



CENTRE FOR QUALITY ASSESSMENT IN HIGHER EDUCATION

EVALUATION REPORT

STUDY FIELD of BIOENGINEERING

at Vilnius Gediminas Technical University

Expert panel:

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4. Dr. Justina Rukšnaitė, *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	Biomechanics	Biomedical Engineering
State code	6121EX034	6211EX032
Type of studies	University studies	University studies
Cycle of studies	First	Second
Mode of study and duration (in years)	Full-time (4 years)	Full-time (2 years)
Credit volume	240	120
Qualification degree and (or) professional qualification	Bachelor of Engineering Sciences	Master of Engineering Sciences
Language of instruction	Lithuanian (from 2022 also in English)	Lithuanian and English
Minimum education required	Secondary education	Acquired university higher education (bachelor degree or equivalent) Mandatory study modules of bachelor programme and minimum volume: Study fundamentals: Mathematics 15 cr., Physics 6 cr., Theory mechanics, Mechanics of materials 6 cr., General and applied engineering graphics 3 cr., information technologies 3 cr. Special modules of programme: Automatic control, Biomechanics, Human anatomy and physiology 10 cr.
Registration date of the study programme	19 May 1997 31 August 2009	19 May 1997 31 August 2009

** 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).

Prof. Dr. Donal McNally (panel chairperson), Professor of Bioengineering, School of Mechanical, Materials, Manufacturing Engineering, University of Nottingham, United Kingdom;

Prof. Dr. Ivo Fridolin, Head of Centre for Biomedical Engineering, Tallinn University of Technology, School of Information Technologies, Department of Health Technologies, Estonia;

Dr. Frida Sandberg, Senior lecturer of Department of Biomedical Engineering, Lund University, Sweden;

Dr. Justina Rukšnaitė, Representative of Social Partners; Chief Officer at Global Grant Department, Agency for Science, Innovation and Technology (MITA), Lithuania;

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.	Information about the study modules, teaching departments and number of students (years of 2017-2021).
2.	List of lecturers teaching in the field of bioengineering.
3.	Number of students in bioengineering field studies (years of 2017-2021).
4.	The Description of Procedure for Remuneration of Lecturers, Research Staff and Other Researchers of Vilnius Gediminas Technical University approved by the Vilnius Tech in 2020 October 6 by resolution No. 3-1.
5.	Example progression table of the number of the first cycle students in bioengineering field studies (years of 2016-2021).
6.	Example progression table of the number of the second cycle students in bioengineering field studies (years of 2016-2021).
7.	Extract from the Description of the Procedure for Organising and Certifying Competitions for Vilnius Tech Teachers, Researchers and Other Researchers and Setting the Minimum Qualification Requirements approved by the Vilnius Tech Senate in 2018 February 27 by resolution No. 102-1.
8.	Video about Vilnius Tech library.

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

Vilnius Gediminas Technical University (hereafter referred to as Vilnius Tech, University, HEI) is a university specialising in the technological sciences comprising of 10 faculties: Antanas Gustaitis Aviation Institute, Architecture, Fundamental Sciences, Mechanics, Transport Engineering, Environmental Engineering, Electronics, Creative Industries, Civil Engineering and Business Management. The courses in the Bioengineering Field of study: the **First Cycle Biomechanics** study programme (state code – 6121EX034) (hereafter referred to as - the first cycle study programme) and **Second Cycle Biomedical Engineering** study programme (state code – 6211EX032) (hereafter referred to as the second cycle study programme) are delivered by the Department of Biomechanical Engineering (hereafter referred to as the Department) which is one of three departments within the Faculty of Mechanics (hereafter referred to as the Faculty).

The **First Cycle Biomechanics** study programme is taught over 4 years in Lithuanian, there is a plan to introduce an English version next academic year. The modules taught in the first two years are largely in common with the other Mechanics based degrees with the Biomechanics students comprising approximately 20-25% of the total class size. Bioengineering specific modules form 10% of each of the first two years. By the 4th year, nearly all of the teaching is Bioengineering specific and is taught by members of the Biomechanical Engineering Department.

The **Second Cycle Biomedical Engineering** study programme is taught over two years and is delivered both in Lithuanian and English Language versions. With the exception of two 10 credit modules (Fundamentals of research and innovation and Finite element method in

continuum mechanics) all the modules are Bioengineering specific and delivered by members of the Department of Biomechanical Engineering.

Since the last review in 2014 the Department has responded positively to the recommendations made by the Expert Panel in the following respects:

- The name of the **Second Cycle** study programme has been changed from Biomechanics to Biomedical Engineering to better reflect the course content. A similar recommendation for the **First Cycle** study programme was not implemented.
- A 3 credit Bioengineering module has been introduced into the first and second years for the **First Cycle** study programme to bring in subject specific material into the course earlier.
- The final thesis project of the **First Cycle** programme has been modified to increase the research aspects and **First** and **Second Cycle** students are encouraged to participate in young researcher conferences.

II. GENERAL ASSESSMENT

Bioengineering study field and **first cycle** at Vilnius Gediminas Technical University 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	3
2.	Links between science (art) and studies	3
3.	Student admission and support	4
4.	Teaching and learning, student performance and graduate employment	4
5.	Teaching staff	4
6.	Learning facilities and resources	3
7.	Study quality management and public information	4
	Total:	25

*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.

Bioengineering study field and **second cycle** at Vilnius Gediminas Technical University 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	3
2.	Links between science (art) and studies	3
3.	Student admission and support	4
4.	Teaching and learning, student performance and graduate employment	4
5.	Teaching staff	4
6.	Learning facilities and resources	3
7.	Study quality management and public information	4
	Total:	25

*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

According to the SER, graduates from of the first cycle *Biomechanics* study programme may work with development, design, installation, documentation and production of medical and rehabilitation equipment. The graduates from this programme may also continue their studies and enter in a second cycle programme in engineering and related sciences (SER p6). The aim of the programme, as stated on the study programme webpages for prospective student, is “to train future bioengineers that after completion of their studies would successfully join the share of the labour market related to biomechanical engineering by employment at industrial or state-owned enterprises or in another sector chosen by a graduate, or strive for a higher scientific degree and, upon applying the practice of engineering creation and critical thinking, understanding how their decisions impact the development of the society and continuously improving their professional qualification and competence through lifelong learning process, and thus would contribute to the welfare of the state and the society.”

(SER p7, https://vilniustech.lt/studies/study-programmes/bachelor-and-integrated-study-programmes/317407?element_id=320665&sp_id=5&f_id=9&qualification=a%3A2%3A%7Bi%3A0%3Bs%3A1%3A%22B%22%3Bi%3A1%3Bs%3A1%3A%22A%22%3B%7D#Learning%20outcomes).

According to the SER, graduates from second cycle *Biomedical Engineering* study programme may work in public and private medical and rehabilitation equipment design and manufacturing companies. The graduates may also continue their studies and enter third cycle doctoral programme in mechanical engineering and related fields (SER p6). The aim of the programme, as stated on the study program webpages for prospective student, is “to deepen the knowledge of the future graduates upon applying integrated and interdisciplinary attitude while formation of understanding the most important today problems in the interdisciplinary field of engineering, biology and medicine and to ensure that after completion of the study program, the graduate will have a potential to improve the quality of health services upon applying methods of engineering sciences & innovative technologies and carrying out interdisciplinary research works.”

(SER p8, https://vilniustech.lt/studies/study-programmes/master-study-programmes/317411?element_id=317413&sp_id=18&f_id=9&qualification=a%3A1%3A%7Bi%3A0%3Bs%3A1%3A%22M%22%3B%7D#Learning%20outcomes).

Biomedical engineering is a rapidly growing field internationally, and it is expected to continue to grow. According to the SER there are more than 190 companies involved in medical devices business in Lithuania (p. 6).

(2) Expert judgement/indicator analysis

There is a need for biomedical engineers, nationally and internationally. The *Biomechanics* and *Biomedical Engineering* programmes of both cycles have close interactions with local industry, and the aims and learning outcomes of the programmes are in line with the needs of the local labour market.

Biomedical engineering is a highly interdisciplinary field, and collaborations with medical/healthcare professionals are an important task for engineers working in this field. Not all graduates from the *Biomechanics* and *Biomedical engineering* programmes are sufficiently trained to communicate and collaborate with medical/healthcare professionals. During the site visit, the academic staff gave examples of collaborations with hospitals on university and research level. There were also examples of joint Master of Science (hereafter referred to as - M.Sc.) projects and internships at hospitals. However, all course modules are given by the teaching staff from technical faculties. Hence, not all students of the programmes are exposed to interaction with clinical partners during their education.

The aims and learning outcomes of the *Biomechanics* and *Biomedical Engineering* programmes are to a large extent aligned with the needs of society and labour market.

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

According to the SER, Vilnius Tech aims to train “professionals who would be able to work successfully in both Lithuanian and foreign science and labor markets”, to carry out research at an international level, and to create research-based innovations. Further, Vilnius Tech aims to become a leader of the Baltic universities in the fields of sustainable construction, transport, sustainable environment, information technology and communication science (SER p. 4).

According to the SER (p.4), the missions and visions of Vilnius Tech are declared on the public webpages. However, the expert panel was not able to find this information there.

(2) Expert judgement/indicator analysis

The *Biomechanics* and *Biomedical Engineering* study programmes are in line with Vilnius Tech’s aim to train engineering professionals. However, bioengineering is not recognized as key areas of Vilnius Tech. Further, not all graduates from the Lithuanian *Biomechanics* and *Biomedical Engineering* programmes are sufficiently trained for work in international science and labour markets. For such work, training in scientific communication in English is needed. The second cycle *Biomedical Engineering* programme is given in a Lithuanian and an international version. The students in the Lithuanian version of the programme are not trained in scientific oral and written communication in English, since course reports and presentations are in Lithuanian. A vast majority of the M.Sc. thesis from the programmes are written in Lithuanian; only 1 out of 12 M.Sc. thesis provided to the expert panel was written in English.

The students in the first cycle *Biomechanics* study programme have language courses in English/French/German (6 ETC), but training in the scientific writing and oral presentations in English is not integrated in the engineering courses modules. All Bachelor of Science (hereafter referred to as - B.Sc.) thesis provided to the expert panel was written in Lithuanian.

The aims and learning outcomes of the *Biomechanics* and *Biomedical Engineering* programmes comply with the mission of Vilnius Tech, except for the aim to train “professionals who would be able to work successfully in both Lithuanian and foreign science and labor markets”.

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

(1) Factual situation

The first and second cycle study programmes are 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) (hereafter referred to as – General, Legal Requirements).

