



STUDIJŲ KOKYBĖS VERTINIMO CENTRAS

VILNIAUS GEDIMINO TECHNIKOS UNIVERSITETO  
**STUDIJŲ PROGRAMOS**  
*SAUGOS INŽINERIJA (valstybinis kodas – 621H12001)*  
**VERTINIMO IŠVADOS**

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**EVALUATION REPORT**  
*OF SAFETY ENGINEERING (state code – 621H12001)*  
**STUDY PROGRAMME**  
At VILNIUS GEDIMINAS TECHNICAL UNIVERSITY

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Išvados parengtos anglų kalba  
Report language - English

## DUOMENYS APIE ĮVERTINTĄ PROGRAMĄ

Studijų programos pavadinimas	<i>Saugos inžinerija</i>
Valstybinis kodas	621H12001
Studijų sritis	Technologijos mokslai
Studijų kryptis	Bendroji inžinerija
Studijų programos rūšis	Universitetinės studijos
Studijų pakopa	Antroji
Studijų forma (trukmė metais)	Nuolatinė (1,5)
Studijų programos apimtis kreditais	90
Suteikiamas laipsnis ir (ar) profesinė kvalifikacija	Saugos inžinerijos magistras
Studijų programos įregistravimo data	1993 m. gegužės 29 d.

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## INFORMATION ON EVALUATED STUDY PROGRAMME

Title of the study programme	<i>Safety Engineering</i>
State code	621H12001
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 (1,5)
Volume of the study programme in credits	90
Degree and (or) professional qualifications awarded	Master in Safety Engineering
Date of registration of the study programme	29 May, 1993

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## **I. INTRODUCTION**

### **1.1. Background of the evaluation process**

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

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

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

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

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

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

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

### **1.2. General**

The Application documentation submitted by the HEI follows the outline recommended by SKVC. Along with the self-evaluation report and annexes, no additional documents have been provided by the HEI before, during and/or after the site-visit.

The basis for the evaluation of the study programme is the Self-Evaluation Report (hereafter, referred to as the SER) prepared in 2015, its annexes and the site visit of the Review Team. The site visit included the Fire Research Centre and the Fire Fighters Training School as well as the University on Wednesday 10<sup>th</sup> May 2016. The visit included meetings with the administrative staff of the University; staff responsible for preparing the SER; teaching staff; students currently on the programme; social partners, employers and alumni associated with the

programme. The Review Team evaluated various support services (classrooms, laboratories, library, computer facilities), examined a sample of students' final work including final theses and the assessment reports of these theses, and various other materials such as textbooks and compendia written by the staff. After Review Team internal discussions, the preliminary conclusions and remarks were presented to the community of the University. After the visit, the Review Team met to discuss and agree about the detailed content of the final report, which represents the agreed views of the Review Team.

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

The second cycle study programme Safety Engineering (hereinafter SE or Study Programme) is implemented at the Vilnius Gediminas Technical University (hereinafter VGTU or University). VGTU is a state higher education institution and is one of the largest higher education institutions in Lithuania. The VGTU has about 13500 students in BSc, MSc and PhD studies. The university's mission *"is to develop a publicly responsible, creative, competitive individual who is receptive to science, the latest technologies and cultural values; to promote scientific progress, social and economic well-being; to create value that ensures the development of both Lithuania and the region in the global context"*. The vision of the University includes: *"to be a prestigious Lithuanian institution of higher education, the scientific and studies level of which conforms to the best European technical universities' level"*.

The implementation of the second-cycle Safety Engineering study programme at VGTU started in 2003. The programme has a Fire and Rescue Operation Safety and Management specialization and is organised under the general engineering field, in a solid technological setting among close to 60 second cycle study programmes.

A previous group of experts assembled by SKVC assessed the programme during May 2010. The Programme was accredited until 31st December 2016 by Dree of the director of SKVC No. 1-01-161 of 20th December 2010, with recommendations of changes stated by the SKVC experts team.

The material for the self-assessment report was prepared following the methodology approved by the Centre for Quality Assessment in Higher Education. The self-assessment of the study programme was conducted by the self-assessment group of 7 people, responsible for separate parts of the assessment.

#### **1.4. The Review Team**

The Review Team was assembled in accordance with the *Expert Selection Procedure*, approved by Order No 1-55 of 19 March 2007 of the Director of the Centre for Quality Assessment in Higher Education, as amended on 11 November 2011. The Review Visit to the HEI and relevant social partners was conducted by the team on 10<sup>th</sup> May, 2016.

1. Prof. Dr. Torgrim Log (team leader), Advisor Technical Safety at Statoil ASA, Professor of Technical Safety and Fire Dynamics at Department of Engineering, Stord/Haugesund University College, Norway.
2. Assoc. Prof. Berit Andersson, Senior lecturer at Division of Fire Safety Engineering, Lund Institute of Technology, Sweden.
3. Prof. Dr. Csaba Forgács, Professor at the Department of Agricultural Economics and Rural Development, Corvinus University of Budapest, Hungary.
4. Prof. Dr. Linas Kliučininkas, Head of the Department of Environmental Technology at Kaunas University of Technology, Lithuania.
5. Mr. Ignas Gaižiūnas, 3rd year student of Energy Physics at Faculty of Physics, Vilnius University, Lithuania.

## II. PROGRAMME ANALYSIS

### 2.1. Programme aims and learning outcomes

The survey "Lithuanian specialist training institutions to ensure the competitiveness of the engineering industries growth" commissioned by the Lithuanian Engineering Industry Association in 2013, reveals that engineering science specialists will be among the most demanded professions in 2012-2015. The demand for employees with higher education will increase with 40-50% by 2025. According to the labour market trends overview, carried out by the Lithuanian Labour Exchange in 2014, the greatest part of job vacancies was registered for technology and production engineering professionals. For the labour market trends overview for the first quarter of 2015, there was a growing number of job vacancies (compared to 2014) for professionals in the fields of human health care, scientific and technical activities. However, globalisation also forms new requirements for those looking for jobs and improving their competences.

