faculty have different workloads as communicated to the expert group in the interviews. Moreover, students are associated with different Departments. Therefore, the workload in the various Master's degrees should be harmonized as they now appear to highlight the common practises in various Departments and research groups, as communicated to the Expert Team during the interviews.

The curriculum of the programme takes the participation in research into account. However, rigid protocols for experiments do not allow students to have their own initiatives in the laboratory, developing their responsibilities. It is also the perception of the Expert Team that the old building the Departments reside in introduces a difficulty for the applicability and employment of novel research infrastructure for research and learning purposes. Even though there is an expectation of a new building in the upcoming years, at the time being the situation is highly controversial and even demotivating for the stakeholders. This was clearly communicated during the interviews where the old research environment and accessibility is discouraging co-operation and not well responsive to the needs of the industrial partners.

Only two students from the programme “Nanomaterials chemistry” participated in Erasmus practice programme (one of them visited School of Science & the Environment, Faculty of Science & Engineering, Manchester Metropolitan University (UK), another student visited Institute for Materials Science (Germany). There is a lack of information about exchange possibilities and how these periods are integrated in the courses. It is necessary to advise better the students and to strengthen their level of English. A good practice for this is to use recent and up-to-date scientific literature as learning material, as indicated during the interviews.

In general, about 15% of Vilnius University students’ get scholarships based on the academic performance. Students are informed that participation in extra-curriculum activities increases theirs general competences. Students may participate in students’ organizations, musical or theatre groups. Therefore, the social support in this programme is adequate as students did not express any lack of it in their academic and student life.

A cumulative assessment scheme is applied in most courses which focus on students‘ learning at the end of the courses. On the other hand, no clear evidence either in the SER or during the interviews was extracted which would justify that the system for student assessment guarantees transparent and equal evaluation of student learning outcomes. There are no common guidelines in the Faculty, especially in the case of Master Theses. According to the student interviews, the Expert Team can conclude that depending on which Department the students are affiliated with, they have different workloads and assessment methods.

It is too early to know the efficiency of this programme. Only 9 students have so far graduated in the first promotion in 2013. Employment of this programme graduates is 100%; 40% work in private sector, others in public, i.e. academic, mainly within Ph.D. studies. Professional activities of graduates meet the programme providers' expectations if they continue for research in academia or research institutes but do not, if they go to industry. There is hardly any connection between the programme and the industrial partners, even though it has to be acknowledged that the field of nanoscience is taking its first steps of development, and even the social partners interviewed had a vague view on the field or its current activities in Lithuania. On the other hand, the students in the programme as well as the alumni expressed very positive attitudes that the programme provides the future makers in the field in Lithuania. This, however, should be reflected more strongly on the activities, development and focus of the study programme and all the stakeholders involved.

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) must be clarified. At no time in the SER or the interviews the mechanism of decision-making process was explained.

There is no evidence of systematic data collection, except the student feedback. Having asked several times the question to the various persons in charge during the interviews, it is revealing, for example, that the number of students in various faculty programmes is not exactly known.

Data on continuous improvement must be based on the implementation and correction of non-conformities in the study process that were found necessary. Accordingly, changes within courses in the study programme decided by teachers are not discussed and compared, which indicates that there are neither developed channels of information dissipation nor relevant connection to support meaningful, cross-curriculum development.

Feedback on studies is produced by asking to answer questionnaires and discussion with students. It is necessary to explain the use of inquiries in order to increase transparency of assessment.

There are very few exploitable outcomes in the management of the programme. Within the framework of the Quality Assurance System, it is necessary to set up management indicators with targets and procedures of continuous improvement. Questioned during the interviews, some teachers even ignore the concept or are not aware of such practises within the Faculty.

According to the interviews, the stakeholders are open and even eager to be involved in the programme development and assessment, although the SER states otherwise. As a consequence, a deeper view of the role and co-opperativity with stakeholders would benefit the programme development and throughout quality assessment.

III. RECOMMENDATIONS

Recommendation 1: The programme would benefit from more interdisciplinary nanoscience and focussing the needs and skills of students. The research problems and innovation environments are multidisciplinary, and this should be enforced in the learning environment both in development of the environment and as well as in the educational profile of the programme. Especially the current focus on nanomaterials would benefit from deeper connections into physics and biochemistry.

Recommendation 2: The curriculum must be revised, taking into account the advancements in the area (benchmarking) and the applications of nanomaterials in the country to development and needs of stakeholders. The programme have to take initiative to direct the learning and capacity building into stakeholder-related interests instead of just acting as a growth potential for third level academic research. The legislational, health-related and common practises in the field of nanoscience should be incorporated in the curriculum while less focus should be directed to course and knowledge-building of contents representing the outskirts on nanoscience or negligible applicability in nanoscience. Problem-based learning in authentic learning environments would have positive impacts on demonstrating the novelty, national directions and capability requirements in the evolving innovation atmosphere.

