



STUDIJŲ KOKYBĖS VERTINIMO CENTRAS

Vilniaus universiteto
STUDIJŲ PROGRAMOS *TAIKOMOJI FIZIKA*
(valstybinis kodas – 612F30005)
VERTINIMO IŠVADOS

EVALUATION REPORT
OF *APPLIED PHYSICS* (state code – 612F30005)
STUDY PROGRAMME
at Vilnius University

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Išvados parengtos anglų kalba
Report language – English

DUOMENYS APIE ĮVERTINTĄ PROGRAMĄ

Studijų programos pavadinimas	<i>Taikomoji fizika</i>
Valstybinis kodas	612F30005
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	1997-05-19, Nr. 565

INFORMATION ON EVALUATED STUDY PROGRAMME

Title of the study programme	<i>Applied Physics</i>
State code	612F30005
Study area	Physical Sciences
Study field	Physics
Type 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	Bachelor of Physics
Date of registration of the study programme	19-05-1997, No. 565

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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.	Minutes of the Study Programme Committee meeting at 12/03/2015.
2.	Minutes of the Study Programme Committee meeting at 08/09/2015.

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

The Faculty of Physics is responsible for running the Applied Physics programme in administrative terms. Different departments of the faculty are responsible for the teaching of the main course units related to different sections of general physics. The need for the programme is the demand called by the rapidly developing industry of the Lithuanian high technologies where there is a need for better qualified employees geared by deep and powerful knowledge of physics and the concomitant skills for work involving modern measurement devices. This demand for highly-qualified employees has had manifold consequences in terms of the activities in complicated measurement and diagnostics devices functioning on the laws of physics. These activities and fields are: biomedical diagnostics, chemical technologies, environment pollution measurement technologies, production process management and control.

The self-evaluation preparation group, established by the decree of the dean of the Faculty of Physics, was proposed by the administration of the Faculty, Department of General Physics and Spectroscopy and Students’ Representation Office. Group members were assigned specific

responsibilities in its composition. While it is not wholly clear in the SER which material changes have taken place in accordance with and in relation to, the evaluation of 2008, the programme at that date received full accreditation.

The Review Team had the opportunity to visit the laboratories, classrooms and library and familiarized themselves with a number of documents and with students' final theses, presented by University representatives. All personnel involved in the process of evaluation were open and cooperative and both staff and students were articulate in the English language. The Review Team would like to thank everyone involved in organizing the event and participating in the meetings. After the visit, the Review Team discussed and agreed the content of this report, which represents its consensual view.

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 8-9 October 2015.

1. **Dr. Terence Clifford-Amos (team leader)** *academic*, Université Catholique de Lille/International Consultant, UK.
2. **Prof. dr. Janis Spigulis**, *academic*,. University of Latvia, professor of Physics Department, Latvia.
3. **Dr. Rynno Lohmus**, *academic*, University of Tartu, Senior Research Fellow, Institute of Physics, Estonia.
4. **Prof. dr. Artūras Jukna**, *academic*, Vilnius Gediminas Technical University, Head of Department of Physics, Lithuania.
5. **Dr. Danas Ridikas**, *social partner*, Research Reactor officer, IAEA, Austria.
6. **Mr Benas Urbonavičius**, *students' member* (PhD), Kaunas University of Technology, Lithuania.

II. PROGRAMME ANALYSIS

2.1. Programme aims and learning outcomes

Programme learning outcomes, which are clear incisive and accurately set at the Bologna first cycle are implemented through the main broad aim of the study programme and are realised and achieved through the study modules, the aims and learning outcomes of which are distilled from the programmes aims and learning outcome structures (SER: A-D respectively). The programme *Applied Physics BA* evinces a very broad aim, embracing the training of specialists who are able to meet international standards, capable of pursuing master and ultimately doctoral studies. Fundamental knowledge of *Applied Physics*, early research experience and professional work enable graduates to pursue and contribute to international cooperation towards developing the science of *Applied Physics*. The emphasis of the Vilnius University *Applied Physics* study programme is focused on a 'deeper understanding of physical-equipment functioning according to physical principles'. (SER, 2.1, 11)

Programme aims and learning outcomes were framed according to the Dublin Descriptors, according to the decision No. 535 of May 4, 2010 of the Government of the Republic of Lithuania "On Approval of the Description of Lithuanian Qualifications Structure", and according to the decree No. V-2212 of November 21, 2011 of the Minister of Education and Science of the Republic of Lithuania "On Approval of the Description of Study Cycles" and according to the study field description issued by the SKVC:

http://www.skvc.lt/uploads/documents/files/Kokyb%C4%97s%20u%C5%BETikrinimas/krypciu_aprasai/Fizikos_krypties_aprasas.pdf (SER, 2.1, 7)