The Lithuanian General Requirements of Master Degree Study Programmes, §1.4 state: "*The aim of study programmes shall be to train students for independent research (artistic work) or any other work which requires scientific knowledge, analytical abilities to analyse and use it or creative artistic abilities.*"

The aims of the programme are well-defined and publicly accessible on the VGTU web site, also in English language. The same web site also presents the learning outcomes in Lithuanian as well as English. The programme essentially prepares students to perform important and valuable work related to safety engineering with major focus on fire brigades and building design in order to meet needs of Lithuania.

The programme goals of the *Safety Engineering (SE)* at The Vilnius Gediminas Technical University are in reference SER Annex 8.5 stated as:

1. *To educate master student in the field of safety engineering, who are able to autonomously develop and apply scientific ideas related to this field.*
2. *To provide knowledge on and abilities in applying modern-day methods and scientific results of and in practice; to be able to understand research results and assess their reliability.*
3. *To develop ability in applying knowledge acquired in a new and constantly changing environment related to the safety engineering.*
4. *To develop ability in autonomous learning, critical assessment of theoretical and practical novelties, effective acting when lacking instructions and exhaustive information, substantiating conclusions and explaining these conclusions to*

*stockholders with different education, perceiving ethical and social consequences of decisions being made and responsibility for these decisions.*

The graduates of the second-cycle study programme *Safety Engineering* apply the shaped thinking and practical analytical skills in the working activities related with safety engineering: in both public and private enterprises; in doctoral studies in the field of technological sciences constructions engineering and similar fields. It was confirmed by the staff, the social partners and the alumni that there is a demand for the graduates at various enterprises; fire protection equipment, mechanisms and systems manufacturing and development companies; public institutions, such as the Department of Fire Protection and Rescue at the Ministry of the Interior of the Republic of Lithuania, etc. The social partners confirmed that the graduates from the programme were well fit for the jobs available, and preferred these MSc candidates for higher positions in their organisations. The alumni were satisfied with the study programme and the learning outcomes they got from the programme.

The 1<sup>th</sup> programme goal is quite general and fits for purpose. The 2<sup>nd</sup> programme goal puts weight on modern methods and application of scientific results, as well as being critical to their reliability, i.e. a sound and fit goal. The 3<sup>rd</sup> goal stresses applying the acquired knowledge in new and changing environments within the safety engineering field. This is a goal pointing into the future, and much appreciated by the Review Team. The 4<sup>th</sup> paragraph links learning, assessment and efficient acting and situations of lacking instructions and exhaustive information with the ability to make conclusions and communicate these to stakeholders. This paragraph covers the broad variety of situations a SE MSc will be exposed to in his/her work after graduation, especially when entering leading positions of fire brigades or similar employers.

The Review Team fully agree with the learning outcomes in Z1 and Z2 (VGTU web page). This also holds for GV1 and the abilities described in SG1 and SG2. The focus on operationalization of research knowledge, theories and methods, as well as collecting and processing information fits well for the intended tasks and decisions a graduate has to undertake in his/her professional life.

In learning outcome Z3, it is suggested to incorporate risk assessment together with risk management. The reason for this suggestion it that prior to several international accidents, the risk management was based on insufficient risk assessments/risk analysis or not fully understanding a time changing risk picture. Major accidents may also deserve attention in learning outcome Z3. Besides this minor adjustment, Z3 clearly shows the variety in fields of knowledge needed for a professional in the field of Safety Engineering. Learning outcome GV2 follows up

this wide field of knowledge. Learning outcome GV3 does specifically mention risk assessment showing that this is covered.

Learning outcome CG1 mentions innovations and integral knowledge, as well as the importance of understanding limits of analytical methods, their reliability, etc. This point is very important as there may often be too few questions raised against methods/reports gained by e.g. modern computer codes, modern risk analysis tool, etc. The Review Team is very satisfied with the focus on these issues.

The learning outcomes stated in CG3, AG1 and AG3 clearly support the Point 4 programme goals. The only comment from the Review Team is to AG1 as several areas of knowledge as regards personal skills may be best acquired in a group setting. Therefore, it is suggested to include that the students should be able to acquire knowledge also in a group setting. The SER, page 21, last paragraph states that various methods are applied in the course of studies: oral presentation, demonstration, discussions, team work, case studies, testing, project work, etc. That learning in a group setting is included was also confirmed by alumni and current students.

It is the opinion of the Review Team that the stated SE programme learning goals fully comply with the aim stated in the GRMD §1.4, and fits the purpose of the focus areas of this particular SE programme. It complies fully to the Descriptor of Study Cycles.

Trends in the labour market show that "employers confer priority to universal, technologically advanced and flexible employees". The employers emphasized the need of specialists who have competences wider than strictly technical and this demand is constantly increasing. The students and the alumni were satisfied with the study programme. The change in the study programme as a result of the previous evaluation towards more design, etc. was positively assessed by all stakeholders. According to the Review Team, this change is also in line with the change in other countries on this level of education. This study programme has developed significantly since the last evaluation and further development should preferably follow the same directions. The content of the programme complies well with the title Safety Engineering.

#### Summary:

The programme goals are well formulated and fully comply with the Lithuanian General Requirements of Master Degree Study Programmes. It complies fully to the Descriptor of Study Cycles. The learning outcomes are well linked to the programme goals. The programme aims are in line with the needs in the labour market evidenced both by social partners and alumni satisfaction with the programme. The Review Team suggests only minor adjustments in the

learning goals, the most important are to include risk assessment and the ability of learning in a group setting. The focus on new and constantly changing environment is commendable. The programme aims and learning outcomes are consistent with the type and level of studies and the level of qualifications offered. The name Safety Engineering, its learning outcomes, content and the qualifications offered are compatible with each other.

## **2.2. Curriculum design**

This particular 1,5 years *Safety Engineering* MSc has a special focus on the fire brigades and similar employers, but has also changed during the last 6 years to include more focus on fire safety design. The previous assessment of the study programme suggested more compliance to "A proposal for a model curriculum in fire safety engineering" presented in the Fire Safety Journal 25 (1) 1995 special issue (FSJ). The Review Team observed that this has been done successfully through strengthening courses like Burning Processes and Fire Simulation, Computer Aided Design, Risk Based Design, etc.

