



CENTRE FOR QUALITY ASSESSMENT IN HIGHER EDUCATION

EVALUATION REPORT
STUDY FIELD of MATERIALS TECHNOLOGY
AT KAUNAS UNIVERSITY OF TECHNOLOGY

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Study Field Data

Title of the study programme	Materials Physics and Nanotechnology*	Materials and Nanotechnology
State code	6122FC001	6121FX005
Type of studies	University studies	University studies
Cycle of studies	First	First
Mode of study and duration (in years)	Full-time (4 years)	Full-time (4 years)
Credit volume	240	240
Qualification degree and (or) professional qualification	Bachelor of Technology and Physical Sciences Double degree	Bachelor of Technology Sciences
Language of instruction	Lithuanian, English	Lithuanian, English
Minimum education required	Secondary education	Higher education
Registration date of the study programme		

* *two-fields (bidirectional programme) study program in the study field*

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I. INTRODUCTION

1.1. BACKGROUND OF THE EVALUATION PROCESS

The evaluation of study fields is based on the Methodology of External Evaluation of Study Fields approved by the Director of the Centre for Quality Assessment in Higher Education (hereafter – SKVC) 31 December 2019 Order [No. V-149](#).

The evaluation is intended to help higher education institutions to constantly improve their study process 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 (hereafter - SER) prepared by Higher Education Institution (hereafter – HEI); 2) site visit of the expert panel to the higher education institution; 3) production of the external evaluation report (EER) by the expert panel and its publication; 4) follow-up activities.*

On the basis of this external evaluation report of the study field SKVC takes a decision to accredit study field either for 7 years or for 3 years. If the field evaluation is negative then the study field is not accredited.

The study field and cycle are **accredited for 7 years** if all evaluation areas are evaluated as exceptional (5 points), very good (4 points) or good (3 points).

The study field and cycle are **accredited for 3 years** if one of the evaluation areas was evaluated as satisfactory (2 points).

The study field and cycle are **not accredited** if at least one of evaluation areas was evaluated as unsatisfactory (1 point).

1.2. EXPERT PANEL

The expert panel was assigned according to the Experts Selection Procedure (hereinafter referred to as the Procedure) as approved by the Director of Centre for Quality Assessment in Higher Education on 31 December 2019 [Order No. V-149](#). The site visit to the HEI was organized on the 21 of November 2022.

1.3. GENERAL INFORMATION

The documentation submitted by the HEI follows the outline recommended by 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.	Additional information "Explanation of experts' questions".
2.	Additional information placed in cloud.ktu.edu:
2.1	Documents about the internal quality system;
2.2.	Ph.D. fields are presented in the newer version of Annex 4;
2.3.	Regulation of recognition accreditation;
2.4.	Study field Committee reports and plans;
2.5.	Some survey results;
2.6.	Teaching staff evaluation documents;
2.7.	Funded research projects with students;
2.8.	Practice placements;
2.9.	Publications and other scientific production;
2.10.	Students in programmes.

1.4. BACKGROUND OF THE STUDY FIELD/STUDY FIELD POSITION/STATUS AND SIGNIFICANCE IN THE HEI

Kaunas University of Technology (hereafter - KTU) is a technical university in Kaunas, Lithuania, that originated from the University of Lithuania after the reorganisation of the Higher Courses established in 1920. KTU employs –1994 employees (926 academic staff, 36 foreign) and 7 689 students, 5154 of whom are Bachelor students, 2071 - Master students, 70 - Integrated Master students, 363 - Doctoral students, 31 -professional education students, and 723 foreign students. KTU has 9 faculties, a library, 8 research institutes. KTU offers 98 study programmes (hereinafter referred to as SPs) in bachelor and master level, and 19 in doctorate level.

The study programmes under evaluation: the 1st cycle "Materials Physics and Nanotechnology" (the only bidirectional study programme of physical sciences and technology in Lithuania, started in 2019) and "Materials and Nanotechnology" are realised by the Department of Physics at the Faculty of Mathematics and Natural Sciences (hereafter - MGMF), integrating the KTU Institute of Materials Science.

At the beginning of 2019, the process of optimisation of the SP portfolio of the Department of Physics was initiated to ensure the efficient use of resources, a sustainable number of students, and the quality of studies (SER, Annex 5). One of the 1st cycle SP "Materials and Nanotechnology" will be closed when the last student will graduate, and Master SP "Materials Science" is actually closed this year because the admission was stopped in 2020, and all students have graduated (SER, p.2, Annex 5, Strategic plan for the development of the Materials

Technology study field). Currently, there is still one student in the SP “Materials and Nanotechnologies”, therefore this SP is included in the evaluation report.

II. GENERAL ASSESSMENT

Materials Technology field study and first cycle at Kaunas University of Technology (KTU) is given **positive** evaluation.

Study field and cycle assessment in points by evaluation areas

No.	Evaluation Area	Evaluation of an Area in points*
1.	Intended and achieved learning outcomes and curriculum	4
2.	Links between science (art) and studies	4
3.	Student admission and support	5
4.	Teaching and learning, student performance and graduate employment	4
5.	Teaching staff	4
6.	Learning facilities and resources	5
7.	Study quality management and public information	4
	Total:	30

*1 (unsatisfactory) - the area does not meet the minimum requirements, there are fundamental shortcomings that prevent the implementation of the field studies;

2 (satisfactory) - the area meets the minimum requirements, and there are fundamental shortcomings that need to be eliminated;

3 (good) - the area is being developed systematically, without any fundamental shortcomings;

4 (very good) - the area is evaluated very well in the national context and internationally, without any shortcomings;

5 (excellent) - the area is evaluated exceptionally well in the national context and internationally.

II. STUDY FIELD ANALYSIS

3.1. INTENDED AND ACHIEVED LEARNING OUTCOMES AND CURRICULUM

3.1.1. Evaluation of the conformity of the aims and outcomes of the field and cycle study programmes to the needs of the society and/or the labour market (not applicable to HEIs operating in exile conditions)

The analysis of the needs of the labour market in the EU and Lithuania with respect to the study field (hereafter - SF) under evaluation is given in SER, p. 12-17. For example, a research report commissioned by the Lithuanian Engineering Industry Association (Linpra), "Opportunities for training specialists in Lithuanian institutions to ensure the growth of competitiveness of the engineering industry", points out that there is a shortage of specialists in physics, mathematics, and engineering in Lithuanian industrial companies. This need will increase to 25% by 2025, while 3.6 million jobs will be created in other EU countries.