The broad aims, the necessary skills, the demands and specialisms of study process and learning outcomes are published on the Internet (in Lithuanian): <http://www.vu.lt/studijos/apie-studijas/studiju-programos>. Both websites of Vilnius University and the Physics Faculty contain special sections for students and applicants: <http://www.vu.lt/lt/studijos>/<http://www.vu.lt/en/studies>/<http://www.ff.vu.lt/studijos/stojantiesiems/bakalauro-studijos> A facility for questions about the study programme is also available online <http://www.vu.lt/kviecia/klausk/kreipkis>. (SER, 2.1, 11)

The first-cycle study programme, *Applied Physics* achieves and sustains wide outcomes relating to the destination of the faculty's talented graduates who operate within the rapidly forming industry of the Lithuanian high technologies which, hitherto, were restricted by a lack of qualified employees 'empowered by sufficiently deep knowledge of physics and skills for work with modern measurement devices'. The need for highly qualified employees has dramatically improved activities involving the application of complicated measurement and diagnostics devices, which are predicated on the laws of physics. In particular these amount to: 'biomedical diagnostics, chemical technologies, environment pollution measurement technologies, production process management and control'. (SER, 1, 4)

The learning outcomes, which address cognitive domains in learning, personal and professional development, ethical dimensions, comparative professional systems, qualitative and quantitative skills, communication (and the psychological concomitants appropriate to the understanding of communicative processes), language and creative skills, self-development and the skills required for evaluation and responsiveness appropriate to the field and beyond, are refined, appropriately focused and interfaced in the respective subject areas, of which there are 53, including work-placement and electives.

The faculty is confident that high-level specialists of physical sciences are trained during the programme and that such specialists meet the needs of European countries and can successfully operate in both Lithuanian and international markets. (SER, 2.2, 18)

That modern science and technologies are fast developing, there is a continued demand for broad-profile, highly qualified physicists who are able to participate in scientific research programmes, independently find solutions to many natural science problems and expand the current businesses specialising in technologies. At Vilnius University, in relation to bachelor study programmes of foreign universities and recommendations of international organizations, there is evidence of soundness both in the national and comparative senses of what levelness means in academic study. There is evidence to suggest that studies in this programme are at the high end of Bologna cycle 1 and that graduates are soundly-equipped for further study, research and professional engagement.

The SER states that *Applied Physics* programme stands out in terms of originality that is because most of its focus is on physical knowledge application both in scientific research and industry. (SER, 2.1, 7) The study of *Applied Physics* fully represents these two interrelated facets in comprising 53 intensive subject modules (including work placement) the learning outcomes of which testingly operated at the highest level possible at Bologna Cycle 1. The qualification offered is therefore appropriately representative of the content and is both contextually and universally appropriate and discerningly understood. The Review Team believes the aims and learning outcomes are exemplary.

During interviews with students it became clear that students were aware of learning outcomes and their relevance and application to their studies. While some teaching staff felt that learning outcomes could be a challenge, if not a burden to compose and realise, many saw their benefits, and indeed as part of the entire SER portfolio, appreciated the new opportunities for reflection and revision.

2.2. Curriculum design

With regard to legal requirements, relating to academic credit allocation, core and elective subjects, final project and student placement, Table 4 of the SER sets out the compliance of the study programme plan to the decrees No. V-501, No. V-1190, No. V-232 of the Minister of Education and Science of the Republic of Lithuania.

The Review Team, on examining the programme module subjects found that they clearly convey both academic independence and independent properties and comprise a balanced programme without repetition. The overall programme neither repeats nor excessively weights particular modules, one to another.

The content of the subjects is consistent with the type and level of studies in a modern first-cycle programme encompassing physics. There is a closely-scaled match between content and methods, towards achieving the stated intended learning outcomes, as illustrated both in overall programme and in subject modules. The scope is readily sufficient, though, as might be expected in a high achieving university some programme content and the learning outcomes seem particularly geared at rather high levels. The replete and well-accommodated programme endeavours to be progressive and reflects particular elements of a modern *Applied Physics* multi-disciplinarity, which includes languages general education and elements of philosophy and psychology as well as a course of Sociology.

