STUDIJŲ KOKYBĖS VERTINIMO CENTRAS

Vilniaus Gedimino technikos universiteto

STUDIJŲ PROGRAMOS *SKRYDŽIŲ VALDYMAS (valstybinis kodas – 601H41002)*

VERTINIMO IŠVADOS

EVALUATION REPORT

OF *AIR TRAFFIC CONTROL (state code – 601H41002)*

STUDY PROGRAMME

At Vilnius Gediminas Technical University

1. **Prof. Laszlo Koczy (Chair of the Team),** *academic,*
2. **Prof. Giovanni Palmerini,** *academic,*
3. **Prof. Alessandro Aliakbargolkar,** *academic,*
4. **Maj. Andrius Stuknys,** *representative of social partners',*
5. **Mr Algirdas Navickas,** *students' representative.*

Evaluation Coordinator Ms Eglė Grigonytė

Išvados parengtos anglų kalba
Report language – English

Vilnius
2016

DUOMENYS APIE ĮVERTINTĄ PROGRAMĄ

Studijų programos pavadinimas	***Skrydžių valdymas***
Valstybinis kodas	601H41002
Studijų sritis	Technologijos mokslai
Studijų kryptis	Aeronautikos inžinerija
Studijų programos rūšis	Universitetinės studijos
Studijų pakopa	Vientisosios studijos
Studijų forma (trukmė metais)	Nuolatinė (5 metai)
Studijų programos apimtis kreditais	300 ECTS
Suteikiamas laipsnis ir (ar) profesinė kvalifikacija	Aeronautikos inžinerijos magistras
Studijų programos įregistravimo data	Lietuvos Respublikos švietimo ir mokslo ministro 2006 m. lapkričio 16 d. įsakymu Nr. ISAK-2151.

INFORMATION ON EVALUATED STUDY PROGRAMME

Title of the study programme	***Air Traffic Control***
State code	601H41002
Study area	Technological Sciences
Study field	Aerospace Engineering
Type of the study programme	University studies
Study cycle	Integrated
Study mode (length in years)	Full-time studies (5 years)
Volume of the study programme in credits	300 ECTS
Degree and (or) professional qualifications awarded	Master of Aerospace Engineering
Date of registration of the study programme	16th November 2006, under the Order of the Minister of the Ministry for Education and Science of the Republic of Lithuania No. ISAK-2151.

CONTENTS

I. INTRODUCTION

1.1. Background of evaluation process

The evaluation of on-going study programmes is based on the **Methodology for Evaluation of Higher Education Study Programmes,** approved by the Order No 1-01-162 of 20th December 2010 of the Director of the Centre for Quality Assessment in Higher Education (hereafter, SKVC). 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 the Self-evaluation Report prepared by a Higher Education Institution (hereafter, the HEI); 2) a visit of the Review Panel at the higher education institution; 3) preparation of the evaluation report by the Review Panel and its publication; 4) follow-up activities.*

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

The programme is **accredited for 6 years** if all evaluation areas were 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, the following additional documents have been provided by the HEI before, during and/or after the site-visit:

No.	Name of the document
1.	Updated *Aircraft Piloting* curriculum
2.	Updated list of publications; Updated list of teaching staff
3.	List of visiting professors and topics taught

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

The programme evaluated (hereafter, *Air Traffic Control*) is offered by Vilnius Gediminas Technical University (hereafter, VGTU), a Higher Education Institution based in Vilnius which dates back to 1956. It is managed by Antanas Gustaitis' Aviation Institute (hereafter, AGAI), and is an integrated programme, including both 1st and 2nd cycles for a grand total of 5 years. The study subjects to compose this 300 ECTS curriculum are offered by several departments belonging either to AGAI or to other University's divisions, while the core part of the programme is directly provided by AGAI.

The study programme is primarily devoted to prepare excellent candidates for the air traffic controller role, who are required in Lithuania to earn a higher education degree. Aside from the preparation for the air traffic controller licence it is possible to say that the formation of qualified professionals in the air traffic control and air traffic services area is the broad goal of the programme. Due to such focus to really on the specific field, the size of the programme is necessarily limited in the number of enrolled students, who are indeed selected from a larger pool of candidates. This higher education activity largely benefits from the cooperation of several institutional and social partners. It is clearly in the interest of the management body at the AGAI and VGTU at large to maintain a high quality standard for the programme.

