



STUDIJŲ KOKYBĖS VERTINIMO CENTRAS

Vilniaus Gedimino technikos universiteto  
***INFORMACINIŲ TECHNOLOGIJŲ STUDIJŲ***  
**PROGRAMOS (621E14004)**  
**VERTINIMO IŠVADOS**

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**EVALUATION REPORT**  
***OF INFORMATION TECHNOLOGIES***  
**(621E14004)**  
**STUDY PROGRAMME**

at Vilnius Gediminas Technical university

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## DUOMENYS APIE ĮVERTINTĄ PROGRAMĄ

Studijų programos pavadinimas	<i>Informacinės technologijos</i>
Valstybiniai kodai	621E14004
Studijų sritis	Technologijos mokslai
Studijų kryptis	Informatikos inžinerija
Studijų programos rūšis	Universitetinės studijos
Studijų pakopa	Antroji
Studijų forma (trukmė metais)	Nuolatinė (2)
Studijų programos apimtis kreditais	120
Suteikiamas laipsnis ir (ar) profesinė kvalifikacija	Informatikos inžinerijos magistras
Studijų programos įregistravimo data	1997-05-19 Nr. 565

## INFORMATION ON EVALUATED STUDY PROGRAMME

Title of the study programme	<i>Information technologies</i>
State code	621E14004
Study area	Technical Sciences
Study field	Informatics engineering
Kind of the study programme	University Studies
Study Cycle	Second
Study mode (length in years)	Full-time (2)
Volume of the study programme in credits	120
Degree and (or) professional qualifications awarded	Master of Informatics engineering
Date of registration of the study programme	1997-05-19 Nr. 565

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The Centre for Quality Assessment in Higher Education

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## I. INTRODUCTION

Vilnius Gediminas Technical University (VGTU) has been founded in 1956. The University has nine faculties: Faculty of Environmental Engineering, Faculty of Architecture, Faculty of Electronics, Faculty of Mechanics, Faculty of Transport Engineering, Faculty of Fundamental Sciences, Faculty of Civil Engineering, Faculty of Business Management, and Faculty of Creative Industries. Faculties consist of departments. The structure of the University is approved by the University Senate.

Senate is the highest governmental authority of VGTU. The academic activities are managed by the rector who is responsible for the performance of the University. Key issues can also be addressed in the University Council.

Faculties, and the institutes and centres operating with the faculty rights, are responsible for the organization of studies. A faculty is managed by the dean. Departments have autonomy in solving the academic and scientific tasks set by the faculty and the University. Departments are led by their heads.

The study programme *Information Technologies* has been registered in May 1997. The programme belongs to the second (Master) level of university studies, and results in the degree Master of Informatics Engineering. The programme is organised and implemented by the Faculty of Fundamental Sciences which has ten departments: Chemistry and Bioengineering, Physics, Information Systems, Information Technologies, Engineering Graphics, Graphical Systems, Mathematical Modelling, Mathematical Statistics, Strength of Materials, and Engineering Mechanics. In addition, the Faculty has six science units: Information Systems Research Laboratory, Laboratory for Computer Technology Training, Research Laboratory of Nuclear Hydrophysics, Research Laboratory of Bioinformatics, Research Laboratory of Materials Physics, and Research Laboratory of Security of Information Technologies.

The study programme is evaluated according to the *Methodology for Evaluation of Higher Education Study Programmes*, as approved by Order No 1-01-162 of 20 December 2010 of the Director of the Lithuanian Centre for Quality Assessment in Higher Education. This evaluation report has been produced by an international expert team invited by the Centre for Quality Assessment in Higher Education. The report is based on analysis of the self-assessment material submitted by VGTU and on observations on a site visit conducted by the team.

The site visit to Vilnius Gediminas Technical University took place on 28 February, 2013. During the visit the expert team met and interviewed the administrative staff of VGTU, the group responsible for the self-assessment report, teachers and students of the Information Technologies study programme, as well as graduates, employers and social partners of the programme. The team also observed the central support services of the programme (such as classrooms, library and computer laboratories) and studied the students' final works and examination material.

At the end of the site visit the expert team presented its preliminary findings and general remarks to the staff responsible for the study programme.

After the visit the expert team discussed its findings and produced this joint evaluation report.