Links between subjects and programme learning outcomes illustrate the achievement of the intended learning outcomes; and the aims, content and teaching methods of the subject modules are sufficient to achieve these. The programme, broad and encompassing the main areas of development of Lithuanian high technologies, with particular attention to photonics semiconductor technologies and nanotechnologies, has been formed based on the considerable potential of quantum electronics, semiconductor material technologies, laser, optics technology scientific research and industry in Vilnius. (SER, 2.2, 14) *Applied Physics* is one of six programmes at Bachelor level and is of four years duration with a volume of 240 credits. The average contact workload of the teachers of *Applied Physics* is 33 hours. As of 1st September, 2014, *Applied Physics* had 158 students, yielding a teacher-student ratio of 3.5 students per one teacher.

The comprehensive, and well-rounded learning outcomes are realisable through the technically robust and varied programme module content.

Students are multifariously equipped for: research in materials science, environmental pollution and supervision, biological and medical physics and other scientific research, as well as in modern technologies including the information business. This is backed up by the participation of the teaching staff in the cooperative research projects: *CERN RD50 Collaboration Programme "Radiation Hard Semiconductor Devices for Very High Luminosity Colliders": Materials Characterization; Defect Engineering; CERN RD39 Collaboration Programme "Cryogenic Tracking Detectors": Free Carrier Lifetime in Irradiated Si; EUREKA: Novel Optical Measurement Technologies and Devices for Advanced Semiconductor Diagnostics (E!4473-OPTICAL DIAGNOSTICS); Lithuania-Ukraine programme: II-VI semiconductor*

scintillators for X-ray detectors, just to name but a few. (VU webpage: http://www.vu.lt/en/studijos/58-research/index.php?option=com_content&view=article&id=179) This is a good basis for research-inform teaching. *Applied Physics* colleagues believe that the current programme structure corresponds with the latest developments in Lithuanian high-technology sector with all its expectations and uncertainties. (SER, 2.2, 14) However, in the modern *Applied Physics* elements, the Review Team found that insufficient high and applied technology resources and examples were being used. This was endorsed by students during on-site interviews.

The SER, bullet 14 states: The programme is considerably broad and encompasses the main areas of development of Lithuanian high technologies, with special focus given to photonics semiconductor technologies and nanotechnologies. (SER, 2.1, 8) However, unfortunately there are no specialities in relation to nanotechnology-related subjects in curriculum. This should be considered in future curricular planning. (Annex 1. (Course descriptions))

2.3. Teaching staff

The *Applied Physics* study programme first-cycle students are taught by 44 teachers both from the Physics Faculty and other VU faculties. There are 3 teachers whose main workplace is not VU and of those whose main workplace is VU, the average practical work experience is 29.7 years and teaching experience is 18.6 years. Of the 44 teachers 19 hold the title of professor, 16 are associated professors and 9 are lecturers (table 5). 43 of the total of 44 teachers hold research doctorates, thus ensuring the legal requirements are met. (SER, 2.3, 21)

The high-level qualifications held, confidently ensure the learning outcomes. Given the very favourable staff student ratio (outlined above) the number of teaching staff comfortably ensure the learning outcomes.

The SER articulates an ‘insignificant rotation’ of the teaching staff within the programme. This rotation is intended to replace retiring teachers; consequently, the programme includes doctoral students in the pedagogical process by employing them as lecturers and providing them with teaching responsibilities commensurate with their abilities in organizing laboratory works and workshops. (SER, 2.3, 21)

Besides the pedagogical work in which the teaching staff undertake, they are obliged to carry out research, participate in research projects of the Lithuanian Research Council and make contribution in various other international projects. Research activities and methodological projects directly inform teachers’ professional development. Teaching staff were/are related to several international cooperative research projects. (VU webpage: http://www.vu.lt/en/studijos/58research/index.php?option=com_content&view=article&id=179). Research outcomes are commonly operational in terms of research-informed teaching. All teachers contributing to the study programme of Physics contribute to scientific conferences in Lithuania and abroad, as their CVs attest (SER, 2.3, 22; appendix 3) However, some staff development is recommended in terms of modern teaching and assessment techniques, which the Review Team believes will balance, if not enhance the current traditions of teaching methodologies and their emphasis. Moreover, the programme team might consider engaging in more lectures from high technology industry. Sometimes the *real business* is something else and possibly something enhancing compared to what happens in laboratories. Social partners and alumni are prepared to deliver some lectures.

Some pedagogical training is also recommended for lab technicians in terms of the work they do with students.

Studijų kokybės vertinimo centras

Monographs, papers, overseas visits and internships reveal a highly-qualified and involved teaching staff, pushing at the frontiers of knowledge in their research work who are also incorporating and disseminating their outcomes in terms of programme teaching activities. This means that there is evidence of teaching which engages with current and relevant international developments, often gleaned from current journal publications as well as engagement with the above-mentioned research-informed teaching, of which examples were narrated to the Review Team during interviews.

