CENTRE FOR QUALITY ASSESSMENT IN HIGHER EDUCATION

EVALUATION REPORT

STUDY FIELD of BIOENGINEERING

AT KAUNAS UNIVERSITY OF TECHNOLOGY

Expert panel:

1. **Prof. Dr. Donal McNally (panel chairperson),** *academic;*
2. **Prof. Dr. Ivo Fridolin ,** *academic;*
3. **Dr. Frida Sandberg,** *academic;*
4. **Associate professor Monika Paulė,** *representative of social partners;*
5. **Mr. Dominykas Budrys,** *students' representative.*

Evaluation coordinator – *Ms Evelina Keturakytė*

Report language – English

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Study Field Data*

Title of the study programme	***Biomedical Engineering***
State code	6211EX002
Type of studies	University studies
Cycle of studies	Second
Mode of study and duration (in years)	Full-time (2 years)
Credit volume	120
Qualification degree and (or) professional qualification	Master of Engineering Sciences
Language of instruction	Lithuanian, English
Minimum education required	Bachelor of Engineering Sciences
Registration date of the study programme	28 June 2004

** if there are **joint / two-fields / interdisciplinary** study programmes in the study field, please designate it in the foot-note*

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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 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 is evaluated as satisfactory (2 points).

The study field and cycle are **not accredited** if at least one of evaluation areas is 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 conducted by the panel on *29 April, 2022.* Due to the coronavirus pandemic, the Site Visit was organised online using video-conferencing tool (Zoom).

1. **Prof. dr. Donal McNally (panel chairperson)**, Professor of Bioengineering, School of Mechanical, Materials, Manufacturing Engineering, University of Nottingham, United Kingdom;
2. **Prof. dr. Ivo Fridolin,** Head of Centre for Biomedical Engineering, Tallinn University of Technology, School of Information Technologies, Department of Health Technologies, Estonia;
3. **Dr. Frida Sandberg,** Senior lecturer of Department of Biomedical Engineering, Lund University, Sweden;
4. **Associate professor Monika Paulė,** Representative of Social Partners; CEO, Management Board Member, Co-Founder at LLC "CasZyme", Lithuania;
5. **Mr. Dominykas Budrys,** Student's Representative; Medicine Studies at the Faculty of Medicine, Vilnius University, Lithuania.

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.	EDU_Lab 2021 Activity Report (in Lithuanian)
2.	Videos about new premises of KTU
…	

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

Kaunas University of Technology (hereafter referred to as KTU, the University) gained its university status in 1990. It offers 149 study programmes over 9 faculties, of which 60 are Bachelor's, 71 are Master's, 17 are Doctoral and 1 – non-degree student programmes. Sixty one of these programmes are taught in English. The University has 10,494 students, of which 7,620 are Bachelor's, 2,502 are Master's, 557 are foreign, and 335 are Doctoral students.

The second cycle *Biomedical Engineering* study programme (state code - 6211EX002) (hereafter referred to as the programme) is one of five Second Cycle Masters programmes offered by the Faculty of Electrical and Electronics Engineering (hereafter referred to as the Faculty). It has a very close correspondence with the research priorities of KTU mapping closely to the activities of four of the University's eight research institutes: Biomedical Engineering, Mechatronics, Health Telematics Science and Ultrasound Research. Many of the research projects that form the core of the programme take place within these institutes. The second cycle study programme also has contributions from the Lithuanian University of Health Sciences.

The last external evaluation of the second cycle study programme took place in 2014. The outcome of this review was positive, with the course scoring 22 out of a possible 24 (i.e. receiving the maximum grade in all but two of the evaluation categories). Many of the recommendations that were made in this evaluation were addressed by further clarification of the processes used and information given. Two of the recommendations were addressed with more major changes:

- It is recommended that the curriculum be revised to eliminate some duplication of content in the programme. This has been addressed by replacing the module where overlaps occurred.

- It is recommended that all lecturers should be encouraged by Faculty administration to engage in pedagogical training. This has been addressed by KTU setting up a unit that provides pedagogical training and mentoring support to staff.

II. GENERAL ASSESSMENT

Bioengineering study field and **second 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	5
3.	Student admission and support	4
4.	Teaching and learning, student performance and graduate employment	4
5.	Teaching staff	3
6.	Learning facilities and resources	5
7.	Study quality management and public information	5
	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.

III. STUDY FIELD ANALYSIS

3.1. INTENDED AND ACHIEVED LEARNING OUTCOMES AND CURRICULUM

Study aims, outcomes and content shall be assessed in accordance with the following indicators:

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)

(1) Factual situation

The aim of the *Biomedical Engineering* programme is "To provide interdisciplinary knowledge and skills required for solving health problems with the help of technologies, for analysing of disease diagnostic, treatment and prevention solutions, for design of innovative health monitoring systems, for development of biomedical data processing and analysis algorithms and research of new biomedical technologies."(KTU web)

As stated in SER graduates from the programme work mainly in three areas: 1) as clinical engineers in large Lithuanian hospitals and in companies that supply, install, and maintain medical equipment, 2) as entrepreneurs contributing to innovation related to medical devices and 3) as researchers e.g. entering a doctoral programme.

(2) Expert judgement/indicator analysis

The aims and learning outcomes of the *Biomedical Engineering* programme are perfectly in line with the needs of society and labour market.

Biomedical engineering is a rapidly growing field internationally, and it is expected to continue to grow. There is a need for biomedical engineers in Lithuania. The *Biomedical Engineering* programme at KTU has a strong focus on electronics and computing, which is in line with current trends in digital health.

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

(1) Factual situation

The mission of KTU is "to provide the research-based studies at international level; to develop and to transfer knowledge and innovative technologies for sustainable development of the State and development of innovations; to create an open creative environment which inspires talents and leaders" (KTU web)

(2) Expert judgement/indicator analysis

The aims and outcomes of the *Biomedical Engineering* study programme are in line with the mission of KTU. The aim of the programme to train engineers to solve healthcare problems with the help of technologies, to analyse disease diagnostic, treatment and prevention solutions, to design innovative health monitoring systems, and to develop biomedical data processing and analysis algorithms and research of new biomedical technologies is perfectly in line with the mission of KTU to develop and to transfer knowledge and innovative technologies for sustainable development of the State and development of innovations.

There are strong links between research and education, and about 20% of the graduates continue to doctorate education. The interdisciplinarity of the study programme promotes

cooperation between the different units at KTU, and hence contributes to a creative environment.

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

(1) Factual situation
The second cycle study programme is performed in compliance with the *Descriptor of the Study field of Engineering* (Order No V-964 of the Minister of Education and Science of the Republic of Lithuania of 10 September 2015), *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 and Science of the Republic of Lithuania, 2016).

Table No. 1. Programme's *Biomedical Engineering* compliance to general requirements for *second cycle study programmes*

Criteria	Legal requirements	In the Programme
Scope of the programme in ECTS	90 or 120 ECTS	120 ETC
ECTS for the study field	No less than 60 ECTS	60 ETC
ECTS for studies specified by University or optional studies	No more than 30 ECTS	30 ETC
ECTS for final thesis (project)	No less than 30 ECTS	30 ETC
Contact hours (including distance contact hours)	No less than 10 % of learning (unless otherwise stated in the descriptor of study field)	>26%

(2) Expert judgement/indicator analysis
The second cycle Biomedical Engineering study programme complies with the legal requirement. The students of the programme benefit from significantly more contact hours than legally required.

The aims of the programme (cf Sec 3.1.1) comply with the *Descriptor of the Study field of Engineering* (Order No V-964 of the Minister of Education and Science of the Republic of Lithuania of 10 September 2015). The intended learning outcomes of the programmes (Sec 3.1.5) comply with the learning outcomes stated in *Description of Study Cycles* (Order No. V-1012 of the Minister of Education and Science of the Republic of Lithuania, 2015). The curriculum design and course modules comply with the requirements on programme structure and implementation of study programmes as stated in *Description of General Requirements for the Provision of Studies* (Order No. V-1168 of the Minister of Education and Science of the Republic of Lithuania, 2016).

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

(1) Factual situation
Teaching and learning activities and assessment methods are regulated by Descriptor of the Study field of Engineering (Order No V-964 of the Minister of Education and Science of the Republic of Lithuania of 10 September 2015).
The *Biomedical Engineering* programme uses a variety of teaching and learning activities:
lectures, tutorials, seminars, discussions, assignments, laboratory classes, problem-based learning, case studies, team projects and individual projects.
A variety of assessment methods are used: written examination, oral examination, lab reports, computer-based exams, poster presentation, oral presentation, project reports and defence.

(2) Expert judgement/indicator analysis
The teaching and learning activities and assessment methods used at the *Biomedical Engineering* programme comply with the regulations in *Descriptor of the Study field of Engineering* (Order No V-964 of the Minister of Education and Science of the Republic of Lithuania of 10 September 2015).
The desired learning outcomes (cf. Sec. 3.1.5) are addressed using a variety of learning activities and assessment methods. The assessment methods are tailored t
o each subject module, and therefore likely suitable to evaluate the desired learning outcomes.
Project work and problem-based learning facilitates the students to achieve the desired learning outcomes of the programme related to Engineering analysis, Engineering design, Fundamental and applied research, and Skills of Practical Work in Solving Engineering Problems. The project courses are often assessed with oral presentations, and the students appreciate the practice in public speaking that they get from this.
Further, the students are exposed to the clinical work and hospital environment during their education, for example in the course Systems of Human Physiology. This is a very important experience for future biomedical engineering professionals.

In conclusion the teaching and learning activities of the subject modules comply with the desired learning outcomes, and the assessment methods are appropriate.

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

(1) Factual situation
The desired learning outcomes of the Biomedical Engineering programme are detailed under the headlines: Knowledge and understanding, Engineering analysis, Engineering design, Fundamental and applied research, Skills of Practical Work in Solving Engineering Problems and Personal and Social Skills.