## II. PROGRAMME ANALYSIS

### *1. Programme aims and learning outcomes*

The study programme *Information Technologies* has been registered in 1997. The previous external evaluation of the programme took place in 2003 and a re-evaluation in 2005. Since then, the programme has been improved based on the findings in the evaluations.

The aims, objectives and learning outcomes of the programme of studies of Information Technologies are well defined, clear and published in the information system of Vilnius Gediminas Technical University. The information is easily accessible from the web.

The general objective of the study programme Information Technologies is to educate professionals with the ability to perform analysis, design and maintenance of user-oriented multimedia information systems as well as anticipate their new evolution directions in constantly changing environments. The programme consists of three major specializations with the following additional objectives:

- *Multimedia Information Systems*: provide knowledge and practical experience to deal with modern multimedia information processing technologies. Multimedia Information Systems has replaced the earlier majoring area of *Spatial Information Systems*.
- *Data Mining Technologies*: train the professionals of Information Technologies so they can understand the technical, technological, social, legal and managerial aspects of the development and application of information technologies, are skilful in the business artificial intelligence techniques and their application in developing and managing the informational systems, and are able to evaluate the impact of data, information and knowledge for solving a specific business or societal problem.
- *Engineering and Computer Graphics*: train the professionals in information technologies so they are able to analyze and adapt the data in computer technologies, and apply and use computer modelling and design methods.

According to the list of final works (Master's theses) over the years 2011-2012, 22 students have graduated in Multimedia Information Systems (Spatial Information Systems), 38 students in Data Mining Technologies, and 18 students in Engineering and Computer Graphics. Their average marks in these two years are, accordingly, 9.41 / 7.9, 8.95 / 9.35, and 8.11 / 8.66. So, Data Mining Technologies is the most popular specialization of Information Technologies among the students. This is also shown by Table 2.4 in the self-assessment report.

The programme is implemented by the Faculty of Fundamental Sciences. The specialization Multimedia Information Systems is mainly provided by the *Department of Graphical Systems*, the specialization Data Mining Technologies mainly by the *Department of Information Technologies*, and the specialization Engineering and Computer Graphics mainly by the *Department of Engineering Graphics*.

Except for one general mandatory subject provided by the Department of Mathematical Modelling, the other departments of the Faculty do not participate in the Information Technologies study programme. When improving the contents and quality of the programme, it could be considered to better utilize the study programmes and subjects provided by the other departments, especially the departments of Information Systems and Mathematical Statistics.

According to the self-assessment report, the Lithuanian labour market has an increasing need for professionals in informatics engineering and the country has an intention of becoming a leader in

the knowledge-based industry sector. Hence, the programme aims and learning outcomes are based on the professional needs of the labour market and the society. The graduates of the Information Technologies study programme establish themselves in the labour market very successfully, and are employed immediately and most often to the profession. On the other hand, good employment of the students seems to involve problems as well since the main reason for drop out is starting to work during the studies without completing the Master's degree.

In addition to Information Technologies, VGTU offers five other study programmes in the area of Informatics Engineering: *Safety of Information and Information Technologies* (state code 621E14007), *Engineering of Information Systems Programmes* (621E15002), *Distance Learning Information Technologies* (621E14005), *Activity Process Management Technologies* (621E14006), and *Information Electronic Systems* (621E15003). It seems that to some extent these programmes are overlapping in content.

In general, the aims and learning outcomes of the programme are consistent with the type, level and qualifications of the studies. The name of the programme, as well as its learning outcomes, content and qualifications are compatible with each other. There are, however, some concerns about the specializations of the programme (see Section 2 below) and other minor issues mentioned above.

## **2. Curriculum design**

The programme of Information Technologies is designed according to the general requirements for Master degree study programmes (approved by order No V-826 of the Minister for Education and Science of the Republic of Lithuania on 3 June 2010), the regulations of studies of Vilnius Gediminas Technical University (approved by resolution No 22-2 of Vilnius Gediminas Technical University Senate on 25 June 2003), the schedule of requirements for Master degree programmes of Vilnius Gediminas Technical University and the procedures for their drafting (approved by order No 193 of the Rector of Vilnius Gediminas Technical University on 7 March 2011), and the order "On the approval of description of the studies levels" by the Minister for Education and Science of the Republic of Lithuania (No V-2212 of 21 November 2011).