1.4.The Review Panel

The Review Panel was composed according to the *Description of the Review Team Member Recruitment*, approved by the Order No 1-01-151, 11/11/2011 of the Director of the Centre for Quality Assessment in Higher Education. The visit to the HEI was conducted by the Panel on *03/05/2016*.

1. **Prof. Laszlo T. Koczy (Chair of the Team)**

Professor at Budapest University of Technology and Economics, Hungary.

2. **Prof. Giovanni Palmerini**

Professor at Sapienza Università di Roma, Italy.

3. **Prof. Alessandro Aliakbargolkar**

Professor at Skolkovo Institute of Science and Technology (Skoltech), Russia.

4. **Maj. Andrius Stuknys**

Commander`s Deputy at Lithuanian Air Force Armament and Equipment Repair Depot, Lithuania.

5. **Mr Algirdas Navickas**

1st year student in Control Technologies (second cycle) study programme at Kaunas University of Technology, Lithuania.

II. PROGRAMME ANALYSIS

2.1. Programme aims and learning outcomes

The programme aims to prepare specialists in air traffic control, able to combine the understanding at a university level of the specific technical domain with the practical know-how that will allow them to effectively serve in the operational roles. This perspective depends on a number of actions carried out along the years by the Government of the Republic of Lithuania, the Civil Aviation Authority, the Minister of Transport and Communications concerning the management and development, including a long term future plan of the aviation sector. AGAI has the Government order to implement the part related to the education of air traffic controller.

Both the study programme aims and the intended learning outcomes for the programme managed by VGTU AGAI are clearly advertised and publicly available, either in Lithuanian or in English languages[1].

The founding perspective and the intended learning outcomes are correctly transferred into the structure of the study programme. The transportation industry – and aviation as its advanced sector – plays a leading role in modern economy. To nurture the development in this field can be easily perceived as a national mandate for every developed country. The requirements for an institution which prepares specialists follow from these considerations. It seems consistent that this preparation should be at the higher education and specifically at the university level. In such way, the programme offered at VGTU AGAI effectively targets the specific needs of the different stakeholders in Lithuania, including the national air navigation services provider and the civil aeronautical entities at large, the Military, as well as the professional/academic specific research area. In detail, based on the discussions with alumni and social partners (potential employers, the Civil Aviation Administration and the Military Authorities) it stands clear that the Lithuanian labour market definitely needs this programme. Specifically this programme is the only source for the Lithuanian Armed Forces as far as it concerns the air traffic controllers. Additionally, the aim of the programme seems also to be understood, well known – and appreciated – from the expected audience, as proofed by the number of candidates for the enrollment and confirmed by already enrolled students. In the opinion of the Review Panel, the programme *Air Traffic Control* offered by VGTU AGAI is unique in Lithuania and in the Baltic area.

---

[1] https://medeine.vgtu.lt/programos/programa.jsp?fak=8&prog=73&sid=F&rus=U&klb=en, (lastly accessed in May 2016).

The programme aims to offer a unique combination of the professional skills in the air traffic control that help achieving professional qualification in a short time, and the competences for leadership and carrying out research that are required from a Master's graduate. This combination allows a flexible career choice, even including a possible change from professional to academy paths and the other way round.

The mastering of the air traffic control domain clearly requires remarkable amount of study and training. Indeed, the programme aims and intended learning outcomes cover almost all the areas of interest from the academic point of view, and the programme includes a significant number of practice hours towards air traffic control. With respect to the list of the intended learning outcomes (as reported in the SER), some not major improvements can be applied:

- MATLAB, considered among the intended learning outcomes as a mathematical skill, is rather a programming language. It is recommended to shift the focus in the definition of the intended learning outcomes to algorithm design and general programming skills.
- "*Aeronautical knowledge of aircraft and their systems*" should be reformulated "*Aeronautical knowledge of aircraft, their systems, and support infrastructure*" to better represent the actual nature of the current aircraft as a complex system.

Moreover, in terms of the aims and the intended learning outcomes the Panel remarks two missing items:

- The capability to understand the current aviation industry scenario.
- Adequate knowledge and understanding of flight safety and security issues, also at the level of the global air traffic system.

