



STUDIJŲ KOKYBĖS VERTINIMO CENTRAS

Vilniaus universiteto
ENERGETIKOS FIZIKOS PROGRAMOS (612F30006)
VERTINIMO IŠVADOS

EVALUATION REPORT OF
PHYSICS OF ENERGY
STUDY PROGRAMME (612F30006)
at Vilnius University

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DUOMENYS APIE ĮVERTINTĄ PROGRAMĄ

Studijų programos pavadinimas	<i>Energetikos fizika</i>
Valstybinis kodas	612F30006
Studijų sritis	Fiziniai mokslai
Studijų kryptis	Fizika
Studijų programos rūšis	Universitetinės studijos
Studijų pakopa	Pirmoji
Studijų forma (trukmė metais)	Nuolatinė (4)
Studijų programos apimtis kreditais	240
Suteikiamas laipsnis ir (ar) profesinė kvalifikacija	Fizikos bakalauras
Studijų programos įregistravimo data	2009-08-31, Nr.1-73

INFORMATION ON EVALUATED STUDY PROGRAMME

Title of the study programme:	<i>Physics of Energy</i>
State code	612F30006
Study area	Physical sciences
Study field	Physics
Kind of the study programme	University studies
Study cycle	First
Study mode (length in years)	Full-time (4)
Volume of the study programme in credits	240
Degree and (or) professional qualifications awarded	Batchelor of Physics
Date of registration of the study programme	2009-08-31, Nr.1-73

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The Centre for Quality Assessment in Higher Education

CONTENTS

CONTENTS	1
I. INTRODUCTION.....	4
II. PROGRAMME ANALYSIS	4
1. Programme aims and learning outcomes.....	4
2. Curriculum design	6
3. Staff	7
4. Facilities and learning resources	8
5. Study process and student assessment.....	9
6. Programme management	10
III. RECOMMENDATIONS	13
IV. SUMMARY	14
V. GENERAL ASSESSMENT	15

I. INTRODUCTION

The Evaluation Report was prepared about the Study Programme of *Physics of Energy* at Vilnius University. This first cycle programme is in the Study area Physical Sciences, its study field is Physics and the qualification degree given is Bachelor of Physics. The programme was registered on 2009-08-31. The members of the Expert Team, who are responsible for the Evaluation Report, were selected and appointed by the Centre for Quality Assessment in Higher Education of Lithuania.

The study programme is one of the six first cycle programmes in Physics at the Faculty of Physics at Vilnius University (hereinafter VU). This programme is of particular importance, because its topic deals beside the basic knowledge in Physics with one of the major problem of the present time and of the future, namely with the reliable energy supply of the society. The programme has grown out from the nuclear energy studies, but it has been developed in the last few years with a focus on a more general field, namely on the field of energy production in general. This development was justified by the fact that the energy policy of Lithuania has been changed, there is some uncertainty in which direction the country's policy would go. The nuclear power plant of the country has been stopped and much effort has been invested in renewable energy and solar energy in particular. From that point of view the broadening of the scope of the programme seems to be a logical development.

The Evaluation Report has been prepared on the basis of the study of the Self Assessment Report and with the help of a series of group discussions with different teams of related people on the 8th of October, 2013. There was a discussion with the administration staff, during which all responsible partners were present from the side of the Faculty of Physics. Later a meeting with the staff responsible for preparation of Self-Assessment Report was organized (4 people in total were present, among them one person from the Quality Centre of the University and one student representative). Then the Expert Team had a meeting with the teaching staff (13 people, about half of the teachers were present) and with the students (15 students of the programme were there). The Expert Team visited the auditoriums, libraries, teaching and research laboratories used in the teaching process. After the roundtrip the experts had a possibility to familiarize with the thesis and examination materials of the graduates of the programme. It was followed by a meeting with alumni (4 persons came) and by a discussion with social partners (two persons in the managerial positions were present). The site visit was concluded by introducing the final remarks to the partners responsible for the study programme *Physics of Energy*.