The programme consists of three specializations, Multimedia Information Systems, Data Mining Technologies, and Engineering and Computer Graphics. The curricula for Multimedia Information Systems and Data Mining Technologies have the same basic structure:

- 63 ECTS credits (1680 hours) of study course subjects ("core subjects"), of which 54 credits are for mandatory and 9 credits for optional subjects
- 39 credits (1040 hours) of final work (thesis)
- 18 credits (480 hours) of other ("elective") subjects, of which 6 credits are for university-defined general mandatory subjects, 6 credits for branch subjects and 6 credits for free-choice subjects
- in total: 120 credits (3200 hours)

The curriculum for Engineering and Computer Graphics has a slightly different structure:

- 65 credits (1733 hours) of study course subjects ("core subjects"), of which 56 credits are for mandatory and 9 credits for optional subjects
- 39 credits (1040 hours) of final work (thesis)

- 16 credits (427 hours) of other (“elective”) subjects, of which 6 credits are for university-defined general mandatory subjects, 6 credits for branch subjects and 4 credits for free-choice subjects
- in total: 120 credits (3200 hours)

The duration of studies is four semesters (two years). The extent of all study semesters is 30 credits. The studies are completed by preparation and defence of the final thesis. All four semesters are of equal length, 20 weeks. In semesters 1 to 3, the period of lectures is 15 weeks and 1 week is assigned for individual work. The semesters end with a 4-week examination period. Semesters 1 to 3 include a week of independent work. The 4<sup>th</sup> semester is dedicated for the preparation and defence of the final work. The total number of compulsory subjects and course papers during each semester does not exceed the allowable number of 5 subject modules. Hence, the study subjects are spread evenly over the schedule of studies.

The curricula design meets the legal requirements set by the Lithuanian and University authorities.

According to the general objectives of the programme, its main application area is “user-oriented multimedia information systems”. However, user-oriented themes are not properly included in the curricula, so they should be extended with subjects in user interfaces, usability, and user experience.

The three specializations of the programme are integrated using two common mandatory subjects, *Spatial Databases* and *Object Oriented Design*, and three common optional “core” subjects, *Graphics Programming Technologies*, *Graphics Management*, and *Network Application Development*. The common subjects are a good strategy for establishing a general foundation for the different specializations and strengthen co-operation between the departments. On the other hand, the programme should provide an opportunity to learn a larger number of modern programming languages as optional subjects, especially for those students who come from other universities.

The curriculum of the Multimedia Information Systems specialization covers subjects in image processing and pattern recognition, but also in project management and neural networks (under the subject “Decision Support Strategies”). The specialization is reasonably coherent and up to date, taking into account the fast technical development in the area.

The curriculum of Data Mining Technologies contains subjects in data mining, business intelligence and business processes, but also in mobile communications, information society policies and management of IT services. As such, the specialization is just a collection of different subjects with no real coherence. In the international scientific community, the standard meaning of “data mining” is an intersection of statistics, database systems, artificial intelligence, and machine learning, with no place for topics such as society policies or service management. The specialization has to be substantially revised to better correspond to the actual core of data mining and its technologies.

The curriculum of Engineering and Computer Graphics contains subjects in graphics and computer-aided design, but also in project management, document management, and UML (under the subject “Computer-Aided Design Technology”). The specialization is reasonably coherent and contains the main subjects one would expect to see in such a curriculum.

The main bibliography of the study subjects contains reasonably up-to-date text books in English, except for a few subjects in the Engineering and Computer Graphics specialization. In

general, the study materials are appropriate for the achievement of the specified learning outcomes of the programme.

Different pedagogical methods are used in teaching, such as verbal presentations, demonstrations, discussions, group and team work, case studies, tests, and project papers. In particular, in some subjects an innovative form of studying as a role game has been used. This form of student-centred teaching might be used even more extensively. Clearly, the teaching and study methods are appropriate for the achievement of the intended learning outcomes.

