



STUDIJŲ KOKYBĖS VERTINIMO CENTRAS

KAUNO TECHNOLOGIJOS UNIVERSITETO  
STUDIJŲ PROGRAMOS *Medžiagų mokslas (valstybinis kodas –  
621J50005)*  
VERTINIMO IŠVADOS

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EVALUATION REPORT  
OF *Materials Science (state code - 621J50005)*  
STUDY PROGRAMME  
at KAUNAS UNIVERSITY OF TECHNOLOGY

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## DUOMENYS APIE ĮVERTINTĄ PROGRAMĄ

Studijų programos pavadinimas	<i>Medžiagų mokslas</i>
Valstybinis kodas	621J50005
Studijų sritis	Technologijos mokslai
Studijų kryptis	Medžiagų technologijos
Studijų programos rūšis	Universitetinės studijos
Studijų pakopa	Antra
Studijų forma (trukmė metais)	Nuolatinės (2)
Studijų programos apimtis kreditais	120
Suteikiamas laipsnis ir (ar) profesinė kvalifikacija	Medžiagų technologijų Magistras
Studijų programos įregistravimo data	<b>2006-03-28</b>

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## INFORMATION ON EVALUATED STUDY PROGRAMME

Title of the study programme	<i>Materials Science</i>
State code	621J50005
Study area	Technological Sciences
Study field	Materials Technologies
Type of the study programme	University Studies
Study cycle	Second
Study mode (length in years)	Full-time (2)
Volume of the study programme in credits	120
Degree and (or) professional qualifications awarded	Master of Materials Technology
Date of registration of the study programme	28-03-2006

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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	CHANGES made after the preparation of SELF-ASSESSMENT REPORT of MATERIALS TECHNOLOGY STUDY FIELD SECOND CYCLE STUDY PROGRAMME MATERIALS SCIENCE (State code – 621J50005)
2	Additional information MATERIALS TECHNOLOGY STUDY FIELD SECOND CYCLE STUDY PROGRAMME MATERIALS SCIENCE (State code – 621J50005) : Lectures mobility, the results of admission to study program in 2010-15, the ratio of admitted and successfully graduated studies students, mobility of out going students of Materials Science Master studies

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

On February 16, 1922, the Government of Lithuania passed a resolution on establishing a university, the first independent higher education institution in Lithuania. Major decisions on the reorganization of faculties and institutes were made in 2013. Since 1 January 2014 the University has 9 faculties, 9 research institutes, 20 administration and support units, Student Council, Business Council, Academic Ethics Committee, KTU trade union, 10 public enterprises where KTU is the founder or the shareholder. The number of faculty departments was decreased by half. Today the University has 10 856 students: 7875 undergraduates, 2617 graduates, and 332 post-graduates (as of 01/10/2014). KTU delivers first, second and third cycle studies in the areas of technology, natural, social sciences, humanities, and art.

The University has 751 foreign students. The University employs 2 421.5 staff members: 779.5 teachers, 117 researchers (including 16 internship researchers) (as of 31/12/2014).

The Faculty of Mathematic and Natural sciences (hereinafter MGMF) was established in 1993 as Faculty of Fundamental Sciences. Physics department (hereinafter Department) staff consists of: 7 professors, 14 associate professors, 7 lecturers, 1 researcher, 3 supporting staff persons, and 5 PhD students.

The Materials Science (MS) programme of the second cycle (621J50005) was created by the order No. 247 of the Senate of KTU of 28 October 2005 and was reregistered in the Register of study and education programs in 2006-03-28 (Decree of Minister of Education and Science No. ISAK-5883). The external evaluation of the MS programme was not carried out by the experts from the Centre for Quality Assessment of Higher Education yet. The MS programme was accredited in 17 of August, 2009 till 17 of August, 2015 according to the order of the Minister of Education and Science No.1-73 17 of August, 2009.

This programme is in the field of technological sciences, the second cycle studies program. The MGMF and Physics department were involved in preparation of these specialists and it was improved permanently during this long period. The basic trend is to prepare the specialists, who will have the research skills, deep knowledge in material composition, properties and analysis, knowledge about high technologies (micro- and nano-) open to science and new materials or their compositions that are directly connected, be able to create and apply materials and their manufacturing technologies.

It deserves to be noted that the number of enrolments and the number of graduates is still low. The university understands this problem and some activities will be implemented. The university initiated from the 2016-17 academic year changes in the curriculum and students will be provided with the possibility to apply competence based study model of alternatives. Students are provided with an alternative to choose from about 20 competence blocks that complement their main study field. Also there is a plan to open the study programme for students from abroad (English language study program).

### ***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 25/05/2016.

1. **Prof. dr. Laurens Katgerman (team leader)** *Delft University of Technology, Professor Emeritus, The Netherlands.*
2. **Prof. dr. Janis Spigulis**, *University of Latvia, Professor of Physics Department, Head of Biophotonics Laboratory at Institute of Atomic Physics and Spectroscopy, Latvia.*
3. **Prof. dr. Andres Öpik**, *Tallinn University of Technology, Vice Dean of the Faculty of Chemical and Materials Technology, professor of physical chemistry, Estonia.*
4. **Dr. Denis Guilhot**, *The Institute of Photonic Sciences, Knowledge and Technology Transfer Program Manager, Spain.*
5. **Dr. Sergejus Orlovas**, *Centre for Physical Sciences and Technology, Principal Research Fellow, Lithuania.*
6. **Dr. Milena Medinickienė**, *doctoral student of KTH Royal Institute of Technology (Lietuva. Švedija).*

## II. PROGRAMME ANALYSIS

Materials Science study programme (hereinafter MS) is implemented at KTU as the second cycle study program in Materials technology field. It was launched at Kaunas University of Technology in 2006. Materials and nanotechnologies bachelor (4 years) and MS Master (2 years, since 2006) degree programmes are provided. 71 Bachelors Materials and Nanotechnologies and 32 Masters of Materials science were prepared up to 2014 (SER Pt. 21).