All these steps of the evaluation process took place without any disturbing effects, fully according to the rules of the Centre for Quality Assessment in Higher Education of Lithuania. The Expert Team evaluated all the gathered information in closed section. The Evaluation Report of *Physics of Energy* was accepted by all members of the Expert Team with a one vote will.

II. PROGRAMME ANALYSIS

1. Programme aims and learning outcomes

In general, the Expert Team congratulates the involved team for preparing this strategically important and professionally sound study programme with rather clear aims and learning outcomes. Strong coordination and recognition of existence of topic related with study programmes in Kaunas University of Technology and Vytautas Magnus University are acknowledged, and the Expert Team recognizes this programme as complementary rather than

unnecessary duplication of the important efforts in the national context. Unlike other similar study programmes available in Lithuania, the *Physics of Energy* study programme focuses on providing the students with deeper understanding of physical principles underlying the process of energy production (mainly nuclear) and the use of natural laws and mathematical relationships to solve associated challenges including environment contamination control.

As it is stated in the programme's Self Evaluation Report, the aim of *Physics of Energy* study programme is "training of highly skilled specialists of nuclear energy, who have a deep understanding of nuclear physics, neutron physics, physics of nuclear reactors and nuclear materials, radiation protection, radioactive waste disposal, materials science, renewable energy sources, solar energy, as well as university-level education in social sciences and humanities". The Expert Team thinks that already at this very first statement some more precise and coherent formulation of the aims and learning outcomes is needed.

"Physics of Energy" is quite general definition and therefore one would expect much broader and more complete basket of energy mix to be covered by the programme. However, in practice it includes mainly nuclear energy and at some extent solar energy. The Expert Team also understands that due to uncertainties in national strategy towards nuclear energy, some recent modifications in the study programme were unavoidable. Nevertheless, the programme was supposed to remain consistent and therefore avoid any incoherence in terms of aims and learning outcomes when compared to the actual courses offered by the curricula.

The Expert Team finds that the study programme is structured so as to ensure that students learn general physics and mathematics, theoretical physics, acquire skills and experience of working with modeling and computer programming. The study programme provides information on the latest nuclear technologies and their applications, materials that are used in nuclear energy, safe exploitation of nuclear facilities, radiation protection, and some selected alternative types of renewable energy (mainly solar energy).

The Expert Team is convinced that the specialists prepared by this study programme will have capability to master the physical methods of thinking, have good basic knowledge of physics of nuclear energy and some limited knowledge of other types of renewable energy production. It is also clear that graduates, after some additional and specific nuclear training, would be ready to join the labor market in the future nuclear power plant or other nuclear energy related infrastructures (e.g. safety and regulatory authority, radiation protection centre, nuclear radioactive waste managing company, etc.).

The Expert Team also takes a note that in response to changing priorities of Lithuania's energy policy, the programme originators have made a try to expand the content and aims of the programme by including other technologies of energy production (mostly solar energy). Unfortunately, the Expert Team has found this expansion not yet complete and somewhat misleading in terms of aims and learning outcomes, when compared to the actual courses offered. For example, one of the programme aims includes development of "physical principles of production of renewable and nuclear energy, environment safety control, operation of energy technologies in general and their influence on economic development and the life of society", while in practice it covers the aspects of "solar and nuclear" energy only. The following additional courses would certainly contribute to this aim: society concerns related to energy; energy efficiency; comparative/competitive energy economy and strategies. An extended course on nuclear waste managements is also recommendable, keeping in mind the importance of this subject for the present spent fuel issues in Ignalina Nuclear Power Plant (NPP); and this last suggestion is independent on the future nuclear programme development in the country.

In brief, it is recommended to revise the study programme aims and its learning outcomes according to the offered lectures and laboratory courses, add a few other topical areas in order to have broader coverage of energy mix in addition to already existing nuclear and solar energy. The study programme would only improve if cross-cutting topics such as energy efficiency,

energy economy and society concerns related to energy were included. Expansion of the area related to spent nuclear fuel management is also recommended.