2.4. Facilities and learning resources

The study programme in Physics mostly uses the facilities and learning resources of Faculty of Physics as well as VU Centre of Information Technology Development for computer related courses. Auditoria of the Faculty of Physics meet the requirements of modern teaching (equipped with computers, projector, wireless internet access). Their capacities are generally sufficient for lectures and student practicals, although with some small laboratories (e.g., Teaching laboratory of Atomic and Nuclear Physics II, 1 student place), there may be occasional scheduling problems which need attention. (SER, 2.4, 27)

The Faculty of Physics has recently invested over 555 thousand EUR in research and teaching equipment renovation in the last 5 years. As a result the Faculties of Physics can provide a very good infrastructure for the laboratory teaching. There are also sufficient laboratory consumables and equipment for the research of the students due to a number of well-funded research and EU structural fund projects. In 2011 a cooperation agreement between Vilnius University and the Centre for Physical Sciences and Technology was signed that provides for cooperation in the study programmes, allowing students to use the scientific laboratory equipment, perform placements and undertake final theses in their studies. (SER, 2.4, 28)

Almost all the students of the study programme of *Applied Physics* (~90%) perform their work placement at VU and Centre for Physical Sciences and Technology (CPST). In the last 5 years 4 students went abroad for their practice placements while 2 had an opportunity to do it in a working company environment. (SER, 2.4, 30) The programme management should consider increasing company-related activities.

In 2013 the National Open Access Scholarly Communication and Information Centre was opened, students have gained full access to the Library resources (books, journals, databases) from any computer connected to the University network. Access to the resources from outside the University can be granted by the use of VPN. This facilitates also the use of e-books. The VU library fund of books necessary for Physics Faculty students is constituted of more than 45 thousand units of documents, more than 30 thousand out of which are books and 15 thousand are research periodicals. There is an exhibition of the newest books. The library fund can be used by all VU students, teachers and employees. University subscribes to over 15 most important scientific databases. Students and staff can be rightly proud of the state-of-the-art library, its exceptional appointments, bespoke facilities and overall command of student academic needs. That school students, levels 10 and 11 are invited to 'taster sessions' in the laboratories, is excellent practice in the quest to popularise science among students and motivate the school graduates to join the University. It was noted, impressively, that the Dean himself visits schools and delivers some teaching.

Overall, the facilities for teaching and learning and research laboratories are of excellent quality and well sufficient for successful implementation of the programme

2.5. Study process and students' performance assessment

Admission of students to the programme is competitive and based on grades in secondary School maturity exam and annual scores. Admission score is mainly based on physics, mathematics, Lithuanian and one extra subject final exam scores. Additional points are added for exceptionally bright pupils that had participated as Physics Olympiads. In 2014, the admission score calculation scheme was change to 1-10 scale from the previously used 1-20 scale. There is no entrance examination, but there is a minimum admission score of 3. This information related to admission can be accessed through universities website as well as Joint Admission Network Association of Lithuanian Higher Education (LAMABPO) informational websites and booklets. (SER, 2.5, 34)

There is a prominent competition during the admission to the programme. Although, the popularity of the programme as the 1st choice decreased during the recent years (from ~2 students to one place to ~1.3 student per placement) overall the programme stays popular with an average competition of 5 students per place. This is backed up by the fact that admission scores of the students are high with an average score of 8.7 out of 10 possible in 2014. These figures indicate that the programme is popular and is able to attract good students. The admission rules are consistent with the nature of the studies and skills required from the students. (SER, 2.5, 36-39)

There is a consistent drop-out rate of the students, with ~15% students leaving the programme every year. Most prominent reasons for such a drop-out rate are academic debts and the possibility to stop studies without paying any study fee. (SER, 2.5, 40-41) Although, during the interview with the students lack of motivation in some first year students was mentioned as well.

Often the courses combine theory with practical or experimental work which is mandatory for a programme related to physics. Furthermore, the students are given good possibilities to undertake research practice in the laboratories of the units participating in the programme, and sometimes even be recruited as junior staff in projects supported by external funds. (Annex 1 (Course descriptions), SER 2.5, 46-48) IT possibilities could be explored more in laboratory activities.

Motivated students can start doing research early on – as early as 3rd semester. The number of publications is high (63 during the last 5 years in the journals with impact factor). Participation in scientific conferences is popular amongst students. This shows that students are highly motivated and that the teaching staff gladly accept and motivate students to join research groups. (SER, 2.5, 50)

An important part of the studies is the Final Thesis done under supervision of a senior staff. During the preparation students have to use previously gained skills and knowledge as well as improve upon them. Final Theses are defended as one set at the end of the studies. (SER, 2.5, 49)

The programme team should seriously consider changes in the requirements/evaluation of practical work and final thesis work, so there is no issue in attributing the credits twice for some parts of the same work. This matter was discussed on-site with a senior member of staff and the Dean of the Faculty by providing clear evidence through comparison some reports of practical work and final thesis work. The programme team should also ensure that theoretical work should be consistently related to practical applications where relevant and where possible.