As stated in SER, Annex 5 (Minutes of the meeting of the SP committee of Materials Technology field of study of the Faculty of Mathematics and Natural Sciences), two SPs from the field under evaluation: 1st cycle SP "Materials and Nanotechnologies" and 2nd cycle SP "Materials Science", were retained from the admissions in 2020 and planned to end in 2022. Instead of SP "Materials Science", an interdisciplinary SP "Material Physics" is offered in the Physics study field.

In the strategic plan for developing the 2nd cycle studies of the Materials Technology field for 2021-2026, the plans for developing a new second cycle SP with a preliminary title "Physical Semiconductor Technologies". The content of this programme will be aligned with partner universities in Taiwan, which are leading in the field of semiconductor physics.

The study field of "Materials Technology" is under reconstruction at this point in time. Currently, there is no one active master's programme in this field, however, there is an alternative where students can continue their studies after graduating bachelor programme - an interdisciplinary master's programme "Materials Physics" that is already accredited for the maximum term in another field of studies. As can be concluded from the discussions with the administration, the main reason for the freezing of the admission of the two SPs is the insufficient number of students, so the current situation is to some extent caused by objective facts. However, for the development of the study field under evaluation - Materials Technology, it would be recommended that there should be some SP at the Master level as a direct continuation of the bachelor level, especially considering the industry's stated need for graduates of this direction. In view of the information provided about the opening of a new second-cycle SP, this process should be hastened.

3.1.2. Evaluation of the conformity of the field and cycle study programme aims and outcomes with the mission, objectives of activities and strategy of the HEI

The SPs reflect the mission of KTU to provide research-based studies of the international level, to create and transfer knowledge and innovative technologies for sustainable development of the state and development of innovations, and to form an open creative environment that inspires talents and leaders (SER, p.17). As reported, KTU's strategic priorities are the unity of studies and science, cohesion with industry and business, interdisciplinary research, and studies, in line with the needs of the Lithuanian and EU economy, which lead to striving to conduct interdisciplinary studies. As reported (SER, p. 18), the competitive advantage of the KTU SPs in the field of Materials Technology, is the application of knowledge of materials physics and physical technologies to solve various engineering problems, the formation of functional materials and their structures, and the development of new materials using experimental and numerical methods. The objectives of the SP in the field of Materials Technology at KTU are presented in SER, Table 1.3 in subsection 1.3.

The SP aims, and outcomes correspond well with the mission, objectives, and strategy of KTU. The studies are interdisciplinary, with an international touch and a strong drive toward science.

3.1.3. Evaluation of the compliance of the field and cycle study programme with legal requirements

The study plans are presented. The first cycle study programmes are performed in compliance with the Description of Study Cycles (Order No. V-1012 of the Minister of Education and Science of the Republic of Lithuania, 2015) and the Description of General Requirements for the Provision of Studies (Order No. V-1168 of the Minister of Education, Science of the Republic of Lithuania, 2016) and Descriptor of the Study field of Technological Sciences (Order No V-922 of the Minister of Education and Science of the Republic of Lithuania of 27 July 2015).

The number of credits per module is determined based on the learning outcomes, considering the amount of time required to achieve the learning outcomes. As a rule, 1 ECTS credit or 26.67 hours of contact and self-directed work is allocated per learning outcome.

Table No. 1. Compliance of the programmes “Materials Physics and Nanotechnology” and “Materials and Nanotechnology” with the general requirements for first cycle study program.

Criteria	Legal requirements	In the Program
Scope of the programme in ECTS	180, 210 or 240 ECTS	Yes
ECTS for the study field	No less than 120 ECTS	Yes
ECTS for studies specified by University or optional studies	No more than 120 ECTS	Yes
ECTS for internship	No less than 15 ECTS	Yes

ECTS for final thesis (project)	No less than 15 ECTS	Yes
Contact hours (including distance contact hours)	No less than 20 % of learning (unless otherwise stated in the descriptor of study field)	Yes

The SPs are following the legal requirements. The 1st cycle SP “Materials Physics and Nanotechnology” is a bidirectional SP, having two qualifications, corresponding to the Lithuanian HE regulations.

3.1.4. Evaluation of compatibility of aims, learning outcomes, teaching/learning and assessment methods of the field and cycle study programmes

As stated in the SER, the aim of the SP “Materials and Nanotechnology” is to provide knowledge and competences in materials physics, materials chemistry, micro- and nanotechnology, and their application in the selection and development of new materials and their nano-derivatives for the development of a wide range of engineering and technical solutions (p.21). The aim of the SP “Materials Physics and Nanotechnologies” is to provide a comprehensive knowledge of modern physical technologies for the production and research of materials, micro, and nanotechnologies, and related materials, to be able to select suitable materials or their production technologies for the solution of various engineering problems, as well as to be guided by the theoretical and practical knowledge of physics, material structure, chemistry, and special disciplines (SER, p.22). The bidirectional nature of this SP is reflected both in the formulation of its objectives and in the outcomes to be achieved, which cover both the objectives of the Materials Technology field (synthesis, optimisation, and application of materials to specific problems) and the Physics field (physical technologies, the physical structure of materials, etc.)

The SP “Materials Physics and Nanotechnologies” provides basic knowledge not only in physics and materials sciences but also for example in chemistry and IT. In discussions with students and alumni, one gets the impression that the SP has too much emphasis on the study field’s non-specific basic knowledge from other sectors. It could be concluded that such SP composition was determined by university-level regulation, where, for example, the chemistry and IT modules are provided by other departments, and they are equal for all study fields. The recommendation would be that each of these mandatory modules could be designed in such a way that the content is closer to the needs of the relevant study programme and may be smaller in size. In addition, adding socially oriented or soft skills-developing study subjects should be considered.

3.1.5. Evaluation of the totality of the field and cycle study programme subjects/modules, which ensures consistent development of competences of students

The curricula of SPs “Material Physics and Nanotechnologies”, “Materials and Nanotechnologies”, and “Materials Sciences” in the Materials Technology field, and the links between SP objectives and study outcomes and SP subjects are described in SER,

Annex1. Later, the 2nd level SP “Materials Sciences” was withdrawn from the evaluation process due to the closure of this programme.