According to the Table 2.1 SER, 81 the second cycle students studied at the programmes related or close to the materials technologies in Lithuanian universities according to AIKOS (Open vocational information, counselling and guidance system) data of 19 February, 2013. The KTU MS is orientated to prepare specialists on surface engineering, modification of surfaces by irradiation or using plasma and plasmochemical technologies, thin films, microelectronic technologies and nanoscience. Despite KTU MS program is not orientated only for regional needs, however, regional aspect is quite important.

### 2.1. Programme aims and learning outcomes

The programme aims are listed in SER (on page 11): materials technology master students should combine fundamental and practical engineering knowledge and be able to select, develop, deploy and use materials for various engineering applications. Students are supposed to optimally choose materials and technologies for solving various engineering or technological challenges. At the end of the studies, they should have obtained practical and professional skills and abilities in development of modern technologies, as well as in processing and evaluation of scientific data. The learning outcomes and programme aims (Table 2.2 and 2.3 SER) are based on the Bologna Process: Dublin descriptors, European higher education

structures and activities (TUNING) project materials, A Framework for Qualifications of the European Higher Education Area, the European qualification Framework for lifelong learning - EOF for LLL and The common regulations of study at technological (engineering) sciences approved by the study Minister of education and science on 29 April 2005, Order No. ISAK-734 (Lithuania). The programme aims and learning outcomes are publicly accessible on various pages of KUT website.

Based on the meeting with the programme management and social partners the team of expert can conclude that the programme management has no very clear idea of the professional future and opportunities of its graduates. May be because of that the number of graduates and as well number of enrolled students is low (Pt. 21 in SER, Table 2.12 SER), but during the last year situation has improved.

The programme objectives and learning outcomes mostly address market needs and are based on the experience of foreign countries. Both objectives and learning outcomes satisfy both regulations of technological (engineers) study field and academic and professional qualification requirements for qualification of prepared specialists. However, the analysis in the SER is based on outdated 6 years old foreign demand and labour market estimates. In a rapidly changing world of technologies and material engineering, public needs and needs of the labour market should be updated on a regular basis. Expert team recommends to improve the analysis of the labour market on the basis of feedback, provided by social partners, stakeholders, and alumni.

The objective of Materials Science master study programme was formulated in terms of master's degree requirements set in Dublin descriptors and its compliance with the standard and is consistent with the type and the level of qualification offered by the programme. However, some study objects descriptions are not up to date, thus, level of studies and qualification might be degraded over the years. The field of master sciences is rapidly expanding and the programme management should ensure high level of studies by a proper choice of study objects.

The name of the programme "Materials Science" is general; programme covers different aspects of materials science – physics, chemistry and electronics. The KTU Materials Science is orientated to prepare specialists on surface engineering, modification of surfaces by irradiation or using plasma and plasmochemical technologies, thin films, microelectronic technologies and nanoscience. University suppose that programme structure at the university is rational in order to collaborate with experts in various technological fields. Master programme described in the SER offers the possibilities to choose 24 ECTS and different area research projects and additionally programme gives possibility to compose personal study subjects within 30 ECTS. The expert team observes that the name of the programme does not reflect in the best possible way the general content of the programme and causes also problem for applicants to understand the content and aims of the programme. According to the new version (additional material Changes made after the preparation of SELF-ASSESSMENT REPORT of MATERIALS TECHNOLOGY STUDY FIELD SECOND CYCLE STUDY PROGRAMME MATERIALS SCIENCE (State code – 621J50005) of the programme, students are provided with an alternative to choose from about 20 competence blocks that complement their main study field. A student is free to choose from the entire list of 20 interdisciplinary competences. These changes are in better accordance with the programme name "Materials Science" and the

content of the programme. The expert team also recommends to open the programme also for students from abroad.

## **2.2. Curriculum design**

The presented graduate study programme Materials Science is classified as belonging to the study field of technology studies, Materials technologies field group (J500). MS master degree programme is of 2 years and has the scope of 120 ECTS. 30 ECTS (25%) of alternative-electives deepening subjects are allocated in order to make possibility for deeper studies in materials and high technologies. Three research projects (24 credits (20%) are foreseen in the programme for scientific research working skills training. Subjects “Research projects” are totally assigned for practical works (under supervising of teachers – projects coordinators). 30 credits (25%) are allocated for Final degree project. The expert group observes the subjects “ Research Project 1,2,3” as positive finding.