Table No. 1. Programme’s *Biomechanics* compliance to general requirements for *first cycle study programmes*

Criteria	Legal requirements	In the Programme
Scope of the programme in ECTS	180, 210 or 240 ECTS	240
ECTS for the study field	No less than 120 ECTS	167
ECTS for studies specified by University or optional studies	No more than 120 ECTS	57
ECTS for internship	No less than 15 ECTS	15
ECTS for final thesis (project)	No less than 15 ECTS	18
Contact hours (including distance contact hours)	No less than 20 % of learning (unless otherwise stated in the descriptor of study field)	35.7%

Table No. 2. 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
ECTS for the study field	No less than 60 ECTS	75
ECTS for studies specified by University or optional studies	No more than 30 ECTS	6
ECTS for final thesis (project)	No less than 30 ECTS	39

Contact hours (including distance contact hours)	No less than 10 % of learning (unless otherwise stated in the descriptor of study field)	15.9%
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(2) Expert judgement/indicator analysis

The first cycle *Biomechanics* and second cycle *Biomedical Engineering* study programmes comply with the legal requirements.

The aims of the programmes (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 first cycle *Biomechanics* study programme uses a variety of teaching and learning activities: lectures (traditional and flipped classroom), demonstrations, problem solving, laboratory work, literature studies, case studies, individual projects, team projects, study trips, reflections and discussions. Problem based learning methods and project work is implemented in several modules. A variety of assessment methods are used – assignments, labs and lab reports, written exams, oral exams, project reports, presentations, and defence.

The second cycle *Biomedical Engineering* study programme uses a variety of teaching and learning activities: lectures, literature studies, problem solving, simulation activities, individual projects, team projects, reflections and discussions. Project work is implemented in several modules. A variety of assessment methods are used – assignments, written exams, project reports, presentations, and defence.

The procedure and criteria for assessment of learning outcomes is specified for each subject module and the contribution of each assessment to the final grade in each subject module are listed on the module card. Teachers are expected to present the curriculum, the expected learning outcomes, and assessment criteria and how these links to general goals of the study programme to the students in the beginning of each course.

(2) Expert judgement/indicator analysis

The teaching and learning activities and assessment methods used at the *Biomechanics* and *Biomedical Engineering* study programmes 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 are addressed using a variety of learning activities and assessment methods. The assessment methods are tailored to each subject module, and therefore likely suitable to evaluate the desired learning outcomes.

A large focus on project work makes it probable that the students achieve the desired learning outcomes of the programmes related to research skills, engineering analysis and engineering design.

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 first and second cycle study programmes are formulated with respect to the EUR-ACE standard and detailed under the headlines: Knowledge, Research Skills, Engineering analysis, Engineering design, Personal and social abilities, Engineering practice ability.

The learning outcomes of the first cycle *Biomechanics* study programme, as stated on the study programme webpages for prospective students, reads as follow:

“Knowledge

- The knowledge of social and psychological problems of the disabled persons as well as the principles and possibilities of adapting the environment to people with disabilities and designing & selecting the technical assistance equipment for the disabled.
- The knowledge of the basics of fundamental sciences, technological sciences and biomechanical engineering and the capability to integrate the methods and processes from other areas of science in the context of multidisciplinary engineering.

Research skills

- The skills related to research planning and accomplishment as well as analysis and interpretation of the obtained data.
- The skills of working with engineering equipment.

Engineering analysis

- The capability to identify, formulate and solve engineering problems.
- The capability to choose and apply appropriate analytical and modelling methods.

Engineering design

- The capability to design a system, unit or process for pursuing the set object in presence of real economic, environmental, social, political, health & safety, producibility and sustainability restrictions.
- The capability to understand design methods and be able to apply them.

Personal and social abilities

- The capability to work individually and in multidisciplinary teams, to communicate effectively, to follow the provisions of the professional ethics and engineering activities, to perceive a responsibility for the engineering activities.
- The capability to understand the importance of individual lifelong learning and will preparation for it.

Engineering practice ability

- The capability to combine their knowledge of theoretical and applied engineering for solving the arising problems, to perceive the influence of engineering solutions in a global, economic, environmental and public context.
- The capability to choose and apply methods of advanced engineering as well as the skills and means required for the professional activities.”

(https://vilniustech.lt/studies/study-programmes/bachelor-and-integrated-study-programmes/317407?element_id=320665&sp_id=5&f_id=9&qualification=a%3A2%3A%7Bi%3A0%3Bs%3A1%3A%22B%22%3Bi%3A1%3Bs%3A1%3A%22A%22%3B%7D#Learning%20outcomes).

These learning outcomes differ from those listed in the SER (Annex 9.1), although the learning outcomes in the SER and Vilnius Tech’s web are essentially similar. Each learning outcome as stated in the SER (Annex 9.1) is addressed in several modules.

The learning outcomes of the second cycle *Biomedical Engineering* study programme, as stated on the study program webpages for prospective student, reads as follow:

“Knowledge

- The knowledge of scientific research and innovations; a capability to apply concepts, laws and numerical research methods.
- The knowledge and critical assessment of the up-to-date achievements in biomedical engineering.

Research skills

- The capability to plan and carry out analytic, modelling and experimental research, to assess critically the obtained data and to provide conclusions
- The capability to explore the peculiarities of application of newly appeared technologies in the field of biomedical engineering.

Engineering analysis

- The capability to develop new and original engineering ideas and methods in innovative way.
- The capability to apply the acquired interdisciplinary knowledge and understanding for solving specific problems in biomedical engineering.

Engineering design

- The capability to develop new and original engineering ideas and methods in innovative way.
- The capability to apply the acquired interdisciplinary knowledge and understanding for solving specific problems in biomedical engineering.

Personal and social abilities

- The capability to work effectively both in a team and individually, to communicate with engineering community and public at large on the national and international level.
- The capability to understand in a holistic way the impact of engineering solutions on the society and the environment, to observe the norms of professional ethics and engineering activities, to feel a responsibility for the engineering activities.

Engineering practice ability

- Thorough understanding the applicable methods and methodologies as well as their narrowness and restrictions in the global economic, environmental and public context

- The capability to understand in a holistic way the impact of engineering solutions on the society and the environment, to observe the norms of professional ethics and engineering activities, to feel a responsibility for the engineering activities".
(https://vilniustech.lt/studies/study-programmes/master-study-programmes/317411?element_id=317413&sp_id=18&f_id=9&qualification=a%3A1%3A%7Bi%3A0%3Bs%3A1%3A%22M%22%3B%7D#Learning%20outcomes).

These learning outcomes differ from those listed in the SER (Annex 9.1), although the learning outcomes in the SER and Vilnius Tech's web are essentially similar. Each learning outcome as stated in the SER (Annex 9.1) is addressed in several modules, mainly in the form of individual projects that are assessed by reports and/or presentations.

(2) Expert judgement/indicator analysis

The desired learning outcomes of the first and second cycle study programmes, i.e., those stated in the SER as well as those stated on the study programme webpages for prospective students, 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).

Both study programmes cover all essential areas of Biomedical Engineering, although with a focus on Biomechanics. Hence, a more appropriate title of the First cycle study programme in Biomechanics would be 'Biomedical Engineering'.

The curriculum of the study programmes ensures consistent development of competences of students. The learning outcomes of the study programmes, as stated in the SER, are repeatedly addressed during the studies. Progression with respect to the desired learning outcomes of the study programmes is likely achieved since several subject modules contribute to the learning.

However, medical device regulation and ethics related to development of medical devices, which is very important for biomedical engineers, only seems to be addressed on one occasion in each study programme. More focus on this would be desirable.

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 first cycle *Biomechanics* study programme consists of 95% mandatory modules (228 out of 240 ETC). The students can choose between Politics and Technology/Technical philosophy (3 ETC); English/German/French (6 ETC), and Environmental protection in Medicine/Medical psychology/FirstAid/Ergonomics (3 ETC).

The second cycle *Biomedical Engineering* study programme consists of 97.5% mandatory modules (117 out of 120 ECT). The students can choose between modules from other degree programmes (3ETC).

(2) Expert judgement/indicator analysis

There are limited opportunities for the students to personalise the curriculum since a vast majority of the courses in the *Biomechanics* and *Biomedical Engineering* study programmes are mandatory.

However, there are some possibilities for the students to personalise their education through the choice of topic for the B.Sc. and M.Sc. projects.

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

(1) Factual situation

The procedure for preparation and defence of the final thesis is regulated by directives from Vilnius Tech. The topics and supervisors of the final thesis are formally decided by the Dean of the Faculty. The thesis is evaluated by a final thesis reviewer; the reviewer must have at least a M.Sc. degree and sufficient pedagogic/research/practical work experience in the field of study. The final thesis is defended in a degree award commission consisting of >5 competent specialists in the field of study. For the B.Sc. thesis defence the chairman of the commission must be a practicing professional who does not work for Vilnius Tech, and for the M.Sc. defence at least one member of the commission must be a person who has not worked at the University for the last three years. The composition of this degree award commissions are formally approved by the Rector.

The B.Sc. thesis project (18 ECT) spans over two semesters and focuses on prototype design and analysis. The B.Sc. thesis consists of a written part of 40-50 pages and a graphical part. Three modules are allocated (3+6+9 ETC) for the B.Sc. project. The topic of the thesis is set during the 7th semester and may be related to the internship done during that semester. Examples of such topics proposed in collaboration with the companies UAB Biomedikos centras and UAB OrthoBaltic are given in the SER (p. 14).

The M.Sc. thesis project (39 ECT) spans over all 4 semesters of the *Biomedical Engineering* programme. Four modules are allocated for the project (3+3+3+30 ETC). The M.Sc. thesis consists of a written report. The topic of the thesis and the supervisor is set during the first semester. The students can choose from topics proposed by the lecturers (i.e. the supervisor of the thesis), but can also propose a topic in discussion with the lecturers. Examples of collaborative M.Sc. thesis projects involving other institutions and companies are given in the SER (p.14).

(2) Expert judgement/indicator analysis

The procedure for final thesis preparation and defence are thorough and comply 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, and in most cases the projects are linked to local industry and/or research projects. According to the lecturers, the extended duration of the thesis projects facilitates linking theory from the subject modules to practise. It was clear from the site visit that this arrangement is working – the students were satisfied.

Strengths and weaknesses of this evaluation area:

(1) Strengths:

1. The first and second cycle study programmes are connected to local industry through internship and thesis projects.
2. The extended duration of the B.Sc. and M.Sc. thesis projects facilitate linking between theory and practice.
3. A variety of learning activities and assessment methods promote achievement of the desired learning outcomes.