"Knowledge and understanding

- Is able to explain the functioning of the main human physiological systems and biophysical laws;
- Is able to explain the operating principles of biomedical sensors and non-invasive visualisation techniques, methods for processing biosignals and medical images, and methods for statistical analysis of aggregated data;

- Is able to describe the architectures and functioning of modern diagnostic and therapeutic medical equipment;
- Is able to critically evaluate the latest developments in the field of biomedical engineering.

Engineering analysis

- Is able to identify, formulate and solve unfamiliar, incompletely defined problems in the field of biomedical engineering;
- Is able to develop and apply mathematical models of biomedical processes and physiological systems;
- Is able to compare alternative engineering solutions;
- Is able to interpret and take into account social, legal, health, regulatory, technological and commercial requirements for medical devices.

Engineering design

- Is able to propose and develop original solutions to non-standard problems by applying interdisciplinary knowledge of biomedical engineering;
- Is able to critically examine complex biomedical issues, make reasoned engineering decisions in the presence of technical uncertainty and incomplete information;
- Is able to integrate knowledge of electronics, informatics, and mechanical engineering design to solve biomedical problems;
- Is able to invent and develop innovative engineering ideas and methods.

Fundamental and Applied Research

- Is able to identify, obtain, analyse, and assess in detail the necessary information from biomedical data and biosignal databases or other sources
- Is able to plan analytical, modelling, and experimental research in the field of biomedical engineering, perform that research, interpret the obtained results, and formulate conclusions;
- Is able to reasonably assess the applicability of new biomedical engineering technologies using research methods;
- Is able to prepare a research plan and analyse relevant scientific and technical literature.

Skills of Practical Work in Solving Engineering Problems

- Is able to grasp the applied methods, their advantages and disadvantages, properly select and use computer modelling tools and other software, technical literature, and other sources of information;
- Is able to integrate knowledge of biomedicine and various fields of engineering, apply it to solve complex tasks;
- Is able to organize and carry out engineering activities, evaluate and take into account the ethical, social and economic aspects of practical biomedical engineering activities;
- Is able to reasonably justify the choice of engineering solutions.

Personal and Social Skills

- Is able to work effectively both independently and in a team in scientific projects and business activities;
- Is able to identify a biomedical problem relevant to the society and prepare a project plan for the development of a technological solution to the problem, taking into account economic, social, engineering and ethical aspects;
- Is able to consider and evaluate the impact of engineering decisions on society and the environment, take personal responsibility and adhere to the norms of professional ethics in practical engineering activities;
- Is able to communicate effectively orally, in writing and through multimedia while presenting research results and practical solutions to biomedical problems to the engineering and scientific community and the general public. "(KTU web)

Each learning outcome is addressed in several courses.

(2) Expert judgement/indicator analysis
The desired learning outcomes of the study programme comply with the general aims of Engineering education as stated in the *Descriptor of the Study field of Engineering* (Order No V-964 of the Minister of Education and Science of the Republic of Lithuania of 10 September 2015).

The *Biomedical Engineering* programme at KTU has a strong focus on electronics and computing, and the title of the programme suggests a wider scope than is actually delivered. However, the focus of the programme is consistent with the description in the programme aims, and the focus of the programme is clear from the desired learning outcomes and curriculum presented to prospective students.

The curriculum of the study programme ensures consistent development of competences of students. The learning outcomes of the study programme are repeatedly addressed during the studies. Progression with respect to the desired learning outcomes of the study programme is likely achieved since several courses contribute to the learning. However, SER (p 22) points out that connection between courses in the curriculum as an area of improvement.

Further, the curriculum does not ensure that all graduates from the *Biomedical engineering* programme are sufficiently exposed to local industry during their education. The university actively promotes research collaborations with industry, and it was clear from the site visit that the academic staff are collaborating with local industry. Some students are involved in M.Sc thesis projects proposed by companies, and the Qualification Commission of the study field of bioengineering usually includes one member from the industry. Hence, there are possibilities for the students to meet representatives from the local industry during their education. However, the curriculum does not ensure that all students of the programme are exposed to interaction with local industry during their education.

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

(1) Factual situation
The *Biomedical Engineering* programme consists of 85% mandatory course modules (102 out of 120 ECT). The students can choose between Biophysics/Modelling of Physiological systems (6ECT), Radiation protection and safety/Biomedical technology management/Advanced

digital system design (6ETC) and Medical information systems/Identification of biomedical processes/Medical telemetry systems (6ETC).

(2) Expert judgement/indicator analysis
There are several opportunities for the students to personalise the programme. The students can choose between elective courses in 3 out of four semesters, and the elective courses offered are highly relevant to the programme.
Further, the students can personalise their education by choosing topics for their Master of Science (hereafter referred to as M.Sc.) thesis project as well as for the projects in the course modules Methodology of biomedical engineering, Biomedical technology management, Digital signal processing and machine learning and Human-computer interaction and Research project 1 and 2.

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

1) Factual situation
by the supervisor and linked to research projects. Approximately 30% of the projects are proposed by companies. According to the academic staff, companies are reluctant to propose projects due to issues related to industrial secret and intellectual property protection.
The procedure for the preparation and defence of the final thesis is regulated by directives from KTU and the Faculty of Electrical and Electronics Engineering.
The master's degree final project (30 ETC) is conducted during semester 4. The topics of the thesis can be proposed by the academic staff, industrial partners or the student, and are formally decided by Fields' Study Programme Committee.
The final thesis is evaluated by a reviewer and defended in a public meeting before the Qualification Commission of the study field. The commission consists of scientists and professional practitioners and has a minimum of 5 members with at least one member from another institution.

(2) Expert judgement/indicator analysis
The procedure for the final thesis preparation and defence complies with the requirements in *Descriptor of the Study field of Engineering* (Order No V-964 of the Minister of Education and Science of the Republic of Lithuania of 10 September 2015).

The topics of the thesis projects are relevant for the field of study. A majority of the projects are proposed

Strengths and weaknesses of this evaluation area:

(1) Strengths:
1. The focus of the programme on biomedical electronics and computing is well aligned with the need of society.
2. There is a strong link between research and education.
3. There is a strong link to clinical partners.

(2) Weaknesses:
There are no significant weaknesses of this evaluation area. The suggestions for improvement (Sec. V) relate to minor issues and do not affect the score.

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

1) Factual situation

As stated in the SER (p. 23) earlier evaluation by the Research Council of Lithuania of the research fields related to the study programme at the HEI in terms of quality, economic and social impact, the viability of research articles, carried out research and development (R&D) work, and orders of the economic entities, showed a rather stable level over the years with a positive change upwards. A comparative R&D evaluation was performed in 2018 by the Research and Higher Education Monitoring and Analysis Centre (MOSTA) (current name STRATA) for the period of 2013–2017. The evaluation indicated the scientific output of the research field as strong, highlights the substantial international experience in Seventh Framework Programme (FP7) projects, favourably evaluates work on practical projects, and cooperation with the business sector. During the site visit the HEI informed that a new well-equipped Microchip lab will be opened next year.

The Biomedical Engineering Institute (hereafter referred to as the Institute) reports a stable and even increasing funding from R&D activities in 2018-2021 (SER, p. 25) from several research projects and R&D contracts implemented by the lecturers working in Biomedical Engineering study program (SER, Annex 6). However, the last evaluation brought out reduced national and international funding.

During the period of 2018–2020, the number of articles published by the teaching staff at the Institute in the recognized international scientific journals belonging to the Web of Science (WoS) Master Journal List and having an impact factor increased considerably. Of 84 articles with the impact factor co-authored by lecturers, only 3 were published in national journals (SER, Annex 5). The teaching staff contains 18 PhD degree level persons (Annex 7) totally 84 publications in 2018-2021 indexed in the Web of Science with Impact Factor (4 years, Annex 5). Yearly publication rate per researcher: 84/(4*18)=1,17 papers/(year*researcher). The trend of improving the quality of publications is linked to the stricter requirements for lecturer attestation and competition at the University.

There are seven patents registered by the State Patent Bureau of the Republic of Lithuania, one patent registered by other international Patent Bureaus, and eight patent applications (SER, Annex 5).

According to the SER (p. 25) the Institute conducts interdisciplinary research, cooperating closely with clinical partners from Lithuanian University of Health Sciences and Vilnius University Hospital Santaros Klinikos. Joint projects with clinical partners focus on the development of technologies for long-term unobtrusive monitoring of elderly patients, e.g., with frailty syndrome (project FrailHeart), with kidney disease (KidneyLife), and with heart disease (AFterStroke and TriggersAF).

As a result of cooperation with Vilnius University, a wrist-worn device has been developed, which will be manufactured by Teltonika Telemedic based on a signed licence agreement. Also, a European patent application has been prepared related to the method for non-

pharmacological arrhythmia management. The Institute closely collaborates with researchers from Lund University (Sweden) and the University of Zaragoza (Spain).

During 2018–2021, Biomedical Engineering Institute cooperated with national companies Teltonika, Ortho Baltic, Telemed, DHealthIQ, GruppoFos LT, Būsto automatika, inclusion Netforms, Nivela, Prodentum, Investigo, MB Skaitmeninė era, Reface, and with the international company SzeleStim GmbH (Austria). Within the COST network VascAgeNet, which aims to promote the development and use of technologies for the assessment of vascular ageing, the Institute collaborates internationally with academic partners and businesses such as Atcor Medical Inc. (Illinois, USA), Redwave Medical GmbH (Germany), Fujifilm VisualSonics (Netherlands), SCN4ALL (Hungary), Quipu Srl (Italy).

The competencies acquired while carrying out research activities are applied when developing, upgrading, and teaching thematically close courses, as well as when supervising research and final degree projects. Most of the courses in the Biomedical Engineering master's programme (14 out of 21) are given by researchers who work at Biomedical Engineering Institute (SER, p. 24).