Inclusion of these two items will help to improve further the intended learning outcomes, especially for graduates who at later stage are going to pursue a managerial career. This point will be further discussed in the Curriculum design section which does not imply major changes to the aims and the intended learning outcomes of the study programme.

The elements of the definition of the programme, i.e. the name, its type and level, the intended learning outcomes, the qualification offered, the surrounding scenario in terms of the society needs and jobs' offer are certainly consistent, looking overall as a sounding scheme.

2.2. Curriculum design

The curriculum, intended for an integrated (first plus second cycle) study programme, meets the legal requirements enforced by national law, as well as is compatible with the requirements

originating from VGTU internal rules[2]. The total number of credits amounts to 300 ECTS, and these ECTS are correctly distributed among the different subject areas. The distribution takes into account the required number of credits devoted to the practical activities (19 ECTS) and to the thesis (30 ECTS). This is proved by a corrected and updated version of the study plan which was made available at the time of the site visit.

The different study subjects are spread all along the five years span. The design of the curriculum itself appears to be logical, i.e. built in a way that allows each advanced study subject to be built on the foundations. Generally topics taught on the study subjects are not repetitive.

The contents of the different study subjects are well suited for the university level studies. The compatibility to international standard is proofed by an analysis of the syllabus contents for all study subjects, both in basic sciences and in applied engineering.

Teaching methods are quite traditional. A positive remark has to be granted to a group of activities quite specific to the air traffic control (like *Air Traffic Control Practice*) that also help with respect to general abilities like teamwork, capabilities to effectively tackle unforeseen situations and so on.

Overall, the contents of the study subjects are not being too far from adequate to ensure the achievement of the intended learning outcomes. It is especially true in terms of practical activities: training is done by staff with a day-to-day work experience, exploiting equipment which is certainly representative at current technology levels. Overall, the scope of the programme certainly fulfils – and maybe even passes – the first original goal, i.e. a well-crafted preparation of the candidates to obtain the air traffic controller licence. However, a substantial warning should be put with respect to the intended learning outcomes relevant to other possible professional paths. Future highly skilled professionals in the air navigation interested in pursuing research in the academy – maybe towards a PhD – would greatly benefit from the exposure to disciplines which are currently missing in the curriculum. Moreover, the corrections to the curriculum suggested in the following paragraph also would ensure that the ones who want to become actual air traffic controllers would also follow the advanced curriculum. All the graduates, independently on their initial assignment, would enjoy a better understanding of the aeronautical system, with its multidisciplinarity.

[2] Order of the Minister for Education and Science of the Republic of Lithuania "General Requirements of First Degree and Integrated Study Programmes"

The significant suggested additions to the curriculum, carefully considered by the Review Panel are:

- A study subject offering a broad overview of the air transportation industry and its value chain – essential elements of knowledge required to improve air transportation specific management skills of the graduates. The addition should include material about air transportation security (both in flight and at the airport), either as a part of the general subject or as a specific teaching. In fact, security, including airport procedures and security management, is rapidly becoming one of the significant constraints acting on the commercial aviation system.
- A specific training in integrated logistics support, which is needed to clearly understand the concept of aircraft operations in a commercial and military environment.
- A study subject dealing with the branches of applied mathematics, like operational research and optimization, which have a large impact on the air traffic control structure and implementation. Syllabus for this subject should include modern (heuristic) approaches, like genetic algorithms, simulated annealing, behavioural strategies, etc. to target functions' minimax problems. The relevant knowledge is deemed extremely useful to every professional with managing or technical roles in the air traffic control system (like selection and design of the navigation procedures, definition of the traffic flow, identification of the needs in terms of instrumentation). At the same time, this knowledge is mandatory for everybody seriously aiming to do research in the field.
- A stronger focus on the modern Global Navigation Satellite Systems (GNSS). Systems like GPS, Glonass, Galileo and Beidou will be soon the backbone of the aircraft navigation, so duly mastering of their principles and applications (including differential navigation, satellite based augmentation systems (SBAS) and local area augmentation systems, as well as attitude determination techniques) is a basic knowledge for a graduate in air traffic control. These topics are currently taught in two study subjects, namely *Radio Navigation* and *Air Traffic Control Electronic Equipment and Systems*, but the total devoted time is still limited. The increasing relevance of the topic could be addressed either by adding a new study subject or by adding hours to the existing ones.