According to the legal requirements, the final thesis must be based on independent scientific or applied research and application of knowledge, or it must be developed as a project that demonstrates the skills corresponding to the objectives of the programme. In the final work (project), the student must demonstrate knowledge and understanding of a selected topic, as well as ability to analyze it, evaluate the works of others in the selected field, perform the research in the selected field independently, describe the research work, and formulate the findings in a clear and reasonable manner.

The topics of Master's theses are contemporary and match well the profile of the different specializations in Information Technologies. It is possible to make the thesis on a topic suggested by a social partner (e.g., a company) of the programme. The representative theses provided for the team to be explored were of good quality; the selection, however, was quite small (7).

In general, the scope of the programme is sufficient to ensure the learning outcomes, and the content of the programme – with the exception of the specialization Data Mining Technologies – is consistent with the type and level of the studies, and reflects the latest achievements in science and technologies to good and sufficient degree.

### *3. Staff*

The programme of Information Technologies is implemented by the academic personnel of the Departments of Graphical Systems, Information Technologies, Engineering Graphics, and (to a small extent) Mathematical Modelling. The teaching staff of the programme for the academic year 2011/2012 consisted of 6 professors and 16 associate professors. The volume of the teaching staff is adequate to ensure the learning outcomes.

All the lecturers have a Doctor's degree, and almost all of them have scientific publications within the last five years. The lecturers are quite experienced, most of them having pedagogical experience of far more than 10 years. A number of lecturers have also participated in research and development projects directly related to the study programme. Hence, the qualifications of the teaching staff are sufficient for implementing the programme on the required level and meet the legal state and University requirements. The University has created necessary and sufficient conditions for professional development of the teaching staff.

The staffing profile raises one alarming concern: the number of full professors has been going down, from 9 in 2006/2007 to 6 in 2011/2012. Moreover, three of the professors are over 60 years of age. The Faculty should take actions to guarantee the scientific quality of the programme by keeping the number of professors at the current level. As for current situation this is not a problem, but considering the decreasing trend this problem should be taken into account in the future.

The lecturers of Information Technologies participate quite actively in Socrates and Erasmus exchange programmes. In 2007-2012, 16 visits altogether have been made to United Kingdom,



Finland, Austria, Germany, Portugal, Spain, and Greece. On the other hand, there has been just one incoming lecturer from abroad, in 2007 from Portugal. The study environment should be made more international and innovative by inviting international visiting professors as guest lecturers. This would also widen the scope of the programme with new optional subjects.

According to the Lithuanian laws and University regulations, the lecturers are regularly certified and competing for the lecturer positions. All the lecturers of the Information Technologies programme have been certified within the last five years. By this, turnover of the teaching staff is guaranteed for ensuring an adequate provision of the programme.

#### ***4. Facilities and learning resources***

The studies in Information Technologies take place on the premises of the Faculty of Fundamental Sciences. The Faculty has provided a sufficient number of classrooms, laboratories and other facilities for the programme. Classrooms are equipped with stationary multimedia equipment.

Laboratory work of the programme takes place in specialized laboratories, which have from 15 to 20 workplaces. Laboratory work is supervised by the staff of the training laboratory of computer engineering, and by the staff of the computer labs of the University Computer Centre.

All laboratories utilized in the programme are well equipped with modern computers, the total number being 250. All computers of the Faculty of Fundamental Sciences are connected to the computer network of the University and to the internet. All computers are equipped with Windows 7 operating system, MS Office tools and, depending on the laboratory profile, with Fedora Linux operating system and specialized software. For teaching multimedia and computer-aided design, there is a special laboratory with 25 Apple iMac computers and the needed software packages. The students can connect their personal laptops to the University network, as well as to the infrastructure of the library using a virtual private network (VPN).

As summary, the premises as well as the teaching and learning equipment (classrooms, laboratories, computers, software) are adequate both in size and quality for the implementation of the programme. Also, the programme has adequate arrangements for students' practice.

Students of the Information Technologies study programme can use the services of the University library, and the reading room of the Faculty. Working conditions in the library and in the reading rooms are good. The library has an adequate number of computer workstations, enabling students to quickly and easily find and order study books and other publications. The Faculty has a free wireless internet access, so students can share information using not only the computers in the laboratories, but also their personal laptops.

