

STUDIJŲ KOKYBĖS VERTINIMO CENTRAS

**VILNIAUS GEDIMINO TECHNIKOS UNIVERSITETO**

**STUDIJŲ PROGRAMOS *BIOMECHANIKA***

***(valstybinis kodas – 621H15001)***

**VERTINIMO** **IŠVADOS**

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**EVALUATION REPORT**

**of STUDY PROGRAMME *BIOMECHANICS***

**(*state code – 621H15001*)**

**STUDY PROGRAMME**

**at** **VILNIUS GEDIMINAS TECHNICAL UNIVERSITY**

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| 1. **Prof. dr. Udo Nackenhorst (team leader),** *academic,*
2. **Prof dr. Rita Mária Kiss,** *academic,*
3. **Prof. dr. Māris Kļaviņš,** *academic,*
4. **Mr. Tomas Sinevičius,** *representative of social partners’,*
5. **Mr. Gabrielius Jakutis,** *students’ representative*.

**Evaluation coordinator –****Ms. Natalja Bogdanova** |

Išvados parengtos anglų kalba

Report language – English

**DUOMENYS APIE ĮVERTINTĄ PROGRAMĄ**

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| --- | --- |
| Studijų programos pavadinimas  | ***Biomechanika*** |
| Valstybinis kodas | 621H15001 |
| Studijų sritis | Technologijos mokslai |
| Studijų kryptis | Bendroji inžinerija |
| Studijų programos rūšis  | Universitetinės studijos |
| Studijų pakopa | Antroji  |
| Studijų forma (trukmė metais) | nuolatinė (2) |
| Studijų programos apimtis kreditais | 120 |
| Suteikiamas laipsnis ir (ar) profesinė kvalifikacija | Biomechanikos inžinerijos magistras |
| Studijų programos įregistravimo data  | 1997-05-19 |

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**INFORMATION ON EVALUATED STUDY PROGRAMME**

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| --- | --- |
| Title of the study programme | ***Biomechanics***  |
| State code | 621H15001 |
| Study area | Technological Sciences |
| Study field | General Engineering |
| Type of the study programme | University studies |
| Study cycle | Second  |
| Study mode (length in years) | Full-time (2) |
| Volume of the study programme in credits | 120 |
| Degree and (or) professional qualifications awarded | Master of Biomechanics Engineering |
| Date of registration of the study programme | 19/5/1997 |

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| The Centre for Quality Assessment in Higher Education |

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# **I. INTRODUCTION**

## Background of the evaluation process

The evaluation of on-going study programmes is based on the **Methodology for evaluation of Higher Education study programmes,** approved byOrder No 1-01-162 of 20 December 2010 of the Director of the Centre for Quality Assessment in Higher Education (hereafter – SKVC).

The evaluation is intended to help higher education institutions to constantly improve their study programmes and to inform the public about the quality of studies.

The evaluation process consists of the main following stages: *1)*  *self-evaluation and self-evaluation report prepared by Higher Education Institution (hereafter – HEI); 2) visit of the review team at the higher education institution; 3) production of the evaluation report by the review team and its publication; 4) follow-up activities.*

On the basis of external evaluation report of the study programme SKVC takes a decision to accredit study programme either for 6 years or for 3 years. If the programme evaluation is negative such a programme is not accredited.

The programme is **accredited for 6 years** if all evaluation areas are evaluated as “very good” (4 points) or “good” (3 points).

The programme is **accredited for 3 years** if none of the areas was evaluated as “unsatisfactory” (1 point) and at least one evaluation area was evaluated as “satisfactory” (2 points).

The programme **is not accredited** if at least one of evaluation areas was evaluated as "unsatisfactory" (1 point).