From the Table 2.4 in SER expert team can conclude that the curriculum design meets the legal requirements. Materials Science second cycle study program data corresponds to the description of the general requirements for master degree programs. However, there is some concern of experts regarding the proportion of the contact hours and hours of student’s independent work in this programme – approximately 19% to 81% (legally required for independent studies - at least 30%). In most European universities this proportion is close to 50-50%, and from the point of European credit system this may appear unfair since the value of credit earned at KTU might differ from that earned at other EU universities. Besides, the system of monitoring and assessing of student’s independent work with such high temporal impact is not developed well enough. The expert team recommends increasing the share of contact hours in future, e.g. by introducing new lecture course(s) on recent developments and trends in material sciences.

Table 2.4 in SER give an overview of the general structure of the programme. The normal academic load of every semester is 30 ECTS, which the expert team finds an acceptable range. In general, the team of experts concludes that the themes of the courses are not repetitive and the structure of the curriculum is in line with what can be expected. Themes of study modules range from fundamentals and basics of science to more specific knowledge regarding technological and physical sciences and are evenly distributed along the programme. They allow for progressive learning and are complementary to allow the development of professional skills and competences for a technology master.

All formal requirements are met and the content of the courses is largely consistent with the type and level of the studies. The expert team recommends to consider to include the courses oriented to social experiences (Table.2.4 SER) into list of obligatory subjects.



S181M546	1	Fundamentals of Business and Finance
S190M016	1	Project Management
S190M407	1	Personnel Management

However, the programme belongs to the technological field and some additional attention should be paid to practice, semester and final projects. Industrial and technological partners should be involved into management of practice and study projects.

According to the changes of the programme starting with the 2016-2017 academic year students will be provided with the possibility to apply competence based study model of alternatives. In this programme students will be able to select 18 (30) credit alternatives from either their own study field or from the complementary (different) study field. At the point of enrolment, a student is free to choose whether he/she prefers to fully remain in the study field and, thus, complete all subjects related solely to the selected study program by becoming the field expert. Or, alternatively, they may select an interdisciplinary expert choice by selecting a preferred 18 (30) credit alternative. Students are provided with an alternative to choose from about 20 competence blocks that complement their main study field. A student is free to choose from the entire list of 20 interdisciplinary competences. Thus, a student in this study program is provided with an opportunity to construct own study programme grounded on the competence based learning, by choosing competences that strategically complement their main field and expert team also hopes that these changes will increase the number of students in this program.

The content of the programme (Table.2.4 SER) reflects in general the latest achievements in materials science. This will be provided by the cooperation between the programme and research institutions as National Open Access Centre for Future Energy Technologies and Science and technology park of Institute of Physics (Santaka). At the same time expert team recommends to increase the participation of the business representatives and as well the research staff of the department in the programme activities (especially in Research Projects). Students are interested in more close participation in research projects of the department.

### ***2.3. Teaching staff***

The legal requirements stipulate that no less than half of the study field subjects must be taught by recognized scientists, which comes down to people who have completed a PhD. The lectures and practical work delivered by 6 professors and 8 associate professors all they have PhD degree and academic experience between 5 and 45 years. The expert team concludes that the programme fulfils this requirement

On the basis of the List of Teachers (Annex 3.2.), it can be concluded that the overall majority of the teaching staff has a PhD degree in physics and materials engineering. Hence the qualifications of the teaching staff are certainly adequate to ensure the programme learning outcomes. Though academic qualifications meet formal requirements, both the programme and students would greatly benefit from improvement of scientific qualifications of the teaching staff responsible for the SMP's related to the hottest scientific and technological topics.

The number of teaching staff 6 professors and 8 associate is sufficient to ensure the learning outcomes of the programme.

Hence, the team of experts concludes that the number and the availability of the teaching staff is adequate to ensure the learning outcomes, expert team is surprised that there are no any assistants and doctoral students in the list of teachers. According to the Table 2.7 in SER the workload of professors and associated professors is rather high and this may reduce the research activity of the academic staff.

**Table 2.7.** Academic annual workload of the program lecturers (Annex 3.2).

Lecturers		Contact work (hours per year)	
		Hours	%
	<i>Professors</i>	432	50
	<i>Associate professors</i>	384	44
	<i>Other</i>	48	6

Expert team recommends that this issue should remain an important point of attention for the university and faculty management.

The structure of academic staff by age groups according to the Table 2.9 for SER seems to be adequate. Also programme management made some changes of the lecturers according to the Table 2.8 from SER. The change of the programme lecturers is controlled by the Department of Physics and the teaching staff of eight SMP's were replaced by new members of staff. The age is the main reason for the lecturers' change. The retired teachers are substituted by qualified lecturers who have been prepared in advance to take their subjects. According to Table 2,9 in SER, the structure of the academic staff by age groups is adequate to ensure provision of the programme

Lecturers according to the Lifelong Learning program ERASMUS subprogram have a possibility to go for teaching or training at foreign higher education institutions. Usually these visits are a short time visits. As example is the Joint Innovative Training and Teaching/learning Program in Enhancing Development and Transfer Knowledge of Application of Ionizing Radiation in Materials Processing. Responsible project leader in KTU - prof. dr. Diana Adlienė. Erasmus+ KA1 mobility action, 2014-2017 (SER page 19). The main mobility aims of the teachers participating in mobility activities were: scientific and teaching visits, the raise of their professional and scientific

qualification in accordance with the Rules of qualification development. Expert team recommends also introducing in the faculty the system of sabbatical leave of the teachers which gives possibilities for longer visits.