Since two of the three SPs in the SF of Materials Sciences have decided to close, there is only one SP active in this study field. For the entirety of the study field, it would be urgent to open master's level SP as soon as possible, in close cooperation with local employers and considering regional interests and development.

3.1.6. Evaluation of opportunities for students to personalise the structure of field study programmes according to their personal learning objectives and intended learning outcomes

KTU 1st cycle students have possibility to take levelling courses before the studies, and a general university study module (at least two 6 ECTS modules) (SER, p. 26). Materials Physics and Nanotechnology SP has a range of alternatives: specialisations, product development projects, personalised sets of modules, advanced internships (SER, p.27), etc.

Despite the low number of students, there are many possibilities to personalise the studies. Additional modules possible for gifted students (participating in GIFTed Talented Academy), etc. KTU feels a sense of care to maximise the choice and variety of opportunities for students.

3.1.7. Evaluation of compliance of final theses with the field and cycle requirements

The preparation and defence of final projects is regulated by the KTU Procedure for the Preparation and Defence of Final Projects and the Methodological Guidelines for the Preparation and Defence of Final Projects of the Faculty of Mathematics and Natural Sciences (SER). The themes/topics for final projects are submitted by the University's research institutes and/or by industry, business and public sector institutions, evaluated and approved by the study programme committee; the list of scored themes/topics over the last 4 years is available (SER, Annex 2). Students prepare their final project under a supervisor or advisor independently, taking courses and classes. The process, rules and requirements are described in detail (SER, p. 26-30).

The themes/topics for final projects are varying from year to year, and so are the number and contribution of social partners. While it is quite natural, given the broadness of the Materials Technology study field, more stability and clear and stable contribution of social partners would increase the attractiveness and sustainability of this study area for both students and their future employers. More systematic and stable involvement of social partners could improve cooperation and help graduates with their future careers.

(1) Strengths:

1. There is a high demand for qualified specialists in the Materials Technology field.
2. The field of study supports interdisciplinarity by providing wider job opportunities after graduation.
3. The possibility of attracting international students is strong since the programs are all available in English

4. All described studies are focused on modern and innovative (both physical and chemical) materials technologies.

(2) Areas for improvement:

1. The given field of study is in a transformational phase towards decreasing the number of SPs in the field, which hinders the assessment of its strategic importance and future perspectives.

2. Integration of industry/business competences and practitioners' knowledge and experiences in the study modules could be much improved.

3.2. LINKS BETWEEN SCIENCE (ART) AND STUDIES

Links between science (art) and study activities shall be assessed in accordance with the following indicators:

3.2.1. Evaluation of the sufficiency of the science (applied science, art) activities implemented by the HEI for the field of research (art) related to the field of study

The Materials Technology study field is following the R&D priorities approved by the KTU Senate and is linked to a plethora of strategic and priority areas (SER p. 31-32). The research field - Materials Engineering R&D activities were evaluated and well rated, scientific activities of KTU's research field of Materials Engineering have a high level of performance and are internationally recognised, internationally competitive published articles and a high number of Ph.D. students have been recognised (SER, page 32).

In 2016-2021, KTU employees published 567 publications in the research field of Materials Engineering (T008) in peer-reviewed scientific journals, including 362 publications in publications with citation index in the Web of Science database of the Institute of Scientific Information; they carried out 87 research projects directly related to the field of study, and the leaders or executors of the research projects are the lecturers of this field of study.

In 2019-2020, the research teams of the MGF and their partners submitted 28 proposals for €43.5 million in the Materials Technology field.

The Materials Technology study field is strongly interdisciplinary and allows a sufficient and broad spectrum of science activities to be linked to its study activities on all levels. There is a high number of successful and productive research groups (SER p. 33), most of which are adequately carrying on high-level international cooperation with partners from Europe and the wider World.

3.2.2. Evaluation of the link between the content of studies and the latest developments in science, art and technology

The Materials Technology study field is using its core and in-depth modules to keep the content of studies in close contact with new trends and directions in science and technology. The modules are linked to the latest developments in science and technology through research projects, semester projects, and final projects. During the modules,

students are encouraged to take an interest in and discuss the latest developments in science and technology (SER,page 34).

There is a strong and clear link between the content of studies and the latest developments in science and technology, both through the modules of the field of study, as well as through the themes of research of final theses.

3.2.3. Evaluation of conditions for students to get involved in scientific (applied science, art) activities consistent with their study cycle

The students have the opportunity to get involved in scientific activities through scientific societies, semester projects, research projects, and final projects at Bachelor's and Master's levels. Besides that, the students could work with academic mentors.

In the last five years, 28 study projects (internships) have been carried out and 12 students were involved in research projects between 2016-2022 (SER, page 35). KTU has an established and effectively functioning academic mentoring system, which evolves about 30-50% of students yearly.

The academic mentoring program/system is working well also in the SF of Materials Technology. There are many high-level publications of the students involved in research activities of research groups of faculties. Companies and social partners are submitting problems/tasks to be solved by students and research teams. All research for final projects is supervised by mentors representing different research groups (list in SER, Annex 2). The number of students involved in such research projects/research internships could still be further improved.

(1) Strengths:

1. The study programmes in the Materials Technology field are directly linked to multiple University's strategic and priority R&D areas.
2. The link between the Materials Technology study field, the content of studies, and the latest developments in R&D is strong and carefully maintained.
3. The range of research areas conducted by KTU researchers is very wide, which allows the students to acquire state-of-the-art knowledge and discover themselves in actual and relevant research topics.
4. The research infrastructure is excellent for the needs of the study field.

(2) Areas for improvement

1. The number of students involved in research projects/research internships can be further improved.

3.3. STUDENT ADMISSION AND SUPPORT

Student admission and support shall be evaluated according to the following indicators:

3.3.1. Evaluation of the suitability and publicity of student selection and admission criteria and process

The admission requirements are properly defined both for Lithuanian and EU/EEA residents and for foreign residents that are not members of EU/EEA.

Regarding the Lithuanian and EU/EEA residents, the admission for the first-cycle study programmes is carried out using LAMA BPO (Association of Lithuanian Higher Education Institutions for Organisation of General Admissions) and the students are admitted to the study programme based on their competitive scores. For the admission to the second-cycle programmes, the procedure is the responsibility of the University, where there is also a competitive score based on a defined formula.