## General

The application documentation submitted by the HEI follows the outline recommended by the SKVC. Along with the self-evaluation report and annexes, the following additional documents have been provided by the HEI before, during and/or after the site-visit:

|  |  |
| --- | --- |
| No. | Name of the document |
| 1 | Analysis of description of subject |
| 2 | Biomechanics\_M\_changes\_in\_LO\_since\_2016 |
| 3 | Additional information on academic staff |
| 4 | Additional information on Study Field Descriptors |

## Background of the HEI/Faculty/Study field/ Additional information

Vilnius Gediminas Technical University (VGTU) counts to the largest universities in Lithuania which is organized into 10 faculties. The consecutive Master-program on Biomechanics has been established in 1997 in common with the related Bachelor-program. It is managed by the Department of Biomechanics within the Faculty of Mechanics in cooperation with the Institute of Mechanical Science. However, the Master-program is open for graduates from different engineering disciplines.

## The Review Team

The review team was completed according *Description of experts‘ recruitment*, approved by order No. 1-01-151 of Acting Director of the Centre for Quality Assessment in Higher Education. The Review Visit to HEI was conducted by the team on 28*th April 2016.*

1. **Prof. dr. Udo Nackenhorst (team leader),** *Head of the Institute for Mechanics and Computation Mechanics at Leibniz University Hannover, Germany.*
2. **Prof dr. Rita Mária Kiss,** *Director of Biomechanical Research Center, Budapest University of Technology and Economics, Faculty of Mechanical Engineering, Hungary.*
3. **Prof. dr. Māris Kļaviņš,** *Head of Environmental Science Department****,****Faculty of Geographical and Earth Sciences, Latvia University, Latvia.*
4. **Mr. Tomas Sinevičius,** *Head of Physical Medicine and Rehabilitation Dep. of Karoliniškės Clinics, doctor of physical medicine and rehabilitation, Lithuania.*
5. **Mr. Gabrielius Jakutis,** *Bachelor student of Faculty of Medicine, Vilnius University, Lithuania*.

**Evaluation coordinator Ms. Natalja Bogdanova**

# **II. PROGRAMME ANALYSIS**

## 2.1. Programme aims and learning outcomes

The aim of the VGTU’s second cycle study programme on *Biomechanics* is to prepare specialists who are ready to work in scientific and academic institutions, institutions of the health-care system, medical and rehabilitation equipment design and manufacturing companies, where they can apply scientific knowledge, methods and tools as well as continue to study at PhD level. The learning outcomes (LOs) of the program are well defined in the program self-evaluation report (SER), they are public available. The programme aims and LOs are based on the academic and professional requirements, public needs and the needs of the labour market and they are consistent with the MSc level of qualification in Biomechanics. The revision of the LOs and their renewal is well structured, involves active participation of social partners and considers professional requirements common for engineering students. The program is very much oriented towards needs of local medical services as well as business, a bit on costs of research capacity development. At elaboration of LOs at first needs in Lithuanian labour market is considered as well as continuity with the preceding BSc study program. However, the content of the program would benefit from comparison with the content, LOs of similar study programs in EU as well as elsewhere.

The title of the program is planned to be changed, e.g. to *Medical Engineering*, in the near future in order to better reflect the content of the studies and the needs of labour market. Study courses supporting the development of generic skills and entrepreneurship also are considered for the future development of this program. The site visit to VGTU provided additional evidence that the participating students, faculty, administration and contributing social partners were all supportive of these aims and their actions were consistent with the program. Furthermore, the curriculum and resulting thesis provide strong evidence as to the focus and strength of the program. The outcomes of the program were supported by student reviews of the program and by a strong need for this program by the social partners. The learning focus, curriculum and research efforts were consistent with what needs to be accomplished by students. Certainly, the current LOs need to be continuously monitored and benchmark against other biomechanics programs both in Lithuania (at Klaipeda University) and, more important, internationally. One learning aspect that was developed and integrated in the program is related to the ethical responsibilities in biomechanics. Given the broad impact that biomechanics may have in society it is important that students are trained on the acceptable norms by which one conducts research and development in biomechanics.

## 2.2. Curriculum design

The duration of the programme (four semesters, 120 ECTS), and the volumes (in ECTS) allocated to study field subjects (66), and general study subjects (12), and the number of subjects per semester (5) are in agreement with the legal requirements. The curriculum of the program meets the legal requirements of the legislation.