The structure of the syllabus is compliant to the Lithuanian requirements for second cycle studies. There is a good balance between mandatory and optional courses for development in individual directions. The curriculum design meets the legal requirements regarding all aspects like study length (1,5 years), credits (90), credits distribution during the 1,5 years study as well as the requirements for the final Thesis. The study subjects are spread evenly and their themes are not repetitive. The scope of the programme is sufficient to ensure the learning outcomes.

The curriculum also covers building safety science and the industrial safety science. Covering the whole field of Safety Engineering is challenging. There is then a need to cover areas from general fire behaviour of potential involved fuels, building fires, high rise buildings, industrial hazards, etc. to handling sharp emergency situations as well as fire risk assessment and predictions and welfare of the public and the fire brigades, communication, etc. This gives a very wide set of aims and objectives. The curriculum complies with this challenge in a sound and robust way. The content of the subjects is consistent with the type and level of studies.

The use of software like FDS, SmartFire, Exodus, etc. represents state of the art safety software used by universities as well as research institutions and consultant companies. This is being balanced with codes and regulations (EN, ISO, etc.). A limited amount of laboratory work must be seen in relation to the significant use of state of the art simulation tools, which serves as a virtual laboratory. This balance ensures that the students will be able to understand performance based design as well as prescribed solutions, and being able to assess these solutions and find their strengths and weaknesses. It was confirmed by the alumni and the social partners that

the change towards more design has been a success since the previous assessment. The content and methods of the subjects/modules are appropriate for the achievement of the intended learning outcomes. The last achievements in related science and technology are covered and the scope of the programme is sufficient to ensure the learning outcomes.

Some professional issues related to risk handling in the industry, such as HAZID, HAZOP, LOPA, SIL-requirement, etc. may be worthwhile covering in the industry related safety courses. It is therefore advised to take a closer look at industrial risk assessment and risk reducing methods and, referring to the ALARP principle, argue if not implemented in the next course revision.

Textbooks and compendia in paper and electronic formats have been developed for several courses, which demonstrate that the faculty has given attention to filling gaps in the international literature. In the annotation of the course "Risk-Based Design", the following is stated: "*It is sought to learn from the major accidents in the past and to be able to avoid the accidents in the future*". This clearly shows that learning from major accidents has been given necessary focus. A course like "Safety in Production Processes" introduces the students to safety indicators in the industries, etc. Together with proper focus on fire safety design, this may help the MSc's later on to identify risk indicators in public sector, like building fires, wild fires and situations of high risk to the public, personnel, structures and the environment. A course like "Management of Occupational Stress" shows the wide field the SE curriculum has to cover. The curriculum matches the needs of an international MSc in Safety Engineering. The whole field is covered with a proper balance between the selected courses and topics and holds the expected level.

A number of international research articles are required in student project work during the study program. This is a good way of introducing the students to international research articles. It is suggested that the institution evaluates whether a few leading edge research articles should be included as ordinary curriculum in some of the subjects. At the same time, this will stimulate students to learn professional terms in foreign languages.

The allocation of 3 + 3 + 24 credits for the MSc Thesis during 1,5 years study is a good solution as it allows the students to spend more time for information search while preparing the Thesis. The early decision on Thesis topics also helps the students to choose an optimal course profile. All parties including current students, alumni, social partners and the faculty were satisfied with this arrangement.

The Review Team appreciated that students present the thesis work as a paper at a conference, usually the annual conference of Lithuanian young researchers, organized by VGTU. The best Thesis' are published in "Science - the Future of Lithuania". The final thesis evaluation

using a prescribed board of evaluators (DADAB), including practitioners, scientists (also one from another scientific field) and an outside board leader, ensures proper evaluation quality.

Fire is the most frequent hazard focussed by the SE MSc's in their professional life. In depth understanding of fire dynamics is therefore essential for the professional SE MSc. During the Fire Technology BSc, or similar studies needed to attend the SE MSc, as well as the 1,5 years MSc study, it must be ensured that sufficient Fire Dynamics, including explosions, and their consequences (heat, smoke, pressure, etc.), are taught during the programmes. An improvement possibility is to increase the credits of fire phenomena to ensure even better understanding of fire behaviour. The core knowledge suggested to be strengthened is especially the heat transfer (transient heat conduction and thermal radiation) and fluid dynamics (fire plumes, plume/ceiling interactions, enclosure fire ventilation, etc.). During the coming years, it is therefore recommended to include more of these topics during the studies. The Review Team suggest that this should be better focussed in the BSc in Fire Protection. A separate 6 credits topic in Fire Dynamics adjusted to BSc level, including relevant (for example: small scale in-house demonstrations) may be the way forward. The courses following this new course may then start at a higher level. The SE MSc topic STDGM11102 "Burning Processes and Fire Simulation", as well as other SE courses, can then be upgraded when future matriculates know more fire fundamentals when entering the MSc-programme.

Some of the social partners asked for more focus on legislations. The Review Team does, however, assume that the increasing focus on performance based codes in the EU and North America will also become the trend in Lithuania. This rather requires an increased focus on the fire fundamentals and the fire safety design, i.e. supporting the changes in compliance with the mentioned FSJ suggested curriculum already done in the SE programme. The Review Team looks upon the process of including more fire fundamentals in the Fire Technology BSc as a way of meeting the increasing future challenges.

Summary:

All stakeholders agreed that the recent adjustment of the study programme according to "A proposal for a model curriculum in fire safety engineering" presented in the Fire Safety Journal 25 (1) 1995 special issue has been a success. The Review Team certainly agree to that, and wants this process to continue. It is suggested to look more into industrial hazard identification methodologies. Besides these issues, the Review Team found this second cycle curriculum design well-balanced in all perspectives.