Students have access to more than 20 international scientific publication databases (ScienceDirect, Ztralblatt MATH, CambridgeJournals, EndNote WEB, Project Euclid, RefWorks etc.). Students can also access the reference data bank of the Lithuanian National M. Mažvydas Library, the Lithuanian online bibliographic database of periodical articles.

However, the central digital sources of scientific publications in Informatics (Computer Science), the ACM Digital Library and IEEE Xplore (the IEEE digital library) are no more available in the University library. The University should take immediate actions for obtaining the rights to these libraries, which is essential not only for scientific research in Informatics but also for the Master's theses in the area.

Lecturers of the Faculty can upload their teaching material (lecture slides, methodical materials, laboratory work descriptions) in Faculty's intranet and on the website e-stud.vgtu.lt. Students can read complete electronic materials prepared by the lecturers and published by the Technika University Publishing House on its website. There are also a number of distance courses available to the students in the Lotus LearningSpace remote course delivery system, in Moodle, and in a video archive.

As summary, the teaching materials and the associated technical equipment (text books, periodical publications, study material, distance learning tools) are adequate for the implementation of the programme, and accessible to the students of Information Technologies.

### ***5. Study process and student assessment***

There are no entrance examinations to the Master degree study programme of Information Technologies. Bachelor students who have graduated in a relevant area of studies or in a similar university, and have an established basic knowledge, are accepted for enrolment. The admission requirements are based on the general principles of the University, so they are well-founded.

According to the data on student admission, there have been 56 or 57 students annually enrolled to Information Technologies during the years 2009 to 2012, about the same number as there have been first-request applicants. Since the total number of applicants has varied from 305 to 438 in these years, the programme seems quite competitive and selective; on the average only 16 % of applicants have been accepted to the programme in 2009-2012, and the average entrance score has varied from 10.15 to 10.52. On the other hand, the total number of applicants has been slightly declining in recent years.

On the average, 59 % of the students enrolled to Information Technologies in 2006-2010 have graduated within the nominal Master study time of two years. So, the drop-out ratio is about 40 %. The main reasons for drop out and termination of studies are high demand of IT specialists in the labour market, insufficient motivation, and personal and financial problems. Since most graduates from the study programme have a job related to information technology, their professional activities meet the expectations and learning outcomes of the programme.

The general students' knowledge assessment process follows the publicly available order by the University Senate. Assessment criteria of the Information Technologies study programme are published at the beginning of each course of study, and they are known to and available for students. Examination results are published in the University's information system Medeinė no later than on the third business day after the examination. The students can check their examination sheets, the lecturer's remarks and the grading at a specified time in a specified location. Students have the possibility of discussing their evaluations with the lecturers. The assessment system of students' performance is clear, adequate and publicly available.

A student who disagrees with the examination assessment may submit an appeal to the department head within 10 days from the date of examination. The head of the department forms the appeal panel of three lecturers of the department. Before making the decision, the panel may interview the student and the examiner. The procedure of appeals is regulated by the order of the Rector of the University.

General information about the studies at VGTU is available on its web site. Every year in September and October, meetings are organised for the students of Information Technologies with the heads of departments, the dean's staff, and administration. During the meetings, students can ask about their concerns in relation to tuition programmes, modules and performance of

studies. Personal counselling is provided to the students by the lecturers, e.g, on weekly consulting hours.

Every year in April, VGTU organizes career days with the aim to encourage Lithuanian and foreign companies to meet the students and introduce career opportunities to them. Scientific activities are organized for the students in the “Informatika” and “Computer Graphics and Design” conferences of Lithuanian young scientists, organised by the Faculty of Fundamental Sciences.

For supporting mobility, the Faculty of Fundamental Sciences has signed exchange agreements for students and lecturers under the Erasmus programme with 33 European universities and 7 universities in Turkey. According to the self-assessment report, “the number of students who are willing to travel is high, there are always contests to the most attractive places”. This is simply not true: most of the students are not willing to study abroad in Erasmus exchange, due to issues related to language, job, and personal life. Thus, especially in recent years the number of students in Information Technologies who have been in Erasmus exchange is very small: no students at all in 2010 and 2012, and only two students in 2011. Students should be encouraged to take advantage of their possibilities to international exchange.