The staff in general is involved into the research. The most active period was from 2012-2015, but from 2016 only few research projects exist. The H-index reflecting the activity and quality of publishing in general less than 10 (except prof Tamulevicius). Expert team conclude that teachers must improve more actively scientific qualification and recommends to the university management to support the teaching and research staff activities. The potential of the faculty is high especially due to the cooperation with the research institutions National Open Access Centre for Future Energy Technologies and Science and technology park of Institute of Physics (Santaka).

#### ***2.4. Facilities and learning resources***

Given the small number of students the team of experts deems the number and size of the classrooms is more than sufficient. Students for the practical work also use the laboratories of National Open Access Centre for Future Energy Technologies and Science and technology park of Institute of Physics (Santaka).

Based on the visits of the laboratories, lecture rooms and special laboratories of National Open Access Centre for Future Energy Technologies and Science and technology park of Institute of Physics (Santaka) the expert group can conclude that the teaching and learning equipment (laboratory and computer equipment, consumables) are adequate. The expert group visited also the above mentioned research institutions and emphasized the high level equipment's base which is usable for students and as well teaching staff (research staff) of the department.

Two computer classrooms are available for students and computers were renewed during the last 3-4 years. SER states that the computer classroom No. 506 was renovated in 2014, it has 25 work places. The second computer classroom SC103F has 17 work places, and computers are up to modern standards. An additional access to computer classrooms shared by the university is also available. During the visit, the team of experts was made familiar with computer software available to the students. An impressive number of legal software was installed in computers and was made available to the students either via VPN connection or via Virtual Desktops in the computer cloud. An unlimited number of licenses are available for professional computer programmes like SAS, APL2, MathCad, MatLab. The software is constantly updated and students have free access to cloud based MS Office 365 program package. According to the data provided by SER, about 30 000 EUR were spent for purchase of software licenses. An efficient Moodle environment is made available to the students.

There are enough classrooms for administration of study program. 18 laboratories are specific for the subjects by modules and are used for practical and research work: laboratory of detectors of radiation (4 work places); laboratory of thin films physics and technology (4 work places); two laboratories for optical measurements (11 work places) ; laboratory of vacuum technology ( 4 work places); laboratory of physical technologies ( 14 work places); X-ray laboratory (1 work place), laboratory of solid state and optical systems (16 work places), laboratory of electrodynamics and non-destructive testing methods (18 work places); laboratory of physical modelling ( 2 work places); laboratory of physical processes simulation (4 work places); laboratory of radiometry ( 14 work places); laboratory of dosimetry (12 work places); laboratory of radio spectrometry (2 work places).

The university has adequate arrangements for students practice. The best example is the subject “Research project” (1,2 and 3) (Table.2.4 SER), which continuously gives the students possibility to work in the labs. The programme management has two long-term arrangements with research institutions – Lithuanian Energy Institute and Institute for Materials Science. Among new partners offering places for professional practice are both research institutions (for example, Center for physical science and technology) and companies (UAB Elintos matavimo sistemas, UAB Fudo, UAB Rubedo sistemas, UAB Sportralè, UAB SK Impex Service Center, UAB Brolis Semiconductors etc). Though students and social partners were asking for more collaboration in arrangement of practice places and hours, all formal requirements are met. The HEI provides an adequate arrangements for students’ practice, however, it might be useful to introduce a possibility for individual practice during early semesters. Expert team also recommends to activate the cooperation between the research institutions and the programme and to initiate more topics for the “Research Projects” from the research institutions.

Based on the visit of the library and laboratories expert group can conclude that the electronic journals and databases are available as well for students and researchers from the library or laboratories. All most important databases presented in the university and are accessible.

An initial analysis of SMP’s provided in the Annex has revealed worrisome numbers of printed books unavailable for students. Part of the books was either unavailable at the university bookstore or the amount of books was too low. Nevertheless, during the visit, it was clarified both by the programme management team and by the teaching staff that the university is rapidly replacing printed textbooks with electronic books freely available for students either via e-library, or via an efficient Moodle system. All textbooks crucial to the programme, together with those publications important for the study programme, are available for the students at <https://www.ebooks.ktu.lt/main.php>.

On one hand, it is worth congratulating teachers on the large number of textbooks written by the staff, on the other hand, students would greatly benefit from original worldwide acknowledged courses in English. This would give a good opportunity for the students to increase their English skills and to better prepare themselves for European labour market. Unfortunately, though the number of books in English is adequate, the choice is not diverse and they are not the best in the field.

Electronic databases are available either from computer classes or from the home computer via VPN. An adequate number of subscribed databases is available to the students through the Intranet. Electronic handouts of the lecture slides are also accessible. Thus, overall, the accessibility and adequacy of teaching material is good.

### ***2.5. Study process and students' performance assessment***

Information about the admissions criteria is available on the website of university, and is similar to those of other (State) universities. Expert team points out the big difference between the number of applicants and admitted students (Table 2.11. form SER). The expert team recommends to implement constant action programme in order to attract students' motivation to select this programme.

Despite of intense studies, strict requirements, difficult financial situation of many students and high employment opportunities for students in pre-crisis period of 2004-2008 the “drop-out” rate is not high (Table 2.12 SER). This means that only motivated students study in this program. Overall, the organisation and the study process ensure adequate provision of the programme. However, the rate at which students achieve the learning outcomes should be further improved. In the light of alarmingly high rates of students who did not achieve the grade, the programme management should better motivate students to keep on studying.