### **2.3. Teaching staff**

2 professors and 4 associate professors, all with PhD's, are directly involved in the programme. This core faculty, as well as the teachers from related educations, meets the qualification requirements for MSc programme staff. They are involved in research and publishes frequently, some more than the others. They are involved in projects and research related to, and very relevant for, the *Safety Engineering* programme. The research is relevant to the study programme and covers areas from road accidents with BLEVE risk, via general risk based studies to sharp end research. The staff meets all legal requirements regarding staff qualifications.

The staff cumulative research and working experience which, when added up, covers most of the central aspects of safety engineering in a comprehensive way, represent an important human resource. This is a well-qualified group in terms of formal and informal qualifications needed for an MSc education in Safety Engineering. The academic staff age range is from the thirties to the fifties. The professor/student ratio below 10 and the associate professor/student ratio below 5, ensure a favourable teacher/student ratio. The turnover is low, i.e. there is sufficient staff stability to ensure adequate provision of the programme. The staff members have the opportunity to participate in Erasmus exchange programs. This mobility possibility could be used more by some of the staff members. However, as a total, the number of short duration mobility exchanges is quite significant.

It is stated in the legislations that at least one month, but no more than six months, should be dedicated for improvement of teacher qualification. The Review Team is of the opinion that research work, i.e. producing new knowledge, is one of the best ways to improve teacher qualifications, especially when cooperating with international colleagues. The staff regularly participates in international conferences and exhibitions.

The 5 year public contest tenure system ensures motivation for R&D work. During the last 5 academic years, all of the teachers have therefore been assessed. The scientific research, publishing, scientific conference participation and training courses, exchange programs, etc. are evaluated. The HEI creates conditions for professional development of the teaching staff necessary for the provision of the programme, through peer reviewing of the staff members, staff exchange; 5 years contest tenure, etc. The SER states a weakness in staff exchange and international research cooperation. The identified improvement is "*to encourage teachers to participate in academic staff exchange and research projects*". The Review Team agrees in this statement, and wants the faculty to increase the staff exchange, especially with focus on research cooperation and future student mobility.

With limited number of students (i.e. limited economical resources) and limited number of staff, it seems like there still is a fairly high staff teaching load. It is evident from their CVs that the staff teaches subjects also on other programmes, such as the Fire Protection BSc programme, etc. It is the impression of the Review Group that a significant teaching load limits the available time for research, applying for international research grants, etc.

This problem is not unique to the VGTU, as Safety Engineering also in other universities usually is quite marginal compared to larger fields of engineering. A possible solution may be low cost international research projects with groups in a similar situation. The institution is advised to intensify the search for mobility transfers possibilities for staff and visiting professors. The staff members have developed several books and compendia to fill the gaps in the international literature with respect to this study programme. This has taken its toll when it comes to time and effort. For the benefit of the international society of safety engineering, the staff members are suggested translating even more of these books and compendia to English.

#### Summary:

The staff is well-qualified in terms of both formal and informal qualifications needed for an international MSc education in Safety Engineering. The research is directly relevant for the study programme. The institution should, however, aim at increasing the international research activities and staff exchange.

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

The facilities and learning resources, including the Fire Research Centre and Fire Fighters Training School, libraries, teaching rooms, etc. are adequate and indeed very good, both in size and quality. There is a sufficient number of auditoriums for lectures, training and laboratory sessions. There are also sufficient reading rooms, etc. and all teaching premises meet the proper requirements and hygiene norms. The necessary computer and audio visual equipment associated with a modern HEI are present, and continually maintained, with access to the VGTU intranet and internet. For their lessons, the group of second cycle students gather in a rather small, old fashioned but cosy room, sufficient for them and their teachers, and the students were happy with this room. It is worthwhile mentioning that a good learning atmosphere is not necessarily something that comes with hyper modern facilities.

The library is facilitated for handicapped and visually impaired students and employees with stairs, gangways, etc. The library has more than sufficient capacity, including a 24/7 reading room, and gives the students and staff access to > 20 international scientific publications data bases, and all research journals relevant to a SE programme. The VGTU library cooperation

with 8 foreign exchange partners (EU countries and the USA) for mutual borrowing further extends the literature access for students and staff, and shows that this is a state of the art modern HEI library. As the main library is in another building, 500 m away, it was noted positively that the library has a smaller filial very near the institute. This filial has most of the literature relevant for this particular MSc program. Generally, the students do not use the library so much, partly due to working from home and partly due to the good access to modern academic electronic search engines. But it is available on demand. The students have access to textbooks, books, periodical publications, databases, etc. relevant for the study programme. The teaching materials (textbooks, books, periodical publications, databases) are adequate and accessible, and as mentioned in the previous chapter, the staff has developed relevant books and e-books to fill gaps in the international literature.

The Fire Research Centre has facilities for accredited testing from small scale flash point analysers, via fully instrumented test chambers including laser smoke measurements and paramagnetic O<sub>2</sub>-analysers for calorific measurements and equipment for full scale certified wall section testing. They also have roof testing equipment, with hoods allowing for more purpose built and fundamental research. The MSc students use this equipment during their Thesis work. A total of 6 PhD students have also completed their PhD Thesis using these facilities. The Fire Fighters Training School also represents a potential "laboratory" for the MSc students with a number of container fire enclosures for demonstrations, fire testing, fire investigations, etc. It has gyms, swimming pool for divers rescue training and even a top of the line decompression chamber. The Fire Research Institute and the Fire Fighter School, in the vicinity of Vilnius, represent a unique resource for Thesis work, research projects and international cooperation.

The SE MSc program is organized by the Department of Labour Safety and Fire Protection, which also has ergonomics equipment labs, etc. Studying working environment for the fire fighters, also in sharp situations, represents numerous possibilities for the SE Thesis work and international research. The civil engineering laboratories are also very well developed and include testing of fire heated concrete beams as well. The Department has a small scale lab for demonstrations of several central fire parameters, such as open and closed cup flash point, vertical flame spread, burning rates and flame shapes of inclined small wooden objects, ovens for mass recordings during wood pyrolysis, etc. With some instrumentation, this laboratory may be upgraded to demonstrate several more fundamental principles of fire dynamics.