The Institute identifies three main research areas, closely related to the respective sets of study courses: (1) biosignal processing. (2) medical image processing, and (3) physiological and biomechanical sensors. Every year, the Field's Study Program Committee reviews the structure of the programme and evaluates the courses.

Other technology-oriented institutes at KTU (Biomechatronics Laboratory of the Institute of Mechatronics, Health Telematics Science Institute) are also involved in the study process.

(2) Expert judgement/indicator analysis

There is a significant level of R&D activities, close links are established with the community, business, local decision-makers, and society. Consultations provided to the companies and international institutions are a positive sign about the competency at the HEI valuable and needed outside University. Research activities are being promoted through articles in local journals, television interviews, workshops, open door days, etc. This is important that the HEI employees are members of the editorial boards of national and international conferences, organisations, committees, and journals.

A positive trend is the increasing number of research articles in high-level journals. Intellectual property issues are actively addressed resulting in several patent applications certainly fostering international collaboration with the companies outside Lithuania.

This is favourable that the lecturers of the study field cooperate with universities and companies at the national and international levels. Interdisciplinary cooperation, carried out with the local hospitals, and internationally with the groups in Sweden, Austria and Spain, resulting in several joint publications, is a very good practice.

This is a strength that competencies from research activities are applied when developing, upgrading, and teaching the courses, as well as when supervising research and final degree projects. Most of the courses in the Biomedical Engineering master's programme (14 out of 21) are given by researchers who work at Biomedical Engineering Institute, and there is an inter-institutional cooperation in the KTU to carry out the study program, which are supportive for a stable and integrative study program.

The Institute has identified the main research areas, closely related to the respective sets of study courses, indicating a study program policy which links systematically R&D areas.

There is a successful and even increasing funding from R&D activities in 2018-2021, and a new well-equipped Microchip lab will be opened next year. This is very important that the central administration at the HEI continues their multidirectional help with strategic applications and industrial collaboration as revealed during the site visit.

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

(1) Factual situation

As stated in the SER (p. 25), during 2018–2021, ten master's students conducted research in the Laboratory of Multimodal Biosignal Flows, somewhat fewer students were involved in other laboratories (the Laboratory of Medical Imaging and Information Processing, the Laboratory of Medical Diagnostics and Ultrasonic Technologies, and the Laboratory of Biomedical Electronics and Sensory). Some students performed research in the Laboratory of Technology for Human Non-invasive Physiological Measurement and Monitoring of Health Telematics Science Institute, and in the Laboratory of Biomechatronics of the Institute of Mechatronics.

During the lectures of the course Methodology of Biomedical Engineering, students are introduced to the latest recommendations for biomedical research design and data analysis, specific problems encountered while performing research at the Institute, as well as proposed solutions, are analysed. Other courses (e.g., Experimental Biomechanics B115M001, Digital Signal Processing and Machine Learning T121M501, Digital Processing of Biomedical Signals B110M002, Medical Imaging, B140M100) integrate research results and provide research-inspired examples.

Invited foreign researchers have introduced students to their latest research (for example, in 2019-2021, the scientists from University of Zaragoza, Spain, and from University of Cambridge, England).

To integrate the latest research results into studies when developing new courses during the renewal of the programme in 2018–2019 several courses introduced R&D related topics (e.g. statistical modelling methods, the design of biomedical systems, the processes of development and commercialization of biomedical devices, including regulatory, ethics, and safety issues, etc). These courses are coordinated by young researchers-doctoral students.

The relevance and innovativeness of the research conducted by the lecturers of the programme are positively assessed: one professor was awarded as the Most Innovative Researcher at KTU (2020), one lecturer was awarded by the Kazickas Family Foundation Prize for Lecturers Performing High-Tech Research (2020), Young Scientist Scholarship (Lithuanian Academy of Sciences, 2019), and a prize for the Most Active Young Scientist of KTU (2018). Two doctoral students were awarded scholarships for active engagement in research activities (2019 and 2020).

Attention is paid to introduce the students to the latest scientific achievements during the implementation of final degree and research projects (courses: Research Project 1, Research Project 2, Master's Degree Final Project).

There is evidence based on the response from the site visit that some lecturers are working at the hospitals and there is a teaching is carried out within a hospital setting for an optional module.

(2) Expert judgement/indicator analysis

The fact that during the courses, the lecturers introduce the students to their latest related research work and encourage them to participate in scientific discussions, is very positive. It is valuable that students get into contact with the latest technologies practically by conducting research in the laboratories of Biomedical Engineering Institute. This is supportive for linking the study program and research that most courses of the study programme *Biomedical Engineering* are coordinated by researchers from Biomedical Engineering Institute. Attention has been paid to the integration of the latest research results into studies when developing new courses during the renewal of the programme in 2018–2019.

It is vital that the students are introduced to the latest scientific achievements during the implementation of final degree and research projects. The activities, where the young researchers and doctoral students at Biomedical Engineering Institute share their research knowledge acquired during the preparation of dissertations, whose content is often related to the material of the study courses, are well-positioned.

The international experience is properly facilitated via invited foreign researchers who introduce students to their latest research.

The outstanding work in research and innovativeness of the lecturers of the programme have been recognized by several awards (the Most Innovative Researcher at KTU, Kazickas Family Foundation Prize for Lecturers Performing High-Tech Research, Young Scientist Scholarship, the Most Active Young Scientist of KTU, scholarships for active engagement in research activities).

It is good that various opportunities are available for students to get involved in research activities (e.g. consultations from research mentors on research issues, the activities of the Student Science Society, presentations of their research results at the student scientific conference, and at the exhibition of scientific works organised by the University, etc). This is intensified by the lecturers working at the hospitals and via teaching carried out within a hospital setting.

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

(1) Factual situation

As stated in the SER (p. 26) the opportunities available for students to get involved in research activities include: (1) students can get consultations from research mentors on research issues; (2) the students can participate in the activities of the Student Science Society; (3) the students can present their research results at the student scientific conference organised by the Faculty of Electrical and Electronics Engineering of KTU; (4) the students can present their research results at the exhibition of scientific works organised by the University.

Students are invited to participate in ongoing research projects and often accept such offers. In 2018–2021, the number of students involved in the research project activities carried out by the lecturers of the study programme from a total of 45 students started master's studies

in 2018–2021: 5 students participated in national projects and 11 students participated in R&D contracts.

The students also often receive remuneration, for example, 13 students out of 42 graduates of the programme were employed in the projects (AfterStroke, KidneyLife) carried out at Biomedical Engineering Institute from 2018 to 2021. Students are also involved in the implementation of R&D contracts in the projects ((StrokeMonitor and StrokeRehab), and in cooperation with different companies (SzeleSTIM GmbH, Gruppo FOS, UAB inlusion Netforms, dental clinic Prodentum, UAB OrthoBaltic, Būsto automatika).

The research mentoring programme GUIDed for academic mentoring is established at KTU and involves 4 lecturers of the study programme *Biomedical Engineering*.

Students are invited to demonstrate their research results at the annual student scientific conference Student Scientific Conference on Electronics, Energy, Telecommunications and Automation organised by the Faculty of Electrical and Electronics Engineering, and practically by presenting to the public, potential partners, and investors at the annual international student research exhibition Technorama organised by KTU. During 2018–2021, five students of the programme presented their research work. Two master's students had the opportunity to participate in the student practice "Development of Scientific Competence of Researchers, Other Researchers, Students Through Practical Scientific Activities" funded by the Research Council of Lithuania. KTU students participate as presenters or public in the national science promotion events Researchers' Night and Spaceship Earth. Lecturers coordinating the study programme *Biomedical Engineering*, actively engage in these events.

(2) Expert judgement/indicator analysis

This is seen as very valuable that there are various opportunities available for students to get involved in research activities (e.g. consultations from research mentors on research issues, the activities of the Student Science Society, the student scientific conference, Researchers' Night and Spaceship Earth). It is important that the students are introduced with relevant research topics in scientific discussions and science promotion events (for example the annual international student research exhibition).

This is excellent that the most active and motivated students are involved in research project activities, prepare publications, participate in national and international conferences, and scientific internships funded by the Research Council of Lithuania. Apart from contributing to the research activities, the students were employed in the projects carried out at *Biomedical Engineering*. Students are also involved in the implementation of R&D contracts, demonstrating real efforts to integrate the students into the scientific activities.

This is important that several lecturers of the study programme *Biomedical Engineering* participate in the research mentoring program at the HEI. The very positive outcome from the active involvement of the students in the R&D is that the most active master's students have had the opportunity to participate in the student practice funded by the Research Council of Lithuania and improve their research competencies.

Strengths and weaknesses of this evaluation area:

(1) Strengths:

1. The students are exposed to the latest technologies practically by conducting research in the laboratories of Biomedical Engineering Institute. New well-equipped Microchip lab will be opened next year.

2. The students are introduced to the latest scientific achievements during the implementation of final degree and research projects.
3. The competencies from research activities are applied when developing, upgrading, and teaching the courses.
4. R&D activities are significant outside the University as there is a collaboration with the institutions and companies from USA, Germany, Netherlands, etc.
5. Lecturers of the Bioengineering study field cooperate with universities and companies at the national and international levels.
6. Interdisciplinary cooperation is carried out with the local hospitals, and with the research groups internationally resulting in several joint publications.
7. Large part of the study fields' budget is from national and international projects.
8. There is an inter-institutional cooperation in the KTU to carry out the study programme.
9. Invited foreign researchers introduce students to their latest research.
10. The research and innovativeness of the lecturers of the programme have been recognized by several awards.
11. There are a variety of opportunities available to get involved in research activities for students (research mentors, the Student Science Society; the student scientific conference, the exhibition of scientific works).
12. The study methods support innovative methods combined with the technology transfer elements. For example, the students have to prepare and present a pitch of their project to angel investors.