2.3. Teaching staff

Quantitatively, the listed number of staff, i.e. 37[3] (2 professors, 22 associated professors, 9 lecturers and 4 younger assistants) seems to be adequate. Out of 37 teachers 24 are PhDs. There are 189 ECTS of the study field subjects (Table 3 of the SER, p. 18). Out of those 189 ECTS 125 ECTS are taught by PhD holders. It has been discovered on the site visit that the staff are overloaded with teaching-related activities, with several teachers facing contact hours per year in excess of 800/900. It could be one of the reasons why research activities of the staff are below expectations. Increasing the number of the staff in the study field subjects, improving teaching organisation and better distribution of the workload would help to fix this issue.

The staff providing the study programme meets the legal requirements, including the professors providing 8 out of 34 study field subjects, and contributing to the teaching of 70 ECTS out of the total 300 ECTS of the programme[4]. Lecturers follow the requirements for holding a teaching position, in agreement with the rule expecting them to reach the certain teaching level on a given term. Specialty lecturers, providing highly-skilled training, are certified by Civil Administration Authority. In addition, the staff are actively involved in improvement of their qualification – also at European level – related to teaching ability in the specific subjects. However, also due to the age of professors, there is a danger of legal requirements not being fullfilled in the near future unless the number of PhD holders in the study field will soon increase and several associated professors are promoted to professors.

Considering all the staff members, their qualification is adequate, however staff members directly involved in aviation should definitely do much more research and publish. In fact, looking at information provided in the SER, only 20 publications (all categories, both international and national) in 2014 and 13 in 2013 are claimed, which is quite a limited number with respect to the total number of the staff (37). Research activities need to be carried on in an international context, looking for cooperation and exposure to/in international conferences and leading journals, and should be targeted to acquire and maintain an advanced know-how. Within the bounds of the limited scientific production, the research activity of the staff is related to the topics of the programme, but clearly suffers from exposition in journals and events which are quite far away from the state-of-the-art at international level. Close collaboration with other

[3] Additionally provided information (after the site visit); in the SER the total number of the staff is 43.

[4] Additionally provided information (after the site visit).

faculties is strongly recommended, and such collaboration might include the migration of individual staff members from other faculties to AGAI.

On the other hand, the Panel found that the staff of AGAI are very strongly motivated and dedicated to this particular programme. This fact was also supprted by the unanonimous positive comments provided by the students and the alumni during the site visit.

It has to be considered that part of the staff are represented by non-academic (or partly academic) highly skilled personnel. Such solution adds a remarkable value to the programme as it provides outstanding professional expertise and transfers up-to-date practical know-how to the students (which is quite difficult to obtain with purely academic staff). Also should be mentioned that there is a number of visiting professors on the programme who offered up-to-date lectures on different topics (the list was provided on the site visit). These important additions to the teaching staff should be pursued and continued.

Regarding the turnover issue, already put under scrutiny during the last external evaluation, it was noticed that the situation has improved. Two young assistants joined AGAI, and career perspectives have been outlined for three current staff members. A continuous attention to this aspect in the future is recommended.

The professional development of the teaching staff is an area where the University definitely needs to play a larger role. The Review Panel observed that considerable resources are continuously invested in improving the professional side of the programme, including the development of equipment in facilities. If a larger percentage of these resources would be transferred to academic activities and research a better balance of the two sides of the programme could be assured.

Specific actions should actively chase this issue, at the same time fixing the previously identified issues of internationalization and the limited number of publications. A suitable and convenient solution can be to encourage staff – and especially younger ones – to participate in international conferences. Such participation would easily lead to preparation of scientific papers, to their development by means of peers' criticism, to the exchange of ideas, and to creation of links for the studies and research proposals. VGTU also would gain in terms of visibility ranking based on indexing and chances to be a partner of funded consortia. The educational activities would greatly benefit in terms of know-how and approaches tied with leading worldwide institutions.

2.4. Facilities and learning resources

The teaching and learning equipment are likewise adequate, both in their size and quality. The Review Panel was deeply impressed by the amount and up-to-dateness of available facilities and equipment meeting very high professional standards. Such availability could be considered usual at the air service providers' training centres, but certainly is far better than the standard of universities. Indeed, facilities and equipment are an extremely valuable asset for this programme and are properly exploited by means of a significant amount of study hours devoted to practice.