The current change to more focus on design, which was appreciated by all stake holders, have resulted in more available resources like CFD modelling software (FDS and SmartFire) as well as evacuation modelling software (Exodus). The mentioned types of software represent

practise for the students as this software is representative for the best available technology software in research institutes and consultancy companies, etc. Learning to use these software packages, the students may easily transfer to other software in their future jobs.

The combination of a small scale in house fire lab, fully developed civil engineering lab, PC labs for fire risk modelling, access to social partners full scale accredited facilities at the Fire Research Centre and well-equipped Fire Fighters Training School, is impressive and internationally quite unique. Together with these physical facilities come the very cooperative social partners, who fully support the MSc program by letting students attend certified testing, etc. As a total, this probably represents the best learning facilities the safety experts of the Review Team have ever seen.

When building stronger international relationships, the unique facilities represent valuable assets with respect to cooperation, EU grants, etc. By now, the testing and demonstrations have been directed towards standardised testing. The Review Group wants to challenge the faculty regarding using the facilities for more fundamental and ad hoc research. This requires some general instrumentation which, as an example, may be built during MSc Thesis'. Examples may be scale models, apparatus for studying fire plumes and fire plume ceiling interaction, sprinkler activation times, plexiglas scale models for smoke movement, etc. The Review Team feels confident that the social partners would also appreciate such initiatives, and benefit from it.

Summary:

All the premises, teaching and learning facilities and written materials intended for a SE MSc meet study process requirements. The combined facilities of small scale in house fire laboratory, well developed civil engineering lab, state of the art PC modelling software, full scale social partner facilities (research centre and very well equipped fire fighter school, both with enthusiastic leaders and employees) are quite unique, also in an international view. This combination allows for numerous future teaching and research possibilities. Using the same software packages as the foremost research institutes and consultancy companies, as well as using the partner facilities for Thesis work (and later on for PhD-work) represents very good practise arrangements for the students.

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

The admission requirements to the Vilnius Gediminas Technical University are clear and well founded. Admissions are being carried out by a VGTU Admission and Information Centre. Students are admitted on the basis of competitive score. Information about algorithm of calculating competitive score is present on the VGTU website. The algorithm is rather complex

but clear and understandable. Students who lack subjects needed for admission up to 10 credits are allowed to pass examination at the end of the first study semester.

There is a stable number of students admitted every year. However, in year 2014/2015 there was a sudden decrease of applicants having study programme *Safety Engineering* as their first choice. It should be noted that the study programme has a small dropout rate and majority of the admitted students graduate from the study programme.

There are good proportions between independent and contact work. There seems to be a good electronic environment for studies implemented by VGTU and the majority of the teaching staff uses the advantages it provides.

The VGTU has a very good website which allows students to quickly and efficiently access necessary information such as teachers contacts, scholarships, time tables, etc. Teachers give consultations to students at designated time table. There seems to be some well-founded practices implemented by VGTU Integration and Career Office at informing students about career possibilities. There is a good system of financial support in VGTU. Students are eligible for scholarships for good academic results as well as good result in other areas such as cultural, public or sports activities. Students with difficult financial situation also get financial support from VGTU.

It is strange to see that individual study plan is provided only for foreign students and students with disabilities (SER page 25) while it is provided for all students in bachelor study programme of Fire Protection. It could be considered offering individual study plans for the Safety Engineering students as well as majority of them are working. This practice could turn out as an efficient way of organizing the study process. In SER (page 27, table 6.10) it is indicated that one of the strengths of the study programme is visiting teachers. No evidence of visiting teachers was provided in SER but during the meetings it was learned about positive practice that some teachers invite social partners to give some lectures. For certain study subjects there is a clear lack of book copies (there are only 1 or 2 copies available). The main references can be found in library: Management of Occupational Stress, Forecasting Fires and Accidents and Risk Management, Risk-Based Design, Computer Aided Design and Burning Processes and Fire Simulation. It is indicated in the SER (page 12) that only 0,62 percent of study programme time is devoted for practical training. However, when including fire modelling, which must be included in these types of educations, the total hours of laboratory work is at an adequate level. As a result, the students are able to receive sufficient applied knowledge. The organisation of the study process ensures an adequate provision of the programme and the achievement of the stated learning outcomes.

There is a system of receiving students feedback on their studies implemented at VGTU. Students carry out surveys about the teaching staff at the end of each semester. Results are later analysed and action taken. Students are also able to communicate their problems directly to the Deans office. Students might sometimes be discouraged to take part in surveys at the end of semester as the results do make a little difference to them. It would be appreciated by the students if some sort of more formal system would be implemented to receive students' feedback and improve quality of the study process during the semester, maybe a mid-term evaluation.

The students participate in scientific activities and must present their Thesis at a scientific conference and sometimes students are invited to participate in scientific activities or projects if there are possibilities. Students could be also encouraged to participate in other international or other national conferences. There is also a variety of cultural and sport activities at VGTU and students are welcome to join. VGTU Students' Representative also welcomes students to join.

All theses of the last years were available for the Review Team. There was a variety of topics relevant to both the labour market and/or the public needs. The topics reflected general needs in the field, to name a few: evacuation modeling, smoke ventilation versus sprinkler activation, wood charring, etc. It also covered topics clearly related to research by the staff, to name a few: industrial domino accidents, industry/public interface (road tank explosions), reinforced concrete in fires, fire fighter accidents and health hazards, building fire risk assessment, etc. It is clear that both the available technical facilities (in house and partners) as well as the modern software packages were extensively used in the different Thesis.

VGTU provides some possibilities for students to use mobility programs. During the visit the Review Team learned about some students that used the opportunity to travel abroad. However, this practice is very rare. The main reason for not participating in mobility programs is difficulties in coordinating with their employees as most of the students are working. Despite that, the students expressed a clear need to get acquainted with practice of fire protection field in other countries. There should be put some thought on creating more international relations regarding the safety engineering field providing students with possibilities to get some foreign practices on how to tackle fire protection problems. As the majority of the students are working there could be put some consideration in establishing short term foreign exchanges. Also, students should be better informed about existing possibilities to gain experience in foreign countries.