(2) Weaknesses: none.

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

(1) Factual situation
KTU currently has one functioning study programme in the field of Bioengineering – second cycle.

Second-cycle *Biomedical Engineering* studies are also conducted in English language. For the requirements for English language proficiency, see Additional admission requirements above. Students are admitted via Institutional Admission. Entrants who have acquired education in foreign higher education institutions can apply for state-funded study places in the second-cycle study programmes if they are citizens of the Republic of Lithuania, the European Union (EU) or the European Economic Area (EEA) country or have a permanent residence permit in cycle studies - *Biomedical Engineering* master's degree programme.

All admission procedures are publicly available on the website. Applications are completed online only. Admission to this study programme is carried out in tree steps:

1. Applications for participation in the competition are accepted only by filling in the electronic application form online.
2. The assessment of the applicants' compliance with the requirements of the study field is performed by the faculty admission commission.

3. Study agreements with those invited to study are signed after the publication of the results of each admission stage.

The self-evaluation report states that "students are admitted to the second-cycle studies in the study field of Bioengineering if they have completed the first-cycle studies or integrated studies and meet the requirements specified in the description of the study field and the description of the second-cycle study programs". All entrants must meet the basic and additional admission requirements.

Basic admission requirements for university and college graduates:

- degree in Engineering, Mathematics, Informatics, Physics, Technology, Life, Health or Sport studies;
- ≥18 ECTS completed in Electronics engineering, Electrics engineering, Mathematics, Physics, Informatics or Informatics engineering study field subjects (≥ 18 credits in courses of the main or adjacent field is considered a sufficient basis for studying in the program).

Additional admission requirements:

- The weighted average grades for bachelor's degree is not less than 60%;
- IELTS ≥6.0, TOEFL ≥85, CEFR ≥C1, or previously completed studies in English language.

Lithuania, as well as foreigners of Lithuanian nationality. All the others who have completed their first- cycle studies abroad and wish to study in the second-cycle study programme are admitted to places to not state funded places.

As mentioned in SER, "International Studies Office is responsible for the transfer of grades. Applicants must meet the minimum requirements: a high level of English, a weighted average for the batchelor's degree of at least 60% and additional requirements for the field of study. The additional requirements and the calculation of the competition score are the same for international and Lithuanians entrants."

The tool used to stratify candidates is their competition score:

- Formula: 0.7 * SV + 0.2 * MMV + 0.1 * MV

SV - weighted average grade of the diploma supplement of the first-cycle or

  - integrated studies (min. length – 180 ECTS);
  - MMV - evaluation of research activities (scientific publications, presentations in scientific conferences, participation in exhibitions, work in scientific groups, etc.) in a ten-point scale;
  - MV - evaluation of motivation in ten-point scale.
  - An additional 0.5 point for proficiency in a second foreign language at the B2 level may be added to the competition score.

All the information about student admission and score formation is publicly available in the webpage of the University.

Over the last three years, there were 52 applicants, 21 of which listed Biomedical Engineering programme as their first priority. Since 2020, there is a decline of applications (24 in 2019, 19 in 2020 and 9 in 2021).

28 students were admitted over the last three years – 19 to state funded and 9 to non state-funded places. All non-funded places were taken by the students from abroad. The number of students admitted to the study programme has decreased recently. This may have been influenced by: the pandemic, which complicated the arrival of international students;

- decrease in the number of graduates (and entrants) of the KTU's first cycle study programme *Biomedical Electronics* (most of the entrants to the second-cycle study programme *Biomedical Engineering* are graduates of this first cycle programme);
- growth of specialist demand in labor market (students start working still being undergraduates and don't pursue second cycle studies).

Competitive scores of admitted students remained stable over the period of last three years:

- in 2019, average competitive score was 6,65 (minimal 5,00 and maximal 9,17);
- in 2020, average competitive score was 6,66 (minimal 6,31 and maximal 7,12);
- in 2021, average competitive score was 6,85 (minimal 5,32 and maximal 9,36).

(2) Expert judgement/indicator analysis

University has the ability to admit both Lithuanians and foreigners to the *Biomedical Engineering* study programme. Admission criteria and all other information regarding admission to the second cycle studies in Bioengineering field in KTU are publicly available and can be easily found on the University's webpage. The process of student selection and admission is transparent and clear.

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

(1) Factual situation

Considering recognition of foreign qualifications, partial studies and prior non-formal and informal learning, KTU relies both on state legislation and internal procedures.

In the SER, paragraph 131, it is stated, that "the learning outcomes achieved at other Lithuanian or foreign higher education institutions can be included following KTU Guidelines for the Inclusion of Learning Outcomes and the Guidelines for the Acknowledgement of the Competencies Acquired via Formal Education as a Part of the Study Program to the Persons who Want to Continue Studies at the Higher Education Institution approved by the Minister of Education, Science and Sport of the Republic of Lithuania. The assessment of non-formal and informal learning outcomes and the recognition of competencies are guided by KTU Guidelines for the Evaluation of the Learning Achievements Acquired via Non-Formal and Informal Education and the Recognition of Competencies."

A student can have his previous formal education gained in a foreign or Lithuanian HEI recognized but no more than 75 % of the courses can be included. It is done after the evaluation of their compliance with the formal requirements of the study programme and the subject requirement. The included part may contain the learning outcomes of another study cycle or other type of higher education institution/college, but, according to University's regulations, its volume can not exceed:

- 75% of the volume of the study programme of the first-cycle studies;
- 25% of the volume of the study programme of the second-cycle studies and professional studies;

- 40% of the volume of the study programme of integrated studies. The student's optional courses are included without restrictions, while the final degree project is not included.

As discussed in the SER par. 133, "the University applies the assessment of the learning achievements acquired via non-formal and informal education and the acknowledgement of competencies allowing the person's competencies acquired via non-formal education to be evaluated and assessed as the learning outcomes." A candidate can ask for evaluation of his/her learning achievements obtained in the work activities, non-formal adult educational system, unpaid work, volunteering, traineeships etc. To have the credits granted, a student has to prove that he/she has the knowledge, abilities, and skills described in the outcomes of the study course. No more than 50% of the volume of the intended study programme can be included this way, the final degree project can not be included as well.

Over the last three years, 51 courses were credited (included) to the *Biomedical Engineering* study programme.

(2) Expert judgement/indicator analysis
KTU provides its students in the Bioengineering study field with a possibility to recognize their foreign qualifications gained via both formal and non-formal education. The University has its own procedures, according to which foreign qualifications, partial studies and prior non-formal and informal learning are being recognised. Experts have not noticed any issues in this field.

3.3.3. Evaluation of conditions for ensuring academic mobility of students

(1) Factual situation
KTU provides its students with the opportunity to participate in academic mobility programmes. They can go abroad for partial studies and for internships. All information is accessible in the University webpage. Nevertheless, mobility programmes are also discussed in other contexts, e.g. the newsletters of the University, other publications and various events.

Academic mobility can be:
- physical - students physically go abroad to study at a foreign higher education institution;
- mixed – combining physical mobility with virtual activities carried out remotely without leaving the host country;
- virtual – using information and communication technologies without leaving the country of the host institution.

The students can participate in Erasmus+ programme. They can also have 1–2 semesters or summer/winter programmes abroad under the bilateral cooperation and student exchange agreements signed between KTU and the University partners. The University partners do not apply their tuition fees to KTU students (except for the summer/winter schools). Travel and accommodation costs during the studies abroad have to be financed by the students, however, students can apply for the KTU mobility scholarship. KTU students can also complete the exchange studies under the Network of the Rectors and Deans of the Technical Universities in the Nordic-Ba0 ltic countries (NORDTEK), State Scholarships or other programmes.

Over the last three years, 1 foreign student arrived at KTU for partial studies, 13 KTU students went abroad for partial studies and 1 for internship.

(2) Expert judgement/indicator analysis

KTU students in the Bioengineering study field have opportunities to gain international experience using Erasmus+ programme as well as participating in the bilateral cooperation and student exchange programmes signed between KTU and the University partners. Furthermore, there are ways to do it not only physically, but also partially or completely remotely. Expert panel thinks that the number of incoming and outcoming students is lower than desirable.

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

(1) Factual situation

KTU students have various means of academic support. It includes "GUIDed" Mentorship Programme, "GIFTed" Talent Academy, bridging courses of general study modules for the first-year students of the first-cycle studies, individual consultations by lecturers, etc. Some of the activities are meant to catalyse the symbiosis between students' knowledge and practical realization of their ideas (e.g., "GIFTed" Academy), other provide students with additional time to improve themselves in their study field and career (e.g., individual consultations, career consultations).

University offers various possibilities to support its students financially:

- University's Talent scholarships;
- Nominal Patron's (Sponsor's) scholarships and the scholarships by enterprises;
- One-off incentive scholarships;
- Foundation of International Scientific Events;
- Tuition fee reductions or refunds (in certain cases).

Students with disabilities can be granted with targeted payments for special needs, partial compensation of the costs of studies (if they are admitted to the non-funded studies), a social scholarship, and a reduced fee for accommodation in the dormitory.

Over the last three years, 66 scholarships were given out to second cycle students in the Bioengineering study field in KTU (including academic mobility scholarships).

Social support in KTU includes various programmes which offer different activities from career development and mentorships to art societies and student organisations.

All these social and academic support-oriented activities are uniformly branded by the University, so that the students can easily find information and recognize them ("GIFTed" Talent Academy, "GUIDed Mentoship Programme, "UNITed" programme, "INSIPRed").

Students can use services provided by KTU Sports and Wellness Centre, participate in the free sessions and events organized by the C enter, exercise in the modern KTU sports club.