All students are encouraged to participate in research over the subjects “Research Project 1,2 and 3”. The conditions for students participation in research are very good because of the partner institutions. Based on the meetings with the students and representatives of the research institutions, the expert team recommends to increase the number of projects initiated by the research institutions and social partners, students are interested to work in these institutions.

The mobility of Materials Science master program students is very low (Table 2.13 SER). Possible reasons of this are that most of the students during the study period got a job and as well the financial situation of the students. The expert team recommends supporting by the mobility of students financially.

Academic and other type of support for the students is regular. Students are supported by constant assistance. Regular and updated actual information about study program, scholarships, study goals and learning outcomes, evaluation of achievements, elective subjects, schedules, and mobility possibilities are ensured by regular renewal (updating) of the university website, the web page of the Faculty, KTU Students information centre and informing students by e-mail, on Facebook and other medias. “KTU Career days” were organized systematically by the university and social partners (Pt. 147 of SER). The department has a flexible Master+ model, where students can choose an additional courses and receive an extra certificate for that. Students can apply for additional scholarships, which are being provided by the Social partners.

The student's performance assessment system is clear and adequate. The methods of assessing student's learning outcomes, and the various components of course grading and evaluation are detailed for each course. The meaning of the grades is explained. In sum, the team of experts concludes that the KUT complies with the criteria of clarity, adequacy, and public availability of the student's performance

assessment system. The assessment system is determined by the Rules of Study Module Results Evaluation approved by the University rector<sup>1</sup>. The evaluation system and criteria are also introduced during the first lecture at the beginning of the semester.

The requirements for assessment of the study module are publicly available at academic database and they can also be accessed individually at [https://uais.cr.ktu.lt/ktuis/stp\\_prisijungimas/](https://uais.cr.ktu.lt/ktuis/stp_prisijungimas/). Students can access this database using their unique login names and passwords. After login their individual results are accessible. Privacy and data protection are guaranteed by encryption protocols. Thus, the system is accessible in an adequate manner.

The defence of the final degree project is public and student answers questions of the reviewer, defence committee and audience.

31 graduates of Materials Science Master study programme graduated the studies during the last five years. The graduates do not experience employment problems. Part of them already has the job before the start of master studies. Social partners are satisfied with the quality of education of the graduates.

## ***2.6. Programme management***

All the responsibilities of every individual actor for the various aspects of the programme and its management are defined clearly and systematized. All relevant aspects are clearly allocated. The bodies that take a final decision are clearly marked.

Paragraph 191-209 of SER give a detailed overview of the information collected for the programme management. These data include programme evaluation, course evaluations of each course, faculty review and performance appraisals, and faculty professional development plans, general freshman's, senior and alumni surveys, and feedback from the stakeholders. This means that information from all the relevant parties involved is collected and analysed on a regular base. Director of the study programme carries responsibility for the content and quality of study programme. University level and Faculty level qualification commissions appointed by orders of the Rector are accomplishing management of human resources. The commission acting in accordance with the Law of Science and Education and Description of the procedure of lecturers and researchers attestation and competition to take positions determines whether lecturers match the qualification requirements, teachers once in five year cadence (term) carries out their attestation and organizes competitions to take positions. Expert team recommends to consider to include into the qualification requirements students' feedback on teachers.

Both lecturers and faculty administration can access evaluation results of all relevant study programme modules and base improvements on the outcomes of internal evaluations. External evaluation is also performed. The questionnaire is distributed to the graduates. It recently demonstrated that students would like to see a tighter connection with practical application of the

subject. According to the Table 2.14 of SER, the Faculty has made several changes (as well the additional information Changes, presented separately) both to the programme and its learning outcomes. However, the expert team also notes that not all recommendations of the internal evaluation have been implemented, as has been shown throughout this report and expert team recommends continuing the improvement of the programme. Also it seems, that external evaluations could be further improved: for example, direct involvement of the social and industrial partners, and motivated alumni (who is professionally active in the same area) in the evaluation process could greatly enhance the overall outcome of external evaluation and address problems in a timely manner.

Representatives of employers – members of Study Programme Committee, Faculty Council, and Qualification committees take part in the process of study quality assessment and improvement by taking collegial decisions on study programmes and its content, study subjects, learning recourses and also by providing proposals on study quality improvement. Stakeholders – employers and graduates – also take part in quality assessment and improvement of programmes through participation in meetings with the faculty, professional practice and personal contacts with lecturers. The feedback received from the stakeholders during the site visit confirmed that, although informal input with the programme management is very good, it needs to be set up in a more formal way.

## **2.7. Examples of excellence**

KTU possesses an exceptionally well organised virtual teaching environment: students can access programmes and data stored in the cloud, virtual classrooms and chatrooms with teaching staff. Large scale investments into computer and software infrastructure largely contribute to unprecedentedly well (for Lithuania) organised teaching process.

Research facilities and highly experienced researches are accumulated in the Faculty of Mathematics and Natural Sciences and support the programme Materials Science. Besides that, research equipment of KTU Materials Science Institute and Laboratory of Hydrogen Energy of Lithuanian Energy Institute is used for research and teaching process of the programme over the subject “Research Project 1,2 and 3” during of whole study process.