2. Curriculum design

The “*Physics of Energy*” study programme curriculum design is well composed and meets legal requirements. The authors have clear vision as presented in self-evaluation report. The study programme is structured so as to ensure that students learn general physics and mathematics, theoretical physics, acquire skills and experience of working with a computer and programming. The study programme provides information on the latest nuclear technologies and their applications, materials that are used in nuclear energy, safe exploitation of nuclear objects, radiation protection, alternative types of energy. The students will apply the acquired theoretical and practical knowledge in their work placement and in the bachelor final thesis”. There are physics basic course elements like “Higher mathematics”, “Mechanics and thermodynamics”, etc. and also more energy specific courses like “Introduction to nuclear energy”, “Basics of energy”, etc. All of them are spread reasonably among semesters. There is no overlapping between courses. The lecture and practical work balance is well-designed. Overall assessment of the lectures corresponds well to the good level bachelor level physics education. There have been made several improvements in practical work laboratories improvement. Expert Team would like especially point out really top level equipment for nuclear practical work course.

The leaders of the study programme are experienced and have arranged already several years study programmes in physics. Most of the programme aims are relevant, learning outcomes are achievable and measurable. However, the programme leaders should more focus and also adjust the first aim (*the development of cognitive competences directly related to the application of achievements in physics and mathematics in the field of energy*) for the more measurable learning outcomes. Definitely, the nuclear and solar energy have important role locally and also worldwide. Still, there are also other energy sectors that are not treated in current study programme. Therefore, the first aim and learning outcomes are well composed and have also measurable outputs. The first aim itself just needs to be justified.

Another issue is connected with final thesis. In most cases the thesis compositions were not clearly presented. Only one thesis abstract (out of ten thesis abstracts checked) started with sentence: “*The aim of current work is..*”. Others just described the activities and measurements results. Therefore, Expert Team recommends explaining more in detail to the students the final thesis composition style and required format. As it is related to the final aim of the study programme (*to acquire skills to communicate both orally and in writing in Lithuanian and English, to work individually and in team, to organize own work and to manage time, to learn and to continuously develop professional skills and general education*) there should be probably an additional mandatory course about composing scientific reports and thesis documents.

Another issue is with achieving professional knowledge in English. In Expert Team communication with students, they presented their will to have more seminars presented by foreign scientist to engage more updated knowledge’s and therefore improve their scientific English.

One of the strongest aspects in this particular study programme is well-motivated lecturers with strong scientific background. It is not typical that study programme lector is active in teaching and at the same time successful in high-level science. Most of lecturers have related scientific interests and therefore there is a direct link between course content and latest achievements in science. Some teachers also work on the study programmes related practical fields, what is also valuable for students who can obtain the information connected with “real life” issues. Our recommendation, based on practical needs of the country, is that more emphasis could be given to nuclear waste management-treatment-storage, and related issues. Other already mentioned areas like energy efficiency and energy economy might be considered.

3. Staff

The teaching staff is optimal for this study programme. The staff of 33 teachers of the Faculty of Physics and other faculties of Vilnius University, along with 11 teachers from other institutions, works with the Physics of Energy first cycle study programme students. The average number of years of professional work experience of the staff of Vilnius University, who work in *Physics of Energy* study programme, is 26 years, and their average educational work experience is 17 years. Among the mentioned 33 teachers, whose main workplace is Vilnius University, there are 12 professors, 10 associated professors and 11 lecturers. 30 of those 33 teachers are doctors, which is in accord with the general requirements for the study programmes. The average age of the teaching personnel is sustainable as it is far below 50 years. All teachers are experts in their field and that ensures the teaching quality. 11 of the 44 teachers participating in the study process are not from Vilnius University. Ten of them are specialists working at the Centre for Physical Sciences and Technology (CPST), at the State Nuclear Power Safety Inspectorate (VATESI), and at the Visaginas Nuclear Power Plant Project. Expert Team confirms their valuable practical experience, which has been accumulated during their work in institutions of the Lithuanian energy sector and national regulating authority organizations; those teachers are the most suitable candidates for teaching specialized course units. The average number of years of professional work experience of the staff of CPST, who work in *Physics of Energy* study programme is 18 years, and their average educational work experience is 7 years. All of them are doctors of sciences, who have experience both in fundamental nuclear physics, radioecology, and in applied areas related to nuclear energy, evaluation of safety of nuclear energy facilities, nuclear fuel and radioactive waste management, and relevant national and international legal regulations.