The nominal length of the Information Technologies programme is 3200 hours of studying. The amount of contact training (lectures, laboratory work, exercises, counselling) varies between 689 to 764 hours (about 22 to 24 %) depending on the specialization of the programme. Thus, about 76 to 78 % of studies are independent work of students. This meets the general requirements for Master degree study programmes, order no V-826 by the Minister for Education and Science of the Republic of Lithuania, which states that a student’s self-studies shall account for at least 30 % of the scope of each subject.

In general, the organisation of the study process ensures adequate provisioning of the programme and possibility for the students to achieve the learning outcomes. The students also get an adequate level of academic and social support from the University. However, international mobility should be increased.

## ***6. Programme management***

The rules and responsibilities of study programme management are stated in the general statutes and regulations of the University. The main internal decision-making bodies at the University level are the Senate and the rector’s office, and at the faculty level the dean’s office and the Faculty Council. Issues of studies at the Faculty are addressed by the studies committee. The studies committee regularly assesses the subject modules of study programmes and certifies them for a limited period of one to four years. In addition, the Information Technologies programme has its own study committee. The committee assesses, together with the departments implementing the programme, the scope, content, tasks and schedule of the study modules. However, team of experts found, that responsibilities of those responsible for study programme quality are not clearly allocated.

In 2008, the Faculty of Fundamental Sciences took into use a studies quality management system based on the analysis of performance indicators, feedback and continuous formation of necessary management actions. Quality management of study processes is coordinated by the quality management division of VGTU. Evaluation and improvement of study programmes at the University level takes place every two to four years (in 2001, 2003, 2007, and 2011). The renewal process is based on analyzing the ongoing technical and technological progress, changes

in the labour market, employers' requests, feedback from graduates, and contacts with foreign partners.

Student surveys are carried out at the end of each semester. When filling the survey, the student evaluates the contents of the subject, the teaching material of the subject (clarity, forms of presentation, availability, etc.), the teaching methodology, as well as the lecturer's competence and communication, and may provide suggestions on how to improve the quality of the subject. With this feedback, the lecturer can improve the quality of her or his teaching. There is also a continuous feedback system in use. According to the students, their feedback and suggestions have been taken into account when improving the programme.

Social stakeholders (employers, alumni and others) also have an impact on improving the quality of the programme. Companies offer specific topics for course papers and final works of the students. The final works are applicable in practice and useful for the companies. In addition, social stakeholders have representatives in the Faculty studies committee and in the Faculty Council. Employers are also represented as chairmen in the qualifying degree granting commissions. According to the social partners, their suggestions have been taken into account when improving the programme.

In addition to feedback related to the subjects they study, the students may affect the quality of programme management and programme administration as members in the Faculty competition and certification committee, the Faculty Council and the Faculty studies committee. In all these bodies, students can express their views on quality issues related to studies.

In general, information and data on the implementation of the programme are regularly collected and analyzed, and improvements based on them are systematically done. Also, the internal quality assurance measures are effective and efficient.

The outcomes of the previous evaluation of the Information Technologies study programme have been taken into account and the programme has been improved in the following ways: admission to the programme has been widened, the majoring area (specialization) of Engineering and Computer Graphics has been better integrated with other areas (specializations), extended and modernized, the number of classrooms and computer classes has been increased, and the topics and evaluation processes of final works, especially in Engineering and Computer Graphics, have been harmonized.

### III. RECOMMENDATIONS

1. The specialization in Data Mining Technologies has to be substantially revised to better correspond to the actual core of data mining, especially with subjects in statistics, database systems, artificial intelligence, and machine learning.
2. The programme should be extended with subjects in user interfaces, usability, and user experience. Also, the programme should provide an opportunity to study a larger number of modern programming languages as optional subjects.
3. Actions should be taken to keeping the number of professors at the current level.
4. The study environment should be made more international and the study programme wider in content by inviting international visiting professors as guest lecturers.
5. Actions should be taken to obtaining subscription to the central digital sources of scientific publications in Informatics (Computer Science), the ACM Digital Library and IEEE Xplore (the IEEE digital library).
6. Students should be encouraged to take advantage of their possibilities to international Erasmus exchange.

#### IV. SUMMARY

The aims, objectives and learning outcomes of the programme of studies of *Information Technologies* are well defined, clear and published in the information system of Vilnius Gediminas Technical University. The information is easily accessible from the web.