As written in the SER par. 163, "students with special needs are provided with support for studies, adaptation of infrastructure, financial, psychological support, etc. A social welfare coordinator at the Department of Student Affairs acts as a mediator in providing consultations if the student has issues related to studies (sometimes, in cooperation with the faculties), scholarship competitions, financial support, assistance, adaptation of studies, as well as provides the students with recommendations and guidelines related to studies and ensures full integration of students."

KTU students have possibility to get personal and psychological support. From the beginning they have assigned peer mentors. Also, there are career mentors, psychologists, University's chaplain. Two psychologists work at KTU Student Information and Service Centre and provide individual and group consultations and sessions, stress management, relaxation exercises, art therapy. Information on the working hours of psychologists is provided on KTU website. There are two chapels in KTU, one of which works 24/7.

KTU has an arrangement with one healthcare institution so that its students can get health services free of charge.

(2) Expert judgement/indicator analysis

KTU offers various means of academic, financial, social, psychological, personal and even medical support to its students in the Bioengineering study field. At the University, students can not only find a good academic environment, motivated teachers and fellow students but also many activities to engage and educate themselves in their free time. All the measures taken by KTU to support its students are suitable and adequate.

3.3.5 Evaluation of the sufficiency of study information and student counselling

(1) Factual situation

Basic study information is presented, and students are introduced to the University during the "Welcome Week", which takes place one week before the studies.

Most of the communication between the University and the students is conducted via e-mail, curriculum and subjects are presented in KTU Academic Information System and Moodle.

During the first lecture, tutor presents the programme of the study course, its objectives, expected learning outcomes, informs students about the assessment procedure and methods, assessment criteria, and requirements for student participation. All these requirements for students are also available in the programme of the study course in the KTU Academic Information System and Moodle.

KTU Students' Association and the Students' Association of the Faculty of Electrical and Electronics Engineering represent students' interests, they are also included in University's governing bodies.

(2) Expert judgement/indicator analysis

Study information is presented to the students in the Bioengineering study field using effective and suitable communication methods. Student counselling is sufficient.

Strengths and weaknesses of this evaluation area:

(1) Strengths:

1. Multiple ways of student support create a very positive environment in the University.
2. Flexible variants of students' academic mobility.

(2) Weaknesses:

1. Students' admission rates are lower than desirable.
2. Indicators of students' academic mobility are low.

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

(1) Factual situation

Teaching and learning activities include such classroom work as lectures, practice works, laboratory works, consultation seminars, which can be delivered via daytime studies and evening studies on-campus, remotely or as blended learning as well as individual work.

The learning process is enriched via various study methods like project activities (preparation and visualization of projects), challenge-based learning, experiential learning, case-studies, group work, discussions.

Whereas evaluation methods to enable more active teaching and learning are defence of laboratory work, oral presentation or assignments, other methods are used as well, e.g., poster session, solving of problematic tasks, idea (mind) map, peer-assignment.

The programme aims for students to be engaged throughout the entire semester, therefore there is and accumulative evaluation system where the final evaluation of the module consists of the weighted aggregation of grades of intermediate assessments and final assessment.

(2) *Expert judgement/indicator analysis*

It is obvious that the programme aims to apply various teaching and learning methods, as well combination of classroom work with individual works, applies cumulative evaluation methods via different ways for students to achieve the final evaluation.

The holistic approach ensures that teaching and learning process takes into consider the needs of the students and enables them to achieve the intended learning outcomes.

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

(1) Factual situation

University has and actively implements the Equality and Diversity Policy. It emphasises the open environment to recognize and value each student. The University states that it aims to provide equal opportunities for studies and work to all community members, including the socially vulnerable groups of students and the students with special needs.

The University Student Information and Service Centre provides consultations on the study issues to the students with special needs regardless of their gender, disability, race, and other features.

Department of Student Affairs has a social welfare coordinator that acts as a mediator in providing consultations if a student has issues related to studies, scholarship competitions, financial support, assistance, adaptation of studies, as well as provides the students with recommendations and guidelines related to studies and ensures a comprehensive integration of students.

The University tries, if possible, to offer flexible forms of evaluation, adapted to the students' abilities, including the students with special needs like visual impairment, hearing disabilities, reduced mobility.

The University collects survey from the students with disabilities and learning difficulties on the emotional and physical health.

(2) Expert judgement/indicator analysis
The University has policies which it implements to support the students from the socially vulnerable groups and students with special needs. However, it very much depends on the capabilities of each faculty and its staff in particular to actually implement those policies to the full scope.

It is not fully clear how University was and is continuously dealing with special needs of the students during and after the pandemics, also with students who due various health related issues are struggling to come back to studies, especially the ones held on campus.

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

1) Factual situation
An annual report of the monitoring of the students' learning outcomes is prepared and presented once per year by the Department of Academic Affairs. The report includes the indicators of the students' progress and repeated examinations, the evaluation of the effectiveness of newly introduced methods for the quality assurance in studies, the discussion about the reasons for the termination and interruption of studies, the attendance indicators, the violations of academic ethics, the results of the attendance and testing of the bridging courses and other relevant. This report is the basis for the faculty to analyse students learning outcomes and progress.

The progress of the students is assessed by the number of underperforming students, also by the evaluation results of the study courses.

The Program Committee is monitors such students' achievements as: average overall grade, intermediate and final assessments of the current semester, class attendance percentage. This is done via online Academic Information System to determine the students who have any potential to drop out of their studies.

Students' learning achievements are evaluated by various intermediate and final assessments, depending on the specifics of particular course. What is more, students are provided with a feedback form by their lecturers to ensure communication between students and teaching staff also to facilitate students learning and ensure their progress.

(2) Expert judgement/indicator analysis
University has the system to monitor and control students study process via various data sets, and proactively prevent the drop out of the students. If the system is used systematically, it can ensure successful study planning process.

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

(1) Factual situation

The Expert panel learned that the University has very close relationships with various companies from the Biotech related field from Engineering companies to Health companies, etc. Industry representatives valued the graduates of the programme, and expressed support for the contents and the quality of the whole programme. The graduates have no problems in employability, and find the soft skills from the studies very valuable.

The University collects data on students' employability both through secondary data sources as well as via personal contacts with alumni.

Employability of bioengineering graduate is quite high especially after several years post-graduation. Some of the students are even employed during their period of study.
The University has a career development programme, which includes career events, cycles of the events and seminars, group and individual consultations, as well as job and internship advertisements. The University also organises one of the largest career planning events in the Region.

The coordinator of study programme provides consultations to students about career development as well as internships and job offers. However, no data is provided on the success of such consultations or career related events for the students or graduates employability, except within students' general evaluation of the satisfaction with study program.

University has very close relationships with various companies from the Biotech related field from Engineering companies to Health companies, etc. It also collects their feedback via surveys and interviews. Social partners are involved in final degree projects evaluation and defence.
Industry values the graduates of the program, express support for the studies contents and the quality of the whole program. The graduates state that they have no problems in employability, unless they choose different field on purpose, yet find the soft skills from the studies very valuable.

(2) Expert judgement/indicator analysis
Employability of the graduates has very good potential and graduates have no problems in finding a job according to their profession.

Employability of the graduates has very good potential and graduates have no problems in finding a job according to their profession. University keeps close contacts with stakeholders, which allows them to get various types of feedback and meet the needs of the market by the qualifications and skills of its graduates.

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

(1) Factual situation
The University has a Statute of the University and Provisional Academic Regulations and Code of Academic Ethics; students can also report violations via the Academic Information System.

The Guidelines for the Organisation and Performance of the Assessment of Study Modules ensures integrity, transparency and quality of the assessments performed at the University. Preventive measures include: the students must present their personal identity cards for identification during the examinations, most of the assessments are written, the examinations

are observed by the commission of invigilators, the examination tasks are updated yearly and etc.

The Commission for Settlement of Academic Violations examines any academic violation cases and includes a student representative.

The University has Methodological Guidelines for the Preparation of Written Works and courses to ensure that students know all the requirements of written works. Also, University has plagiarism check system. Both are available in Moodle to make them easily accessible to students.

The Commission for Settlement of Academic Violations aims to deal with any issues arising from identified study violations and decides on penalties where appropriate.

The University promotes equal opportunities and accept students from all over the world.

(2) Expert judgement/indicator analysis
University has many policies, guidelines, rules, and committees to ensure the ensure academic integrity, tolerance and non-discrimination. It is very important that such policies, Guidelines, rules, committees would be known to students and they could actively follow them.

There are few foreign students, therefore it is little data as to the success of integration of various students groups

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

(1) Factual situation
University has Guidelines for the Submission and Processing of the Students' Appeals and Complaints, which contains rules and explanations of how appeals are transferred to the Board of Appeals or Commission for Handling of Complaint. This Board analyses the appeals and makes decisions. However, no appeals were submitted by the Programme.

(2) Expert judgement/indicator analysis
University has all the procedures to ensure effective appeals and complaints, however up until now it was never an issues for the Programme.

Strengths and weaknesses of this evaluation area:

(1) Strengths:
1. University involves students in their learning process through applying various teaching and evaluation methods and approaches.
2. Students can find all the Policies, Guidelines, Rules and Regulations in the internal University systems.
3. University has very strong relations with industry, a good reputation of the programme among future employers, makes efforts to assist students in finding internships and job positions.
4. Graduates are evaluated not only technical and professional skills but also soft skills and find them all valuable for the work either in study related positions as well as other industries and positions.
5. Graduates have quite high employability especially after several years of their studies.

6. Processes and systems for feedback collection, complaints etc. exist and the University uses this feedback to improve the studies.

(2) Weaknesses:

1. University has many Policies, Guidelines, Rules and Regulations to ensure active monitoring of the study process, ethical issues, compliance, appeals and many others. However it is not clear whether students do not make active use of the because they are fully satisfied with the studies or because they do not know about the existence of such documents.