Recommendation 3: A medium-to-long term planning (3-6 years) of human resources and programme content should be enforced. This is important due to the current developments in the local research infrastructures, industrial endeavours in the country, and competition of training programs in similar fields throughout the whole European research area. Focusing and branding of the current study programme is essential in order to make impact on growth of local nanotechnological scientific ambience.

Recommendation 4: Harmonize assessment of learning outcomes. Develop assessment criteria for skills and competences. Enhancing the opportunities for international modules will benefit the programme.

Recommendation 5: Quality Assurance system needs improvement throughout the Faculty. A collaborative, transparent and equal way of development and assessment enhance motivation of students, outcomes of the learning activities and provide more profound ways of interactive discourses with social partners both from the view of programme content and graduates´ capabilities.

Recommendation 6: The programme development would benefit of an higher degree of student- centred, enquiry-based learning methods, which would give students more practical and recognisable skills in the fields of research and development. Focusing on student learning would also increase the efficiency of training even though this needs a mental change from research-group oriented, basic research ambition. Involve social partners in the development of the study programme and its content.

IV. SUMMARY

Nanoscience is a multidisciplinary field related to molecular level approaches and structures with controllable and desirable properties. The field is vastly growing and extremely competitive, which makes focused study programmes in the field necessary and timely. The study programme of Master in Nanomaterials at Vilnius University is new and lacking maturity, but it is built on a niche and presents a lot of potential developments. Unfortunately, at the time being it appears to be established upon available resources and not from the objective in sync with identified needs. The research and study environment is constantly evolving, which supports the activities within the programme. Novel and adequate research infrastructure consists of relevant research equipment but these could be benefitted more in training future experts and methodological specialists. The environment also opens possibilities in increased social partner interaction and co-operation. Moreover, the culture of Department practises overriding the programme policies should be rethought in order to promote learning activities, study paths, and knowledge-building supporting the programme aims and learning outcomes.

The Faculty must set up a strategic plan and clarify the positioning of this programme with respect to the Departments. In this way the implementation of a quality management system with quantitative indicators and targets seems imperative. Common standardised assessment methods, criteria and practises would benefit programme development and improve transparency of actions and equal treatment of students beyond Department boundaries.

Finally, to focus better the programme on nanomaterials, it is recommended to lead a benchmarking of diplomas existing in the foreign universities associated with a better implication of the stakeholders.

V. GENERAL ASSESSMENT

The study programme Nanomaterials Chemistry (state code – 621F10005) at Vilnius University 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	2
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:	**14**

*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
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Vertimas iš anglų kalbos

VILNIAUS UNIVERSITETO ANTROSIOS PAKOPOS STUDIJŲ PROGRAMOS *NANOMEDŽIAGŲ CHEMIJA* (VALSTYBINIS KODAS – 621F10005) 2014-06-16 EKSPERTINIO VERTINIMO IŠVADŲ NR. SV4-341 IŠRAŠAS

<...>

V. APIBENDRINAMASIS ĮVERTINIMAS

Vilniaus universiteto studijų programa Nanomedžiagų chemija (valstybinis kodas – 621F10005) vertinama **teigiamai**.

Eil. Nr.	Vertinimo sritis	Srities įvertinimas, balais*
1.	Programos tikslai ir numatomi studijų rezultatai	2
2.	Programos sandara	2
3.	Personalas	3
4.	Materialieji ištekliai	3
5.	Studijų eiga ir jos vertinimas	2
6.	Programos vadyba	2
	Iš viso:	**14**

* 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)

<...>

IV. SANTRAUKA

Nanomokslas – daugiadalykė kryptis, susijusi su molekulinio lygio metodais, reguliuojamų ir pageidaujamų savybių struktūromis. Ši sritis sparčiai auga ir yra labai konkurencinga, todėl būtina laiku orientuoti studijų programas į šią sritį. Magistro studijų programa *Nanomedžiagų chemija* Vilniaus universitete yra nauja, jai trūksta brandos, tačiau ji turi nišą ir pristato daugybę galimų veiklų. Deja, šiuo metu atrodo, kad ji sukurta turimų išteklių pagrindu, o ne suderinta su uždaviniais ir nustatytais poreikiais. Mokslinių tyrimų ir studijų aplinka nuolat vystosi, kas yra naudinga programoje vykdomai veiklai. Naują ir tinkamą mokslinių tyrimų infrastruktūrą sudaro atitinkama mokslinių tyrimų įranga, tačiau ja būtų galima daugiau pasinaudoti rengiant būsimus specialistus ir metodologijos specialistus. Ši aplinka taip pat atveria galimybes didinti sąveiką ir bendradarbiavimą su socialiniais partneriais. Be to, katedros praktika svarbiais programos politikos principais turėtų būti peržiūrėta, siekiant skatinti mokymosi veiklą, studijų pasirinkimus ir žinių kūrimą, kurie padėtų pasiekti programos tikslus ir studijų rezultatus.