(2) Weaknesses:

1. The training for interaction with medical/health care professionals is limited.

2. The students from the Lithuanian programmes are not sufficiently trained for an international career with respect to oral and written scientific communication in English.
4. There are limited possibilities for students to personalise the curriculum.
5. The title 'Biomechanics' does not accurately reflect the scope of the first cycle programme.

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 the research activities at the Faculty of Mechanics are coordinated by the Vice-Dean for Science and Innovation. The research carried out in the Department of Biomechanical Engineering is led by the Head of the Department and the executors are all lecturers employed by the Department. The researchers of the Department work closely with researchers in the field of medical sciences and most of the publications of research results are interdisciplinary (e.g. mechanical engineering and medicine). Every five years, research plans are drawn up, which involve researchers working in the Department. Under these plans, core funding for research is planned to be raised through project activities and outsourcing with business partners.

Researchers in the bioengineering field are involved in research projects. A total of 13 project applications were submitted during 2016–2021, resulting in total funding of over € 900,000 from 2018 to 2021 as the projects and outsourced contracts. Researchers are currently preparing applications for international and national projects, collaborating with businesses on possible outsourcing, with the aim of attracting around € 300,000 in funding per year.

In 2018–2021, research active members of the Department of Biomechanical Engineering published 23 scientific articles included into the Clarivate Analytics Web of Science database, and 14 publications in other international databases. A total of 64 publications have been published in the last 3 years.

(2) Expert judgement/indicator analysis

The teaching staff is actively involved in the research activities and applied research in cooperation with local companies and publishes regularly in high quality (WoS) scientific journals. Considering that the total number of teachers in the second cycle is 13 (SER Table 6.2) the ratio, number of publications per year per researching teaching staff, could be even higher. Moreover, joint interdisciplinary research activities are ongoing with researchers in the field of medical sciences.

A research plan is composed after every five years. The staff makes systematic efforts to find external funding to support R&D despite facing high pedagogical workload. As an encouraging answer to the question, 'how does the HEI support external funding?', asked by the expert panel members on the meeting with senior management and Faculty administration staff, was that there is a support for preparing research grant applications in terms of administration and the process is funded by the HEI. This kind of support has been increased in recent years helping to mitigate the risk that the number of nationally or internationally funded research projects over the last 20 years has been limited and incapable of creating sustainable research activities.

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

(1) Factual situation

Science is based on the research directions approved by Vilnius Gediminas Technical University – “Mechatronics”, which is identified as a priority in the Lithuanian Smart Specialization Strategy. Current R&D is carried out under the topics “Intelligent Embedded Systems”, “Metamaterials and Nanoderivatives”, and “Bionics and Biomedical Engineering Systems”, and are implemented and performed as the outsourced works by Lithuanian and foreign companies. There is daily connection of scientific and technological achievements with studies takes place through lectures, exercises, preparation of coursework, final theses, internships, informal activities, etc. The project “Biological Feedback Measurement and Analysis Technology Center for Strengthening Personal and Public Health (Bio-MAC)” financed by the EU Structural Funds in 2020–2023 serves as a tool for improving the scientific competence of project implementers and study programme teachers. The students are employed to execute some project activities, the bachelor's and master's thesis topics are linked to the project objectives.

During the period under review, the Department has submitted and received annual funding for the visiting lecturers from abroad from the Education Exchange Support Foundation. Since 2015, a visiting professor from Switzerland (ETHZ and University of Bern) has read 40 hours’ “Trauma Biomechanics” as an intensive course which is completed with student group projects and their presentations. In 2018, in cooperation with ESEM (Educating Students in Engineering and Medicine, <http://www.esem.eu>) a total of 10 ESEM Biomedical Engineering Lectures were organised for students at partner universities from 8 different universities.

(2) Expert judgement/indicator analysis

The lecturers of the first and second cycle study programmes under evaluation introduce students to the latest scientific and technological achievements in the lectures, exercises, preparation of coursework, final theses, internships and informal activities. This is supported by the involvement in the research topics “Bionics and Biomedical Engineering Systems” belonging to the field “Mechatronics” identified as a priority in the Lithuanian Smart Specialization Strategy. The students are employed to execute ongoing research project activities linking the bachelor's and master's thesis topics to the project objectives. The latest developments in science and technology are introduced by regularly visiting lecturers from foreign universities.

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

The students are introduced to the possibilities of participating in applied science activities during their studies. For this the bachelor's studies in bioengineering include a course “Introduction to the specialty” taught in the 1st year in the autumn semester. The students can participate in projects initiated either by the Faculty of Mechanics or in other faculties. The students are also involved in applied science activities through internships. Finding good practice places for students plays a key role here. During the internship, the manufacturers themselves involve the students in various research activities, where the equipment and qualified staff in the laboratories of the Faculty of Mechanics help to solve various problems.

The course “Fundamentals of Research and Innovation” is taught in the first semester in the autumn semester of the second cycle study field of bioengineering. The master students are encouraged to carry out research through dissertations, coursework and complex projects by contributing to the Department's researchers who participate in the announced National (RCL; ASIT – Agency of Science, Innovation and Technology) competitions, which encourage young researchers – postgraduate students to carry out research, leading to at least 1 summer practice place “Investigation of the Possibilities of Pain Objectification Using the Analysis of Functional Nuclear Magnetic Resonance Data”.

Active master's students are employed in the research projects carried out in the Department if possible. The topics of the bachelor's and master's theses are related to the project objectives or the scientific interests of the lecturers at the Department. The manufacturing of prototypes is encouraged in the final works, and the Department and the Faculty allocate funds for the materials.

The master programme students choose topics already in the first semester in order to have time to prepare the final work and to deepen their knowledge on subject matter. They usually begin to delve into the chosen area and refine their research object, goals, and objectives. It happens that the topics change as a result, that there are no more uncertainties to deal with, or that the direction of the topic changes. Students are given every opportunity to roll out their research directions and improve or change them. There are also cases where students completely change the field of the subject for one reason or another. Some of them are interested in new areas or start working in a company that conducts some kind of targeted research, or changes are made due to research restrictions, complicated research conditions, lack of technical means. During each semester assessment of master thesis progress is organised in a seminar form – all students present their work, the problem they are solving, progress and plans. This kind of form allows the identification of the challenges and problems the students are facing, modification of tasks and direction of research. Students always communicate with the supervisor, are able to consult with other teachers of Department and if the problem arises – it is addressed individually: topic and/or supervisor can be changed, student can choose alternative topic, as the list of topics for the thesis is longer than the student list, therefore students can choose alternative topic suggested by supervisor or propose their own.

Students (especially master students) are encouraged to share their scientific achievements in public at the annual conference of young Lithuanian scientists’ “Mechanics, Materials Engineering, Industrial Engineering and Management” organised by Vilnius Tech every year. The students attended on the international conference BIOMDLORE (<http://www.biomdlore.lt>, in Białystok (Poland) in 2018 and in Vilnius in 2021) organised by the Department of Biomechanical Engineering together with the Lithuanian Society of Biomechanics.

Informal creative and applied science projects are arranged in the Creativity and Innovation Centre Vilnius Tech "LinkMenų fabrikas" and in the special lab at the Faculty of Mechanics.

(2) Expert judgement/indicator analysis

Related courses such as “Introduction to the specialty” on the first cycle and “Fundamentals of Research and Innovation” on the second cycle (SER p. 19-20, and Annex 9.2) are taught in the first semester of the bioengineering study field. The master students are encouraged to carry out research through dissertations, coursework and complex projects supervised by the Department's researchers. The topics of the bachelor's and master's theses are related to the project objectives or the scientific interests of the lecturers at the Department. It is very positive that active master's students are employed in the research projects carried out in the

Department if possible, and the manufacturing of prototypes is encouraged in the final works with the materials funded by the Department.

The second cycle study programme enables students to choose the final thesis topics early with the possibility to modify or change it. The assessment of master thesis progress is organised in a seminar form during each semester. There seem to be healthy routines for supervising the thesis. A master student planned to work for 1-2 years then study for a PhD in the USA, which is a good sign indicating that conditions for students to get involved in scientific activities promote further doctoral studies.

It is important that the students were satisfied with the laboratories as the primary locations to engage with the scientific activity. A little warning sign that can hamper students' involvement in scientific activities is a relatively high workload of the students during the studies (especially on the bachelor level), sometimes on the study-unrelated activities. But this should be seen as a general remark not specifically addressing the study programmes under evaluation.

The HEI could create even better conditions for the students to get involved in scientific activities to provide metal printing possibility, which could be essential for the field of biomechanics, and also other specialities.

Contacts with the employers seem to be close and good (based on the expert panel interviews with the alumni, employers, social partners) supporting finding research-oriented practice places for the students. The employees indicated that teaching activities should be more oriented to future employment including creative thinking/problem solving. This could facilitate even more students' involvement into scientific activities. Moreover, there were not any concerns between doing internship/working at the companies and intellectual property (IP). IP strategy is agreed in advance.

Strengths and weaknesses of this evaluation area:

(1) Strengths:

1. The teaching staff is actively involved in the research activities and applied research in cooperation with the local companies.
2. The staff publishes regularly in high quality (WoS) scientific journals.
3. Joint interdisciplinary research activities are ongoing with researchers in the field of medical sciences.
4. A research plan is composed after every five years.
6. The staff makes systematic efforts to find external funding to support R&D.
7. There is support for preparing research grant applications in terms of administration and the process is funded by the HEI.
8. The lecturers of the first and second cycle study programmes under evaluation introduce students to the latest scientific and technological achievements in the lectures, exercises, preparation of coursework, final theses, internships, and informal activities.
9. The course "Fundamentals of Research and Innovation" is taught in the first semester in the autumn semester of the study field of bioengineering.
10. The students are employed to execute ongoing research project activities linking the bachelor's and master's thesis topics to the project objectives.
11. The latest developments in science and technology are introduced by regularly visiting lecturers from foreign universities.
12. The manufacturing of prototypes is encouraged in the final works with the materials funded by the Department.

13. The study programme enables students to choose the final thesis topics early with the possibility to modify or change it.
14. The students were satisfied with the laboratories as the primary locations to engage with the scientific activity.
15. Assessment of master thesis progress is organised in a seminar form during each semester.
16. Close cooperation with the employers in the field since finding research-oriented practice places for students can be crucial for the students being involved in applied science activities through internships.
17. A positive trend is that the number of undergraduate students willing to present their research at the annual conference of young Lithuanian scientists' is increasing.

(2) Weaknesses:

1. Only a few grant applications have been funded in recent years.
2. The participation of both masters and bachelors (e.g. through the final thesis) to participate in research, creative thinking and present their research publically is not yet very popular.
3. Intellectual property issues are not very actively addressed.