The assessment system of particular subject is clearly described in its description (Annex 8.1). Students have access to study descriptions and are aware of the assessment system. Several different assessment systems are used. It is appreciated by the students that tests are implemented

during their study semesters. Generally, assessment in VGTU helps to distribute student workload more evenly during the semester. The assessment and procedure for master thesis defence is clear. Final master thesis is evaluated by a commission and the final result is average of all members of commission.

It is positive to see that entire community of VGTU is taking measures to prevent academic dishonesty. Actions taken by VGTU Students' representative to discourage unfair behaviour are very commendable.

The graduates have a particular place in the labour market as Safety Engineering specialists are only prepared at VGTU. During the visit to VGTU it was also learned that there is a need of this programmes graduates especially in regional provinces of Lithuania. It was confirmed by both graduates and social partners that finishing studies at master level meets the expectations of the profession and ensures very good career possibilities. Though this is evident by these groups, this might not be so evident to the public. Some consideration should be considered into creating a formal system tracking graduates' employability as this is in itself a strong marketing possibility for this particular programme.

#### Summary:

The admission requirements for the study programme requirements are well-founded. The organisation of the study process ensures adequate provision of the programme and achievement of the stated learning outcomes. The students are encouraged to participate in research, artistic and applied research activities as well as in cultural and sports activities. The students have opportunities to participate in student mobility programmes, but few students participate due to working alongside studying. The institution ensures an adequate level of academic and social support. The assessment of students' performance is clear, adequate and publicly available and the graduates are well received by the employers giving good career opportunities.

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

The Review Group got the impression of a well-run study programme. Senate regulations, and other similar regulations, are followed up on a regular basis. Information and data on the implementation of the programme are regularly collected and analysed. The responsibility for decisions and monitoring of the implementation of the programme are clearly allocated. The organised peer reviewing of the staff members is a good tool for improvement. Attendance in classes, discussions with students as well as the assessment of lectures' content, visual presentation of the material, teacher's communication with students, teaching methods, are organised. These issues indicate a thorough process for quality improvements. The student polls

and the systematic follow up work after each semester also indicate efforts in quality improvements. The internal quality assurance measures are sufficiently effective and efficient. In the meeting with the Review Team, the students did, however, ask for mid-term evaluation as this would benefit them the same semester. The programme management is therefore asked to evaluate the possibility for mid-term topics evaluation. The adaption of the teaching hours to fit the needs of the students is evaluated positively by all stake holders (students, alumni and social partners). This is a strong proof of programme management and staff flexibility, and is very much appreciated by the Review Group.

The European countries are likely to move even more towards performance based design, in the industry as well as in the public sector. Increasing demand of employers in this field may represent an opportunity for student recruitment to the programme. The programme management is advised to continuously look for potential new emerging social partners in the increasing field of safety engineering.

The frequent meetings with current social partners, such as the Department of Fire Protection and Rescue (DFPR) and the Fire Brigade Training School, ensure feedback and new ideas of improvement of the study programme. They confirmed being listened to when suggesting programme changes confirming evaluation and improvement involvement. The invitation of employers to involve in teaching and suggestions for final thesis topics shows the close partner cooperation. Regular meetings with alumni also add value to this picture. Information on the implementation of the programme is used for programme improvement.

The improvements done since the previous assessment, such as specifying the objectives of the programme specialization, aims and course units, have given a well described SE programme acknowledged by all stakeholders, including the present students. The skills utilization analysis of graduates and employed graduates' have been completed in order to improve both the study programme and organization of the study process. The analysis of Safety Engineering speciality choice and perspective was also carried out to improve both the study programme and the organization of the study process. The Review Team now sees the result of this, and has only few further comments stated in previous pages. The Review Team is of the opinion that the programme management should try even harder to increase staff and student mobility. New international partners may open doors in this respect. The Review Team encourages the faculty to get more involved in research in the directions they are already involved in, including safety design, as well as to seek opportunities for low cost fundamental research based on the available software and facilities. Seeking cooperation with institutions in the same situation may be a way

forward. The unique social partner facilities and cooperation may be marketed stronger to future foreign partners.

#### Summary:

The programme management has a close cooperation with the social partners, who also suggest improvements to the study programme. The responsibility for decisions and monitoring of the implementations are clear and allocated. The programme management should consider mid-term topics evaluation so the current students benefit from their own suggestions. The programme management is advised to evaluate new social partners in the field of safety design. Towards potential foreign research partners, the unique facilities and cooperation with the Fire Research Center and Fire Fighter Training School should be better marketed.

### **III. RECOMMENDATIONS**

1. The core knowledge of fire fundamentals should still be strengthened. This may preferably include changes in the first cycle study of Fire Technology to increase the matriculate's qualifications with subsequent adjustments of the *Safety Engineering* MSc programme.

2. Consider a formal way to receive students' feedback during the semester.

3. It is suggested to strengthening the student and staff mobility.

4. Consider more fundamental fire research and market the unique social partner cooperation to potential international research partners.

### **IV. EXAMPLES OF EXCELLENCE (GOOD PRACTICE)\***

The combined facilities of small scale in house fire laboratory, well developed civil engineering lab, state of the art PC modelling software, full scale social partner facilities (Fire Research Centre) and very well equipped Fire Fighter Training School, both with enthusiastic leaders and employees, are quite impressive. It is the best combination of facilities and learning resources ever seen by the Review Group's international fire and safety experts.

### **V. SUMMARY**

The programme aims and learning outcomes are based on the academic and professional requirements, public needs and the needs of the labour market. They are consistent with the type and level of studies and qualifications offered. The courses prepare the students well for the future professional life. The focus on new and constantly changing environment is

commendable. All stakeholders agreed that the recent adjustment of the study programme according to "A proposal for a model curriculum in fire safety engineering" presented in the Fire Safety Journal 25 (1) 1995 special issue has been a success. The program has developed significantly since the last evaluation 6 years ago. The Review Team wants to make a note on the depth of fire fundamentals, which can be improved in the Fire Protection first cycle programme giving the matriculates an even better background in fire fundamentals. Besides that, this second cycle curriculum design is well-balanced in all perspectives.