The students are able to participate in international mobility programmes to obtain important experience and contacts. Out of 127 graduates in the past 5 years 12.7 % used the mobility option. This relatively low percentage is mostly due to the fact that it was possible to use

ERASMUS exchange programme only from semester 6 and that most of the students are happy with quality of the studies and do not see the need to travel abroad. There were 30 foreign students studying in the faculty of physics in the last 5 years. (SER, 2.5, 45) The operation of ERASMUS should be more equitably organised, so that Bachelor students do not have to compete for places with Master students.

Students can receive various forms of financial support. There are scholarships for mobility as well as social scholarships for students from poor background. Up to this date all students that met the requirements for a social scholarship have got it. Disabled students get financial support as well. Various student-driven activities (organizations, clubs and events) within the University provide an important boost of morale and social support. Studies are undertaken in well-equipped learning facilities and students have access to internet everywhere and can use various sports facilities (including swimming pool), as well as living in University dormitories during their studies. (SER, 2.5, 50-52, 55)

The students' performance is assessed by diverse methods in more than half of the study subjects, sometimes combining feedback and evaluation during the course with examinations as a summative assessment. Although, the assessment system appears diverse, some course subject have just an examination (*Basics of Law, Computer Application II, History of Civilization, History of Physics, Methods of Investigating Biological objects, Material Science, Computer Controlled Physical Experiment*). During the on-site interview with the students it was stated that examination mark of some study subjects (ex. *Electrodynamics, Fundamentals of Photonics*) is based on 2-3 open questions during the examination, which, according to students, requires learning by heart rather than the achievement of full understanding. This issue diminishes motivation amongst students and should be addressed. Other study subjects have a large emphasis on a theoretical knowledge assessment examination with weighting factors of 70-80%, while the rest of the final mark (20-30%) is the assessment of laboratory work. Such situations can also be found in several study subjects such as: *Introduction to Semiconductor Physics, Spectroscopy*. Having only an examination for theoretical knowledge assessment may or may not be the most effective means of achieving the learning outcomes. The programme team might take these comments into further consideration. Study subjects *Computer Controlled Physical Experiment, Experimental Physics I* do have laboratory work in their description, but the final mark does not include the assessments of such works. Study subjects *English I* and *Equations of Mathematical Physics* have unclear assessment description. (Annex 1 (Course descriptions))

Students' opinion about the study quality is collected by the mandatory questionnaires at the end of each subject. These questionnaires evaluate the facilities, schedule of the subject, lecture and/or practical session quality, examination procedure quality. According to the results changes are made to required areas. (Annex 1 (Course descriptions), SER 2.5, 46-48, SER 2.6, 58). During interviews this view was not universal. Students expressed opinion about the lack of feedback to them after the questionnaires are evaluated. This reduces the motivation in students for any further involvement in the development of the study programme and should be addressed.

During on-site interview with the students it was clearly expressed that some of the study subject's content is outdated (ex. *Computer Applications I/II*). That some of the mandatory general subjects like *History of Civilizations* is not of great importance and could be replaced with a subject for minor studies (eg. in Pedagogy). During the same interview it was expressed that the possibility to choose minor degree studies in Pedagogy makes the study process more fulfilling.

Again during interviews with the students it was expressed that optional subjects are chosen blindly due to the lack of the study subject description availability. Related to this, it was expressed that the difficulty of the available optional subjects is not equal and that the content of subjects like *History of civilizations*, *Analysis of environmental pollution*, *Information theory* is not entirely related to the studies in the field of Physics. These issues should be addressed and avoided in the future.

The majority of graduates from the *Applied Physics* continue their studies at the Master level. Some students start their working careers. This shows good prospects for students of this programme. (SER, 2.5, 53-54)

Graduates are followed up by the use of personal communication; there is no University wide alumni programme. Students and the alumni are largely happy with the teaching methods during the studies, though this view was not universal. Over a half of all the graduates of the programme continue their studies at Master level. This shows that the programme prepares the students for further scientific work. (SER, 2.5, 46) Some improvements are recommended in the systems being currently operated for the compilation of destination statistics. This will facilitate contact with former students.

The Study Programme Committee should be Formalised and systematised to make it alive and active to the needs and interests of students. Teaching staff should publicise topics for research (Bachelor Thesis) earlier together with a list of tutors and also publicise all opportunities for students including ERASMUS. Virtual learning practices should be more unified in terms of a policy for staff and students.