The average contact workload of the teachers, who work in *Physics of Energy* first cycle programme, is 90 working hours. That counts approximately a bit more than 2 students per one teacher. The teachers also have to supervise their students. So far there have been no complaints from the teachers about too big or too small contact workload. The teachers also do research work, as well as are involved in projects of Lithuanian Academy of Science and various international projects. Working in research and methodological projects is directly related to rising of teachers' qualification. The results of the projects are continuously being used to update the contents of the course units. As the time sharing between teaching and science is not disturbing each other, this situation is reasonable. Many lecturers have experience in teaching abroad. This should be seen as an asset, as many European universities have better know-how in this topic. Most of the teachers visit international scientific conferences in the average 1-3 times per year. This ensures input to the certain lecture course and the exchange of latest scientific trends. Faculty administration is also active in recruitment of new teaching personnel. Among the PhD students, who have defended their thesis in the faculty, the best ones are invited to teach.

4. Facilities and learning resources

The premises for studies are adequate both in their size and quality. Lectures are given in the Great Physics Auditorium adapted for demonstrations (165 working places) and equipped with multimedia. Other lectures seminars and workshops are delivered for different student groups in smaller classrooms (one with 79 working places, 4 with 56 working places each, 5 with 40 working places each, 4 with 20 working places each, and 4 with 12 working places each). For laboratory works of 6 general physics teaching laboratories of the Faculty of Physics are used. There is one teaching laboratory specially adapted and well equipped with laboratory works in the field of atomic and nuclear physics. For specific laboratory experiments and final projects four research laboratories of the Centre for Physical Sciences and Technology can be used. For theoretical and computational work, the computer classrooms (47 computers in total), which are located in the VU Information Technologies Application Centre are available for

students of this programme. The teaching laboratories are constantly renewed and equipped with new scientific devices by using EU structural funds, National complex programme and social partners. The laboratories are used not only by students of Physics of Energy programme, but also by students of other study programmes of the Faculty of Physics. Since the load of laboratories is huge, the problems of equipment accessibility are solved by working in shifts. Nevertheless, the current facilities are sufficient to prepare bachelor students of *Physics of Energy* study programme.

Students of *Physics of Energy* study programme perform their final thesis practice work also in the Centre for Physical Sciences and Technology and Vilnius University. Students also have possibility to perform their final thesis and practice work in other institutions. Several of them worked at State Nuclear Power Safety Inspectorate, Radiation Protection Centre, Lithuanian Energy Institute. Students of *Physics of Energy* have a possibility to perform their work also in other research laboratories of VU, which are well equipped and modern, and in which high level research work is done by the University staff. Students are motivated to start research work from the first courses of the studies, and therefore some of them are using such possibilities.

VU library subscribes over 50 global databases (ACM Digital Library, IEEE/IEL, Morgan & Claypool, SPIE Digital Library, Cambridge Journals Online, Ebrary, Nature Publishing Group, Oxford Reference Online, SAGE Publications Online, Oxford University Press: Oxford journals, ScienceDirect, Science Online, SpringerLink, Taylor & Francis, Wiley Online Library (Wiley-Blackwell), ISI Web of Knowledge. Study literature is added to the library funds every year. New books are purchased in VU library according to teachers' recommendations. VU library is modern, computerized with free internet places and free WiFi connections and easily accessible for students. The students can also connect to the subscribed databases from their homes by using the University supplied VPN (Virtual Private Network) service.

Teachers are active in writing their own original textbooks, slides and other teaching materials easily accessible for students by university web pages. During discussions with students, teachers and alumni, no additional need or other problems related with study literature was expressed. Teaching materials are adequate and accessible for students and teachers in most of the case, both in Lithuanian and English.

5. Study process and student assessment

Admission to *Physics of Energy* first cycle study programme is implemented according to the procedures of admission to Vilnius University first cycle and integrated studies. Only persons whose competition score is no less than 50% of the maximum competition score (plus additional scores) are admitted. So, the admission requirements are well-founded.