The faculty meets all qualification requirements. A large portion of the staff has long experience in research and pedagogical areas. Their research activities are extensive in terms of scientific publications directly related to the study programme. They are involved in both Lithuanian and international research projects. Some staff members take part in the MVG/Erasmus academic staff mobility programs.

The admission requirements are clear and well founded. The organisation of the study process ensures adequate provision of the programme and achievement of the learning outcomes. The students are encouraged to participate in research, artistic and applied research activities as well as in cultural and sports activities. There is good availability of electronic resources. The students use the specialized exercise fields at the Fire Research Centre (FRC) and the Fire Fighters Training School (FFTR) for teaching courses and the final Thesis work. The students have opportunities to participate in mobility programmes, but few students do that due to working alongside studying. The students that did go abroad were, however, very satisfied. The mobility cooperation with foreign institutions for students and staff could be strengthened. The adaption of the teaching hours to fit the needs of the students is evaluated positively by all stakeholders (students, alumni and social partners). The study programme has a small dropout rate.

The Review Team got the impression of a well-run study programme. Senate regulations, and other similar regulations, are followed up on a regular basis. Information on the implementation of the programme are regularly collected and analysed. Peer reviewing of the staff members (attendance in classes, discussions with students as well as the assessment of lectures' content, visual presentation of the material, teacher's communication with students, teaching methods) are organised and shows a thorough process for quality improvements. The internal quality assurance measures are efficient. The students did, however, ask for mid-term evaluation as this would benefit them the same semester. The frequent meetings with current social partners ensure feedback and ideas of improving the programme. They are listened to when suggesting programme changes confirming evaluation and improvement involvement.

They also frequently suggest interesting thesis topics. Regular meetings with alumni also add value to this picture.

The software packages used are similar to those used by the foremost research institutes and consultancy companies. The premises, teaching and learning facilities and written materials intended for the program meet study process requirements. The combined facilities of small scale in house fire laboratory, well developed civil engineering lab, state of the art PC modelling software, full scale social partner facilities (very well equipped research centre and fire fighter school, both with enthusiastic leaders and employees) are quite unique, also in an international perspective. This combination allows for numerous future teaching and research possibilities. Towards potential foreign research partners, these unique facilities represent valuable assets that can be better marketed.

The study program is unique and needed for the country and it holds the necessary international standard. Students, graduates, social partners and employers were positively evaluating the study program. It is also evaluated positively by the Review Team.

## VI. GENERAL ASSESSMENT

The study programme *Safety Engineering* (state code – 621H12001) 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	4
5.	Study process and students' performance assessment	3
6.	Programme management	3
	<b>Total:</b>	<b>19</b>

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

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

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

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

Grupės vadovas: Team leader:	Prof. Dr. Torgrim Log
Grupės nariai: Team members:	Assoc. Prof. Berit Andersson
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**VILNIAUS GEDIMINO TECHNIKOS UNIVERSITETO ANTROSIOS PAKOPOS  
STUDIJŲ PROGRAMOS SAUGOS INŽINERIJA (VALSTYBINIS KODAS – 621H12001)  
2016-07-25 EKSPERTINIO VERTINIMO IŠVADŲ NR. SV4-175 IŠRAŠAS**

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#### V. APIBENDRINAMASIS ĮVERTINIMAS

Vilniaus Gedimino technikos universiteto studijų programa *Saugos inžinerija* (valstybinis kodas – 621H12001) vertinama **teigiamai**.

Eil. Nr.	Vertinimo sritis	Srities įvertinimas, balais*
1.	Programos tikslai ir numatomi studijų rezultatai	3
2.	Programos sandara	3
3.	Personalas	3
4.	Materialieji ištekliai	4
5.	Studijų eiga ir jos vertinimas	3
6.	Programos vadyba	3
	<b>Iš viso:</b>	19

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

2 – Patenkinamai (tenkina minimalius reikalavimus, reikia tobulinti)

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

4 – Labai gerai (sritis yra išskirtinė)

&lt;...&gt;

#### IV. GEROSIOS PRAKTIKOS PAVYZDŽIAI

Gana nemažą įspūdį daro VGTU mažų bandinių gaisrinės saugos laboratorija, gerai įrengta Civilinės inžinerijos laboratorija, moderni PC modeliavimo programinė įranga, moderni PC modeliavimo programinė įranga, platus socialinių partnerių tinklas (Gaisrinių tyrimų centras ir labai gerai įrengta Ugniagesių gelbėtojų mokykla ir entuziastingi šių padalinių vadovai bei darbdaviai). Tai geriausias materialinių išteklių derinys, kokį vertinimo grupės tarptautiniai gaisrinės saugos ekspertai kada nors yra matę.

#### V. SANTRAUKA

Studijų programos *Saugos inžinerija* tikslai ir numatomi studijų rezultatai pagrįsti akademiniais ir (ar) profesiniais reikalavimais, visuomenės ir darbo rinkos poreikiais. Jie atitinka studijų rūšį, pakopą ir kvalifikacijų lygį. Studijų dalykai padeda studentams gerai pasiręsti būsimam profesiniam gyvenimui. Pagirtinas dėmesys naujai ir nuolat kintančiai aplinkai. Visi socialiniai dalininkai sutiko, kad šios studijų programos pakeitimas, neseniai atliktas remiantis

*Fire Safety Journal* 25 (1) 1995 specialiame leidinyje pateiktu „Gaisrinės saugos inžinerijos programos pavyzdžio pasiūlymu“, yra sėkmingas. Po paskutiniojo vertinimo, kuris buvo atliktas prieš 6 metus, ši studijų programa buvo smarkiai patobulinta. Vertinimo grupė nori atkreipti dėmesį į fundamentaliųjų gaisrinės saugos dalykų gilumą, kurį būtų galima padidinti pirmosios pakopos (bakaluro) studijų programoje *Gaisrinė sauga* taip priimtiems studentams suteikiant dar geresnius fundamentaliųjų gaisrinės saugos dalykų pagrindus. Be to, šios antrosios pakopos (magistrantūros) studijų programos sandara yra visais atžvilgiais subalansuota.