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

Admission to the first cycle studies of the Bioengineering study field in Vilnius Tech (study programme *Biomechanics*) is carried out by an institution authorised by the Ministry of Education, Science and Sports of the Republic of Lithuania – the Association of Lithuanian Higher Education Institutions. Candidates apply using an e-system (LAMA BPO). Requirements, admission rules, structure of the competition score, information about additional points etc. is provided for the candidates in University's webpage and LAMA BPO webpage.

As stated in SER in the last 3 years, there were a total of 213 applicants to the first cycle studies in the field of Bioengineering in Vilnius Tech. 35 of them listed this study programme as their first priority. 34 were enrolled. Over this period, the highest competition score was 10 (in 2021) and the lowest was 4,33 (in 2019). All the students admitted got state-funded places. From 2019 to 2021 the average competition score of enrolled students was 6,51, 7,90 and 5,43, respectively.

Admission to the second cycle studies in Bioengineering study field in Vilnius Tech (study programme *Biomedical Engineering*) is conducted by the University's Admission and Information Center (SPIC). There are no entry exams to the *Biomedical Engineering* programme. Bachelors who have completed university studies (college degree is not accepted) in this field of study or a field close to it and who have established minimum knowledge of the study programme are admitted to study. If there is a lack of knowledge of up to 10 credits of subjects, it is allowed to cover the missing subjects until the end of the first semester of master's studies. The competition score for entering a master's degree is the weighted average of undergraduate studies.

According to SER in the last 3 years, there were a total of 116 applicants to the second cycle studies in the field of Bioengineering in Vilnius Tech. 34 of them listed this study programme as their first priority. 28 students were enrolled. Over this period, the highest competition score was 12,45 (in 2020) and the lowest was 8,47 (in 2019). All the students were admitted to state-funded places. From year 2019 to 2021 average competition score of enrolled students was 9,36, 10,78 and 10,25, respectively.

The admission of foreign students to the second cycle programme *Biomedical Engineering* (in English) is carried out by the University's Center for International Studies (TSC). Admission requirements are available on the TSC website. Over the last three years, there were 13 entrants, all having selected this programme as their first priority. 4 students were enrolled (3 in 2019, 1 in 2020 and none in 2021). As mentioned in SER, 2021 was not successful due to different reasons – problems receiving visas, some students decided to reapply next year, some faced COVID-19 and other medical issues. Over this period, the highest competition score was 9 (in 2020) and the lowest was 6 (in 2020). Average competition score was 7,89 in 2020 and 7,59 in 2021. Information on 2019 is not provided and numbers regarding year 2021 are irrelevant as long as no enrolled students began their studies.

(2) Expert judgement/indicator analysis

Webpage of LAMA BPO is conveniently available in Lithuanian language as well as English. Admission criteria to first and second cycle studies are clearly stated and updated each year by the University. All information regarding admission to both first and second cycle studies of Bioengineering field in Vilnius Tech can be found on the University's webpage. Whole process is clear and transparent.

Expert panel found out that higher admission rates would be beneficial for both first and second cycle study programmes in the field of Bioengineering. Currently, e.g., international master students' classes consist of very few students, usually one or two, which is questionably efficient for the University.

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

Vilnius Tech has its own procedure of crediting study results. It is possible to recognise study results acquired in other Lithuanian or foreign higher education institutions, as well as internships in foreign companies.

Partial ERASMUS + studies abroad are also recognized and accredited in Vilnius Tech. If the volume of an analogous subject studied in another institution reaches at least 2/3 of the credits required under the programme then such module is credited. As the subjects to be studied during the exchange are agreed in advance before the departure, there are no problems with their accreditation.

A candidate seeking recognition of competencies through non-formal and informal learning must have at least a secondary education and at least two years of practical work experience in the field for which recognition of competencies is sought. The amount of study credits that can be awarded for competencies acquired informally and spontaneously by a candidate shall not exceed 70%.

The University did not provide exact numbers of cases when competencies and qualifications gained through formal and non-formal learning were recognised during the period of evaluation.

(2) Expert judgement/indicator analysis

Vilnius Tech relies on its own regulations regarding recognition of foreign qualifications, partial studies, and prior non-formal and informal learning. This applies for first and second cycle studies in the field of Bioengineering. The whole process is transparent, clear and understandable.

3.3.3. Evaluation of conditions for ensuring academic mobility of students

(1) Factual situation

All first and second cycle students studying in the field of Bioengineering have the opportunity to participate in Erasmus+ student mobility programme. In the period under evaluation, 1 person from first cycle and 1 from second cycle studies in the Bioengineering study field participated in such programmes.

As stated in SER over the last three years, 1 first cycle and 0 second cycle students from Bioengineering study field took the opportunity of partial studies funded by Erasmus+ programme. 59 first cycle and 4 second cycle foreign incoming students took at least one course from *Biomechanics* (first cycle) or *Biomedical Engineering* (second cycle) study programmes. The information provided by the HEI in self-evaluation report was not sufficient to find out which part of the incoming students chose *Biomechanics* (first cycle) or *Biomedical Engineering* (second cycle) study programme entirely instead of having one or two separate courses from it.

Top countries and universities for outgoing students, as provided by the Faculty:

- Denmark – University of Southern Denmark, Vitus Bering Center for Higher Education;
- Finland – Helsinki University of Technology; Tampere University of Technology; Ostrobothnia Higher Technical School;
- Germany – Eslingen Higher Technical School; Braunschweig Technical University;
- Portugal – Porto Polytechnic Institute.

(2) Expert judgement/indicator analysis

There are all opportunities for all Vilnius Tech's first and second cycle students to leave for partial studies abroad. The expert panel sees a need for wider promotion of academic mobility to the students in the study field of Bioengineering. It would bring some even wider perspective and new ideas to the Faculty as well as students themselves. A higher number of incoming students could spread a message about University and characterise it at the international level.

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

All first and second cycle students in the Bioengineering study field have an introduction to studies at the beginning of their first year. Academic support is provided throughout the studies. It includes various training organised by the Library staff (on information search, data resources), career planning, lectures about Erasmus+ opportunities, internships. The University also organises career days for students.

Students with academic deficits may retake them after the session (if they have received a failing grade) or re-take exams, credits, defend course projects during the re-examination period. A student who has passed all the examinations, credits, defended the course projects

and received one grade less than 9 and all the others 10 or 9 by the end of the session may improve this grade by retaking the exam, taking the test or re-defending the course project during the re-examinations.

Social support in Vilnius Tech embraces activities related to sports, health and culture – academic choir “Gabija”, sports and tourism club “Inžinerija”, tourist club “Turistas”, theatre studio “Palėpė”, folk dance ensemble “Vingis”. Every year, Vilnius Tech hosts many cultural and entertainment events for students.

As stated in SER there are different types of scholarships and financial support that first and second cycle students in the Bioengineering study field can get:

- incentive;
- social – awarded by the State Studies Foundation. Allowances are paid in accordance with the ordered of the Rector;
- nominal – there are established several nominal scholarships that students can apply to;
- one time – scholarships awarded to students for active cultural, sports and other social activities that also benefit the University;
- allowances – one time scholarship due to difficult financial situation, illness, loss of parents or guardians;
- children and grandchildren of foreigners of Lithuanian descent studying at VILNIUS TECH can receive State support. Students can receive state-sponsored loans, the receipt of which is administered by the State Studies Fund. Incentives for students to pay tuition fees (deferral, splitting of fees, discounts, compensations).

A detailed description of the procedure for awarding scholarships and benefits and distributing the scholarship fund can be found on University's webpage: <https://vilniustech.lt/studentams/studiju-procesas/stipendijos/26728?lang=1>.

Special conditions are created for students with mobility impairments: adjustable tables, sanitary facilities for the disabled and elevators. Individual study programs can be created for students with disabilities.

Students are provided with dormitories near the Campus according to the procedure approved by Vilnius Tech. The main focus is on undergraduate students, according to need, social and material situation. For the past year, dormitories have been provided to all students who wished to receive them.

The University has a permanent psychologist's office, where students can receive professional mental health help. Seminars and workshops on mental health topics relevant to students were also organised in order to reduce the stress experienced and improve communication, time planning and effective learning skills while studying. Discussions and lectures are held for teachers to provide psychoeducation and crisis prevention, information consultations were provided in case of difficulties in teaching and working with students.

(2) Expert judgement/indicator analysis

There is an extensive range of academic, financial, social, psychological, and personal support provided to the students of the Bioengineering field in Vilnius Tech. It contributes to the creation of a good overall atmosphere in the University, trying to embrace students with various financial, social, psychological or physical needs.

On the other hand, many students work 20-40 hours a week to support themselves during studies. Some of them expressed that such work had taken away a big portion of their time that could be used for studying.

3.3.5 Evaluation of the sufficiency of study information and student counselling

(1) Factual situation

The University organises “Introduction to Studies” lectures for the freshmen. Every year, in September, student meetings are held with the Heads of the Department, Dean's office staff, administration, and group curators.

All studies-related information is accessible to first and second cycle students in the Bioengineering study field via the internet – in the University's information, webpage, or Moodle systems. Students can contact their tutors using the University's e-mail, Moodle and Zoom platforms. In addition, teachers also consult students individually on call twice a week for 2 hours during the semester. The days and hours of on-call time of the Department's lecturers are published physically on the Department's notice board and electronically on the Department's website.

Students' needs and interests are also represented at the Faculty Student Representation. The Representation is interested in students' study conditions, living conditions in dormitories, participates in the activities of the Study Committee, cooperates with student organisations of other educational institutions, participates in joint activities of teachers and students, organises student surveys and meetings, discussions, conferences.

(2) Expert judgement/indicator analysis

According to the expert panel, study information is delivered conveniently to the first and second cycle students of the Bioengineering field in Vilnius Tech. There is sufficient student counselling and welfare support.

Strengths and weaknesses of this evaluation area:

(1) Strengths:

1. Many ways in which students get counselling and various support.
2. Students have a lot of opportunities to be included in academic mobility programmes, various social, sports and cultural activities organised by the University.

(2) Weaknesses:

1. Low indicators of academic mobility.
2. Number of enrolled students to both first and second cycle studies is lower than desired.

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

As stated in SER criteria for the assessment of study achievements are indicated and defined by the VILNIUS TECH Senate in 2018 December 11 in the approved resolution No. 107-2.3 "On the Approval of the Description of the Procedure for the Assessment of Students' Achievements and the Organisation of Assessments of Vilnius Gediminas Technical University". Students' knowledge and skills acquired during studies are assessed on a ten-

point scale (regulated by Order No. ISAK – 2194 of the Minister of Education and Science of 2008 on the Approval of the Study Outcomes Assessment System) and based on the cumulative assessment criteria defined in the Student Achievement Assessment Procedure. The knowledge and skills acquired by the students during the studies are applied and improved during the internships, the procedure of which is regulated by the Rector of the University in 12, October 2020 order No. 10.8-857.