The organization of the study process ensures an adequate provision of the programme and the achievement of the learning outcomes. Autonomous learning takes about a half of time of students'-work. Others are lectures (25%) and practical works (25%). During the placement the students work with new people, in most cases the students do not work in the university research laboratories, therefore, they are assessed for their placement report and presentation. The assessment of the report takes into account scientific language, the relatedness of the content of the report to certain disciplines of the Faculty of Physics, which he attended, the ability to generalize and analyze research results. The assessment also includes the acquired physical information, the ability to critically evaluate this information, present arguments orally and in writing, the ability to present the experience gained to informed audience. Final projects are carried out in departments, research institutions and various companies and institutions. The majority of final projects are carried out under the supervision of university teacher by continuous cooperation. As a rule, student's theoretical research or experimental work are related

to supervisor's research field. Student's work is supervised by faculty teachers and employees with a scientific degree who are actively involved in research work.

Students are also encouraged to participate in research activities. Many active students start participating in the activity of research laboratories as early as in the second year. These students choose the topic and the supervisors of their final project according to their own research interests. In the beginning, students perform not-complicated experimental research and get introduced to the issues of a narrower research area or new technology. The goal is to have as many students participating at least in student-organized scientific conferences as possible, where they could present their research results.

Students have opportunities to participate in student mobility programmes from the third year, however, only a limited number of students of the *Physics of Energy* programme actually do so. The Expert Team suggests that the programme management should improve the conditions for students, who participate in the ERASMUS studies in the future.

Mobility of teachers can be estimated as average. It is realized mainly by participation in conferences and workshops, but much less training or teaching programmes like ERASMUS. The number of students, who arrive from abroad by mobility programmes is low.

The higher education institution ensures an adequate level of academic and social support. Some students receive encouraging scholarships for study results. Previously as many as 30% of students received scholarships. As the financing procedures changed in 2009, around 14% of students receive scholarships. These are of two types – regular (195 Lt) and increased (325 Lt). Social scholarships can be allocated to students, who are not so well off. These scholarships are distributed by the Students' Representation Office. Students can also apply for specific scholarships based on scientific results, achievements in art or sports, public activities; they can also apply for nominal scholarships. Student events are supported financially, sports equipment is being acquired; approximately 2000 Lt are dedicated for these purposes yearly.

The assessment system of students' performance is clear, adequate and publicly available. The students' knowledge and progress are assessed on the basis of 'The assessment procedures of study progress at Vilnius University', approved by the VU Senate Committee. The cumulative assessment system applies to most course-units. The specific progress assessment methods for each course-unit are outlined in course-unit descriptions and are well known for students.

Professional activities of the majority of graduates meet the programme providers' expectations. Data on the employment or further studies of graduates have been registered since 2012, because that was the year of the first issue of graduates of this programme. The majority of them continue their studies in second-cycle programmes of Vilnius University.

6. Programme management

Responsibilities for decisions and monitoring of the implementation of the programme are clearly allocated. The study programme is managed by the Study Programme Committee, which is formed from the staff of the Faculty of Physics, the students recommended by Students' Representation Office, department Faculty of Physics and the representatives of social partners. The head of the Study Programme Committee is elected from the Committee members by the majority of votes. The Study Programme Committee approves course unit descriptions approved in the department meetings, proposes to the Faculty Council to approve the changes in the programme or changes in the admission procedures. The heads of the department inform the Study Programme Committee about the shortcomings in the programme and possible ways of solution (the heads of departments are informed by teachers, Students' Representation Office and social partners). The head of the department is in charge of the quality of course units related to the profile of the department and the study course of these course units. The course of the study

programme is administered by the dean's office, i.e. the dean and the vice-dean for academic issues.

Information and data on the implementation of the programme are regularly collected and analyzed. Since the spring semester of 2008-2009 students are surveyed online after each semester. These surveys are organized by VU Quality Management Centre. The participation in the survey is obligatory. VU Quality Management Centre organizes surveys about specific course units studied. The main goal of the survey is to make conditions for every student to express his/her opinion about the subject studied, and for teachers to get introduced to survey results and to improve their course units according to reasonable expectations of students.