Dėstytojai atitinka visus kvalifikacijos reikalavimus. Didelė jų dalis turi ilgalaikę patirtį mokslinių tyrimų ir pedagogikos srityse. Jų mokslo tiriamoji veikla yra intensyvi, turint omenyje tiesiogiai su šia studijų programa susijusias mokslines publikacijas. Dėstytojai dalyvauja Lietuvos ir tarptautiniuose mokslinių tyrimų projektuose, kai kurie – MVG/Erasmus akademinio personalo judumo programose.

Priėmimo į studijas reikalavimai yra aiškūs ir pagrįsti. Studijų proceso organizavimas užtikrina tinkamą programos įgyvendinimą ir studijų rezultatų pasiekimą. Studentai skatinami dalyvauti mokslinių tyrimų, meno ir mokslo taikomojoje veikloje, kultūros ir mokslo veiklose. Gerai prieinami elektroniniai išteklių. Mokymosi ar baigiamojo darbo rengimo tikslais studentai naudojami Gaisrinių tyrimų centro ir Ugniagesių gelbėtojų mokyklos teikiamomis specializuotomis praktikos vietomis (laboratorijomis). Studentai turi galimybių dalyvauti judumo programose, bet jomis pasinaudoja nedaugelis, nes studijuodami dar ir dirba. Tačiau studentai, kurie buvo išvykę į užsienį, tuo labai patenkinti. Būtų galima stiprinti studentų ir dėstytojų bendradarbiavimą su užsienio institucijomis judumo srityje. Visi socialiniai dalininkai (studentai, absolventai ir socialiniai partneriai) teigiamai vertina tai, kad studijų laikas suderintas su studentų poreikiais. Šios studijų programos studentų nubyrėjimo lygis žemas.

Vertinimo grupė susidarė įspūdį, kad ši studijų programa yra gerai organizuota. Reguliariai įgyvendinami Senato taisyklės ir kiti panašūs reglamentai. Nuolat renkama ir nagrinėjama informacija apie programos įgyvendinimą. Organizuojamas dėstytojų tarpusavio vertinimas (lankymasis paskaitose, aptarimai su studentais, paskaitų turinio vertinimas, vaizdinis medžiagos pateikimas, dėstytojų bendravimas su studentais, mokymo metodai), kuris liudija, kad vyksta gilus kokybės gerinimo procesas. Vidinės kokybės užtikrinimo priemonės yra veiksmingos. Tačiau studentai pageidauja vidurio laikotarpio vertinimo, nes tai jiems duotų naudos tą patį semestrą. Dažni susitikimai su dabartiniais socialiniais partneriais užtikrina grįžtamąjį ryšį ir naujas idėjas dėl studijų programos tobulinimo. Atsižvelgiama į socialinių partnerių pasiūlymus dėl studijų programos ir vertinimo metodų patobulinimų. Socialiniai partneriai dažnai pasiūlo įdomias baigiamųjų darbų temas. Nuolat organizuojami susitikimai su absolventais taip pat kuria pridėtinę vertę.

Programinės įrangos paketai yra panašūs į tuos, kuriuos naudoja mokslinių tyrimų institutai ir konsultavimo įmonės. Patalpos, studijų (mokymo ir mokymosi) įranga ir rašytinė medžiaga, skirtos šiai programai įgyvendinti, atitinka reikalavimus. Bendros galimybės, kurias užtikrina VGTU mažų bandinių gaisrinės saugos laboratorija, gerai įrengta Civilinės inžinerijos laboratorija, moderni PC modeliavimo programinė įranga, platus socialinių partnerių tinklas (labai gerai įrengtas Gaisrinių tyrimų centras ir Ugniagesių gelbėtojų mokykla, entuziastingi šių padalinių vadovai bei darbdaviai), yra unikalios, taip pat ir tarptautiniu mastu. Šis derinys suteiks daug mokymo ir tyrimų galimybių ateityje. Ieškant galimų mokslinių tyrimų partnerių užsienyje, šios unikalios priemonės yra vertingas turtas, kurį būtų galima geriau reklamuoti.

Studijų programa *Saugos inžinerija* yra unikali ir šaliai reikalinga, ji atitinka būtiną tarptautinį standartą. Studentai, absolventai, socialiniai partneriai ir darbdaviai teigiamai vertino šią programą. Vertinimo grupė taip pat teigiamai ją įvertino.

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### III. REKOMENDACIJOS

1. Reikėtų toliau stiprinti pagrindines fundamentaliųjų gaisrinės saugos dalykų žinias. Tam tikslui vertėtų atlikti bakalauro studijų programos *Gaisrinė sauga* pakeitimus siekiant padidinti priimtųjų į aukštąją mokyklą kvalifikacijas, o vėliau taip pat atlikti magistrantūros studijų programos *Saugos inžinerija* pakeitimus.

2. Apsvarstyti studentų grįžtamojo ryšio teikimo semestro eigoje formalizavimo klausimą.

3. Rekomenduojama didinti studentų ir dėstytojų judumą.

4. Apsvarstyti galimybę atlikti daugiau fundamentaliųjų tyrimų gaisrinės saugos srityje ir reklamuoti unikalų bendradarbiavimą su socialiniais partneriais galimiems tarptautiniams partneriams mokslinių tyrimų srityje.

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Paslaugos teikėjas patvirtina, jog yra susipažinęs su Lietuvos Respublikos baudžiamojo kodekso 235 straipsnio, numatančio atsakomybę už melagingą ar žinomai neteisingai atliktą vertimą, reikalavimais.

Vertėjos rekvizitai (vardas, pavardė, parašas)