The aims and learning outcomes of the programme are based on the professional needs of the labour market and the society. The general objective of the programme is to educate professionals in information technology, with emphasis in areas that are covered in the programme as its three specializations: Multimedia Information Systems, Data Mining Technologies, and Engineering and Computer Graphics.

The programme is implemented by the Faculty of Fundamental Sciences, mainly by the departments of Graphical Systems, Information Technologies, and Engineering Graphics. When improving the contents and quality of the programme, it could be considered to better utilize the study programmes implemented by the other departments of the Faculty, especially the departments of Information Systems and Mathematical Statistics.

The programme is designed according to the general regulations and requirements for second cycle (Master degree) study programmes in higher education. The duration of studies is four semesters (two years). The extent of all study semesters is 30 credits. All four semesters are of equal length, 20 weeks. The 4<sup>th</sup> semester is dedicated for the preparation and defence of the final work. The total number of compulsory subjects and course papers during each semester does not exceed the allowable number of 5 subject modules. Hence, the study subjects are spread evenly over the schedule of studies.

The specializations Multimedia Information Systems and Engineering and Computer Graphics are reasonably coherent and up to date in their content. The curriculum of Data Mining Technologies, however, contains a couple of relevant subjects in data mining, business intelligence and business processes, but also such topics as mobile communications, information society policies and management of IT services. As such, the specialization is just a collection of different subjects with no real coherence. In the international scientific community, the standard meaning of “data mining” is an intersection of statistics, database systems, artificial intelligence, and machine learning. The specialization has to be substantially revised to better correspond to that actual core of data mining and its technologies.

The main application area of the programme is “user-oriented multimedia information systems”. However, user-oriented themes are not properly included in the curricula, so the programme should be extended with subjects in user interfaces, usability, and user experience. Also, the programme should provide an opportunity to learn a larger number of modern programming languages as optional subjects, especially for those students who come from other universities.

Different pedagogical methods are used in teaching, such as verbal presentations, demonstrations, discussions, group and team work, case studies, tests, and project papers. In some subjects an innovative form of studying as a role game has been used. This form of student-centred teaching might be used even more extensively. Overall, the teaching and study methods are appropriate for the achievement of the learning outcomes of the programme.

The topics of Master's theses are contemporary and match well the profile of the different specializations. It is possible to make the thesis on a topic suggested by a social partner (e.g., a company) of the programme. The representative theses explored were of good quality; the selection, however, was quite small.

All the lecturers of the programme have a Doctor's degree, and almost all of them have scientific publications within the last five years. The lecturers are quite experienced, most of them having pedagogical experience of far more than 10 years. A number of lecturers have also participated in research and development projects directly related to the study programme. The qualifications of the teaching staff are sufficient for implementing the programme on the required level.

The staffing profile of the programme raises one alarming concern: the number of full professors has been going down, from 9 in 2006/2007 to 6 in 2011/2012. Moreover, three of the professors are over 60 years of age. Actions should be taken to guarantee the scientific quality of the programme by keeping the number of professors at the current level. Also, the study environment should be made more international and innovative and the study programme wider in content by inviting international visiting professors as guest lecturers.

The studies in Information Technologies take place on the premises of the Faculty of Fundamental Sciences. The Faculty has provided a sufficient number of classrooms, laboratories and other facilities for the programme. Classrooms are equipped with stationary multimedia equipment. Laboratory work of the programme takes place in specialized laboratories, which have from 15 to 20 workplaces. All computers are connected to the computer network of the University and to the internet. The students can connect their personal laptops to the University network, as well as to the infrastructure of the library using a virtual private network (VPN).

Students of the study programme can use the services of the University library, and the reading room of the Faculty. Working conditions in the library and in the reading rooms are good. The library has an adequate number of computer workstations, enabling students to find and order study books and other publications.

The central digital sources of scientific publications in Informatics (Computer Science), the ACM Digital Library and IEEE Xplore (the IEEE digital library) are no more available in the University library. The University should take immediate actions for obtaining the rights to these libraries, which is essential not only for scientific research in Informatics but also for the Master's theses in the area.