The outcomes of internal and external evaluations of the programme are used for the improvement of the programme. Having analyzed the survey data, the faculty administration try to find out the reasons of dissatisfaction and, if there is a need, make corrections to the number of hours of certain course unit, introduce new course units, modernize teaching laboratories, invite teachers from companies or organizations to deliver some course units, try to involve young employees to teaching activity who most often have just come from abroad or gained a doctor's degree in the university. VU Quality Management centre provides another indicator of students' satisfaction with studies – total evaluation average, which consists of evaluating the statements or questions about the quality of contents, delivery of certain course units, students' encouragement to express their opinion, to examine and analyze various problems. The evaluation and improvement processes involve stakeholders.

The internal quality assurance of the programme has several elements; however, according to the Expert Team, they do not come together in a well-established system. It is necessary that the programme management adapt a functioning quality assurance method in the near future.

III. RECOMMENDATIONS

1. The programme managers should make efforts to enhance the mobility and staff exchange, in particular for students. Various available instruments can be used for this purpose, for example, ERASMUS grants, project research grants, bilateral agreements between institutions, etc.
2. The programme managers should continue and strengthen their efforts in providing courses in English. This should be the case if the students' group involves some foreign students. In this regard, the programme might be promoted as capable to offer lectures and practical courses in English. Equally, invitation of more guest lecturers and scientists is strongly encouraged. Finally, students should have a chance to give a seminar or conference presentation in English.
3. The internal quality assurance of the programme is one of the most important prerequisite to maintain its sustainability. Therefore it is recommended that the programme management builds up a closed and detailed system of quality assurance and quality control. It should include all aspects of curriculum development, staff renewal and further training of the members, the review of material resources and all other aspects of the study process. This quality assurance system should interlock in those of the Faculty of Physics and of the Vilnius University.
4. The programme needs to motivate the involved staff and strengthen their engagement in programme preparation and implementation, identify their direct contribution to the aims and learning outcomes. For example, programme coordination meetings on a semester basis could be organized among the involved stakeholders to discuss issues and challenges the programme might face, to share good practices and lessons learned.
5. The programme title "*Physics of Energy*" does not reflect properly the aims and learning outcomes. Therefore, some more general and introductory courses need to be added, for example, such as "Energy efficiency" and "Energy market economy", where both nuclear energy and alternative energy scenarios are compared. Furthermore, independently on the future nuclear power development plans in Lithuania, spent fuel management (nuclear waste) course should be expanded.

IV. SUMMARY

The *Physics of Energy* study programme is a necessary and important member of the first cycle programme family at the Faculty of Physics of Vilnius University.

The study programme gives a good basic knowledge in physics, well enough to found the Bachelor of Physics degree. The structure of the study is healthy and is of high scientific level. As for the energy part of the programme, one may have questions to the aims and learning outcomes, but they, in their present form, give enough flexibility to be appropriately adjusted to the eventually changing energy policy of Lithuania, and will always allow educating experts needed for the country.

The laboratories for student's practice had a substantial development in the last years. They are very good even when compared to international practices. The teaching staff is well prepared and motivated. The age composition is appropriate in order to maintain sustainability. The students are nice people, they seem to be knowledgeable and committed.

The Expert Team, besides the appreciation, has several recommendations to the management of the *Physics of Energy* first cycle program.

The members of the staff do not belong to the same department. Therefore their group identity with the study programme, with the common work seems to be somewhat weak. They should be more conscious and this consciousness should be strengthened by the programme management. The involved staff need to be motivated and they should strengthen their engagement in programme preparation and implementation, identify their direct contribution to aims and learning outcomes.

The Expert Team suggests investigating of inclusion of courses, which could be beneficial for students, like "Energy efficiency", "Energy economy" and "Energy and society".

The programme should make efforts to facilitate and increase the mobility of students and staff exchange. Various available instruments can be used for this purpose, like ERASMUS scholarships, project research grants, or bilateral agreements between institutions. The programme management should study possible other reasons of the low mobility.