Information about application conditions is publicly available on the websites of the University, the MGMF faculty, LAMA BPO, and other websites/means.

Most of the students have signed study agreements in state-funded places.

The total number of students admitted to the first-cycle study programmes was low (minimum - 9 and maximum - 19). During discussions with the administration, it was explained that the number of applicants due to demographic aspects is decreasing throughout Lithuania. There are some foreign students that were admitted to the first-cycle SPs.

There were reported activities in order to attract both undergraduate and postgraduate students to the SPs. By offering study programs in English, the Faculty has started adequate actions to increase the number of students. However, by attracting foreign students, further efforts are needed to create an international university environment and services for international students, like improving the website, student surveys in English, internal documents, etc.

3.3.2. Evaluation of the procedure of recognition of foreign qualifications, partial studies and prior non-formal and informal learning and its application

There are defined procedures for the evaluation of foreign qualifications and there are some cases of bachelor students that had recognized their partial studies abroad in Lithuania. More cases of recognition of partial studies were reported. Furthermore, regarding procedures of recognition for non-formal and informal learning, one case was reported in the assessment period.

The system needed to recognise foreign qualifications, partial studies, and prior non-formal and informal learning is in place and seems to be working sufficiently. There are factual cases that show the recognition of qualifications in this study field where students can approve their prior learning.

The recognition is based on the KTU Study Results Crediting procedure, and other systems which allow the successful recognition.

3.3.3. Evaluation of conditions for ensuring academic mobility of students.

The students have the possibility to do international mobility under different programmes, namely through Erasmus+. The University has registered the "KTU DISCOVERed International Student Exchange" trademark (SER, page 47) to publicise the

different mobility opportunities for KTU students. Additionally, information about mobility opportunities is given on the website of the University, in newsletters and other publications, and through events organised by the University and by the Faculty, also meetings at the KTU Student Campus.

There are some full-time foreign students enrolled in the different study programmes.

Even during the visit it is not made clear if there is a central International Relations Department at KTU and also if there is some staff at the MGMF to manage studies abroad and international cooperation.

There were some incoming students in the last three academic years. The number of outgoing students is rather low, and it was linked to the Covid-19 pandemic.

It is not clear how many institutions are available for students to go to in the related study field, so this raises the question of plausible mobility destinations.

3.3.4. Assessment of the suitability, adequacy and effectiveness of the academic, financial, social, psychological and personal support provided to the students of the field

The students have different types of support. The academic support is provided through the “GUIDed mentoring programme” (“In 2017-2020, 134 students: 57 students from “Materials Physics and Nanotechnology”, 54 students from “Materials and Nanotechnology”, 23 students from “Materials Science”, participated in the KTU GUIDed Academic Mentoring Programme by having academic advisors and/or research mentors.”, SER page 49), the “GIFTed talent academy”, and by training courses or individual tutoring. Furthermore, the Study Centre of the MGMF, together with the Coordinator of the MGMF Mentoring Programme, organises the additional academic support called “SOS Help” for students that have difficulties in specific modules of the study programmes.

The students can receive scholarships for their achievements, may also apply for social grants and other kinds of help in cases of manifest need. There are different non-formal education programmes that students could get involved. Furthermore, the students can use the services of the KTU Sports and Wellness Centre and receive psychological support at the KTU Career and Service Centre.

KTU has quite a wide range of support services for students in the academic, financial, social, psychological and personal fields. There are special programs in place, such as the Gifted, Guided and so on, which allows students to excel in different subjects and broaden their knowledge next to their curricula.

There are also support systems in place to help students financially with scholarships for great study results, as well as social support mechanisms, when students need additional support.

Students with special needs seem to get all of the support from the University staff in regard to the study process as well as accessibility.

Although one point that raises concern is the integration of international students in the study field as the expert panel has encountered a situation where foreign students are feeling excluded from the community and not always receive the support that is required for them.

3.3.5 Evaluation of the sufficiency of study information and student counselling

The week before the start of their studies, students take part in an "Introductory Week" event, during which they are introduced to all related study process procedures/facilities.

First-year students are assigned a starting mentor, a senior student who introduces them to the University's procedures, helps them to adapt to the academic community, advises them on the current study, learning, and social issues, and assists them in solving other problems.

Information and documents relevant to students are provided on the KTU student intranet Office365, KTU Academic Information System, in the Student Information and Services Centre's periodic weekly newsletter, by e-mails, Faculty information screens, and in information notices distributed by the Faculty. (SER, page 53).

Students' interests are represented by the KTU Students' Representation and the Faculty of Mathematics and Natural Sciences Students' Representation "FUMSA" (SER, page 54).

In each subject teachers provide students with consultations in order to support their work and help them improve their knowledge in the study field. Students have the possibility to take part in an introductory week where they get the needed information about their studies and the University itself.

The expert panel didn't get any negative feedback from the students on this topic and received good feedback on the systems that are currently in place.

(1) Strengths:

1. KTU and the MGF have quite many different types of student support.
2. Involvement in student academic support is very active.
3. Important work has begun, by offering studies in English to attract foreign students.

(2) Areas for improvement

1. Integration of foreign students should be better.
2. International mobility of students could be more intense.

3.4. TEACHING AND LEARNING, STUDENT PERFORMANCE AND GRADUATE EMPLOYMENT

Studying, student performance and graduate employment shall be evaluated according to the following indicators:

3.4.1. Evaluation of the teaching and learning process that enables to take into account the needs of the students and enable them to achieve the intended learning outcomes

Active learning study methods such as project-based activities (project design and visualisation), design thinking, creative workshops, group work, field trips, discussions, interviews, problem-solving sessions, reflection, idea maps, etc., are used to promote student activity and creativity. In addition to the traditional assessment methods such as examination, colloquium, defence of laboratory work, problem solving, laboratory report or project report, other methods are used to assess achievement such as problem solving, engineering project, reflection on performance, self-assessment, etc.

The number and percentage of intermediate assessments of the subject and their percentages are chosen by the lecturer coordinating the module. In addition to the classic forms of assessment (e.g. defence of laboratory works), an additional assessment form "Assessment of student activity (level)" (up to 10% of the final grade) is used, which assesses students' readiness for case analysis, active discussion, participation in debates, case analysis, etc.