The air traffic control instrumentation provided for students' training is correctly staffed and maintained in perfect working conditions, as proved during the site visit. Specifically, a control room duplicating the Vilnius airport scenario with large panoramic displays and air traffic control system simulator are available in order to train students in conditions as much realistic as possible. All equipment for practice in ground/onboard communications is available. The capacity granted is more than enough for the typical class size of the *Air Traffic Control* programme. Overall, it can be evaluated that facilities currently available to the students are outstanding and this is one of the reasons why graduates with no difficulties pass the licence exams.

Facilities are located in several places in Vilnius, but it seems to be a minor issue, also due to the peculiar constraints typical to aeronautical studies; it should also be noted that a specific action aimed to a more logical distribution is in process.

Classrooms are provided with a number of personal computers/workstations which is adequate in comparison to the number of students. The Panel during the site visit found that there is availability of useful software related to the disciplines taught on the study subjects.

Teaching materials are adequate (including the number of copies) and accessible to students. Digital databses are available in the library (except of IEEEexplore) and there is a possibility to access specific scientific literature (paid articles) through the library, if necessary. Students benefit from the availability of a significant number and variety of bibliographic resources.

2.5. Study process and students' performance assessment

The admission requirements are well-founded. Admission is carried on a national level basis, depending on the high school results by interested students. The grades obtained in state exams in *Mathematics, Physics, Lithuanian* and *Foreign Language* are taken into account to orderly list

the applicants. In detail, 56 applicants have been enrolled in 4 years period (2012-2015), out of 167 total applicants (with 143 of them having the programme amongst their first-sixth choice, therefore showing their motivation). Along the years, the *Air Traffic Control* programme had indeed an admission interest consistently 2.2 times higher than the admission quotas, ensuring the enrollement of the brightest and the most motivated students. The admission rate could be therefore considered as quite restricted with respect to the volume of demand. On the other hand, the limited number of enrolled students reflects the perspective figures of the labour market and allows for a very good programme-specific student/staff ratio, ranging between 1.14 and 1.37 in the 4-years period. However, it is clear that larger intake of foreign students (even from the Baltic region) would involve some changes, including the quality of studies.

The organisation of the study process ensures the adequate provision of the programme and the achievement of the intended learning outcomes. An area of improvement as was discussed in the section 2.2 of the report, is to consider a revision of the curricular offer in order to modernize the programme and to face the needs and complexities of the current air transportation system. Resulting formation would be more up-to-date, therefore closer to the programme aims and more appealing to the enrolled students.

The organization of the study process duly takes into account students' needs. Assistance to students, both in terms of counselling regarding the curriculum and assistance in learning is available, as was proved by students during the site visit.

Only a limited number of students is involved in research activities and they must be much more encoruraged to do that which is considered instrumental to obtain a sound Master's degree. Inevitably the real availability of such opportunities depends on the research that teachers are engaged in. The improvement in this area (section 2.3 of the report) would also affect the quality of students' theses, which in some cases seem to be closer to Bachelor's degree.

While students are encouraged by the University to participate in mobility programmes, yet the mobility of students seems to be quite low. Participation of students range from 2 to 12 depending on the year, and their number can be considered in average close to one half of the total of their class. Involvement in programmes, such as ERASMUS is extremely important for students, and it is even more relevant if not mandatory for the ones studying the disciplines like air traffic control. In fact, the overall world of aeronautics is deeply "international". Even more, the air traffic control process is nowadays intrinsically built on transnational operations, where every country is unable to act without sharing the procedures with neighbours. Therefore, a

personal knowledge of the expertise and even regulations of other European countries is a must, and should be gained since the studies. This is the main reason why international aspect should be important for all students enrolled in the *Air Traffic Control* programme. While the Review Panel acknowledges that the extension of the mobility option to junior students has been a good move, the management of the programme is encouraged to continue to stress it. New connections with international top level universities also should be targeted.

Academic and social support to students is adequate. According to students remarks on the site visit, teachers are ready to help and assist them in the learning process. The website of the programme contains sufficient information to students, who also are provided with personal e-mail addresses and access to educational systems. Scholarship opportunities are available to students.