The programme management should continue and strengthen their efforts in providing courses in English. This should be the case if the students' group involves some foreign students. In this regard, the programme might be promoted as capable to offer lectures and practical courses in English. Equally, invitation of more guest lecturers and scientists is strongly encouraged. Finally, students should have a chance to give a seminar or conference presentation in English.

The internal quality assurance of the programme is one of the most important prerequisite to maintain sustainability. Therefore it is recommended that the programme management of *Physics of Energy* should build up a closed and detailed system of quality assurance. It should include all aspects of curriculum development, staff renewal and further training of the members, the material resources and all aspects of the study process. This quality assurance system should interlock in those of the Faculty of Physics and of the Vilnius University.

V. GENERAL ASSESSMENT

The study programme *Physics of Energy* (state code – 612F30006) 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	3
2.	Curriculum design	3
3.	Staff	4
4.	Material resources	4
5.	Study process and assessment (student admission, study process student support, achievement assessment)	4
6.	Programme management (programme administration, internal quality assurance)	3
	Total:	21

*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.

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Team leader:

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Grupės nariai:
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V. APIBENDRINAMASIS ĮVERTINIMAS

Vilniaus universiteto studijų programa *Energetikos fizika* (valstybinis kodas – 612F30006) vertinama **teigiamai**.

Eil. Nr.	Vertinimo sritis	Srities įvertinimas, balais*
1.	Programos tikslai ir numatomi studijų rezultatai	3
2.	Programos sandara	3
3.	Personalas	4
4.	Materialieji ištekliai	4
5.	Studijų eiga ir jos vertinimas	4
6.	Programos vadyba	3
	Iš viso:	21

* 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

Energetikos fizikos studijų programa yra būtina ir svarbi Vilniaus universiteto Fizikos fakulteto pirmosios pakopos programų dalis.

Ši studijų programa suteikia išsamių pagrindinių fizikos žinių, pakankamų fizikos bakalauro laipsniui pagrįsti. Studijų programos sandara gera, atitinkanti aukštą mokslinį lygį. Kalbant apie su energetika susijusią programos dalį, gali kilti klausimų dėl tikslų ir numatomų studijų rezultatų, bet jie, dabartine forma, yra pakankamai lankstūs, kad galėtų būti tinkamai derinami atsižvelgiant į ilginiui kintančią Lietuvos energetikos politiką, ir visada užtikrins šaliai reikalingų specialistų mokymą.

Studentų praktikai skirtos laboratorijos pastaraisiais metais buvo nemažai tobulinamos. Jos yra labai aukšto lygio netgi palyginus su tarptautine praktika. Dėstytojai gerai pasirengę ir motyvuoti. Amžiaus sudėtis yra tinkama programos tvarumui užtikrinti. Studentai yra puikūs, kompetentingi ir atsidavę mokslui.

Ekspertų grupė, nepaisant palankaus *Energetikos fizikos* pirmosios pakopos programos vertinimo, jos vadovams pateikia keletą rekomendacijų.

Personalą sudaro įvairių katedrų darbuotojai. Todėl jų grupinis identitetas šios studijų programos ir bendro darbo atžvilgiu silpnokas. Jie turėtų būti labiau sąmoningi, o šį sąmoningumą turėtų stiprinti programos vadovai. Darbuotojai turi būti motyvuoti, aktyviau dalyvauti rengiant šią programą ir ją įgyvendinant programą, žinoti, kuo jie tiesiogiai prisideda prie programos tikslų ir numatomų studijų rezultatų.

Ekspertų grupė siūlo apsvarstyti kai kurių dalykų, kurie būtų naudingi studentams, įtraukimo į programą klausimą, pavyzdžiui, „Energijos efektyvumas“, „Energetikos ekonomika“ ir „Energetika ir visuomenė“.

Įgyvendinant šią programą, reikėtų pasistengti palengvinti ir padidinti studentų judumą bei apsikeitimą dėstytojais. Šiam tikslui gali būti pasinaudota įvairiomis priemonėmis, pavyzdžiui, ERASMUS stipendijomis, mokslinių tyrimų projektams skiriamomis dotacijomis ir institucijų dvišaliais susitarimais. Programos vadovai turėtų ištirti kitas galimas mažo judumo priežastis.