The courses are evenly distributed between the four semesters (30 ECTS per semester). The course descriptions in the SER do not indicate substantial overlap or unnecessary repetition. For most parts the courses seem to form a coherent educational package which builds on previous Bachelor level studies and deepens the knowledge and skills of the students in the subject area of biomechanics. The strength of the programme is in combining of deepening of biomechanics topics with health care study courses.

Multiple teaching/learning methods are employed, however a students indicated need to further improve study methods, considering the best international practices. The courses consist of lectures, laboratory practical’s, exercises and consultations. Almost all courses have 30 hours of lectures and four hours of consultations with the teacher. The majority of courses have either laboratory practical or problem-based exercises, or in some cases both forms are used. The study course realisation approach support development of needed competences. Development of relevant generic skills (e.g. presentation) is integrated in the courses (in exercises). Most courses are compulsory leaving little space for elective courses to be chosen based on the student’s personal interests. A wider selection of elective courses and their links with the program content could improve student education results.

Discussions during the site visit indicated that students are generally quite satisfied with the content of the program and quality of teaching but wish to have more elective courses.

Biomechanics graduates should have a strong theoretical knowledge and ability to apply analytical, quantitative thinking and practical skills to solve problems. The most important component of Master´s level studies to develop problem-solving skills is the Master´s thesis. The volume of Master´s thesis is quite extensive, 39 ECTS. The topic is chosen and the preparative work begins already at the first semester, whereas the bulk of work (30 ECTS) is performed during the last (4th) semester. Although choosing the topic at an early stage gives sufficient time for good preparation, but it may also be a problem because at the beginning of their studies, the students haven´t yet had time to see different laboratories and may be uncertain about their preferred areas of specialization. However, the students may be given a possibility to change their originally assigned topic, although it is not clear how this works in practise. Based on their topics (Appendix 8.4. of the SER) and the summaries of the theses which were on display during the site visit, the Master´s theses are generally of good quality and deal with questions relevant to biomechanics.

Generally, the descriptions of the contents and study methods of the courses are consistent with the indicated aims and learning outcomes. Overall, the curriculum of *Biomechanics* MSc programme appears sound and provides good biomechanics education.

##  2.3. Teaching staff

The program is delivered by staff recruited from VGTU and from centres of expertise in the VGTU, such as Institute of Mechanic Science, Department of Biomechanics and Mechanical Engineering. As a positive aspect the active involvement of PhD students in the teaching process is appreciated.

Based on the participating faculty CV’s and discussions during the site visit it is clear that the faculty staff is skilled enough to deliver the proposed classes. As some problem might be considered the level of English language skills especially amongst the senior staff, however this problem is known to University administration and work is going on to improve skills and rise the use of foreign languages.

The leveraging of non VGTU staff into this program has been accomplished very professionally and this was evident from student responses and the review team interactions with teaching staff. On average 62,50 % of the staff is approximately in age range 31-40, however well experienced teachers play significant roles at delivering the program. The staff renewal can support several PhD students already now involved in research and teaching.

The bulk of the academic staff comes from the departments of Biomechanics and Mechanical Engineering, but there are also representatives from other institutions as well as medical doctors. Results of research as indicated by the CV of staff could be significantly improved at first considering need to achieve better international visibility. All staff members need to focus on improving the impact factor of their publications over the next few years. Also, activities in research projects could be significantly improved. The need to improve staff mobility and research activities is understood by the University administration considering availability of resources for adequate support. A further problem is research fundraising: despite a number of research project applications major funding for research is lacking and the change of this situation should be achieved.

A review of the CVs of the teaching staff and discussion with faculty during the site visit made clear that there were sufficient qualified teaching staff (especially from professional perspective) involved in the program. This opinion was strengthened with site discussions with the participating study program students and social partners.