2.6. Programme management

The overall management of the programme is in the hands of the Study Programme Committee, a body drawn from the departments of the Physics Faculty, students' self-government and representatives of social partners and Committee's Head an elected office. The work of the Committee comprises approval of course unit descriptions arising from departmental meetings, makes proposals to the Faculty Council concerning any the changes in the programme or to any changes in admission procedures. Heads of the departments also update the Study Programme Committee about any programme shortcomings in the programme together with the means of addressing them. Information concerning the quality of the programme comes from teachers, Students' Representation Office and social partners for oversight by Heads of Department who is principally concerned with the developmental profile of the programme. The study programme is administered by the Dean's office, via the dean and the vice-dean for academic issues. Programme administration is a weekly agenda issue in the Dean's office. The VU Study Directorate has to be involved where there are proposals to change the study plan of the programme during its running. (SER, 2.5)

There is no mention of the European Standards and Guidelines (or other benchmarking mechanism such as the European Foundation for Quality Management (EFQM) within the programme's quality philosophy and mechanisms.

Evaluations on the specific course units take place following examinations at the conclusion of each semester. Surveys are organized by VU Studies Department, Quality Management division. Student participation is obligatory. Students are encouraged to express their opinion on the study fields for the collective improvement of units and programmes, although no feedback is given to them. All teachers are able to access the data base and read the student responses. The Faculty administration can also access survey results about the work of any teacher; such survey

results are taken into account in the assessment of a teacher's work. Student survey data also accounts for the quality of studies at Vilnius University. (SER Table 17) provides an example of a typical student questionnaire. There is also the Total Evaluation Average (TER) in operation as a further indicator.

Methods for improvement of the programme are achieved through the Study Programme Committee, though no particular examples are furnished. A problem with teaching quality is said to be one of academic emphasis, in the teacher evaluation which tends to be more focussed on research than pedagogy. This 'legal' emphasis is difficult to modify, the SER claims. However, the University does wish to re-emphasise the professional evaluation of teachers. Centrally, the University now has a strong quality assurance system, which was positively reviewed in 2014. The programme team should make strong connections with the centre and all that is recommended there. While Stakeholders are keenly supportive and vibrant in their attitudes towards the programme generally and the good graduates who take up good and profitable employment, the levels of involvement with this programme are variable. The Review Team recommends their more formal involvement in quality assurance mechanisms, feedback, and action planning towards a strong and developmental future, in particular because many sectors are owned and run by VU graduates.

Equally the programme team, largely through the Study Programme Committee, should listen more to the student voice, the positive nature of their drive for stronger internal satisfaction and their wish for stronger engagement with the management of the programme and its development. The articulate, adroit and excellent students interviewed could be said to be 'pleading' to be listened to more systematically. Programme students are highly supportive, highly aware and yearn to be 'partners' in the learning process.

2.7. Examples of excellence *

Exceptional Research Indexes among teaching staff.

A library that will rank amongst the finest in Lithuanian universities.

Super Computer technology

III. RECOMMENDATIONS

General

1. Consider engaging with some strategic staff development on:
 - a) Modern Teaching Methods;
 - b) Assessment Strategies;
2. Involve Social Partners and Alumni more operationally with staff students and the Curriculum;
3. Formalise and systematise the Study Programme Committee - make it alive and active;
4. Publicise topics for research (Bachelor Thesis) earlier together with a list of tutors and publicise all opportunities for students, including ERASMUS – which needs some attention in terms of fairness for all;
5. Unify virtual learning practices.
6. Consider changes in requirements /evaluation of practical work and final theses work, so there is no issue in attributing the credits twice for some parts of the same work.

Subject: Applied Physics

1. Use modern applied physics elements during the study programme more commonly.
2. Consider some pedagogical development for lab practice technicians;
3. Improve student destination statistics at programme level.

IV. SUMMARY

Epistemologically, the programme aims and learning outcomes are sound in their cognitive, professional, technical and social domains. They have been designed and purposed by university teachers with high subject ideals. In complement, students are aware of learning outcomes and are attuned as to how they are applied to their work. The content of the programme is again sound in its broad educational principles and is especially relevant to local industry and business. It is nevertheless recommended that programme staff use modern applied physics elements during the study programme more commonly.

Teaching staff are talented members whose research work receives very high index scores. They are highly active in conferencing both nationally and internationally and are well known in their fields and the programme benefits from their celebrated academic achievements. Teaching staff are often well connected with influential social partners. The Review Team respects their professional standing. However, some staff development is recommended in terms of modern teaching and assessment techniques, which the Review Team believes will balance, if not enhance, the current strong traditions of teaching methodologies and their emphasis. Some pedagogical training is also recommended for lab technicians in terms of the work they do with students.