Fakultetas turi sukurti strateginį planą ir išaiškinti šios programos vietą katedrų atžvilgiu. Tokiu būdu būtina įgyvendinti kokybės valdymo sistemą su kiekybiniais rodikliais ir tikslais. Bendri standartizuoti vertinimo metodai, kriterijai ir praktika padėtų plėtoti programą ir pagerinti veiksmų skaidrumą bei vienodą požiūrį į studentus už katedros ribų.

Galiausiai, programą reikėtų daugiau koncentruoti į nanomedžiagas. Rekomenduojama atlikti užsienio universitetuose išduodamų diplomų palyginamąją analizę, aktyviau įtraukiant socialinius dalininkus.

III. REKOMENDACIJOS

Pirmoji rekomendacija. Reikėtų padidinti šios studijų programos nanomokslų tarpdalykiškumą ir sutelkti dėmesį į studentų poreikius ir įgūdžius. Tyrimų problemos ir inovacijų aplinka yra daugiadalykinė ir ji turėtų būti stiprinama tiek tobulinant mokymosi terpę, tiek rengiant edukacinio profilio programą. Ypač šiuo metu, kai daug dėmesio skiriama nanomedžiagoms, būtų naudinga programą labiau susieti su fizika ir biochemija.

Antroji rekomendacija. Programos sandara turi būti persvarstyta, atsižvelgiant į pasiekimus šioje srityje (palyginamoji analizė), nanomedžiagų taikymą šalyje socialinių dalininkų plėtojimui ir jų poreikiams. Programa turėtų imtis iniciatyvos ir mokymąsi bei gebėjimų ugdymą orientuoti į su dalininkais susijusius interesus, o ne tik rengti potencialą trečiosios studijų pakopos moksliniams tyrimams. Studijų programa turėtų supažindinti su įstatymais, taikomais nanomokslų srityje, reikalavimais, keliamais su sveikata susijusiai ir bendrajai praktikai; mažiau dėmesio reikėtų skirti dalykams, nesusijusiems su nanomokslais ar dalykams, kurie menkai pritaikomi šioje srityje. Probleminis mokymasis autentiškoje aplinkoje turėtų teigiamą poveikį, siekiant supažindinti su naujovėmis, nacionalinėmis gairėmis ir besivystančios inovacijų aplinkos reikalavimais.

Trečioji rekomendacija. Reikia stiprinti žmogiškųjų išteklių vidutinės trukmės ir ilgalaikį planavimą (3–6 metai) bei programos turinį. Tai svarbu atsižvelgiant į dabartinę situaciją vietos mokslinių tyrimų infrastruktūroje, pramonės pastangas šalyje ir mokymo programų konkurenciją panašiose srityse visoje Europos mokslinių tyrimų erdvėje. Labai svarbu koncentruoti ir reklamuoti dabartinę studijų programą, siekiant daryti įtaką vietos nanotechnologijos mokslo plėtrai.

Ketvirtoji rekomendacija. Būtina suderinti studijų rezultatų vertinimą. Parengti įgūdžių ir kompetencijų vertinimo kriterijus. Būtų naudinga padidinti programos tarptautinių modulių galimybes.

Penktoji rekomendacija. Viso fakulteto mastu reikia gerinti kokybės užtikrinimo sistemą. Bendradarbiaujantis, skaidrus ir vienodas plėtros ir vertinimo metodas padidintų studentų motyvaciją, gerintų mokymosi rezultatus ir numatytų sudėtingesnius būdus, kaip interaktyviai diskutuoti su socialiniais partneriais programos turinio ir absolventų galimybių klausimu.

Šeštoji rekomendacija. Būtų naudinga, jei rengiama programa būtų labiau orientuota į studentus, tyrimais grindžiamo mokymosi metodus, kurie suteiktų studentams daugiau praktinių ir pripažįstamų įgūdžių mokslinių tyrimų ir plėtros srityse. Studentų mokymosi akcentavimas taip pat pagerintų studijų efektyvumą, nors šiuo atveju reikėtų keisti suvokimą: nuo orientavimo į tyrimus grupėse pereiti prie fundamentaliųjų mokslinių tyrimų. Socialinius partnerius reikia įtraukti į studijų programos ir jos turinio kūrimą.

<...>

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

[1] Žin., 2002, Nr.37-1341.