The development of exchange agreements with foreign and Lithuanian entities on conducting scientific research or experimental developments is a promising trend for staff and should be encouraged to grow in the future. For example, the department has successfully utilized the staff mobility options, with visits to Polytechnic University of Catalonia, Barcelona, Bialystok University of Technology, International Center of Mechanical Science, Udine and Porto University. Also a good numbers of incoming lecturers participated in the study process. The review team views these exchanges as very beneficial to the study program should be clearly expanded in the future.

Likewise, faculty participation in professional organizations has been noted and needs to be increased in the future. Faculty should strive to take senior positions on international editorial boards and in organizing international conferences and workshops.

## 2.4. Facilities and learning resources

Second cycle of *Biomechanics* program proceeds in the same building as for the bachelor’s students. Lectures for Master students are offered to provide possibilities to perform Master’s thesis or to train practically in companies engaged in activities relevant to the learning outcomes of the study program. Major part of lectures takes place in classrooms of Faculty of Mechanics. Many of the study courses are available in the Moodle environment as – e-courses – are actively used by lecturers and students, especially for those which are employed.

For the study process of importance is practical training of students – placements. The practical training process is well organised, essential element of the study curricula and it takes place in research institutions, University as well as in private enterprises (several graduates of the programs are eager to offer for students’ placement possibilities). The practical training process is organised accordingly with agreements and students have to prepare reports, thus reflecting acquired skills.

 All premises intended for studies are in compliance with the requirements of safety at work and personal hygiene. There are all conditions for students with disability to successful studies. Classrooms for lectures are equipped with computers and video projectors. Wireless internet access is available which allows convenient use of personal computers during the lectures. Studies proceeds in classroom with adequate number of workplaces equipped with PCs which are sufficient for performing the tasks set under the program.

The material basis for the studies helps to achieve LOs and cover basic needs for a successful introduction into the field and development of graduation thesis. The study and research infrastructure has been significantly improved during recent years. The list of new laboratory equipment covers basic needs for a successful running of the study program, however further improvements and continuous efforts are needed, to consider recent developments in technologies in the field of the studies and research. Exploitation of the equipment has been started since 2011-2013. Two laboratories used for Master studies are equipped with all the instrumentation necessary for practical work. Cooperation with social partners also support development of infrastructure used for studies, elaboration of MSc thesis and research.

Teaching materials for second cycle of Biomechanics studies are available at central library of VGTU and reading room of the faculty. Publications available at the central library represent the basis of learning resources for Master studies. Some other teaching materials can be found at the reading room. Students are provided with internet access to major subscribed databases in various scientific areas and themes. This service covers free, full text scientific and scholarly journals in all subjects and languages. It is mentioned in the SER that there is sufficient amount of learning books presented at the library of university. During last 2 years Faculty’s library acquired high number of books for students teaching. Majority of those books were issued during the last 5-10 years. The library collects the newest scientific literature in English intended for this program too.

The library and reading room space is sufficient for the students, with quite long working hours for the library (from 9.00 to 21.00) and 24 hour access to the reading room. Also students can use the newly built Science and Communication Center in Saulėtekis, which is open 24/7.

## 2.5. Study process and students‘ performance assessment

Admission to postgraduate studies is organised by the admission commission of the University. No admission examinations are for the *Biomechanics* Master programme. The admission requirements are based on the principles commonly applied at the University. Applicants to the *Biomechanics* Master study programme must be graduates of university-level studies and have Bachelor Degree in the corresponding area. The background education is specified in the admission requirements. Usually the students who indicate the *Biomechanics* programme as the first priority are admitted.

As a definite problem can be regarded full time employment of full time studying students indicating serious problems related to adequate accounting of study time and study results. A drop-out analysis (ration between the enrolled and exmatriculated students 0.11 – 0.36) for the period of the programme implementation shows that full-time students often terminated studies on their own will. The reasons for the discontinuation of studies are of personal nature.

Students are informed on the possibilities to write scientific articles, reports and on participation in conferences. The majority of postgraduate students are positive about the conditions to participate in scientific conferences and to publish the results. The students can present their scientific works and research papers there, thus the student early involvement in the research can be appreciated.