Concerning resources, they are all considered by the Review Team to be largely excellent; in particular they were impressed with the super computer, available to all students. The programme's students can also be rightly proud of the outstanding new library, substantially equipped to meet their academic needs. Aesthetically, the new library is attractive and tasteful.

Student academic support in many ways is very good, both academically and socially. Notwithstanding, there are some matters in need of attention. These generally concern student participation in the study process, largely through the Student Study Committee, and in other matters concerning a feeling of shared ownership of the programme, effective feedback and involvement in programme development and change. Changes should also be considered in terms of assessment strategies and practice as indicated in section 5 of this report. The Review Team believes that not inconsiderable development is required in these various respects.

Programme management could be improved with more student involvement. Systems are largely in place, though destination statistics appear to be less strong. Furthermore, the programme team should ensure that all quality assurance mechanisms fully tie into university central systems. The university's quality assurance system was positively appraised in 2014.

Stakeholders are keenly supportive and vibrant in their attitudes towards the programme generally and the good graduates who take up good and profitable employment; however, involvement in the framework of this programme could be far stronger. The Review Team recommends their more formal involvement in quality assurance mechanisms, feedback, and action planning towards a strong and developmental future.

In so many ways, generally, this programme is deserving of high commendation, but from the evidence provided, the Review Team believes there is work to be done in areas outlined in sections 5 and 6 of this report, in particular.

V. GENERAL ASSESSMENT

The study programme *Applied Physics* (state code – 612F30005) 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	4
5.	Study process and students' performance assessment	2
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:	Dr. Terence Clifford-Amos
Grupės nariai: Team members:	Prof. dr. Janis Spigulis
	Dr. Rynno Lohmus
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**VILNIAUS UNIVERSITETO PIRMOSIOS PAKOPOS STUDIJŲ PROGRAMOS
TAIKOMOJI FIZIKA (VALSTYBINIS KODAS – 612F30005) 2015-11-27 EKSPERTINIO
VERTINIMO IŠVADŲ NR. SV4-312 IŠRAŠAS**

<...>

VI. APIBENDRINAMASIS ĮVERTINIMAS

Vilniaus universiteto studijų programa *Taikomoji fizika* (valstybinis kodas – 612F30005) vertinama **teigiamai**.

Eil. Nr.	Vertinimo sritis	Srities įvertinimas, balais*
1.	Programos tikslai ir numatomi studijų rezultatai	4
2.	Programos sandara	3
3.	Personalas	3
4.	Materialieji ištekliai	4
5.	Studijų eiga ir jos vertinimas	2
6.	Programos vadyba	3
	Iš viso:	19

* 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)

<...>

2.7. Išskirtinės kokybės pavyzdžiai

- Dėstytojai dalyvauja daugelyje mokslinių tyrimų projektų.
- Biblioteka laikytina viena geriausių Lietuvos universitetų mastu.
- Superkompiuterių technologijos.

IV. SANTRAUKA

Vertinant teoriniu požiūriu, programos tikslų ir studijų rezultatų kognityvinės, profesinės, techninės ir socialinės sritys yra tinkamos. Jas parengė ir pritaikė universiteto dėstytojai, puoselėjantys aukštus dalykinius idealus. Be to, studentai yra susipažinę su studijų rezultatais ir žino, kaip šių rezultatų siekiama studentų darbe. Studijų programa – tinkama, nes edukaciniai jos turinio pagrindai yra plačios apimties ir ypač tinka vietos pramonei bei verslui. Nepaisant to, dėstytojams rekomenduojama į studijų programą įtraukti daugiau šiuolaikinės taikomosios fizikos elementų.

Dėstytojai – talentingi specialistai, kurių mokslinis tiriamasis darbas itin aukštai vertinamas. Jie aktyviai dalyvauja šalies ir tarptautinėse konferencijose, yra gerai žinomi savo srities specialistai, todėl jų pripažinti akademiniai pasiekimai studijų programai išeina į naudą. Dažniausiai dėstytojai palaiko glaudžius ryšius su įtakingais socialiniais partneriais. Ekspertų grupė gerbia dėstytojų profesinę reputaciją, tačiau kai kuriems jų rekomenduoja kelti profesinę kvalifikaciją šiuolaikinio dėstymo ir vertinimo metodų požiūriu, nes, ekspertų grupės nuomone, tai

subalansuotų, o gal ir sustiprintų gyvuojančias dėstymo metodikų tradicijas ir jas dar labiau pabrėžtų. Pedagoginiai mokymai rekomenduojami ir kai kuriems su studentais dirbantiems techniniams laboratorijų darbuotojams.