To ensure the active work of students throughout the study period, the University applies cumulative assessment of achievements. The studies of each study subject are completed with a final assessment, which is assessed with a grade or passed / failed. The final assessment of the study subject (module) is calculated according to the proportions provided in the card of the study subject (module): by adding the percentages of the assessments of intermediate assessments and final assessments. The assessment accumulated during the student's semester for the intermediate tasks provided in the study subject (module) may range from 30% to 70% (inclusive) of the final assessment. Interim assessments and final exams are counted if they each meet at least the threshold level of achievement. The University educates students by combining several forms of learning - group and individual. Students work in groups during various lectures, laboratory works or prepare reports or final theses individually.

After graduating bachelor studies in Vilnius TECH University, students have the opportunity to continue their master's studies at the same university, choosing the same field.

(2) Expert judgement/indicator analysis

The first and second cycle study programmes in the field of Bioengineering help students achieve best results and gain various types of experience/ achieve the desired learning outcomes related to cumulative assessment of achievements. For example, the intermediate assessments are obligatory, their forms can be report, term paper, laboratory work, homework, colloquium, test, review of works. Furthermore, there is a possibility to gain 10% to the final assessment grade for active work and / or quality tasks. There was no complaint from the student about the evaluation system, the system works.

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

(1) Factual situation

As stated in the SER Vilnius Tech faculties, considering the needs and illness of a student with a disability, apply a flexible payment schedule, partially or completely exempt them from tuition fees due to a severe disability.

Since 2012 the State Study Fund implements the project "Ensuring the Accessibility of Studies for Students with Special Needs". Students with disabilities are granted a monthly targeted allowance.

In Vilnius Tech SER was reported that people who are orphaned or have lost one of their parents are exempt from the registration fee (40 Eur – paid upon entering the University when the study contract is signed). A copy of the death certificate(s) must be provided. If a student loses one of their parents during their studies, a one-time benefit from the Dean's fund is provided.

The University offers several types of scholarships for Vilnius Tech students: incentive, social, nominal and one-time. For example nominal scholarships were awarded to students of the first and second cycle study programs in the field of bioengineering as follows: – 0

scholarships in 2016, in period of 2017 – 2018 – 1 scholarship each year, in 2019 – 2020 – 2 scholarships each year.

The information about social scholarships awarded by the State Studies Foundation was reported in the SER. Allowances are paid in accordance with the Rector of the University approved by order no. 10.8–298, 21 April, 2020. One-time scholarships can be awarded to students for active cultural, sporting and other social activities for the benefit of the University, as well as allowances (due to difficult financial situation, illness, loss of parents or guardians) – awarded by the Dean of the Faculty one-time scholarship and allowance fund. Disabled students studying at Vilnius Tech receive financial assistance from the Department of Disability Affairs under the Ministry of Social Security and Labour.

Children and grandchildren of foreigners of Lithuanian descent studying at Vilnius Tech can receive State support. Students can receive state-sponsored loans, the receipt of which is administered by the State Studies Fund. Incentives for students to pay tuition fees (deferral, splitting of fees, discounts, compensations).

As stated in the SER special conditions are created for students with mobility impairments: special adjustable tables, sanitary facilities for the disabled and elevators. More information is given in section 5.2 of the SER. Students are provided with dormitories according to the procedure approved by Vilnius Tech, without excluding students of a specific study programme. The main focus is on undergraduate students, according to need, social and material situations. For the past year, dormitories have been provided to all students who wish to receive them.

If necessary, the psychologist gives training to teachers about mental disability, counselling students with disabilities, providing emotional support, some information and referring them to the appropriate medical facility if necessary. Students with disabilities can seek emotional support or short-term psychological help.

(2) Expert judgement/indicator analysis

The University and Lithuanian Government provide a lot of help and opportunities to first and second cycle students with special needs and socially vulnerable groups in Vilnius Tech University. The different opportunities were implemented in the University and support of the training of educational specialists is also organised which is to help improve the study conditions for students with special needs. It is important that the teachers receive training in how to recognize psychological difficulties, learning disabilities, communicate or, if necessary, help, direct help to the University staff and students. Furthermore, it is important that all the students and staff of the Vilnius Tech can seek emotional support or short-term psychological help.

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

As stated in SER “assessment of students' knowledge is regulated on 11 December 2018 Senate Resolution No. 107–2.3, the “Description of the Procedure for the Assessment of Student Achievements and the Organization of Assessments of Vilnius Gediminas Technical University” was approved”.

Based on the provided information in the SER the certificate of assessment of study results consists of the assessment accumulated by the student for the obligatory semester tasks, provided in the module of the subject; evaluation of the mid-term examination for theory

during the semester, evaluation of the exam during the session. Subject module tabs show the weighting factors for all components. Assessment criteria are published at the beginning of each subject and are known and available to students.

The SER provided information on how the students in the Faculty of Mechanics are directly involved in the life of the Faculty and may therefore have an impact on programme quality management and programme administration. This is implemented through the delegated members of the Student Representation in the Dean's Office, the Faculty Competitions and Certifications Commission, the Faculty Council and the Faculty Studies Committee. In all these bodies, students can express their views on issues of study quality.

As stated in SER student progress analysis is performed on an ongoing basis. This is done after each semester during the joint meeting of the Department and the Study Programme Committee (SPC), an attempt is made to find out the shortcomings of the content of certain study subjects and their implementation, and to analyse their reasons. Ways to eliminate vulnerabilities are envisaged. For this purpose, study methods, knowledge assessment and reporting systems are improved, independent work tasks and schedules are reviewed.

Data on the study progress of students in the first and second cycle in relation to the results of admission to studies and the number of graduates showed that the results getting better every year (e. g. first cycle 2016 - 30,9%, 2017 - 39,3%, 2018 - 75%, 2021 - 100%; e. g. second cycle 2018 - 16,7%, 2019 - 44,4%, 2020 - 54,5%, 2021 - 66,6%). Provided data describes the progress of studying students by the weighted average of all exams, term papers and project grades in the first and second cycle programmes.

To avoid copying during exams, only one group of up to 30 students is examined in one room. Exam tasks are individualised as much as possible. In addition to the teacher, assistants also take part in the exam. There are very severe penalties for dishonesty, for example, if a student is found to have a transcript during an exam.

The impact of remote working necessitated by the COVID pandemic, on the quality of studies has been significant since some things cannot be replaced by video recordings and online sessions. Hands-on skills development and contact work are needed in many places, which make learning outcomes more difficult to achieve, motivation to study can be reduced, and there is a social gap with friends, etc. However, the University adapted well to the situation, conducting remote consultations, compiling lists of students and work schedules in laboratories, and takes all possible legal measures to ensure that research and study work did not stop.

The SER and additional information provided to the expert panel reports a total dropout rate of the first and second cycle studies in the field of Bioengineering during the last 6 years of between 17 and 67 %. There is a smaller dropout in the second cycle study programme. The reasons given for students dropping out in the meeting with staff included failure to thrive academically (as opposed to exclusion based on failure to progress in studies) and leaving to take up (or continue in) paid employment.

(2) Expert judgement/indicator analysis

The strong part is that the knowledge evaluation system of the first and second cycle study programmes in the field of bioengineering consists of two parts: cumulative and critical. The student can get full support from the teacher of the module during the studies (e. g. while doing homework or laboratory work) and after the assignment (e. g. term paper or project (after each stage)), later during the defence of the final project the teacher reflects on status of achievements. As well, consultations take place before the exams. Teachers comment on the results of the exam, if necessary, individually for each student. Such an assessment system

encourages students to work more evenly during the semester, allowing for a full and objective assessment of study achievements. To have individual consultation is very favourable because the number of the students is decreasing to return to the next year of study.

The dropout rates reported are alarming, but there is no evidence that it is caused by factors within the control of the Department or University. As noted, discussions with students revealed that they typically spent 20-40 hours per week in paid employment and felt that this had a negative impact on their studies. It was also apparent that many students who did drop out did so to work full time in the medical technology sector.

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

(1) Factual situation

Data presented in the SER examined how long it takes for the graduates to establish themselves in the Bioengineering labour market (the graduates of the study programme until graduation), their employment in general and employment according to the acquired specialty (including those employed before graduation), and the need for specialists.

Regarding the first cycle study programme *Biomechanics* the situation in the labour market was assessed by employers as good or average. 2013–2019 as the economy grew, there was a shortage of specialists, especially engineers with higher education. Creativity and analytical skills are one of the most missed traits. Although students are encouraged to perform various tasks independently during their studies and are taught to analyse the results obtained, employers notice that engineering professionals lack such skills.

Regarding the second study cycle study programme *Biomedical Engineering* in the labour market, employers have assessed the situation on average, and the need for higher-skilled specialists is increasing. With the introduction of innovative technologies by companies, there is a demand for specialists with a master's degree. This is especially important for employees pursuing a career. After the second cycle studies, the graduates of the bioengineering study programme gain more creativity, independence and initiative. Although students are encouraged to perform various tasks independently during their studies and are taught to analyse the results obtained, they conduct research, but employers note that engineering professionals need to develop more creativity and analytical skills.

The data from the SER analysed the employment of the graduates of the programmes in the labour market, it examined how long the graduates enter the labour market, the graduates of the programmes, their employment in general and employment according to the acquired specialty (including those employed before graduation) and the need for specialists. During the survey, 17 respondents were interviewed, 1st and 2nd cycle students of current and former study programmes in the field of Bioengineering. The questionnaire consisted of 14 questions. The results of the survey showed that as many as 60 % of all respondents work according to the acquired specialty.

Representatives of social partners with experience in employing graduates from these programmes indicated that whilst the students are excellent at learning new skills, are self-confident, communicate effectively and have good IT skills, more could be done to foster problems solving skills and consideration of whole product life cycle.

(2) Expert judgement/indicator analysis

It is commendable and necessary to monitor the employment and establishment of the graduates of the field of Bioengineering in the labour market. Vilnius Tech does that and uses

the information to manage course improvements. A significant number of students who are still studying start working, especially after an internship and about 10 % of students (of the 1st cycle) start working in the 4th year (often, they do so while remaining in the company after completing an internship). These numbers are promising on one hand (that the employment in this study field is high) and disturbing on the other hand regarding the study quality for the student. Employers previously identified the traits of creativity and analytical skills as less developed in the students. The University responded by encouraging students to perform various tasks independently during their studies and by teaching them to analyse the results obtained. It shows that the University reacts and adapts to the needs of the market. It is commendable that Vilnius Tech helps to reach students the employers and vice versa organising different events like Vilnius Tech career days, various job advertisements are published on the Department's notice boards on the website and Vilnius Tech has student CV database.