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

(1) Factual situation

There are 24 teachers delivering the programme in the Bioengineering study field, of these 9 work < 1.0, 2 = 1.0 and 12 > 1.0 full time, with the greatest workload being 1.5 FTE.

Several of the staff have relevant external work activities that are relevant to their teaching on the course including 2 with senior industrial positions, 3 in clinical engineering/physics positions in local hospitals and 3 with consultancy/industrial advisory activities.

Table No. 2. *Bioengineering* field lecturer compliance with the requirements for the second cycle studies

Requirement stated in Descriptor of the Study Field of Engineering	**In *Biomedical Engineering* study programme of the second cycle**
At least 80 percent (or 60 percent if study programme of respective Engineering study field is focused to practical performance) of teachers of the second study cycle of all study subjects shall hold a doctor's degree, out of which at least 60 percent (or 40 percent in case the study programme of respective Engineering study field is focused to practical performance) shall be engaged in scientific field, which corresponds to subjects taught by them.	18/22 (82%) staff hold a doctoral degree.

In case the study programme is orientated to practical performance, up to 40 percent of teachers teaching subjects of respective Engineering study field may be practitioners with at least 3 years of professional experience corresponding to specific subjects taught, gained during recent 7 years. Experience of professional performance indicated in this paragraph is binding to teachers of specialised subjects of programmes oriented to practical performance.	5/6 (83%) teachers at MSc level have >5 years professional experience.
At least 20 percent of the scope of study field subjects shall be taught by teachers holding professor's position.	In the study program 60 credits are allocated for the courses in the study field (6 credits per course). Seven courses are compulsory and 2 of them are taught by the professors. Other courses are electives and students can choose 3 courses out of 8 offered. Three out of 8 electives are taught by professors. In such a way, students have from 2 to 5 courses out of 10 in the study field taught by professors. So, the percentage can vary from 20% to 50% based on individual study plan of the student.

(2) Expert judgement/indicator analysis
The second cycle study programme in the Bioengineering study field is well staffed with teaching staff who are appropriately qualified.
Several of the staff also have external industrial or clinical positions that will ensure that their teaching is current and will be able to introduce relevant examples into their teaching materials.

However, these activities may contribute to what is a very high (>1.1 FTE) workload for the majority of teaching staff. Such high workloads (8/24 staff are more than 1.4 FTE) raises concern for sustainability and wellbeing.

Staffing **meets the requirements** of the General Requirements for the Provision of Studies and also the Descriptor of the Study Field of Engineering since 82**% of staff** hold PhDs, 5/6 of the remaining staff hold more than 3 years professional experience.

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)

(1) Factual situation

Documentation of academic mobility activities was provided by 21 staff. Academic mobility is largely associated with Erasmus+ activities. Over the past three years there were 8 visits to academic institutions outside Lithuania undertaken by 6 members of staff who visited 6 countries. Travel restrictions due to COVID has been a limiting issue. However, when meeting with the teaching staff, they believed that such visits were for senior members of staff. It should be noted that 50% of staff are below 40 years of age. KTU has newly developed requirements for lecturer certification and categorization that make teaching at a foreign institution compulsory.

In 2018-19 there were 2 visiting lectures from different institutions in Spain, whilst in 2020-21 COVID restrictions meant that 2 visiting lectures (from Spain and the UK) were delivered online.

Discussion with the teaching staff revealed that there was very little experience of teaching in other institutions within Lithuania. However, there are currently discussions with Vilnius Gediminas Technical University (hereafter referred to as Vilnius Tech) for a programme of lecture exchanges within the Bioengineering study field.

(2) Expert judgement/indicator analysis

Academic mobility to HEIs outside of Lithuania (as noted within the Self-Assessment) is quite low. COVID has clearly had an impact, but more could be done to encourage, particularly younger members of staff, to seek Erasmus+ and other funded opportunities. KTU has already started to address this issue by updating its lecturer certification process to make teaching abroad compulsory.

There is also room to expand 'guest' lectures from HEIs external to Lithuania. The Department is clearly working on developing these links, and has shown an imaginative use of technology, so that there is a foundation to build upon.

As noted in 3.5.1, a good number of members of staff also have either industrial or clinical positions in addition to teaching at KTU. This is a real strength.

Teaching staff have little experience in working at other institutions. Whilst this speaks well of the ability of KTU to retain their staff, it does run the risk of limiting diversity of approach. The proposed link with Vilnius Tech is a very good idea as it expands the diversity of teaching experienced by the students both in terms of personnel and subject material. Although both institutions offer Second Cycle programmes in the Bioengineering field studies, these are quite distinct; KTU being more focussed towards electronic instrumentation and signal processing and Vilnius Tech towards biomechanics.

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

(1) Factual situation

KTU has a policy for continuous development of teaching skills: 'Procedure for the Development of the Lecturers' Didactic Competencies'. Training is implemented through the EDU_Lab Teaching and Learning Competencies Centre, which has been operating for five years. Four courses are provided together with a single follow-up programme, mentoring and a Teachers' Café.

Uptake of EDU_Lab training has been mixed with 9/24 staff taking courses over the 2-year period 2018-2020. These staff took between 1 and 3 courses covering 4 titles. The majority of teachers selected the 'E-Learning Tools and Methods' and 'Problem Based Learning'.

The Department seeks to explain the level of uptake of such courses by stating that ever a longer time period uptake is 53% of staff, 3 lecturers are only involved in project teaching whilst 3 more are recent appointments.

Sixteen, out of 21 staff who provided information, attend training and seminar events and the same number attended research conferences over the period 2018-2022.

(2) Expert judgement/indicator analysis
A recommendation of the previous review was that 'all lecturers should be encouraged by faculty administration to engage in pedagogical training.' Whilst this has been addressed by the formation of the EDU_Lab, there is clearly a way to go before uptake of these courses is universal.

Ideally competency development should be seen as a continuous process which engages all staff throughout their careers. It should encompass a wide range of fundamental and high level skills. At present the training offered by EDU_Lab is highly limited and is primarily focussed on establishing a baseline skill set. This may well be a reason for the low uptake amongst staff.

The reasons given by the Department for low uptake are weak since 1 of the 4 courses offered focusses on project teaching and another on basic skills. One would expect that these would be required for teachers who only teach projects and new staff.

In terms of maintaining a high level of technical competence, there is a much higher engagement with research training and conferences.

Strengths and weaknesses of this evaluation area:

(1) Strengths:

1. Staff have excellent industrial and clinical links, not simply in terms of research/industrial interactions, but also in terms of external working in these settings.

(2) Weaknesses:

1. High use of postgraduate students in teaching.
2. Very high workloads amongst some staff.
3. Uneven uptake of academic mobility opportunities.
4. Limited range of opportunities for development of pedagogic skills which results in a relatively poor uptake of current opportunities and which do not foster an ethos of continuous development (rather than establishment of a minimum baseline) of such skills.

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

1) Factual situation

The Expert Panel visit was necessarily performed remotely to ensure robustness against COVID and other travel issues. We were therefore limited in our ability to view the facilities and information was able to be gathered only through the Self-Assessment documentation, video tours of the new library facilities, a slide presentation and meetings with staff and students.

Teaching on the course takes place mainly within the facilities of the Faculty of Electrical and Electronic Engineering which include 14 auditoriums with occupancies appropriate to different sizes of class. The auditoriums have either multimedia projectors with screens or smart boards and computers with Internet access. There are currently no issues with occupancy of these spaces. Laboratory work takes place within the Biomedical Engineering, Biophysics and 3 computer laboratories within the Faculty with specialist teaching and laboratory work undertaken in the Experimental Biomechanics laboratory in the Faculty of Mechanical Engineering and Design and in the classrooms and laboratories of the Lithuanian University of Health Sciences. Students are also able to visit local hospitals to see how aspects of biomedical engineering are implemented. Research project work also takes place in the Biomedical Engineering Institute, the Health Telematics Science Institute, the Prof. K. Baršauskas Ultrasound Research Institute, the Institute of Mechatronics, and the Faculty of Mechanical Engineering and Design.

Teaching is supported through the use of the Moodle VLE to present teaching materials and learning and assessment methods. During the COVID pandemic, there was a transition to remote lectures, mainly performed using MS Teams and Zoom platforms. Training and recommendations as well as assistance for remote lectures are provided in Moodle.

More generally, studies are supported by extensive library facilities, including physical books and publications in the field of Bioengineering as well as access to KTU Virtual Library, the resources of the Lithuanian Academic Library eLABa, and 55 licensed databases. Training in the used of these facilities is provided through the Moodle virtual learning environment. The library has, very recently, moved into a new, purpose designed building.

The buildings are mostly suitable for people with reduced mobility and dedicated parking is available close to the building entrances. In addition the following facilities are available for students with the following disabilities:

•Reduced mobility: ergonomic tables and chairs, organisation of lectures (selecting the adapted auditoriums), special computer accessories (mouse, keyboards).

•Visual impairment: reading devices that convert printed text to audio, software and equipment for magnifying images and text and a Braille printer.

•Hearing disability: hearing aid loop or radio transmitter/receiver for auditoriums, provision of a sign language translator to facilitate participation in lectures and seminars.

• Special learning needs: help of a psychologist, an assessment of the disability so that suitable adaptations and additional time can be provided if required.

(2) Expert judgement/indicator analysis

The provision of learning facilities and resources is very good and has been carefully thought out to support the second cycle study programme in the Bioengineering study field. An

excellent aspect of this provision is access to specialist facilities in a number of research institutes as well as visits to hospitals. It is particularly noteworthy that visits to hospitals remained possible throughout the COVID pandemic.

The new library building is an excellent addition to an already good library provision.

Facilities to support students and staff with physical and other disabilities is well thought out and comprehensive permitting full inclusivity.