During the meetings with the teaching staff as well as students we've received a lot of positive input on the variety of teaching methods that are being used during the studies. Student input on the teaching methods used during the studies is taken into account and is reviewed each semester in order to assure the relevance of the methodology and create opportunities for students to achieve the intended learning outcomes.

Each subject has its own explanation of the way students will be evaluated; of what parts the final grade consists of.

3.4.2. Evaluation of conditions ensuring access to study for socially vulnerable groups and students with special needs

KTU, in organising its activities, implements the Equal Opportunities and Diversity Policy and ensures its application, creating an open environment in which the individual differences, potential, and contribution of all its employees and students are recognised and valued. Every employee and student have the right to work and study in an environment that promotes respect for the dignity of everyone. KTU strives to provide equal opportunities to study and work for all members of the community, including socially disadvantaged groups of students and students with special needs. The University does not tolerate direct or indirect forms of discrimination.

When assessing the study achievements of students with special needs (visual, hearing, mobility, or other disabilities), flexible forms of achievement assessment are applied according to the Faculty's possibilities, adapting to the student's abilities - for example, increasing the font size of exam tasks, extending the time allocated for the assessment of the study achievements, providing the necessary lighting of the examination (assessment)

venue, ensuring the accessibility of the examination venue, and so on. The Study Centre of the Faculty of Mathematics and Natural Sciences informs the lecturer of the subject/module about students with special needs and ensures the adaptation of the academic classes and the place of assessment. The Faculty currently has two students with special needs studying at the Bachelor's level.

During the panel meeting with the students and asked about the accessibility of studies to vulnerable groups, we have received positive feedback on the ability of lecturers to have an individual approach for students who have specific needs.

There have been cases where such students have taken part in the studies and received the required assistance in order to fully take part in the studies.

KTU has a wide variety of different activities to involve all the students in the community.

3.4.3. Evaluation of the systematic nature of the monitoring of student study progress and feedback to students to promote self-assessment and subsequent planning of study progress

Once a year in September, the Department of Studies prepares and submits to the Rector's Office an annual report on the monitoring of students' study results (by faculties and study levels), which includes student progress and pass rates, evaluates the effectiveness of the implementation of new quality measures, discusses the reasons for dropping out and interruption of studies, attendance rates, violations of academic ethics, results of attendance at and testing of levelling courses, and any other relevant information to assess the quality of studies and the systematicity of the monitoring of students' study progress.

Students' achievements are also evaluated after each semester. The Faculty also has a procedure for monitoring and assisting students' study achievements. MGMF Study Centre, the Vice-Dean of Studies and the Mentoring Programme Coordinator are responsible for this monitoring.

The achievement of the study results is assessed by various methods of evaluation of the study results: written examination; written and oral examination; report and defence of the results of laboratory work; simulation/modelling work; problem solving; individual or team project report; oral and poster presentations; presentation and defence of research reports; colloquium; tests with closed and/or open-ended questions; written work (literature review, paper, essay, etc.); Coursework, thesis and its defence.

The evaluation uses guiding principles while providing feedback on assessment results - timeliness, completeness, objectivity, and diversity.

The systems that are currently in place create opportunities to appear various methods of evaluation for the study results. The students have the possibility to get extensive feedback on their results in different subjects and receive consultations in order to reach the level required.

The monitoring is being done by the study centre, vice-dean of studies as well as the mentoring programme coordinator, which keep track of students' academic progress and if there are any indicators, that students require additional support in their studies.

3.4.4. Evaluation of employability of graduates and graduate career tracking in the study field.

KTU, together with other Lithuanian HEI, is connected to a common Career Management Information System, which allows for career monitoring of graduates 6, 12, and 36 months after graduation. Graduate employment is also monitored using the Government Strategic Analysis Center (STRATA) Graduate Career Monitoring Tool providing information on the average income of graduates one year after graduation, the type of occupation they choose, and the share of graduates in high- or low-skilled jobs.

In 2020 only 14 out of 23 first-cycle graduates were employed within 1 year, many of whom continued their studies in the second cycle, and 5 out of 5 second-cycle graduates were employed. In general, undergraduate and postgraduate graduates report that it is not difficult to find a job related to their degree programme and that their studies have provided them with the necessary skills to find the job they want. This does coincide well with the social partners' positive comments.

KTU has a great connection with the alumni of the programme, which allows the Faculty to have a good approach towards following the career of graduates. The Faculty has round table discussions with the alumni as well as employers to review the programme and provide good support measures for improving the studies.

The Faculty tries to keep track of the career paths that the graduates take.

3.4.5. Evaluation of the implementation of policies to ensure academic integrity, tolerance and non-discrimination

KTU administration ensures compliance with the University Statute and the KTU Provisional Academic Regulations. The Code of Academic Ethics is enforced by the Board of Academic Ethics. The University has a description of the procedures for the organisation and conduct of module assignments, the aim of which is to ensure the fairness, transparency and quality of assignments at the University. Preventive measures are used to ensure academic integrity: students are identified during examinations by presenting an identity card, most of the assignments are written, examinations are conducted by a board of examiners, the examination tasks are updated annually, and each laboratory or term paper is presented by the student who has done it to check whether the student has done it independently. Teachers receive regular training on how to formulate assignments to ensure academic integrity.

If a case of academic dishonesty is identified, an academic dishonesty report is completed for further analysis and decision by the Dean of the Faculty or the Academic Misconduct Committee.

During the period of 2017-2020, 4 undergraduate students in the field of Materials Technology have been subject to sanctions, including 3 students reprimanded for academic dishonesty in 2018/2019 (Academic misconduct was recorded at the time of the final examination in January 2019), including 1 student expelled from the University

in the same year after a repeated violation of academic dishonesty (date of the order - 11.04.2019). In 2017/2018, 2 students were reprimanded for non-attendance of academic classes.

KTU takes the academic integrity topic in high regard, having different policy papers in place in order to tackle the issues. There haven't been a lot of cases of academic integrity breaches in the Faculty. But if such a case should arise, the Faculty has measures in place to tackle the situation and have an objective approach towards solving it.

3.4.6. Evaluation of the effectiveness of the application of procedures for the submission and examination of appeals and complaints regarding the study process within the field studies

The University has a Student Appeals and Complaints Procedure. An appeal can be made against a written decision taken against a student by the University where the decision may have been made in breach of academic ethics, procedures and/or technical errors.