Feedback from employers was, on the whole extremely positive. However, it is clear that there is still room for improving the first and second cycle study programmes to address the full life cycle of the medical devices (rather just design and evaluation) and to develop more fully intellectual skills such as problem solving.

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

(1) Factual situation

The data from the SER explained that University lecturers, students and listeners follow the principles of academic integrity defined in the Code of Academic Ethics of Vilnius Gediminas Technical University in the study process.

As stated in SER the lecturer must react in principle and report to the administration of the University or its department (faculty, institute, department) or the Legal and Ethics Committee on cases of student dishonesty, such as plagiarism, copying, falsification of data, fabrication, examination or credit test, during the credit, submission of someone else's written work as their own, earning money by preparing written work for other students, purchasing the written work and submitting it to a member of the academic community for evaluation, submitting the same evaluated written work when paying for another course, etc.

The information was stated in the SER that the teacher must reduce the chances of students experiencing academic dishonesty during the assessments. In order to prevent cases of dishonesty during the interim and final reports, the head of the Department may appoint more lecturers or use student representatives.

As well SER showed that students and listeners follow the principle of academic integrity in the study process. The principle of academic integrity is violated in the study process by: copying or allowing another to copy; failure to report observed cases of academic dishonesty of members of the academic community; narration, use of notes or other means not authorised by the examiner; plagiarism, i. e. presenting someone else's written work as their own; taking advantage of another student's work or results through assessment; submission of the same written work when paying for several courses; the student's settlement for himself through another person or the settlement for another person, and so on. Every student who enters the University signs a Student Declaration of Integrity, which is valid for the entire term of the study contract. This declaration can also be signed by the listeners in accordance with the procedure established by the University.

The University has implemented a specialised text alignment check system that checks the amount of alignment in uploaded written works by comparing them with active and archived websites and international scientific databases, as well as with previously uploaded written works and other sources of information. The system allows uploading all digital versions of written works in various formats, checking the works in Lithuanian, English and other popular world languages.

Vilnius Tech stated in SER that relationships between members of the academic community are based on the principles of respect, goodwill, impartiality and non-discrimination. These principles are violated by discrimination against members of the academic community in language, action or academic evaluation, as well as tolerance of such discrimination; humiliation of a member of the academic community in the exercise of his or her authority.

As stated in SER personal data is processed in accordance with Vilnius Tech's personal data security policy and other internal legal acts related to personal data protection, ensuring from 2018 May 25 of the General Data Protection Regulation No. (EU) 2016/679) and the Law on the Legal Protection of Personal Data of the Republic of Lithuania, other laws and legal acts regulating the processing and protection of personal data.

(2) Expert judgement/indicator analysis

During the evaluation of the first and second cycle study programmes in Bioengineering study field there were no concern or suspicions that University policies to ensure academic integrity, tolerance and non-discrimination is not followed.

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

As stated in the SER the student has the right to submit: an appeal regarding the assessment score; an appeal against breaches of knowledge assessment procedures; a complaint about the actions of the administration, except for complaints about the content of study programmes, academic ethics or employment relations. The entrant has the right to appeal against the decision of the Board of Appeal, which hears appeals against breaches of the entrance examination procedures.

Violations of the assessment procedures may be appealed immediately without recourse to the evaluating lecturer or panel. Description of the Procedure for Examination of Appeals and Complaints of Students of Vilnius Gediminas Technical University (Order No. 10.8-1009 of 2 December 2020). As well the methodology of the application procedures are provided of the Centre for Quality Assessment in Higher Education – the application of the procedures for the submission and examination of appeals and complaints regarding the study process is described (procedure of submission and examination of appeals and complaints, number of appeals and complaints submitted by the students of the evaluated field studies, and decisions made over the last 3 years).

(2) Expert judgement/indicator analysis

The University has procedures of the submission and examination of appeals and complaints regarding the study process within the Bioengineering field studies. The procedure clearly describes the course of the appeal regarding the assessment score; an appeal against breaches of knowledge assessment procedures; a complaint about the actions of the administration. Such a procedure is clear to manage.

Strengths and weaknesses of this evaluation area:

(1) Strengths:

1. The first and second cycle students of the Bioengineering study field gain high competences during the studies: high levels of self-confidence; good software skills including FEA and 3D printing; 'fast learners'; have electronics skills; and communicate effectively.
2. The graduates collaborate with Vilnius Tech to improve the first and second cycle study programmes in the field of Bioengineering and share experiences with the students.

(2) Weaknesses:

1. Poor understanding of the medical product lifecycle.
2. Room for improvement in the development of reasoning skills, evaluating decisions.
3. No sessions dedicated to feedback, where mistakes occurred etc.

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

The first five semesters of the first cycle study programme are mostly taught alongside students from other mechanics based courses in the Faculty. Class sizes for these fundamental science modules range from 45-80. More specialist teaching predominates in the final three semesters where the Biomechanics cohort is largely taught independently. These specialist classes have fewer than 30 students.

The second cycle study programme is largely taught independently of other students, with the exception of two modules. Class sizes are therefore small and have been consistently lower than 15 over the past 4 years.

7/41 (17%) of teachers for the first cycle study programme work less than 0.5 FTE (Full-time equivalent), only one lecturer has joined the teaching staff since 2018. 10/41 (24%) have less than a B2 English qualification.

1/9 (11%) of teachers from the second cycle study programme work less than 0.5 FTE, all have worked at Vilnius Tech for more than three years. All have at least a B2 English qualification.

Table No. 3. *Bioengineering* field lecturers' compliance with the requirements for the first cycle studies

Requirement stated in Descriptor of the Study Field of Engineering	In the <i>Biomechanics</i> study programme of the first cycle
At least half of Engineering study field subjects shall be taught by scientists holding a doctor's degree, performing research of respective Engineering study field and publishing findings thereof in	For the First Cycle course 72% of the teachers hold a doctoral degree.

scientific publications, also taking part in national and international scientific events, and teachers of state regulated specialties shall have experience in respective qualification work in marine vessels, related to the subject taught.	
At least 10 percent of subjects of the study field of the first cycle studies shall be taught by teachers holding professor's position.	For the First Cycle course, for the latest 4 years, the percentage of teachers holding a professor's position has always been greater than 10% with the proportion increasing to 16% in 2020-2021.

Table No. 4. *Bioengineering* field lecturers' compliance with the requirements for the second cycle studies

Requirement stated in Descriptor of the Study Field of Engineering	In <i>Biomedical Engineering</i> 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.	For the Second Cycle course 97% of teachers hold a doctoral degree.
At least 20 percent of the scope of study field subjects shall be taught by teachers holding professor's position.	For the Second Cycle currently 31% of teachers are at professor level.

(2) Expert judgement/indicator analysis

The class sizes in both first and second cycle programmes are appropriate for the material being taught. Whilst class sizes are large for the early semesters of the first cycle programme, the subjects being taught are amenable to large lecture hall style teaching. Where small class sizes are beneficial, for example project and specialist subject areas, the class sizes are small.

The teaching staff for both programmes is extremely stable with few teachers leaving or joining. Career progression is by internal promotion.

The first cycle programme is currently taught in Lithuanian and it is therefore not a problem that 24% of staff do not have at least a B2 English qualification. With plans to introduce an English language version of the first cycle programme, staff English qualifications should be reviewed and upgraded if necessary. The second cycle programme is taught in both English and Lithuanian and all staff hold an appropriate English qualification.

The level and educational attainment of staff comply with the requirements.

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

53% of **First Cycle** and 44% of **Second Cycle** teachers have only worked at Vilnius Tech.

According to the SER, funding is available for academic mobility through ERASMUS+ and National Science Agency schemes. Similarly, there is an internal scheme within Vilnius Tech to fund PhD attendance at conferences. The University rewards staff for visiting institutions outside Lithuania through its salary bonus scheme. During the site visit teaching staff reported that they receive a high level of support from the University. However, over the last 6 years only 4 of the core Bioengineering staff have made more than one academic visit abroad.

There appears to be a strong academic exchange programme with Bialystok Technical University in Poland with a total of 7 outgoing and 3 incoming visits over the last 6 years. Similarly, the Department has used funding from the Ministry of Education, Science and Sport of the Republic of Lithuania to implement a series of 6 academic visits from a visiting professor from Zurich Institute of Technology to provide 40 hours per year of Trauma Biomechanics teaching.

(2) Expert judgement/indicator analysis

Many teaching staff spend their entire academic career at Vilnius Tech. Whilst this speaks highly of the ability of the University to retain valued staff, it does mean that staff are not exposed to the diversity that comes from other working environments.

Support for academic mobility, in the sense of visits to institutions outside Lithuania, appears to be good both in terms of support for funding and incentivisation through salary bonuses. However, uptake of these opportunities is patchy with a minority of staff showing excellent mobility whilst the remainder little or none. This is an area for further development.

The Department has developed good, long-term academic links with Zurich Institute of Technology and Bialystok Technical University which will have a positive impact on the teaching they provide.

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

(1) Factual situation

As stated in SER, from 2016 the development of educational competencies is linked to teacher certification procedures. Staff continuous professional development is provided by Educational Competences Group (ECG) of the Academic Support Centre at Vilnius Tech who offers 21 different seminars/training sessions in the current session as well as hosting meetings to showcase the work of innovative teachers.

Information about professional development training was provided for the teaching staff in the Department of Biomechanics. All staff have taken a range of professional development courses covering fundamental teaching skills but also in more advanced teaching including 'flipped classroom' and online teaching and specific, technical, subjects. Similarly, this training takes place continuously (rather than only as part of an induction programme) as staff develop their teaching skills. Most staff report more than 30 hours CPD training.

(2) Expert judgement/indicator analysis

It is clear that continuous professional development is taken very seriously within the Institution. The range of courses provided is excellent and well suited to modern teaching methods. The engagement of the staff with the process is also clear with all staff showing a willingness to develop a good balance of teaching competencies.

Strengths and weaknesses of this evaluation area:

(1) Strengths:

1. Good support for international visits by teaching staff.
2. Formation of long-term academic relationships with Zurich Institute of Technology and Bialystok Technical University.

(2) Weaknesses:

1. Appointment to more senior posts is dominated by internal promotion with little external recruitment.
2. Mixed uptake of opportunities for international visits and experience.

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's ability to assess provision in this area was limited by the necessity of an online visit where video tours of teaching and library facilities and a slide presentation of new infrastructure developments were made.