Studijų programos materialinė bazė, ekspertų grupės manymu, yra itin puiki; vertintojams ypač didelį dėmesį paliko superkompiuteris, kuriuo gali naudotis visi studentai. Programos studentai taip pat gali pagrįstai didžiuotis išpūdinga ir labai gerai įrengta nauja biblioteka, kuri patenkina visus jų akademinis poreikius. Vertinant estetiniu požiūriu, naujoji biblioteka įrengta patraukliai ir skoningai.

Tiek akademinė, tiek socialinė pagalba studentams daugeliu požiūrių yra labai gera. Nepaisant to, į kai kuriuos dalykus būtina atkreipti dėmesį. Studentai turėtų būti labiau įtraukiami į studijų procesą, visų pirma per Studentų komitetą, ir jaustis programos šeimininkais, teikti veiksmingą grįžtamąjį ryšį ir įsitraukti į programos kūrimą bei pokyčius. Taip pat reikia galvoti, kaip pakeisti vertinimo strategijas ir praktiką (žr. šių vertinimo išvadų 5 skyrių). Vertinimo grupė įsitikinusi, kad šias sritis būtina gana smarkiai tobulinti.

Programos vadybą būtų galima pagerinti labiau įtraukiant studentus. Sistemos didžia dalimi veikia tinkamai, nors statistika apie tai, kur įsidarbina studentai, atrodo prastokai. Be to, studijų programos komandai reikia pasirūpinti, kad visi kokybės užtikrinimo mechanizmai būtų iki galo susieti su universiteto centrinėmis sistemomis. Universiteto kokybės užtikrinimo sistema 2014 m. buvo įvertinta teigiamai.

Socialiniai partneriai dėmesingai stebi ir aktyviai reiškia savo nuomonę apie studijų programą apskritai, padeda gerai ją baigusiems absolventams, kurie gauna įdomų ir gerai apmokamą darbą; tačiau į šios studijų programos eigą galėtų įsitraukti dar labiau. Siekiant užtikrintos ir perspektyvios ateities, ekspertų grupė rekomenduoja socialinius partnerius labiau įtraukti į kokybės vertinimo mechanizmus, grįžamojo ryšio procesą ir veiksmų planavimą.

Apskritai daugeliu kitų požiūrių ši studijų programa nusipelno aukšto įvertinimo, tačiau, remdamasi pateiktais įrodymais, ekspertų grupė yra įsitikinusi, kad ypač reikėtų padirbėti prie šių išvadų 5 ir 6 skyriuose nurodytų sričių.

<...>

III. REKOMENDACIJOS

Bendrosios rekomendacijos

1. Apsvarstyti dėstytojų kvalifikacijos kėlimo strategiją šiose srityse:
 - a) šiuolaikiniai dėstymo metodai;
 - b) vertinimo strategijos.
2. Socialinius partnerius ir alumnus skatinti aktyviau bendradarbiauti su darbuotojais ir studentais, raginti prisidėti prie studijų programos.
3. Formalizuoti studijų programos komitetą ir sukurti jo veiklos sistemą, kad komitetas taptų gyvybingas ir aktyvus.
4. Iš anksto paskelbti mokslo tyrimų (bakalauro darbo) temas ir darbo vadovų sąrašą visiems studentams, įskaitant atvykusius pagal programą ERASMUS, ir sudaryti sąlygas su šia informacija susipažinti viešai – tai būtų sąžininga visų besimokančiųjų atžvilgiu.
5. Suvienodinti virtualaus studijavimo praktiką.
6. Apsvarstyti, kaip pakeisti praktikai ir baigiamajam darbui keliamus reikalavimus ir vertinimą, kad nekiltų problemos, kai už tas pačias darbo dalis kreditai skiriami du kartus.

Studijų dalykas: Taikomoji fizika

1. Studijų programoje plačiau naudoti šiuolaikinius taikomosios fizikos elementus.
2. Apsvarstyti galimybę kelti laboratorinės praktikos techninių darbuotojų pedagoginę kvalifikaciją.
3. Pagerinti statistiką apie tai, kur įsidarbina programos studentai.

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Paslaugos teikėjas patvirtina, jog yra susipažinęs su Lietuvos Respublikos baudžiamojo kodekso 235 straipsnio, numatančio atsakomybę už melagingą ar žinomai neteisingai atliktą vertimą, reikalavimais.

Vertėjos rekvizitai (vardas, pavardė, parašas)