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

(1) Factual situation

Although strategies for the planning and upgrading of resources are not explicitly discussed in the Self-Evaluation documentation it is clear that they exist and are effective through the evidence of a number of major development projects:

- The new library facilities have already been discussed.
- An interdisciplinary prototyping centre, KTU-Mlab, is under development featuring nine thematic research group-experimental laboratories: sustainable and smart cities, sustainable and smart environment, industrial design, e-business models, individual nutrition, remote health care management, promotion of personal wellness and productivity in the working environment, robotic assistants, and contactless health monitoring. Clearly several of these themes are directly relevant to Bioengineering.
- Modernisation of the University infrastructure is being implemented, including the renovation of 24 auditoriums to facilitate active learning, innovative study methods, and provide areas for the students to work in teams. The need for such facilities for hybrid working was echoed in the comments of teaching staff.
- The concentration of student services into a single access point Student Information Centre.

The Self-Assessment documentation indicates that there is a need for greater involvement of industrial partners to ensure provision of new and updated laboratory equipment.

(2) Expert judgement/indicator analysis

It is clearly an exciting time in KTU with the development of a number of major projects that will enhance student experience and, in particular, those studying in the Bioengineering field. The underlying strategy for such major infrastructure developments is clearly well thought out and is being implemented effectively. They will be important for KTU for future developments in teaching research.

Little evidence has been provided for a department level strategy for development and renovation. The good current state of provision of facilities means that this is of little concern since it is clear that such a strategy is in place and is being implemented effectively. In the Self-Assessment document the need for greater involvement of industrial partners to ensure provision of new and updated laboratory equipment is identified. Again, this is evidence that there is a clear awareness of issues and a planning process to ensure that appropriate facilities are in place.

Strengths and weaknesses of this evaluation area:

(1) Strengths:

1. Good basic provision of learning facilities including teaching spaces, workshops and library with excellent access to specialist laboratories for project work.

2. Strong, institution level, development plan with a number of exciting projects that will greatly enhance the provision of teaching at KTU.

(2) Weaknesses: none

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

(1) Factual situation

AS stated in the SER (p. 57) the internal quality assurance system of the University is described in the Quality Manual. This system is based on the main documents of European Higher Education Policy (Bologna and Copenhagen Declarations, Berlin and Bergen Communiqués, etc.) and complies with the European Higher Education Quality Assurance Regulations and Guidelines and the main laws and legal acts regulating higher education in the Republic of Lithuania. The internal quality assurance system in studies of the University is based on five key components: (1) the studies management model (including responsibilities and the management of the study program portfolio), (2) the organisation of student-centred education, (3) the system for the improvement of academic staff competencies, (4) the system of student's success at the University, and (5) the monitoring system (including the feedback and monitoring systems and their development).

The internal quality assurance system of studies is based on the following principles: a) quality improvement is based on the University's vision, mission, values, and goals set in the strategic plan; b) the model of the quality assurance system in studies of the University is based on the guidelines for quality assurance in the European higher education and the excellence framework of the European Foundation for Quality Management; c) everyday activities include a combination of various approaches to the quality of studies from excellence to compliance with requirements and satisfaction of the needs and expectations of the stakeholders; d) the responsibility and accountability of all stakeholders (both internal and external) for quality assurance of studies is expected. Members of the University community and social partners are involved in the processes of study quality assurance and improvement; e) openness and tolerance for new and creative working ways is ensured by improving the quality of studies; f) a systematic approach to the quality of studies is followed, ensuring the relationship between science and studies; g) equal opportunities are ensured for all students to complete their studies and obtain a degree; h) the study process is based on a student-centred approach, innovation, and collaboration.

The quality assurance in studies and management of fields/study programmes are carried out at three levels: university, faculty, and study programmes.

The main functions of the internal assessment and monitoring of the quality in studies are performed by the University Study Quality Committee, the Department of Academic Affairs together with the Study Quality Assurance and Development Office and the Faculty Study Committees together with the Fields' Study Programme Committees. Committees periodically analyse and evaluate the approved study fields and programmes provided at the University and their portfolios and provide suggestions for the improvement of study programmes. The

Faculty prepares a plan for studies quality improvement, focused on development, improvement, and quality assurance of studies at the Faculty.

The management of study fields and programmes is based on the KTU Statute, KTU Provisional Academic Regulations, the Code of Academic Ethics, the Law on Higher Education and Research of the Republic of Lithuania, and other legal acts related to the regulation of higher education. The University has implemented a study programme management model, which enables the effective management of the study fields and programmes, ensures the quality of studies, and provides activities of the Fields' Study Program Committees and their heads.

The Faculty of Electrical and Electronics Engineering coordinates and ensures the realisation of the bioengineering study field and the distribution of human resources.

The Fields' Study Program Committee and the head of study programmes are responsible for the management of the bioengineering study field, in cooperation with social partners from the business area (industrialists and employers), the representatives of students and lecturers. The Fields' Study Programme Committee is responsible for: (1) the compliance of the content and implementation of the study programme(s) with the University's and legal acts regulating studies, (2) the selection of the internal measures for the quality assurance in the study programme and the insurance of their implementation, (4) the quality and continuous improvement of the study programme(s) and the achievement of the objectives.

The Fields' Study Programme Committee consists of thirteen members, including the head of the Committee, associate professor, eight competent lecturers of the study field (five professors, two associate professors, and one lecturer), two social partners, and two students.

Every year, the study programmes are reviewed and updated, the new study programmes are proposed and approved, the study courses are updated, taking into account the observations and suggestions of the stakeholders. The main management processes of study programmes, their participants, and terms are provided in KTU Change Management Process in Study Programmes.

The Fields' Study Programme Committees and the heads of academic departments conduct the approval of study courses following KTU Regulations on the Approval of the Study Modules of the First and Second Study Cycle.

(2) Expert judgement/indicator analysis
The internal study quality assurance at the HEI is described in the Quality Manual determining responsibility for the quality of studies, involving all stakeholders (students, lecturers, administration staff, graduates, employers). The internal quality assurance system defines the processes, measures, and activities for the quality assurance in studies and provides the documents regulating them to meet external standards and requirements.

There are clear responsibilities and tasks in the HEI for different levels for the quality assurance in studies and management of fields/study programmes.

The Fields' Study Programme Committees plan their activities and prepare the annual improvement plans for study programmes and reports as well as the improvement plan for the field integrating the follow-up activities and the recommendations by the external experts. Evaluation of the study programme provides an opportunity to update study programmes

with regards to the international trends in research and academic development, the market changes, and proposals by students, lecturers, and employers.

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

(1) Factual situation
According to the SER (p. 59) the stakeholders are the members of the Fields' Study Programme Committees, the Qualification Commission, and the Council of the Faculty.

The alumni participate in the University's events (open lectures, conferences, meetings), share their knowledge and experience with the academic community (career mentoring, giving lectures and presentations, support of young talent, etc.), and express their opinion on relevant issues.

The representatives of Lithuanian companies have been invited to participate in the the defence commission of the final degree projects (e.g. Head of UAB Ortho Baltic, Head of Research and Experimental Development Division of UAB Elinta, Head of the sector of Medical Technology Inspection at the Hospital of Lithuanian University of Health Sciences Kaunas Clinics, Head of UAB Teltonika Telemedic). A representative of another higher education institution participates in the defence commission of the final degree projects.

The Fields' Study Programme Committee has representatives of two external stakeholders: the director of UAB Teltonika High-Tech Hill and the Product Development Engineer of UAB MANTA CWS. Other two internal stakeholders on the committee are students.

(2) Expert judgement/indicator analysis
The second year students seem to be involved in the activities of the governing bodies and operating commissions of the University at all levels (the Council, the Senate, the Fields' Study Programme Committees, various commissions).

The employers participate by providing individual topics of the study programme courses as well as thematic and opportunities for the final degree project or research work, and participate in the defence commission of the final degree projects. Additionally, a representative of another higher education institution participates in the defence commission of the final degree projects.

The Fields' Study Programme Committee includes a reasonable number of external stakeholders.

During the site visit it was revealed that potential quality assurance institutions facilitating involvement of stakeholders and processes as a professional accreditation system for the biomedical engineers is missing in Lithuania, and Biomedical Engineering Society exists but is not active anymore.

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

1) Factual situation

As stated in the SER (p. 59) the Fields' Study Programme Committee and the head of the study programme are responsible for the quality of the implementation and of the studies of a specific study programme.

The results of the feedback are presented at the Rector's office and KTU Students' Association every semester, and are analysed later at the Deans' offices of the faculties and the Study Programme Committees. The central administration is responsible for general changes and further actions, while each faculty is responsible in specific cases: the Vice-Rector for Studies, in cooperation with the University Study Quality Committee, initiates the actions for the improvement of studies; the Department of Academic Affairs considers the results of the feedback and plans annual activities; the faculty prepares the annual plan for study quality improvement; the Fields' Study Programme Committee schedules the plans and the actions for the improvement of the field each year. Later, the achieved results are reviewed, discussed, and used in the planning of further actions for the improvement of studies. The feedback on the implemented changes with regards to the observations of the stakeholder is provided in the nearest meetings.

The University website publishes information about the study programmes open for admission, the admission requirements for the candidates, the tuition fee, the learning outcome (their relation to the study and assessment methods), the structure of study programmes, the accreditation data, the acquired qualifications and career opportunities, the programmes of the study courses, the values of study programmes, the guest lecturers, the opportunities of additional competencies, the results of study surveys, and the opinion of stakeholders about the relevant competencies in the labour market with regards to each study programme.

(2) *Expert judgement/indicator analysis*
Feedback collection from the students is performed using the electronic Survey on Study Modules and Teachers at the end of the autumn and spring semesters at the HEI. The results of the feedback are presented at the different levels at the HEI.
The University website seems to provide sufficient information about the second cycle study programme in the Bioengineering study field. During the site visit the students said that they are using and are satisfied with the information services.