Programos vadovai turėtų ir toliau stengtis, kad dalykai būtų dėstomi anglų kalba. Tai turėtų būti daroma, kai studentų grupėje yra keletas užsieniečių. Šiuo atžvilgiu programa galėtų būti reklamuojama kaip galinti pasiūlyti paskaitas ir praktinį kursą anglų kalba. Be to, primygtinai raginama pasikviesti daugiau atvykstančiųjų dėstytojų ir mokslininkų. Pagaliau ir studentams turėtų būti suteikta galimybė pristatyti seminarą ar konferenciją anglų kalba.

Viena iš svarbiausių programos tvarumo išsaugojimo prielaidų yra jos vidinis kokybės užtikrinimas. Todėl rekomenduojama, kad *Energetikos fizikos* studijų programos vadovai sukurtų uždara ir išsamią kokybės užtikrinimo bei kokybės kontrolės sistemą. Ji turėtų apimti visus programos tobulinimo, personalo atnaujinimo ir tolesnio jų mokymo klausimus, materialiuosius išteklius ir visus kitus studijų proceso aspektus. Ši kokybės užtikrinimo sistema turėtų būti sujungta su Fizikos fakulteto ir Vilniaus universiteto sistemomis.

<...>

III. REKOMENDACIJOS

1. Studentų labai programos vadovai turėtų pasistengti didinti judumą ir apsikeitimą darbuotojais. Šiam tikslui galima pasinaudoti įvairiomis priemonėmis, pavyzdžiui, ERASMUS stipendijomis, mokslinių tyrimų projektams skiriamomis dotacijomis, dvišaliais institucijų susitarimais ir t. t.
2. Programos vadovai turėtų toliau stiprinti ir didinti pastangas, kad dalykai būtų dėstomi anglų kalba. Tai turėtų būti daroma, kai studentų grupėje yra užsieniečių. Šiuo atžvilgiu programa galėtų būti reklamuojama kaip galinti pasiūlyti paskaitas ir praktinį kursą anglų kalba. Be to, primygtinai raginama pasikviesti daugiau atvykstančiųjų dėstytojų ir mokslininkų. Pagaliau ir studentams turėtų būti suteikta galimybė pristatyti seminarą ar konferenciją anglų kalba.
3. Viena iš svarbiausių programos tvarumo išsaugojimo prielaidų yra jos vidinis kokybės užtikrinimas. Todėl rekomenduojama, kad programos vadovai sukurtų uždara ir išsamią kokybės užtikrinimo ir kokybės kontrolės sistemą. Ji turėtų apimti visus programos tobulinimo, personalo atnaujinimo ir tolesnio jų mokymo klausimus, materialiuųjų išteklių peržiūrą ir visus kitus studijų proceso aspektus. Ši kokybės užtikrinimo sistema turėtų būti sujungta su Fizikos fakulteto ir Vilniaus universiteto sistemomis.
4. Personalas turėtų būti skatinamas aktyviau dalyvauti rengiant ir įgyvendinant šią programą, žinoti, kuo jie tiesiogiai prisideda prie programos tikslų ir numatomų studijų rezultatų. Pavyzdžiui, kiekvieną semestrą galėtų būti rengiami programos koordinavimui skirti socialinių dalininkų susitikimai, kuriuose būtų aptariami klausimai ir uždaviniai, galintys iškilti įgyvendinant šią programą, ir pasidalyta gerąja patirtimi ir išmoktomis pamokomis.
5. Programos pavadinimas „Energetikos fizika“ tinkamai neatspindi programos tikslų ir numatomų studijų rezultatų. Todėl programą reikėtų papildyti kai kuriais bendraisiais ir įvadiniais dalykais, pavyzdžiui, „Energijos efektyvumas“ ir „Energetikos ekonomika“, kur būtų palyginami branduolinės ir alternatyvios energijos scenarijai. Be to, nepriklausomai nuo būsimų Lietuvos branduolinės energetikos vystymo planų, reikėtų išplėsti panaudoto kuro (branduolinių atliekų) tvarkymo kursą.