The Department is currently based in a building in the centre of Vilnius at some distance from the main University campus where the library and other student facilities are based. The time taken to travel between sites was raised as an issue in meetings with both staff and students. However, a new Faculty of Mechanics building is currently under construction on the main campus site with an expectation that the Department and teaching will move there for the 2022/23 teaching session. Within the new building there will be 500m² of dedicated Biomechanical Engineering laboratories.

The majority of teaching currently takes place in the Faculty of Mechanics which has a range of teaching facilities including lecture theatres, laboratories, computer rooms and other study areas comprising a total of 2532 m². Specialist Bioengineering takes place in a dedicated laboratory, classroom and computer room.

It was notable that both first and second cycle students and employers/industrial partners highly commended the biomechanical laboratory facilities and equipment. The Head of Department reported that he was finding it difficult to recruit a laboratory manager since the salary available was uncompetitive in the wider technical job market.

Students also have access to the Centre for Technical Creation and Innovation which is an open-access workshop where students can use the facilities to create and design, but also to produce the first prototypes or layouts of products.

There is a small library reading room in the Faculty of Mechanics building, however the main library facilities are on the main campus site. The library gives the students access to a wide range of print and electronic resources (including books, journals and bibliographic databases) with an online catalogue/access system. The library also has bookable areas for individual or group studies. Whilst library staff reported that the bookable work areas consistently had capacity, students reported that they found the library 'crowded'.

State Studies Foundation 2015 implemented the project "Ensuring the Accessibility of Studies for Students with Special Needs". Consideration has been given to provision of access for students and staff with disabilities including wheelchair accessible routes to most areas including canteen and toilets. Similarly, aids are available for students with sight and hearing impairment.

The students reported that there was a lack of catering outlets on campus in general and, in particular, in the Faculty of Mechanics building. They would like to have access to low-cost, healthy food close to where they study.

(2) Expert judgement/indicator analysis

The overall provision of teaching facilities is good and of the standard required to deliver a high-quality teaching experience. There are clearly tensions created by the Faculty of Mechanics being at some distance from the main campus, however, these should be resolved by the move to the new Faculty building in the next academic year.

The biomechanics laboratory and Centre for Technical Creation and Innovation are very well equipped, the latter being highly innovative. Both these facilities enhance the commercial application of the bioengineering courses.

Suitable provision has been made for students with disabilities both in terms of access and equipment to ensure that they are able to take part fully in learning activities.

Consideration should be given to integrating catering outlets with the study and library spaces.

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

(1) Factual situation

The new Faculty of Mechanics building is the highest profile example of investment by the University in the bioengineering study field. It offers an increase in both space and quality of space for delivering the teaching, in particular the expansion of the biomechanics laboratory. It also addresses the issues created by the separation of the Faculty of Mechanics from the main University site.

In addition to the upgrade to the physical infrastructure offered by the new building, Vilnius Tech has a programme of renewal and development of IT resources with an annual budget of €350k. The data network has also recently been upgraded to 10Gb/s financed by EU Structural Funds.

Library resources, furniture and fittings, and laboratory equipment are upgraded through funds allocated from EU Structural Funds, Government of the Republic of Lithuania and the University.

(2) Expert judgement/indicator analysis

The new building is a major and exciting development which will enhance the learning environment for the first and second cycle bioengineering students by providing spacious,

modern, updated facilities. It shows considerable investment and support by the University in the bioengineering study field.

There is a well thought out strategy for maximising the benefits, to both teaching and research, through the renewal and upgrade of IT facilities. Less detail was given to the expert panel concerning resource planning in other aspects, however, it clearly seems to be in place.

Strengths and weaknesses of this evaluation area:

(1) Strengths:

1. The new Faculty of Mechanics building will not only be a big investment in the quality of the teaching and research infrastructure for the subject area, it will also resolve the physical separation of the two sites.
3. The equipment available within the biomechanics laboratory was highly commended by both students and employers/industrial partners.
4. The Centre for Technical Creation and Innovation is a highly innovative teaching facility which greatly enhances the commercial focus of the degree courses.

(2) Weaknesses:

1. There seems to be a lack of catering outlets that provide healthy, low-cost food in areas where students are studying.

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

The quality of studies is ensured in accordance with several resolutions of the Vilnius Tech Senate (e.g. Description of the internal quality assurance of studies at Vilnius Gediminas Technical University (Resolution No. 118-1 of 19 May 2020); Regulations of Vilnius Gediminas Technical University study programmes (Resolution 62-2.2 of 19 February 2013, etc) at different levels in the HEI (SER, p. 47).

The documents related directly to the quality of studies (e.g. Description of the Procedure for Submission and Examination of Appeals of Vilnius Gediminas Technical University Students Regarding Knowledge Assessment (Order No. 10.8-1009, 2-12-2020) and Description of the Procedure for Organizing Distance Learning Studies in Vilnius Gediminas (No. 10.8-390, 25-04-2019), etc); are also referred in the SER (p. 47-48).

It is mentioned in the SER (p. 48) that the Vilnius Tech information system "Alma Informatika" is a central point where all information related to the implementation of the direction programmes is stored. The HEI collects additional information and the protocols for the review and evaluation of the direction programmes at the Department, dean's office of the Faculty, Vilnius Tech Studies Directorate.

According to the SER (p. 48) "the University's internal study quality assurance system is based on the European Higher Education Quality Assurance Regulations and Guidelines (ESG). Vilnius Tech internal study quality description determines the internal study quality assurance measures, the scope of application, the principles of involving the academic community in the study quality assurance, defines the University study quality maintenance, monitoring and evaluation processes".

It is also stated in the SER (p. 47) that “Vilnius Tech implements a quality management system for all university processes that meets the requirements of the EUA Higher Education Quality Assurance Standard. Vilnius Tech quality management system documents integrate national and international requirements relevant to the organization and implementation of quality university studies. Quality management system (QMS) process models, indicators and legal acts are available to Vilnius Tech employees via the “Quality Management System” section of the Vilnius Tech intranet.”

According to SER (p. 50), “all lecturers are involved in the preparation and improvement of study programs, as the study subject modules of the program are prepared in the departments after evaluating the comments and wishes of the social stakeholders.” When updating the programme according to its goals and expected study results, a matrix of links between study programme goals, study results and study subjects is created, describing the place of study subject modules in the study programme and their relations with other study subject modules.

(2) Expert judgement/indicator analysis

The different resolutions at all levels of the HEI – the University (study programmes, Study Procedure, internship procedure, Code of Academic Ethics), the Faculty, the Department, and by the orders of the Rector demonstrate that the internal quality assurance system of the studies is an important part of the HEI’s internal culture. It is valuable that all information related to the implementation of the field programmes can be easily accessed and stored in the Vilnius Tech information system "Alma Informatika" or at the Department and dean's office of the Faculty.

The international standards are appropriately followed as the University's internal study quality assurance system is based on the European Higher Education Quality Assurance Regulations and Guidelines (ESG) and for internal study quality assurance, Vilnius Tech implements a quality management system for all University processes that meets the requirements of the EUA Higher Education Quality Assurance Standard.

A positive synergy is established considering that the lecturers and the social stakeholders are involved in the preparation and improvement of first and second cycle study programmes in the field of bioengineering.

It is worthy that when updating the programme according to its goals and expected study results, a matrix of links between study programme goals, study results and study subjects is created.

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. 49-50), the stakeholders (students, teachers, employers, graduates, etc.) have been involved to improve the quality of the first and second cycle study programmes in the field of bioengineering as following: (1) via delegated student members in the different bodies (the Student Representation in the Dean's Office, the Faculty Competitions and Certifications Commission, the Faculty Council and the Faculty Studies Committee); (2) on the Department meetings – teachers who do not belong to the administration, committees or commissions; (3) via involving companies and organisations working in the field of biomechanical engineering and related fields (internships, course projects and dissertations, public lectures, chairpersons of the degree award committee).

(2) Expert judgement/indicator analysis

There is an active engagement of different stakeholders confirmed by: (1) the students can express their views on issues of study quality via the delegated members of the Student Representation in the Dean's Office, the Faculty Competitions and Certifications Commission, the Faculty Council and the Faculty Studies Committee; (2) teachers who do not belong to the administration, committees or commissions participate in the evaluation and improvement of the quality of studies by expressing their opinion in the department meetings; (3) close relations have been established during the years with the companies working in the field of biomechanical engineering and related fields.

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. 50) the collection, analysis and publication of information on the study improvement processes of the first and second cycle bioengineering study field is coordinated by the Study Committee of the Faculty of Mechanics including the heads of the Departments in the Faculty, a representative of social stakeholders, and a Student Representation of the Faculty of Mechanics. The tasks of the Study Committee of the Faculty are among others certification and re-certification (if necessary) of the modules of study subjects for a period of 1 to 4 years. The main responsibility for the quality of the field lies on the program committee and the members of the Study Committee of the Faculty.

Various information about the implementation of Bioengineering study programmes (like formation of admission plans, admission of students, development of study and teaching plans, distribution of teacher workload, accounting of diplomas, distribution of scholarships and dormitories, register of students, etc) is collected in the University information system as a basis for the analysis of the quality and future planning of the programmes.

The study programme quality related items are available to the members of the Dean's Office, the Faculty Study Committee, the study program developers, the teachers, the students and the employers. The dean, the head of the Department, the lecturer and the student representative will have access to the annual student surveys.

The information about class schedules, prepared by the Vice-Dean of the Faculty involving the lecturers and taking account input from the students, is published on the Faculty and University websites in Lithuanian and English.

The preparation of the study field programmes involves the lecturers taking account input from the social stakeholders.

Several activities, popularising the Bioengineering field study programmes and involving lecturers and students, the Vilnius Tech Career and psychological consultation group, the Study Directorate, the Admission and Information Centre, the Public Communication Office, are mentioned in the SER (p. 51) ("School of young engineers" and the camp "Get to know the profession" organised for senior pupils). The programmes are presented in the annual exhibition "STUDIES", on the Faculty and social websites, open days are organised, and it is presented in general education schools. The website of the University and the Faculty provides information about the programme, career opportunities, admission results of the previous year, admission conditions for entrants.

The lecturers participate in different events promoting the study programmes to the potential students at the HEI and outside.

The Faculty of Mechanics annually appoints a lecturer to the admissions committee, who takes care of the issues of admission to the Faculty.

(2) Expert judgement/indicator analysis

The collection, analysis and publication of information on the study improvement processes of the study field is coordinated by the dedicated groups (e.g. Study Committee of the Faculty of Mechanics), which certainly helps to create an effective and focused action plan.

The main responsibilities for the quality of the bioengineering study field are in place, being the responsibility of the Study Programme Committee and the members of the Faculty Study Committee. The study committee of the faculty certifies the modules of study subjects for a period of 1 to 4 years, which gives flexibility from one side and stability from another side.