## **III. RECOMMENDATIONS**

1. Experts team recommends improving the analysis of the labour market on the basis of feedback provided by social partners, stakeholders, and alumni.
2. The experts team recommends considering inclusion of the courses oriented to social experiences into list of obligatory subjects, and, eventually, a course on recent trends in material science. This would increase the share of contact hours in the programme which seems to be low if compared with Master programmes of other European universities.

3. The expert team recommends increasing the participation of the business representatives and as well the research staff of the department in the programme activities (especially in Research Projects). Students are interested in a closer participation in research projects of the department.
4. The workload of professors and associated professors is rather high and this may reduce the research activity of the academic staff. Expert team concludes that this issue should remain an important point of attention for the university and faculty management.
5. The expert team recommends also introducing in the faculty the system of sabbatical leave of the teachers which gives possibilities for longer mobility visits.
6. Expert team concludes that teachers must improve more actively scientific qualification and recommends to the university management to support the teaching and research staff activities.
7. It deserves to be noted that the number of enrolments and the number of graduates is still low, though improving. The expert team recommends implementing constant action program in order to attract students' motivation to select this programme.
8. The expert team recommends increasing the number of projects initiated by the research institutions and social partners, students are interested to work in these institutions.
9. The expert team recommends the university to support financially the mobility of students.
10. Expert team recommends including the feedback from students into the qualification requirements of the academic staff.
11. The feedback received from the stakeholders during the site visit confirmed that, although informal input with the program management is very good, it needs to be set up in a more formalised way.

#### **IV. SUMMARY**

##### *Strengths*

The content of the programme reflects in general the latest achievements in materials science. This will be provided by the cooperation between the programme and research institutions as National Open Access Centre for Future Energy Technologies and Science and technology park of Institute of Physics (Santaka).

Research facilities and highly experienced researches are accumulated in the Faculty of Mathematics and Natural Sciences and support the programme Materials Science. Besides that, research equipment of KTU Materials Science Institute and Laboratory of Hydrogen Energy of Lithuanian Energy Institute is used for research and teaching process of the program over the subject “Research Project 1,2 and 3” during of whole study process. All students are encouraged to participate in research over the subjects “Research Project 1,2 and 3”. The conditions for students’ participation in research are very good because of the partner institutions.

Academic and other type of support for the students is regular. Students are supported by constant assistance. Regular and updated actual information about study program, scholarships, study goals and



learning outcomes, evaluation of achievements, elective subjects, schedules, and mobility possibilities are ensured by regular renewal (updating) of the university website, the web page of the Faculty, KTU Students information centre and informing students by e-mail, on Facebook and other medias. "KTU Career days" were organized systematically by the university and social partners.

The electronic journals and databases are available for students and researchers from the library or laboratories. All most important databases presented in the university and are accessible.

31 graduates of Materials Science Master study program graduated the studies during the last five years. The graduates do not experience employment problems. Social partners are satisfied with the quality of education of the graduates.

All the responsibilities of every individual actor for the various aspects of the programme and its management are defined clearly and systematized. All relevant aspects are clearly allocated. The bodies that take a final decision are clearly marked.

#### *Areas for improvement*

It deserves to be noted that the number of enrolments and the number of graduates is still low. Expert team recommends improving the analysis of the labour market on the basis of feedback provided by social partners, stakeholders, and alumni. The feedback received from the stakeholders during the site visit confirmed that, although the informal input with the program management is very good, it needs to be set up in a more formal way.

From the 2016-17 academic year the university initiated changes in the curriculum and students will be provided with the possibility to apply competence based study model of alternatives. Also it is planned to open the study programme for students from abroad (English language study program). The expert team recommends to implement constant action program in order to attract students' motivation to select this programme.

The expert team recommends to consider including the courses oriented social experiences into list of obligatory subjects and, eventually, a course on recent trends in material science. This would increase the share of contact hours in the programme which seems to be low if compared with Master programmes of other European universities

The expert team recommends increasing the participation of the business representatives and as well the research staff of the department in the programme activities (especially in Research Projects). Students are interested in a closer participation in research projects of the department. The expert team recommends increasing the number of projects initiated by the research institutions and social partners, students are interested to work in these institutions.

The team of experts concludes that the number and the availability of the teaching staff is adequate to ensure the learning outcomes. The workload of professors and associated professors is rather high and this may reduce the research activity of the academic staff. Expert team concludes that this issue should remain

an important point of attention for the university and faculty management. Expert team recommends including into the qualification requirements of the academic staff the feedback from students.

The expert team recommends also introducing in the faculty the system of sabbatical leave of the teachers which gives possibilities for longer period visits and research activities.

Expert team conclude that teachers must improve more actively scientific qualification and recommends to the university management to support the teaching and research staff activities.

The expert team recommends supporting by the university the mobility of students financially.

## V. GENERAL ASSESSMENT

The study programme Materials Science (state code – 621J50005) at Kaunas University of Technology 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	3
2.	Curriculum design	3
3.	Teaching staff	3
4.	Facilities and learning resources	4
5.	Study process and students' performance assessment	3
6.	Programme management	4
	<b>Total:</b>	<b>20</b>

\*1 (unsatisfactory) - there are essential shortcomings that must be eliminated;

2 (satisfactory) - meets the established minimum requirements, needs improvement;

3 (good) - the field develops systematically, has distinctive features;

4 (very good) - the field is exceptionally good.