Before submitting an appeal or complaint, the student must consult the documents and other relevant information governing the area in which the violation may have occurred and, if necessary, consult with the Vice-Dean of Studies of his/her Faculty. If possible, it is recommended that the problem be first taken up with the University staff member/student concerned. During the analysed period (2017-2020), there were no appeals or complaints regarding violations of academic ethics or students' rights and legitimate interests.

The expert panel didn't get any responses from the meetings regarding this topic. It does seem that the current system in place should function but due to the lack of appeals and complaints it's difficult to reach a conclusion on how effective the system actually is.

(1) Strengths:

1. Studies are well accessible for vulnerable groups.
2. Available assistance for students is of very wide range.

(2) Areas for improvement:

1. Choice options of elective courses are limited.

3.5. TEACHING STAFF

Study field teaching staff shall be evaluated in accordance with the following indicators:

3.5.1. Evaluation of the adequacy of the number, qualification and competence (scientific, didactic, professional) of teaching staff within a field study programme(s) at the HEI in order to achieve the learning outcomes

All teaching staff has a doctoral degree. Most of the teaching staff are Professors (19%) and Associated professors (43%). The numbers of associate professors and professors are increasing with the upgrading of teachers' qualifications; all lecturers have extensive

teaching experience (SER, Annex 4 contains all 69 CV's). Furthermore, they also have extensive practical work experience in the subject areas they taught.

The average ratio of lecturers to students in the study field is 0.69 (increasing from 0.56 in 2018-2019 to 0.86 lecturers/students in 2021-2022) (SER, page 74).

There is special attention to including professionals from the industry in the teaching staff. The number of the teaching staff from industry has increased, from 12 to 16 over the last three years (SER, page 74).

The share of English-speaking lecturers (at least at B2 level) to the total number of lecturers teaching subjects in the SF programmes was 50.75 % in the period 2021-2022, 53.86 % in 2020-2021, 52.59 % in 2019 -2020, and 52.22 % in 2018-2019 (SER, page 74).

Table No. 3. Materials Physics and Nanotechnology program lecturers' compliance with the requirements for the first cycle studies

Requirement stated in Description of General Requirements for the Provision of Studies	In the <i>Materials Physics and Nanotechnology</i> study program of the first cycle
No less than 50% of the first-cycle university level subjects of study field must be taught by scientists/researchers or renowned artists (art subjects).	Yes.

The ratio of 0.86 lecturers/students in 2021-2022 is very high and guarantees excellent access of students to teachers. The spectrum of academics is quite well balanced including both highly experienced (20-44 years) professors and a high number of younger academics. The gender balance is also good slightly towards females for younger and males for senior professors. The increasing involvement of teachers from industry helps to keep the study modules in contact with the needs of industrial partners and employers.

3.5.2. Evaluation of conditions for ensuring teaching staffs' academic mobility (not applicable to studies carried out by HEIs operating under the conditions of exile)

The teaching staff has the opportunity to perform Erasmus+ mobility for teaching and training, where in the last five years 13 (45%) of the lecturers of the Department of Physics have participated (SER, page 76). Furthermore, there were 10 (34%) incoming lecturers from the Department of Physics. The Erasmus+ Teaching Visits enable the promotion and adoption of new pedagogical methods and encourage teachers to broaden and enrich the range and content of their study modules.

The number of outgoing teaching staff is quite good with 45% of the total number of teachers, while the incoming number is low, only about 1/3 of the total. Higher mobility and exploring other means for mobility and cooperation beyond Erasmus + (COST actions, Horizon 2020 and beyond, International Training Networks (ITN), etc.) would strengthen internationalisation and contacts with colleagues elsewhere.

3.5.3. Evaluation of the conditions to improve the competences of the teaching staff

The teaching staff has the possibility to develop their didactic competences through the EDU_Lab Teaching and Learning Competence Centre, which has been operating for six years (SER, page 76), participating in basic didactic competences development training and other training on innovative study methods. This EDU_Lab also organises curriculum design training and curriculum analyses with study programme committee members and lecturers in the fields of study. Furthermore, KTU organises continuous opportunities for staff development by offering one module per semester for the renewal of their competences and acquisition of necessary skills.

Regarding scientific activities, the teaching staff participates in national and international scientific and scientific-practical conferences/events that can be funded mainly by national funds.

The University aims to ensure that academic and administrative staff have at least Advanced English (B2) competences, and that lecturers and tutors who lecture and teach in English have Proficient English (C1) competences. English studies are organised during working hours, and the costs of the courses are covered by the employer (usually the Faculty) (SER, page 77).

It is obvious that KTU is investing in the improvement of the competences of their teachers and lecturers. It is not clear how adequate the financial support that the teaching staff has for participating in both national and international events is.

(1) Strengths:

1. High lecturer/student average ratio allows close contact between teaching staff and students.
2. Teaching experience and practical work experience are well related to the study subjects.

(2) Areas for improvement

1. International mobility and projects could be a subject for improvement.
2. Participation in international projects should be more intense.
3. The integration of business/industry representatives into the study process could be enhanced.

3.6. LEARNING FACILITIES AND RESOURCES

Study field learning facilities and resources should be evaluated according to the following criteria:

3.6.1. Evaluation of the suitability and adequacy of the physical, informational and financial resources of the field studies to ensure an effective learning process

Currently, the MGMF contains 13 auditoriums with a total of 510 workplaces. All auditoriums have been refurbished in the last 5 years. In addition, the Faculty has two well-equipped computer classes. The infrastructure is well-adapted for people with disabilities. This is strengthened by the project “Thresholds” which focuses on the accessibility of KTU premises, facilities, and equipment for people with special needs.

The Faculty possesses 5 teaching laboratories dedicated to fundamental physics and uses the Physics Laboratory Center with 18 laboratories for the needs of more extensive laboratory work and research projects, including but not limited to the Radiation Detector Laboratory, Laboratory of Physical Modelling, and so on. In addition, part of the laboratory work takes place at the KTU Institute of Materials Science and Lithuanian Energy Institute. All study material is hosted in the Moodle virtual learning environment.