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

(1) Factual situation
According to the SER (p. 60) the students have the opportunity to anonymously express their opinion about the quality of courses of their study programme in the Survey on Study Modules and Teachers at the end of the autumn and spring semesters. At the end of the questionnaire, students are given the opportunity to answer open questions and submit additional proposals on study courses and lecturers, thus ensuring continuous improvement and updating study quality. These periodic student surveys are organised by the Performance Management Department. The surveys are voluntary but receive sufficient students' activity: from 2018, on average, about 69% in the second-cycle studies.

For the quantitative assessment of students' satisfaction with the course, the respondents are asked to confirm the statement "I am satisfied with this study course". A 5-point Likert scale is used for the answers: strongly disagree (-2 points), disagree (-1 point), neither disagree nor agree (0 points), agree (1 point), strongly agree (2 points).

For the surveys conducted in 2018–2020, the average result of the individual study courses for the study programme was 1.35 points (283 students).

Summarising the results of the surveys, it can be stated that students are generally positive about the didactic system, communication between lecturers and students, and the relevance of the materials. One of the most frequently mentioned areas for improvement is an expansion of the scope and content of the practical sessions.

Lecturers can see the results of students' surveys in the University Academic Information System, i.e., the number of students who attended the course and evaluate the course, distribution of assessments in frequencies and percentages. Lecturers have access only to the evaluation of their study courses, while the faculty administration and the heads of the study programmes can see the evaluation results of all the study courses in the department or study programme.

The University conducts the survey Student Voice in which the students are requested to express their opinion on the quality of teaching, the quality of the organisation of their study programme, the quality of the work of the Study Centres, the social environment, the environment and premises of the University, the additional services, and the offered leisure activities.

One of the survey questions was "Would I recommend the study programme to my friend?". A 5-point scale is used for the answers: I would definitely recommend (5 points), I would recommend (4 points), I am not sure if I would recommend (3 points), I would not recommend (2 points), I would definitely not recommend (1 point). The average response rate for the 2018–2020 was 4.35 points.

The University also has surveys for lecturers to express opinions about the quality culture in studies, the development of the study programme, and the organisation of the study courses. In recent years, 39% of employees participated in this survey.

(2) Expert judgement/indicator analysis
There is an electronical feedback collection system from the students about the study courses at the HEI (the Survey on Study Modules and Teachers). The average result about the satisfaction of the individual study courses for the study programme was clearly above the mean level (1.35 points from max 2 points using a 5-point Likert scale, N=283 students). According to the students' feedback one of the most frequently mentioned areas for improvement is an expansion of the scope and content of the practical sessions.

Also, the HEI conducts the second survey (Student Voice) aiming to gather students' feedback about the other aspects of the higher education studies at the HEI (the quality of teaching, the quality of the organisation of their study programme, the quality of the work of the Study Centres, the social environment, the environment and premises of the University, the additional services, and the offered leisure activities). According to the response from the 2018–2020 the students seem to be satisfied and would recommend the second cycle study programme to others (average 4.35 points from max 5 points).
No results were provided about the surveys for lecturers at the HEI.

Strengths and weaknesses of this evaluation area:

(1) Strengths:
1. The internal quality assurance system is well integrated at the HEI.

2. There are clear responsibilities and tasks in the HEI for different levels for the quality assurance in studies and management of fields/study programmes.
3. The Fields' Study Programme Committee involves different stakeholders including the students and employers, and it seems to be actively planning their activities.
4. The students are involved in the activities of the governing bodies and operating commissions of the University at all levels.
5. The employers participate on different levels of the study programme courses, the final degree projects and the research works, and participate in the defence commission of the final degree projects.
6. A representative from another higher education institution participates in the defence commission of the final degree projects.
7. Feedback collection from the students is regularly performed using the electronical Survey on Study Modules and Teachers at the HEI. The results of the feedback are presented at the different levels at the HEI.
8. According to the survey (Student Voice) gathering students' feedback (from the 2018–2020) about the various aspects of the higher education studies at the HEI, the students seem to be satisfied and would recommend the second cycle study programme to others.
9. The University website seems to provide sufficiently information about the study programmes. The students are using and are satisfied with the information services.

(2) Weaknesses: none.

IV. EXAMPLES OF EXCELLENCE

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

If, according to the expert panel, there are no such exceptional characteristics demonstrated by the HEI in this particular study field, this section should be skipped / left empty.

Teaching integrated with clinical practice including hospital visits and projects undertaken within a hospital setting.

Year on year increase in external research funding ensures that teaching staff are also internationally recognised researchers and can bring this expertise and experience to their teaching.

Excellent facilities with continuing investment at the University level.

V. RECOMMENDATIONS*

Evaluation Area	Recommendations for the Evaluation Area (study cycle)
Intended and achieved learning outcomes and curriculum	Involvement of local industry in courses and projects can be improved. The connections between courses in the second cycle Biomedical Engineering study programme can be strengthened. Changing the title 'Biomedical Engineering' to clarify the scope of the programme could be considered.
Links between science (art) and studies	1. The teaching staff is publishing regularly in the international scientific journals. The number of publications indexed in the Web of Science with Impact Factor per researcher in the teaching staff per year is currently 1,17. It is recommended to keep research output and international visibility of the teaching staff via the publication activity at least on the same level. 2. The Biomedical Engineering Institute has been successful in acquiring national and international research projects. However, a coordinated action is advisable by HEI to provide more stable (national) funding for the study program as there is a potential risk to maintain a stable and continuous quality improvement of the study program if the budget of Biomedical Engineering Institute relies heavily on the successful funding of the highly competitive R&D projects.
Student admission and support	Improve recruitment processes in increase admission numbers.
Teaching and learning, student performance and graduate employment	Ensure that students have access and actually use all the guidelines, systems and etc. for feedback, introducing themselves to rules & requirements as well as complains. Maintain and develop even closer contacts with industry to ensure higher graduates employability during and especially right after the studies.
Teaching staff	More academic staff should be recruited/deployed so that staff workloads are managed better and that reliance on using graduate students as primary teachers is reduced. The proposed plan to review and improve pedagogical staff training should be implemented and monitored to ensure that it is effective. KTU should improve the number and range of opportunities for development of pedagogic skills. It develops its strategy to one that seeks to inspire engagement from both new and experienced teachers rather than simply ensuring a minimum baseline competence.

Learning facilities and resources	Exploit fully the opportunities afforded by the new building developments.
Study quality management and public information	Potential quality assurance institutions that could facilitate involvement of stakeholders and processes to improve the study programme, as a professional accreditation system for the Biomedical engineers, is missing in Lithuania, and Biomedical Engineering Society exists but is not active anymore. A recommendation is to establish a professional accreditation system for the Biomedical engineers (for example coordinated/under umbrella of the Biomedical Engineering Society).

*If the study field is going to be given negative evaluation (non-accreditation) instead of RECOMMENDATIONS main **arguments for negative evaluation** (non-accreditation) must be provided together with a **list of "must do" actions** in order to assure that students admitted before study field's non-accreditation will gain knowledge and skills at least on minimum level.

VI. SUMMARY

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

The following is a summary of the findings of the expert panel based on the Self-Evaluation Report (SER) and the interviews with the Kaunas University of technology administration (senior management and faculty administration staff), staff responsible for the preparation of the SER, teaching staff and stakeholders (students, alumni, employers, social partners). The expert panel gives a positive evaluation to the implementation of the study field of Bioengineering and second cycle at Kaunas University of Technology with all areas assessed as good, very good and excellent.

The Biomedical Engineering programme at KTU is very good overall and excellent in several areas. The highly positive findings of the Expert Panel were echoed by former and current students as well as representatives of employers.

This programme has a focus towards biomedical signal processing and is excellently aligned with the needs of industry and employers. Students are embedded in both research and clinical environments in many aspects of the course from visits to projects. The outcome is that the students have a well balanced and comprehensive educational experience that prepares them very well for employment.

The programme is linked with several thriving research institutes within KTU. The research at these institutes is at an international level as evidenced by peer-reviewed publications and collaborations. These links afford the students an excellent exposure to modern research techniques and facilities. It also integrates current research into the curriculum that ensures its relevance to employers. Good links with clinical partners provides the students with insight into how medical devices are used and how to meet clinical needs when developing such devices.

Support for the Biomedical Engineering students at KTU is very good with clear support routes for those with disabilities and special educational needs as well as for those with study or welfare issues. There are several routes for academic mobility and students are encouraged to engage with research activities and opportunities.

There is an extremely strong relationship and excellent reputation with industry that has enormous benefits throughout the programme. Employability of the students is seen to be excellent amongst employers who praise, not only the graduates' knowledge and technical abilities, but also their wider transferable skills. Teaching staff have excellent industrial and clinical links which they use to provide the students with the experience of working in these environments as well as support in developing their careers and seeking placements.

The learning environment at KTU is excellent with all the necessary infrastructure in terms of lecture theatres, laboratories, workshops, and library facilities to support the Biomedical Engineering programme to a very hight level. Excellent use is made of online information systems for provision of teaching material, study guidelines and regulations and for communication with the students in terms of feedback. There is a strong development plan in place within the University that will ensure that these facilities are continuously upgraded and developed.

There is a strong culture of quality assurance within the University at all levels with full engagement of all the stakeholders from students to employers. Student performance in

externally benchmarked by involving representatives of employers and external HEIs in assessment, particularly of project work. Student feedback is widely sought and acted upon.

This review was performed under the constraints of the COVID pandemic which necessitated an online 'visit'. The Expert Panel would like to thank the Department for their professional, flexible, and supportive provision of information. We would also like the students and representatives of employers for their objective and frank observations and opinions as well as their valuable time.

Expert panel chairperson signature:
Prof. dr. Donal McNally