Grupės vadovas: Team leader:	Prof. Dr. Laurens Katgerman
Grupės nariai: Team members:	Prof. dr. Andres Öpik
	Prof. Dr. Janis Spigulis
	Dr. Denis Guilhot
	Dr. Sergejus Orlovas
	Dr. Milena Medinickienė

**KAUNO TECHNOLOGIJOS UNIVERSITETO ANTROSIOS PAKOPOS STUDIJŲ  
PROGRAMOS *MEDŽIAGŲ MOKSLAS* (VALSTYBINIS KODAS – 621J50005) 2016-09-26  
EKSPERTINIO VERTINIMO IŠVADŲ NR. SV4-213 IŠRAŠAS**

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**V. APIBENDRINAMASIS ĮVERTINIMAS**

Kauno technologijos universiteto studijų programa *Medžiagų mokslas* (valstybinis kodas – 621J50005) vertinama **teigiamai**.

<b>Eil. Nr.</b>	<b>Vertinimo sritis</b>	<b>Srities įvertinimas, balais*</b>
1.	Programos tikslai ir numatomi studijų rezultatai	3
2.	Programos sandara	3
3.	Personalas	3
4.	Materialieji ištekliai	4
5.	Studijų eiga ir jos vertinimas	3
6.	Programos vadyba	4
	<b>Iš viso:</b>	<b>20</b>

\* 1 - Nepatenkinamai (yra esminių trūkumų, kuriuos būtina pašalinti)

2 - Patenkinamai (tenkina minimalius reikalavimus, reikia tobulinti)

3 - Gerai (sistemiškai plėtojama sritis, turi savitų bruožų)

4 - Labai gerai (sritis yra išskirtinė)

&lt;...&gt;

**2.7. Išskirtinės kokybės pavyzdžiai**

KTU turi ypač gerai organizuotą virtualiąją mokymo aplinką: studentai turi galimybę naudotis „debesyje“ esančiomis programomis ir saugomais duomenimis ir diskutuoti su dėstytojais virtualiose auditorijose ir pokalbių kanaluose. Didelės investicijos į aparatinę ir programinę įrangą gerokai prisideda prie neįprastai puikiai (Lietuvoje) organizuojamo mokymo proceso.

Matematikos ir gamtos mokslų fakulteto materialioji tyrimų bazė ir ypač patyrę tyrėjai didina *Medžiagų mokslo studijų* programos vertę. Be to, KTU *Medžiagų mokslo* instituto ir Lietuvos energetikos instituto Vandens energijos laboratorijos tyrimų įranga naudojama tyrimams ir vykdamas Tiriamojo projekto 1, 2 ir 3 dalis visą studijų laikotarpį.

&lt;...&gt;

## IV. SANTRAUKA

### Stiprybės

Studijų programos turinys apskritai atspindi naujausius medžiagų mokslo pasiekimus. Tą užtikrina studijų programos vykdytojų bendradarbiavimas su tokiomis tyrimų institucijomis kaip Nacionalinis atviros prieigos Ateities energetikos technologijų mokslo centras ir Fizikos instituto mokslo ir technologijų parkas („Santaka“).

Matematikos ir gamtos mokslų fakulteto materialioji tyrimų bazė ir ypač patyrę tyrėjai didina Medžiagų mokslo studijų programos vertę. Be to, KTU Medžiagų mokslo instituto ir Lietuvos energetikos instituto Vandens energijos laboratorijos tyrimų įranga naudojama tyrimams ir vykdamas Tiriamojo projekto 1, 2 ir 3 dalis visą studijų laikotarpį. Visi studentai skatinami dalyvauti tyrimuose studijuojant dalyko „Tiriamasis projektas“ 1, 2 ir 3 dalis. Studentų dalyvavimo tyrimuose sąlygos ypač puikios institucijų partnerių dėka.

Akademinė ir kitokia studentų parama yra reguliari. Studentams teikiama nuolatinė pagalba. Reguliariai teikiama ir atnaujinama aktuali informacija apie studijų programą, stipendijas, studijų tikslus ir rezultatus, pasiekimų vertinimą, pasirenkamuosius dalykus, tvarkaraščius ir judumo galimybes skelbiama universiteto interneto svetainėje, fakulteto tinklalapyje, KTU studentų informacijos centre, taip pat siunčiama studentams el. paštu, skelbiama *Facebook* paskyroje ir kitose žiniasklaidos priemonėse. Universitetas ir socialiniai partneriai sistemingai organizuoja KTU „Karjeros dienas“.

Studentai ir tyrėjai bibliotekoje ar laboratorijose gali naudotis elektroniniais žurnalais ir duomenų bazėmis. Universitetas suteikia galimybę naudotis visomis svarbiausiomis duomenų bazėmis.

Per pastaruosius penkerius metus Medžiagų mokslo magistrantūros studijų programą baigė 31 absolventas. Baigusieji studijų programą nesusiduria su įsidarbinimo problemomis. Socialiniai partneriai patenkinti absolventų išsilavinimo kokybe.

Kiekvieno atskiro veikėjo atsakomybė už įvairius studijų programos aspektus ir jos vadybą yra aiškiai apibrėžta ir susisteminta. Visi svarbūs aspektai aiškiai paskirstyti. Galutinį sprendimą priimančias asmenys aiškiai nustatyti.