As far as the Review Panel could experience, the assessment system of the students is correct and adequate. However, the assessment of academic performance might become stricter when an increased involvement of the students in research activities will enhance the thesis level, corresponding to international expectations for the Master‘s degree.

The management of VGTU AGAI provides support to students to find jobs. The professional activities of the graduates meet programme providers’ expectations, with a large majority of them ending up working in the field which happens to be air traffic control or quite close one. This evidence has been strongly confirmed by the alumni who participated in the meeting with the Review Panel.

2.6. Programme management

Implementation of *Air Traffic Control* study programme is surpevised by a Study Programme Committee, including the Director and a Vice-Director of AGAI, the Head of Aviation Technologies Department, the Director of the Air Traffic Control Training Unit and a representative of the students. The Study Programme Committee is responsible for the proposition of the new study subjects and the revision or the closure of the existing ones. The Study Programme Committee monitors the quality of the studies and collects the feedback from all interested parties (students, graduates, social partners and employers). From the analysis of the provided documentation, it appears that responsibilities for decisions and monitoring of the implementation of the programme are clearly allocated. As highlighted during the discussion with alumni, social partners and employers, they are regularly contacted to provide their views

and expectations on the programme. Also from the site visit, it can be confirmed that the opinions of the students are taken into the consideration, even with respect to the suggestions about teachers‘ assignment.

As part of the programme management, the Panel has to mention a couple of weak points in the SER, such as contradictory and imprecise data in terms of number of ECTS per semester, a large number of missing CVs, missing updates of publications, limited clarity and order while presenting teaching staff data in paragraphs 4.2, 4.3 and Annex 2 of the SER. Following the request of the Panel, an updated set of CVs and lists of publications was made available on the and after the site visit. However, such a lack of updated information about the staff raises questions and concerns on how the implementation of the programme is continuously monitored.

The suggestions and remarks form the previous Review Panel have not been fully implented as well: in fact, the issue about staff involvement in research (still present) was already strongly stressed.

Generally, internal quality assurance measures are just partially efficient, rather good in the professional part of the programme, but need improvement in the academic part, including the revision of the curriculum design and involvement of a continuous encouragement and monitoring of the research activities of the staff on the Master‘s level study programme.

III. RECOMMENDATIONS

1. To increase qualification of the teaching staff; to foster research activity, publication productivity in high scientific level peer-reviewed journals and conferences, and international mobility with leading universities in the area; to increase the scientific collaboration with other Faculties of the University. The first step, as an example, could be to encourage younger staff members to participate in international conferences where they could present their scientific work, compare it with their fellows from other universities, gain from / contribute to new cooperation links.
2. Introduce a study subject on applied mathematics with contents relevant to air traffic control operational research, optimization, behavioural algorithms, also to promote the interest for novel developments, research and innovation. Also develop new study subjects providing an overview of the air transportation industry, of the safety and security issues (including procedures on flight and at the airport) and a basic knowledge of logistics. Increase and improve the contents of study subjects regarding satellite-based navigation (GNSS).
3. Maintain and increase students' mobility – through Erasmus initiative or bilateral agreements with foreign universities – to have almost all of them following some subjects in different study programmes abroad. The goal is to improve students' awareness of the European scenario of air traffic control.
4. Monitor in an effective way the academic activities of the staff in order to encourage and ensure the quality of Master's level studies.

IV. EXAMPLES OF EXCELLENCE

The facilities available for students' training are really outstanding in a University environment, set a standard for similar academic programmes, and can be only compared to the formation centres of the air navigation national authorities (which, of course, are not higher education institutions).

The relation with social partners is very good, as evidenced by the feedback from alumni and social partners during the site visit. There is a perfect match between the size and the structure of the *Air Traffic Control* programme and the needs and expectations of the Lithuanian authorities (both Civil and Military) and economic entities.

The Review Panel also would like to highlight very high academic staff motivation and dedication to the programme.

V. SUMMARY

The Review Panel found that the programme in *Air Traffic Control* offered by VGTU AGAI is evolving in a positive manner as far as it refers to its quality.

The programme has an important role in educating highly skilled professionals, and provides an effective answer to the needs of social partners, including Lithuanian Civil and Military Administration.

The training facilities available to the programme are outstanding. They ensure an up-to-date professional formation of the enrolled students. In fact, graduates easily find jobs in the air traffic control domain or in related fields.