For individual student work, there are 27 workstations (including 10 computerised ones, meaning a complete computer setup) in the reading room of the Faculty's library, as well as the SC103F computerised lecture room for students to use during their free time. There are 174 (32 computerised) workstations in the KTU Central Library. In general, The University Library has 916 workstations, including 380 individual workstations, 260 group workstations, 122 computer workstations, and 11 workstations for the disabled. The Multifunctional Centre with integrated library space has 346 workstations, including 113 individual workstations, 114 group workstations, 18 computer workstations, and 2 workstations for people with disabilities. The Library of Science and Technology has 68 000 books, of which 25 800 are in the open reading room. Furthermore, the University offers access to electronic databases, which are accessible via VPN from home computers. It acquires about 13000 new publications each year and orders new books according to the applications of lecturers. Students can access a variety of electronic books from EBSCO, ScienceDirect (Elsevier eBooks), ProQuest Ebook Central, SpringerLINK, and other collections.

Students can also access Microsoft Office software, programming, and mathematics software such as Matlab, Statistica, etc. Furthermore, design and engineering software such as Autodesk Inventor, Solidworks are also accessible to the students.

Reacting to the pandemic, the Faculty has prepared video presentations on different experiments. They also have 4 large auditoriums for hybrid teaching. They used the Moodle system before the pandemic; thus, this helped them to react well and extend the online material in the process.

The resource infrastructure accessible to the students of the Materials technology field is of the highest standards. The number of workplaces for study, post-study activities, and research strongly exceeds the number of students, which means there are no restrictions that could impact the performance of the students, and their complete focus can be dedicated to the completion of the studies.

3.6.2. Evaluation of the planning and upgrading of resources needed to carry out the field studies

The University is annually investing into the renewal of its infrastructure and implementing several projects at the moment of external evaluation. Some good examples of investing in the resources in 2022 were a multifunctional centre with an integrated library space and renovated learning spaces and a new student information centre, bringing together all student services in one place.

Currently, a project for the development of the interdisciplinary prototyping laboratory centre "M-Lab" at KTU is being implemented, which will create an infrastructure for scientific, technological and experimental development activities; thus, will not only be able to carry out research, but also to develop, produce and demonstrate prototypes that will be useful to society.

Other investments at the moment are updating the laboratory of optical measurements, and creation of space for students and teaching staff. Furthermore, they are updating computer workspaces and software, as well as related textbooks. The total cost of ongoing investments is estimated at ca. 16000 EUR.

The solid planning and upgrading of resources is proven by the most recent establishments of facilities, including but not limited to the upgrading of the state-of-the-art library. While the well-listed ongoing investments are not of a large scale, this does not mean that larger investments are required at the moment in time. In case there is a need, both students and teaching staff can participate in the development of the resources.

(1) Strengths:

1. The premises are larger than currently necessary; thus, there is a possibility that more students could be attracted to the study field.
2. The study field has at its disposal a very modern library and state-of-arts classrooms.

3.7. STUDY QUALITY MANAGEMENT AND PUBLIC INFORMATION

Study quality management and publicity shall be evaluated according to the following indicators:

3.7.1. Evaluation of the effectiveness of the internal quality assurance system of the studies

According to the SER, the internal quality of studies is ensured by the implementation of the internal quality assurance system approved by the resolution of the KTU Senate and based on the ESG for QA as well as EFQM. (KTU Senate Resolution No. 49, 2010-07-02). Short information is given on the homepage of KTU (<https://ktu.edu/studiju-kokybe/#1496822127464-c06dd010-e9c5>). The University's internal quality assurance system is described in the Quality Manual (Quality Manual, approved by the Resolution of the Senate of Kaunas University of Technology V3-S-45 of 11 June 2014.). Additional material, provided by KTU (in 2022-11-15) showed that the Quality Manual was cancelled in 2022-10-5 by the Senate resolution Nr. V3-S-42, and a new system is approved "Description of KTU studies internal quality assurance system (free translation from Lithuanian)". Plans for rising study quality also were provided additionally. However, the material was provided in Lithuanian making it difficult to access. Examples of formal alumni and employer survey results were also provided. Additionally, it was mentioned that also discussions are held where the newest trends in the field are discussed with alumni, employers and lecturers. According to SER (p.88), the MGMF coordinates and ensures the implementation of the SPs in the Materials Technology field of study and the allocation of resources. The Council of the Faculty of Mathematics and Natural Sciences and the Dean of the Faculty ensure the implementation of the University's research and

study policy and the efficiency of processes at the Faculty and take decisions on the initiation and closure of study programmes, the competitiveness and quality of the portfolio of SPs. The Faculty Council annually presents ongoing and planned SPs, and major curriculum changes, approves study programme curricula, discusses SP perspectives and receives feedback from social stakeholders. The Faculty Council proposes to the Rector of the University the composition of the study programme committee of the field. The Faculty has a Faculty Study Committee (FSC), which provides suggestions and recommendations to the Dean on the development of the Faculty's portfolio of SPs. The head of the joint study programme committee for Physics, Materials and Medical Technologies and the relevant study programme committee are responsible for the management of the field of study, with the involvement of social partners from business (industry and employers), student representatives and lecturers.

KTU has a long tradition in internal quality assurance, its internal quality assurance system has been developed and is currently updated, and it seems to be working well overall. As a minus - the University is inclined to become internationally recognized, this means that additional efforts must be made to translate all relevant material, such as the description of the quality assurance system, into English and/or other important languages on the website and internal systems.

3.7.2. Evaluation of the effectiveness of the involvement of stakeholders (students and other stakeholders) in internal quality assurance

According to SER, students and other stakeholders are involved in the quality assurance process. Student representatives are included in the Council, the Senate, the study programme committees, and working groups. The study programme committee (SPC) is composed of at least 3 social partners from business, at least 2 students, and 5 lectures from physics and materials technology. Additionally, after the expert's request, examples of student survey questionnaires and some results were provided. During the discussion with the administration and the self-evaluation team, it was explained that there is an employer's survey twice per year. Additionally, information was provided that at the "local level" employers are surveyed after internships. A new surveying campaign will be launched after the new year. During the discussion, it was mentioned that the representative of the industry in the SPC is selected based on the proposal of the SPC head without any specific criteria.