It is appropriate that there is an information system that collects information about the relevant data on studies, their evaluation and improvement processes and outcomes.

The regularity and involvement at different levels seems to be in place as the annual student surveys and their results on the lecturers, the applied study methodology and the content of the subjects are presented to the dean, the head of the Department, the lecturer and the student representative.

There are several good examples how several popularising activities are carried out for the Bioengineering field study programmes of first and second cycle, in cooperation with the Vilnius Tech Career and psychological consultation group, as the "School of young engineers", the camp "Get to know the profession" organised for senior pupils, which should be continued.

The fact that the website of the University and the Faculty provides information about the first and second cycle study programmes, career opportunities, admission results of the previous year, admission conditions for entrants, must be a standard and maintained-updated regularly.

It is important and even vital that there is a representative from the first and second cycle study programmes in the admissions committee of the Faculty of Mechanics, taking care of the issues of admission.

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

All students are encouraged to participate in the study improvement process to provide feedback on their studies by expressing their opinion in student surveys organised by the University. Feedback is provided through systematic student surveys and the use of generalised survey results to improve first and second cycle study programmes in the field of bioengineering, improve the organisation of the study process, and strengthen the composition and skills of the academic staff.

The annual student surveys and their results on the lecturers, the applied study methodology and the content of the subjects are presented to the dean, the head of the Department, the lecturer and the student representative.

In popularising the Bioengineering field study programmes, lecturers and students cooperate with the Vilnius Tech Career and psychological consultation group.

(2) Expert judgement/indicator analysis

Systematic student surveys are arranged to get feedback about the quality of the studies at the HEI. The results are processed and used to improve first and second cycle study programmes in the field of Bioengineering. However, the feedback provided (e.g. in Annex 9.7 of SER) indicates that the questions about the courses, teaching methods and teachers are rather general, and could be even more specific (e.g. reflecting the students experience separately about the lectures and labs, individual course organization, etc). It is not very clear whether the feedback is collected electronically or in the paper form. Since the feedback is not mandatory the question arises how HEI ensures that the most students are responding to the survey.

Strengths and weaknesses of this evaluation area:

(1) Strengths:

1. The quality of studies is ensured in accordance with the different resolutions and by the orders of the Rector at the all levels of HEI.
2. All information related to the implementation of the programmes is stored in the Vilnius Tech information system "Alma Informatika".
3. The University's internal study quality assurance system is based on the European Higher Education Quality Assurance Regulations and Guidelines.
5. HEI implements a quality management system for all University processes that meets the requirements of the EUA Higher Education Quality Assurance Standard for internal study quality assurance.
6. The lecturers and the social stakeholders are involved in the preparation and improvement of first and second cycle study programmes.
7. The Study Committee of the Faculty of Mechanics includes the representatives from the Faculty (the heads of the Departments in the Faculty), a representative of social stakeholders, and a Student Representation of the Faculty of Mechanics.
8. Close relations have been established during the years with the companies working in the field of biomechanical engineering and related fields. For example the employers are involved in the programme evaluation process as chairpersons of the degree award committee.
9. Several popularising activities are carried out for the Bioengineering field study programmes, in cooperation with the Vilnius Tech Career and psychological consultation group.

(2) Weaknesses:

1. The student feedback about the courses, teaching methods and teachers are rather general currently and should be even more specific facilitating to focus more directly on the elements and courses, which need improvements in the study programme.
2. The students' participation in the feedback process seems not to be mandatory currently, and the question arises how HEI ensures that the most students are responding to the survey(s).

IV. RECOMMENDATIONS*

Evaluation Area	Recommendations for the Evaluation Area (study cycle)
Intended and achieved learning outcomes and curriculum	<ol style="list-style-type: none"> 1. Include interaction with medical/health care professionals in the curriculum. 2. Incorporate and integrate training in oral and written scientific communication in English also in the Lithuanian programmes. 3. Extend the curriculum with relevant elective courses to improve the possibilities for students to personalise their education. 4. Change the title of the first cycle study programme from 'Biomechanics' to 'Biomedical Engineering'.
Links between science (art) and studies	<ol style="list-style-type: none"> 1. Only a few grant applications have been funded in recent years. Coordinated and University supported grant applications should be actively continued to create a sustainable project application process. 2. The participation of both masters and bachelors students (e.g. through the final thesis) to participate in research, creative thinking and present their research publically is not yet very popular. In this context the HEI could create even better conditions for the students to get involved in scientific activities (e.g specifically to provide metal printing possibility). 3. Intellectual property issues seem not very actively addressed. Innovation activities resulting in intellectual property output (e.g. as patent applications) could be one way to foster international collaboration with the companies outside Lithuania.
Student admission and support	<ol style="list-style-type: none"> 1. To promote academic mobility among students more, provide them with all necessary information, resources and counselling regarding this topic. Overall increase in study quality, extensive advertising and collaboration with foreign HEI's could help to increase the rates of incoming students. 2. Increase the number of admitted students to both first and second cycle studies. Good study quality, advertising, prospects of promising scientific work and career can be helpful in attracting more students to first and second cycle studies of Bioengineering field in Vilnius Tech.
Teaching and learning, student performance and graduate employment	<ol style="list-style-type: none"> 1. Expand the curriculum to include more aspects of the medical product lifecycle. 2. Introduce learning activities that develop reasoning skills and decision evaluation. 3. Introduce sessions dedicated to giving and explaining feedback for assessed work.

Teaching staff	<ol style="list-style-type: none"> 1. Consideration should be given to developing recruitment strategies so that there is a greater diversity in educational and employment background for, particularly senior, teaching staff. 2. All staff, particularly those at junior grades, should make use of opportunities for international visits and experience.
Learning facilities and resources	<ol style="list-style-type: none"> 1. The University should ensure that students have access to catering outlets that provide healthy, low-cost food in areas where students are studying.
Study quality management and public information	<ol style="list-style-type: none"> 1. The student feedback about the courses, teaching methods and teachers are rather general currently and should be even more specific facilitating to focus more directly on the elements and courses, which need improvements in the study programme. 2. The students' participation in the feedback process seems not to be mandatory currently, and the question arises how HEI ensures that the most students are responding to the survey(s).

*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.

V. SUMMARY

The following is a summary of the findings of the expert panel based on the Self-Evaluation Report (SER) and the interviews with the Vilnius Gediminas Technical University (hereafter referred to as Vilnius Tech, University) 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, first cycle and second cycle, at Vilnius Gediminas Technical University with all areas assessed as good or very good.

There are two programmes of study taught at Vilnius Tech that fall within the Bioengineering field of study: the first cycle *Biomechanics* study programme (state code - 6121EX034) (hereafter referred to as the First Cycle programme) and the second cycle *Biomedical Engineering* study programme (state code - 6211EX032) (hereafter referred to as the Second Cycle programme). Both study programmes received high levels of praise from current students, alumni and employers. Bioengineering is a very wide and multi-disciplinary field and, whilst both programmes cover all the essential areas, it would be fair to say that both have a more biomechanics focus. Having said that, the title of the First Cycle programme '*Biomechanics*' does not do the scope of the curriculum justice; '*Biomedical Engineering*' would be more appropriate.

Both First and Second Cycle study programmes address the social and economic need, within Lithuania and elsewhere, for Biomedical Engineers and have suitable curriculums to ensure that graduates are well prepared for working life. Learning is delivered through a wide range of different activities. There are excellent links with industrial partners that are exploited throughout the programmes, but particularly in terms of research projects. The suitability of graduates for employment within the biomedical industry was praised by employers. Currently, the First Cycle programme, which is taught largely in Lithuanian, does not prepare the students for careers outside Lithuania but there are plans to introduce an English language version soon.

There is no doubt that the teaching staff keep up to date with developments within the field. Whilst research income is relatively low with only a subset of staff gaining awards, the majority of staff are research active and publish their work in national and international journals. As noted above, the staff have excellent industrial links, and this cutting edge knowledge of commercial activity in the field is fed directly into the teaching.

Student numbers are currently low for both First and Second Cycle programmes. There are many reasons for this including national trends in student recruitment and the effects of the COVID epidemic, however numbers are starting to reach critical levels. The University is highly supportive of both programmes and it is hoped that the new English language version of the First Cycle programme will provide access to a larger pool of potential recruits. Once the students arrive at the University, they are looked after well. There is an excellent range of support activities and the University experience is enhanced by a wide range of sporting and social activities. However, there is a high drop-out rate, particularly from the First Cycle programme, that appears to be linked to students spending excessive amounts of time in paid employment. Neither the programmes nor the University are to blame for this situation, but it may reflect the costs (and opportunities for employment) of Vilnius. The programmes take part in the Erasmus programme but, whilst there are a large number of incoming students, uptake of mobility opportunities is low.

As noted above, the employers of graduates from both First and Second Cycle programmes are highly complementary about their quality. In particular they spoke highly of the students' ability and flexibility to learn new skills quickly, their self-confidence and communication

skills and technical skills in finite element analysis, 3D printing and electronics. They felt that there was room for improvement in the development of reasoning and problem solving skills and a greater appreciation of the whole product life cycle (rather than just the design, regulation/adoption and manufacturing stages).

The teaching staff are suitably qualified and enthusiastic and are appropriately deployed so that subjects are taught in appropriate class sizes throughout both programmes. There is good support for academic mobility and the Department of Biomechanical Engineering (hereafter referred to as the Department) has formed international partnerships with two Higher Education Institutions that have a significant impact on the diversity of teaching.

The teaching facilities are currently good, with both students and industrial partners praising the laboratory facilities. However, a new Faculty of Mechanics (hereafter referred to as the Faculty) building is nearing completion. Once the Department moves to its new location not only will the teaching infrastructure be improved and modernised, current issues with the physical separation of the Faculty building from the main University campus will be resolved.

The University, Faculty and Department implement a very good quality control and management regime. Student feedback is sought in a systematic manner and is incorporated into the review processes for both First and Second Cycle programmes. Likewise, the other stakeholders: teachers, employers and alumni are involved in the review process.

In summary, both First and Second Cycle programmes are very good. They offer a supportive and varied student experience and deliver well qualified graduates with the skills needed for employment in the biomedical technology industry.

The Expert Panel would like to express their thanks to the staff at Vilnius Tech who provided the information required for their review under difficult conditions. Similarly, the Expert Panel would like to thank the students, alumni and employers for giving up their time to talk to them. The Expert Panel very much regret that they were not able to visit in person on this occasion and greatly appreciate the flexibility shown by all to deliver a 'virtual visit'.

Expert panel chairperson signature:

Prof. Dr. Donal McNally