To maintain and improve this standard – especially in the area of the research capabilities and skills associated with a Master's degree, a number of actions are urgently needed.

A revision of the curriculum is mandatory. The introduction of some missing elements (logistics, flight safety and security procedures at the airports, overview of the air transportation system) is required. The most important addition – also in a view of supporting research – is a new study subject in applied mathematics, focussed on the optimization and mathematical programming techniques which are important to air traffic control. An effort to stress in the syllabus the contents related to satellite-based navigation (GNSS) is also strongly suggested.

An action to encourage and improve the research activity carried on by the teaching staff is mandatory too. Capability to carry on research is a basic part of a Master's graduate skills, and can be taught only by staff deeply involved in advanced research. The ways to achieve such an objective can be different, including increased cooperation with other Faculties at VGTU and with foreign leading universities, participation in conferences, attention to research closer to the far larger attention currently devoted to lecturing. The final goal is to significantly improve the number and quality of international publications, which is currently too low. As far as it concerns staff qualification and inclination to research, some limited actions have been implemented since the last external evaluation, but this aspect needs to be quickly improved in order to maintain a qualified Master's programme.

Wider opening to international scenario is also important for students, who have to gain it through mobility. The programme already showed to pay attention to this aspect, which has to be additionally stressed by means of ERASMUS initiative and/or bilateral agreements.

VI. GENERAL ASSESSMENT

The study programme *Air Traffic Control* (state code – 601H41002) at Vilnius Gediminas Technical University is given a 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	2
3.	Teaching staff	2
4.	Facilities and learning resources	4
5.	Study process and students' performance assessment	3
6.	Programme management	2
	Total:	**16**

*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. Laszlo Koczy
Grupės nariai: Team members:	Prof. Giovanni Palmerini
	Prof. Alessandro Aliakbargolkar
	Maj. Andrius Stuknys
	Mr Algirdas Navickas

VILNIAUS GEDIMINO TECHNIKOS UNIVERSITETO VIENTISŲJŲ STUDIJŲ PROGRAMOS *SKRYDŽIŲ VALDYMAS* (VALSTYBINIS KODAS – 601H41002) 2016-07-14 EKSPERTINIO VERTINIMO IŠVADŲ NR. SV4-171 IŠRAŠAS

<...>

VI. APIBENDRINAMASIS ĮVERTINIMAS

Vilniaus Gedimino technikos universiteto studijų programa *Skrydžių valdymas* (valstybinis kodas – 601H41002) vertinama **teigiamai**.

Eil. Nr.	Vertinimo sritis	Srities įvertinimas, balais*
1.	Programos tikslai ir numatomi studijų rezultatai	3
2.	Programos sandara	2
3.	Personalas	2
4.	Materialieji ištekliai	4
5.	Studijų eiga ir jos vertinimas	3
6.	Programos vadyba	2
	Iš viso:	**16**

* 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)

<...>

V. SANTRAUKA

Ekspertų grupės manymu, studijų programa *Skrydžių valdymas*, kurią vykdo VGTU AGAI, yra tobulinama reikiama linkme.

Programa yra svarbi ugdant aukštos kvalifikacijos specialistus, taip pat ji atitinka socialinių partnerių, įskaitant Lietuvos civilinės ir karinės administracijos, poreikius.

Materialioji bazė, skirta programos vykdymui, yra puiki ir užtikrina įstojusiųjų mokytis tinkamą profesinį parengimą. Iš tiesų, absolventai nesunkiai randa darbą skrydžių valdymo arba susijusiose srityse.

Norint išlaikyti ir toliau tobulinti aukštus skrydžių valdytojų rengimo standartus, ypač įgūdžius, susijusius su moksliniais tyrimais ir antrąja studijų pakopa apskritai, reikia skubiai imtis tam tikrų veiksmų.

Būtina peržiūrėti studijų programos sandarą. Reikia įtraukti kai kuriuos trūkstamus studijų dalykus (logistikos, skrydžių saugos ir saugumo procedūrų oro uostuose, oro transporto sistemos apžvalgas). Svarbiausias pokytis, įskaitant ir paramą mokslo tiriamajai veiklai, naujo taikomosios matematikos studijų dalyko įtraukimas, kuriame daugiausia dėmesio būtų skiriama optimizavimui ir matematinio programavimo metodams. Taip pat siūloma programoje akcentuoti temas, susijusias su palydovų navigacijos sistema (GNSS).