### *Tobulintinos sritys*

Verta paminėti, kad į studijų programą priimamų ir ją baigusių studentų skaičius vis dar mažas. Ekspertų grupė rekomenduoja gerinti darbo rinkos analizę remiantis socialinių partnerių, socialinių dalininkų ir absolventų grįžtamoju ryšiu. Vizito į universitetą metu išklaudyta socialinių dalininkų nuomonė patvirtino, kad nors neformalus indėlis į programos vadybą yra labai geras, jis turėtų būti formalus.

2016–2017 akademiniiais metais universitetas keitė studijų turinį ir studentams suteikė galimybę taikyti gebėjimais grįstą alternatyvų studijų modelį. Taip pat planuojama pristatyti studijų programą užsienio studentams (studijų programa anglų kalba). Ekspertų grupė siūlo įgyvendinti nuolatinių veiksmų programą, siekiant motyvuoti studentus rinktis šią studijų programą.

Taip pat rekomenduojama apsvarstyti įtraukti į socialinius aspektus orientuotus dalykus į privalomųjų dalykų sąrašą, ir galiausiai – kursą apie naujausias medžiagų mokslo tendencijas. Taip padidėtų studijų programos kontaktinių valandų dalis, nes kol kas ji atrodo nedidelė, palyginti su kitų Europos universitetų magistrantūros studijų programomis.

Ekspertų grupė rekomenduoja didinti verslo atstovų ir katedros tyrėjų dalyvavimą programos veiklose (ypač vykdant tiriamuosius projektus). Studentai domisi intensyvesniu dalyvavimu katedros vykdomuose tyrimų projektuose. Ekspertų grupė rekomenduoja didinti tyrimų institucijų ir socialinių partnerių inicijuojamų projektų skaičių, nes studentai suinteresuoti dirbti šiose institucijose.

Ekspertų grupė daro išvadą, kad dėstytojų skaičius ir prieinamumas pakankami studijų rezultatams užtikrinti. Profesorių ir docentų darbo krūvis ganėtinai didelis, todėl gali nukentėti jų tiriamaoji veikla. Pasak ekspertų, universiteto ir fakulteto vadovybė turėtų ir toliau skirti didelį dėmesį šiam klausimui. Ekspertų grupė rekomenduoja į dėstytojų kvalifikacinius reikalavimus įtraukti studentų grįžtamąjį ryšį.

Ekspertai taip pat siūlo įdiegti dėstytojų kūrybinių atostogų sistemą fakultete, suteikiant galimybę ilgesniems vizitams ir tiriamajai veiklai.

Ekspertų grupė daro išvadą, kad dėstytojais privalo aktyviau kelti savo mokslinę kvalifikaciją, ir rekomenduoja universiteto vadovybei remti dėstytojų ir tyrėjų veiklą.

Ekspertų grupė rekomenduoja universitetui finansiškai remti studentų judumą.

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### **III. REKOMENDACIJOS**

1. Ekspertų grupė rekomenduoja gerinti darbo rinkos analizę remiantis socialinių partnerių, socialinių dalininkų ir absolventų grįžtamuoju ryšiu.

2. Taip pat rekomenduojama apsvarstyti įtraukti į socialinius aspektus orientuotus dalykus į privalomųjų dalykų sąrašą, ir galiausiai – kursą apie naujausias medžiagų mokslo tendencijas. Taip padidėtų studijų programos kontaktinių valandų dalis, nes kol kas ji atrodo nedidelė, palyginti su kitų Europos universitetų magistrantūros studijų programomis.

3. Ekspertų grupė rekomenduoja didinti verslo atstovų ir katedros tyrėjų dalyvavimą programos veiklose (ypač vykdant tiriamuosius projektus). Studentai domisi intensyvesniu dalyvavimu katedros vykdomuose tyrimų projektuose.

4. Profesorių ir docentų darbo krūvis ganėtinai didelis, todėl gali nukentėti jų tiriamaoji veikla. Pasak ekspertų, universiteto ir fakulteto vadovybė turėtų ir toliau skirti didelį dėmesį šiam klausimui.

5. Ekspertai taip pat siūlo įdiegti dėstytojų kūrybinių atostogų sistemą fakultete, suteikiant galimybę ilgesniems judumo vizitams.

6. Ekspertų grupė daro išvadą, kad dėstytojais privalo aktyviau kelti savo mokslinę kvalifikaciją, ir rekomenduoja universiteto vadovybei remti dėstytojų ir tyrėjų veiklą.

7. Verta paminėti, kad į studijų programą priimamų ir ją baigusių studentų skaičius vis dar mažas, nors šis rodiklis gerėja. Ekspertų grupė siūlo įgyvendinti nuolatinių veiksmų programą, siekiant motyvuoti studentus rinktis šią studijų programą.

8. Ekspertų grupė rekomenduoja didinti tyrimų institucijų ir socialinių partnerių inicijuojamų projektų skaičių, nes studentai suinteresuoti dirbti šiose institucijose.

9. Ekspertų grupė rekomenduoja universitetui finansiškai remti studentų judumą.

10. Ekspertų grupė rekomenduoja į dėstytojų kvalifikacinius reikalavimus įtraukti studentų grįžtamąjį ryšį.

11. Vizito į universitetą metu išklaudyta socialinių dalininkų nuomonė patvirtino, kad nors neformalus indėlis į programos vadybą yra labai geras, jis turėtų būti formalesnis.

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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)