Student knowledge evaluation is clear and it is approved by VGTU Senate. The evaluation system of each module is provided in module cards individually. The subjects of final thesis correspond to the programme aims and LOs. The evaluation of final thesis depends on supervisors and reviewer’s evaluation as well as on analytical value and practical application of the work. The final evaluation of the work is the average of all evaluations of commission members and the quality of presentation. The list of final thesis is available in the internet; the subjects correspond to the program.

Assessment of knowledge of postgraduate students is regulated by the *Procedure of the evaluation of student knowledge.* The criteria on assessing academic achievements of the students are linked to the anticipated LOs of the studies. The level of student knowledge is measured according to the criteria set in the module of studies and each grade reflects the achieved LOs. The knowledge of VGTU students is graded using a ten-point grading system, while knowledge is assessed in compliance with the ECTS grading scale. The discussions with students indicated some problems in student performance assessment, especially possibilities to solve conflict situations. Students can discuss their works with the lecturer after the examinations. In case of disagreements on evaluation mark students can appeal in writing to the head of Department within 10 calendar days after the date of assessment. The student knowledge evaluation system is well elaborated.

Academic progress of students is revealed from the analysis of postgraduate students’ examination results of the study courses. The examination results show that weighted average of grades is more than 8. The length of the study programme is 3200 hours. The total length of auditorium work hours is 19,3 % of the programme scope. From these lectures take 56,4 %, laboratory-base work – 20,5 %, practical works – 23 %. Students have 40 hours of work per week. Student’s self-study is intended for students’ preparation to contact work and performance of other tasks set out in study programmes without the teachers’ guidance. The majority of MSc students (89,5 %) are positive about the time-table of training session. Student study quality evaluation system ensures positive motivation and good quality of the achieved results.

Measures are taken to guarantee an ethically sound and proper academic conduction in the study tasks. The cases of cheating during examinations are processed and corresponding actions are undertaken. A *bona fide* statement confirming the authenticity of the works must be signed by a student.

The chairperson, members of the committee for the programme and supervisors provide regular consultations to postgraduate students. The students may also consult teachers engaged in the programme implementation and teachers delivering individual courses under the programme at issue. All teachers have duty hours for additional consultations. Contact information of the University staff is available in the websites of the Departments of the Faculty. According to the master student’s questionnaire results the time of lecturers’ consultation is effective.

Academic and social support is supplied by University and Students association. Student association aims to represent academic interest of students and organize social events, Centre of Physical Training and Sports organises sports activities and provides information on healthy life-style. The website and notice boards of Faculty and University provide students with other questions like general policies, regulation of studies, study system, course of studies, methods of student information, etc. Other information is published on the Faculty website or notice boards next to the Department offices. Academic staff offers students office-based consultations and communicate with them via internet.

Three types of scholarships are available for VGTU students: social, memorial and annual. These grants are dedicated for socially vulnerable persons. Memorial Scholarships and scholarships for good academic achievements are awarded for outstanding academic and research achievements by the order of the Rector. Annual grants are paid for active cultural and social participation in favour of university and faculty.

Students are provided with residences in the University campus according to the order approved by VGTU proportionally to their social and financial status.

Information on partial studies at foreign universities, integration in the process of international studies and ERASMUS program is provided by the Department of International Relations of the University. The students can also find information on study opportunities at EU universities, the short-listing procedures, study assessment procedures, devising partial study programmes, student placements, impressions, and other relevant information on the website of VGTU ERASMUS studies. However, the international mobility programme shows extremely low students mobility, thus further efforts are needed to achieve study program internationalisation aims.

Staff members of the Faculty provide consultations to students on career opportunities. Close contacts are maintained with potential employers. According to questionnaire results, the majority of the program graduates remain positive to find employment after graduation. As a problem has been indicated that the information about companies offering practical training options and a need to regularly upgrade information and renew contacts from side of university and program administration.