Būtina skatinti dėstytojų mokslo tiriamosios veiklos vykdymą. Gebėjimas vykdyti mokslinius tyrimus – pagrindinė magistro studijų įgūdžių dalis, kuri gali būti užtikrinama tik aktyviai pažangius mokslinius tyrimus atliekančių dėstytojų. Būdai šiam tikslui pasiekti gali būti įvairūs, įskaitant aktyvesnį bendradarbiavimą su kitais VGTU fakultetais ir pirmaujančiais užsienio universitetais, taip pat dalyvavimą konferencijose bei mažesnį dėmesį dėstymui. Galutinis programos vykdytojų tikslas turėtų būti pagerinti tarptautinių publikacijų skaičių ir kokybę, kurie šiuo metu yra per menki. Kalbant apie dėstytojų kvalifikaciją ir įsitraukimą į mokslo tiriamąją veiklą, keletas ankstesnio išorinio vertinimo rekomendacijų buvo pradėta įgyvendinti, tačiau šią sritį būtina tobulinti, siekiant vykdyti aukšto lygio magistro studijas.

Didesnis dėmesys tarptautiniam kontekstui yra svarbus šios studijų programos studentams. Tam tikru mastu programos vykdytojai į šį aspektą atsižvelgė, vis dėlto jį būtina dar labiau plėtoti pasinaudojant Erasmus iniciatyva ir (arba) dvišaliais susitarimais.

<…>

IV. IŠSKIRTINĖS KOKYBĖS PAVYZDŽIAI

Universiteto materialioji bazė, skirta studentų mokymui, yra išskirtinė ir gali būti pavyzdys panašioms studijų programoms. Ji gali būti lyginama tik su oro navigacijos nacionalinių institucijų centrais (kurie, žinoma, nėra aukštojo mokslo institucijos).

Ryšiai su socialiniais partneriais yra labai geri. Tai įrodo absolventų ir socialinių partnerių grįžtamasis ryšys vizito į universitetą metu. Studijų programos *Skrydžių valdymas* sandara atitinka Lietuvos valdžios institucijų (civilinių ir karinių), taip pat ūkio subjektų poreikius ir lūkesčius.

Ekspertų grupė taip pat norėtų pabrėžti akademinio personalo motyvaciją ir atsidavimą studijų programai.

<…>

III. REKOMENDACIJOS

1. Kelti dėstytojų kvalifikaciją, skatinti mokslo tiriamąją veiklą, publikacijų skelbimą gerai vertinamuose recenzuojamuose moksliniuose žurnaluose ir konferencijose, tarptautinį judumą su šioje srityje pirmaujančiais universitetais; didinti mokslinį bendradarbiavimą su kitais universiteto fakultetais. Pirmasis žingsnis, pavyzdžiui, galėtų būti toks – skatinti jaunesniuosius dėstytojus dalyvauti tarptautinėse konferencijose, kur jie galėtų pristatyti savo mokslinius darbus ir palyginti juos su kolegų iš kitų universitetų darbais, taip pat gauti naudos užmezgus naujus bendradarbiavimo ryšius.
2. Įtraukti taikomosios matematikos studijų dalyką, kurio turinys būtų aktualus skrydžių valdymo moksliniams tyrimams, optimizavimui, elgsenos algoritmams, taip pat skatintų domėtis naujausiais moksliniais tyrimais ir inovacijomis. Kurti naujus studijų dalykus, kuriuose būtų apžvelgiama oro transporto pramonė, saugos ir saugumo klausimai (įskaitant procedūras skrydžio metu ir oro uoste) bei suteikiama bazinių logistikos žinių. Plėsti ir tobulinti studijų dalykų, susijusių su palydovų navigacine sistema (GNSS), turinį.
3. Išlaikyti ir didinti studentų judumą per Erasmus iniciatyvą arba dvišalius susitarimus su užsienio universitetais, kad beveik visi studentai susipažintų su tam tikrais studijų dalykais skirtingose studijų programose užsienyje. Tikslas – didinti studentų žinias apie skrydžių valdymą Europoje.
4. Veiksmingai stebėti dėstytojų akademinę veiklą, siekiant skatinti ir užtikrinti magistro studijų kokybę.