It was demonstrated that there is student involvement in the internal quality assurance system and cases were demonstrated when the student's opinion was taken into account, mainly via discussions. There are also some contacts with social partners and some employers, but the involvement is not systematic enough, it is rather based on some private contacts. Discussion once per year is quite an acceptable method but not enough. It is recommended to improve both the student's feedback system, especially what concerns the actions after the student surveys, and the employers. Concerning the involvement of the social partners, a more formalised and systematic system should be introduced, at all levels - at the leadership level, Faculty level, and SPC level. Special

attention should be paid to the involvement/contacts/needs of local municipalities and local industry taking into account that the role of the university in the development of the region cannot be overestimated.

3.7.3. Evaluation of the collection, use and publication of information on studies, their evaluation and improvement processes and outcomes

As stated in SER (p. 92), each academic year, the study programme and its modules, their coherence and content are reviewed and improved, taking into account the observations of students, graduates, employers, and the recommendations of experts, without prejudice to the general requirements of the study programme.

The data collection and publication were properly described, and additional documents and examples were provided. In discussions with students, social partners, and academic staff some points were made where additional effort is needed, especially in ensuring regular and systematic feedback with major employers, especially in the work of the SPC.

Cooperation with leading employers and industries needs to be put on a regular and systematic base since KTU is the driving force for the development of the region. The cooperation and actions towards the involvement of local regional authorities and government need to be put on the priority list not only at the Faculty but also university level.

3.7.4. Evaluation of the opinion of the field students (collected in the ways and by the means chosen by the SKVC or the HEI) about the quality of the studies at the HEI

According to SER (p.92), the improvement of the field of study includes roundtable discussions, evaluation of subjects/modules and lecturers, evaluation of the quality of the study programme, evaluation of the compulsory internship, evaluation of the alternatives (MA+), evaluation of the preparation and defense of the final degree project, the Student Voice survey.

Student surveys are organised after each semester to evaluate the content of the course, teaching methodology, and the competence of lecturers, and to make suggestions (Student Voice survey and Study Modules and Teachers survey). A thorough analysis of the results of the surveys and the feedback received is carried out.

During discussions with students, the opinion arose that students' voices and wishes are heard, and changes are introduced if they are justified. However, it should be taken into account already that the above-mentioned involvement of foreign students in improving the quality of studies should be promoted. In any case, the students emphasised that they were treated as equal partners.

(1) Strengths:

1. There exists a tradition of constant striving for the rising quality of the study and research.
2. The attitude towards students as equal partners is very good.

(2) Areas for improvement:

1. The involvement of social partners, especially the most prominent employers in the improvement of the content development (and quality) of the study field and study programmes should be more intense.

IV. EXAMPLES OF EXCELLENCE

Core definition: Excellence means exhibiting exceptional characteristics that are, implicitly, not achievable by all.

- 1) There is excellent student support having a variety of tools and an attitude towards students as equal partners.
- 2) Excellent research infrastructure and very modern library, state-of-art classrooms.

V. RECOMMENDATIONS

Evaluation Area	Recommendations for the Evaluation Area (study cycle)
Intended and achieved learning outcomes and curriculum	<ol style="list-style-type: none"> 1) Labour market analysis should be improved on the basis of systematic feedback provided by social partners, especially local and national industries, especially the biggest companies on the national level, local government, and alumni. 2) In view of the information provided about the opening of a new second cycle SP, this process should be hastened since at the moment of the evaluation there is only one active SP in the Materials Technology study field. 3) Mandatory university-level modules (IT, chemistry, etc.) should be designed in such a way that the content is closer to the needs of the relevant study programme (and consider reducing their volume in terms of ECTS). 4) In addition, adding socially oriented or soft skills-developing study subjects should be considered. 5) More systematic and stable involvement of social partners in defining themes/ topics for final projects should be ensured.
Links between science (art) and studies	<ol style="list-style-type: none"> 6) The number of students involved in research activities must be further improved.
Student admission and support	<ol style="list-style-type: none"> 7) Reinforce the measures/programmes to attract students for the SPs as the numbers are too low. 8) Incentives for outgoing student mobility should be improved.
Teaching and learning, student performance and graduate employment	<ol style="list-style-type: none"> 9) Involve the largest companies in the field to define the skills required in the labour market. The previous recommendation suggested to “look for new social partners with an industrial profile (possibly outside Kaunas region)”, yet this is still lacking.
Teaching staff	<ol style="list-style-type: none"> 10) International mobilities of both the teaching and the training should be improved.
Learning facilities and resources	-

Study quality
management
and public
information

- 11) It is recommended to improve both, student's feedback systems, especially what concerns the actions after the student surveys. The survey needs to be made accessible also for international students.
- 12) Concerning the involvement of the social partners, a more formalised and systematic approach should be introduced, at all levels - at the leadership level, faculty level, and SPC level. Special attention should be paid to the involvement of local municipalities, and the needs of both local and national industries.
- 13) Improve the content and actions beyond the study programme committee reports.

VI. SUMMARY

Main positive and negative quality aspects of each evaluation area of the Materials Technology study field at Kaunas University of Technology:

The expert's team had an overall very positive impression of the Kaunas Technology university and the work of the Department of Physics at the Faculty of Mathematics and Natural Sciences, including the KTU Institute of Materials Science.

As main positive aspects of the Materials Technology field can be mentioned:

- 1) High demand for a qualified workforce in the field of Materials Technology which is important for industry development.
- 2) High-quality studies, supporting interdisciplinarity and focusing on modern and innovative materials technologies conducted by qualified and experienced academic staff.
- 3) Strong striving to become visible in the international arena, providing studies in English to attract international students
- 4) Very good infrastructure both for research and studies, it is worth mentioning the modern library.
- 5) Excellent student support, providing a variety of tools and ensuring the attitude to treat students as equal partners.
- 6) continuous striving for better quality and rising competitiveness.

Key areas where there would be a need to improve performance is to increase the number of students since the premises and infrastructure allows to attract more students, to stimulate international mobility, both for students and staff, and there is a possibility to involve more industry representatives in the development of the study offer, especially the region's and national key players, but not only, and to cooperate more closely with the local municipality, as the university's role in the region cannot be overestimated.

Finally, we are thanking the Kaunas University of Technology for all the efforts in organising the process of self-assessment, quick reactions to the expert's request for additional information, and smooth and excellent organising of the evaluation visit, as well as constantly striving, to rise the quality of their studies and research.

Expert panel leader

Prof Dr. Gita Rėvalde