## 2.6. Programme management

The program is managed by the head of Department of Biomechanics, but responsibilities for decisions and monitoring of the implementation and control of the program are clearly allocated. The program management system is well functioning and is based on a structured process organised at VGTU with identifiable responsibilities and tasks. The review team got the impression, that the young management team of the program has a strong position within the Faculty of Mechanics in the VGTU. This positive leadership is of importance on the successful operation of the program. The program implementation is closely followed up (partly considering also recent trends in labour market and technological progress in the field), however, more attention should be paid to development in other EU member states as well as worldwide. An important element of the program management is the preparation of SER and internal quality assurance system. However, the aim of self-assessment is not only to sum up existing situation, but looking forward to identify weaknesses and to develop solutions for them.

Communication between students and academic staff is good (“open door” policy) and students as well as graduates appreciate it. An important aspect of the program management includes involvement of local and international stakeholders in the development of the study program content and its improvement. This aspect is especially important considering the applied character of the study program. In this respect, the direct involvement of practitioners into the study processes (as lecturers, supervisors of thesis) can be acknowledged. The same is true also in respect to work with alumni – much can be done to improve and develop well-functioning system how to work with alumni, considering opinion survey on the study quality, suggestions for the program improvement, support for life-long learning.

# **III. RECOMMENDATIONS**

1. It is highly recommended to increase mobility of academic staff and students and development of pedagogical skills of lecturers. Student and lecturer mobility could help to achieve internationalisation aims of the study program, but also to get acquainted with latest developments in biomedical engineering, latest technological developments and research.
2. Further increase of research performance is strongly recommended, including also fundraising for research and improvement of infrastructure. Active participation at international conferences organized by the international societies on biomechanics and biomedical engineering as well as engagement in these scientific societies should be encouraged.
3. More attention could be paid to contacts with social partners as well as hospitals to better meet the needs of labour market and obtain skills needed.

**IV. SUMMARY**

A major strength of the study program is its relevance in respect to needs of local labour market, good contacts with stakeholders in the field and consideration of their suggestions.

Significant progress of the program content has been achieved during last 4 years since the last accreditation and most of the recommendations have been considered and implemented.

Program aims and learning outcomes are well elaborated and reflect the actual needs in the society of Lithuania as well as (partly) trends of development in the field of biomechanics.

Curriculum design is consistent with the latest Bologna rules, in its structure consistent and considers latest developments in the field.

The study quality management system is well elaborated and ensures permanent study content improvement, study process management and student feedback consideration.

The program staff are motivated, young and open to changes in the program, closely follows the developments in the area of the study program and understands the need to improve research results.

The administration of the University is taking care about development of pedagogical skills of lecturers, support their mobility. However, further efforts in this direction should be considered.

As one negative aspect it is emphasised, that the teaching staff is overloaded with teaching duties, as the result of less efficiency in research activities and scientific fundraising.

Negligible international visibility has been identified as a significant problem. Staff and student’s mobility should be increased in order to grasp up the latest scientific trends in this field of expertise.

# **V. GENERAL ASSESSMENT**

The study programme *Biomechanics* (state code – 621H15001) at Vilnius Gediminas Technical University is given **positive** evaluation.

*Study programme assessment in points by evaluation areas*.

|  |  |  |
| --- | --- | --- |
| **No.** | **Evaluation Area** | **Evaluation of an area in points\*** |
| 1. | Programme aims and learning outcomes  | 3 |
| 2. | Curriculum design | 3 |
| 3. | Teaching staff | 3 |
| 4. | Facilities and learning resources  | 3 |
| 5. | Study process and students’ performance assessment  | 3 |
| 6. | Programme management  | 3 |
|   | **Total:**  | **18** |

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

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

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

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

|  |  |
| --- | --- |
| Grupės vadovas:Team leader: | **Prof. dr. Udo Nackenhorst** |
| Grupės nariai:Team members: | **Prof. dr. Rita Mária Kiss**  |
|  | **Prf. dr. Māris Kļaviņš** |
|  | **Mr. Tomas Sinevičius** |
|  | **Mr. Gabrielius Jakutis** |