Admission to the programme is based on the general principles of the University, and the requirements are well-founded. There have been 56 or 57 students annually enrolled to Information Technologies during the years 2009 to 2012, about the same number as there have been first-request applicants. The programme seems quite competitive and selective; on the average only 16 % of all applicants have been accepted to the programme in 2009-2012. On the other hand, the total number of applicants has been slightly declining in recent years.

For supporting mobility, the Faculty of Fundamental Sciences has signed exchange agreements for students and lecturers under the Erasmus programme. According to the self-assessment report, "the number of students who are willing to travel is high, there are always contests to the most attractive places". This is simply not true: most of the students are not willing to study abroad in Erasmus exchange, due to issues related to language, job, and personal life. Thus, especially in recent years the number of students in Information Technologies who have been in Erasmus exchange is very small. Students should be encouraged to take advantage of their possibilities to international exchange.

The rules and responsibilities of study programme management follow the general statutes and regulations of the University. The responsibilities for decisions and monitoring of the implementation of the programme are clearly allocated, and management of the study process is adequate.

Information and data on the implementation of the programme are regularly collected and analyzed, and improvements based on them are systematically done: both the students and the social partners have representatives in the studies committee, and their opinions and suggestions are taken into account for improving the programme. Also, the internal quality assurance measures based on regular student surveys and the study feedback system are effective.



## V. GENERAL ASSESSMENT

The study programme *Information technologies* (state code 621E14004) at Vilnius Gediminas Technical University is given **positive** evaluation.

*Study programme assessment in points by evaluation areas.*

No.	Evaluation Area	Evaluation Area in Points*
1.	Programme aims and learning outcomes	3
2.	Curriculum design	3
3.	Staff	4
4.	Material resources	3
5.	Study process and assessment (student admission, study process, student support, achievement assessment)	3
6.	Programme management (programme administration, internal quality assurance)	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. Vladimir Oleshchuk

Grupės nariai:  
Team members:

Prof. Dr. Jörg R. Mühlbacher

Prof. Dr. Jukka Paakki

Doc. Dr. Daiva Vitkutė-Adžgauskienė

Mr. Faustas Zubka

Mr. Juras Biliūnas

## V. APIBENDRINAMASIS ĮVERTINIMAS

Vilniaus Gedimino technikos universiteto studijų programa *Informacinės technologijos* (valstybiniai kodai – 621E14004; 62407T104) vertinama **teigiamai**.

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

\* 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)

## IV. SANTRAUKA

Informacinių technologijų studijų programos tikslai, uždaviniai ir studijų rezultatai yra gerai apibrėžti, aiškūs ir skelbiami Vilniaus Gedimino Technikos Universiteto informacinėje sistemoje. Informacija lengvai pasiekama internete.

Programos tikslai ir mokymosi rezultatai yra paremti darbo rinkos ir visuomenės profesionalų poreikiu. Bendras programos uždavinys yra rengti informacinių technologijų profesionalus, sutelkiant dėmesį ties sritimis, kurios programoje išskirtos kaip trys specializacijos: Multimedijos informacinės sistemos, Duomenų gavimo technologijos ir Inžinerija ir kompiuterinė grafika.

Programą vykdo Fundamentinių mokslų fakultetas, pagrindinai Grafinių sistemų, Informacinių technologijų ir Inžinerinės grafikos katedros. Tobulinant programos turinį ir

kokybę, galima būtų apsvarstyti galimybę geriau panaudoti studijų programas, kurias vykdo kitos Fakulteto katedros, ypač Informacinių sistemų ir Matematinės statistikos katedros.

Programa sukurta pagal bendrus reglamentus ir reikalavimus, keliamus aukštosiose mokyklose siūlomoms antrosios pakopos (Magistro laipsnio) studijų programoms. Studijų trukmė keturi semestrai (dveji metai). Visų studijų semestrų apimtis yra 30 kreditų. Visi keturi semestrai yra vienodos trukmės, t.y. po 20 savaičių. Ketvirtasis semestras yra skirtas baigiamojo darbo rašymui ir gynimui. Bendras privalomų dalykų ir kursinių darbų skaičius kiekviename semestre neviršija leidžiamo 5 dalykų modulių skaičiaus. Studijų dalykai yra tolygiai paskirstyti po visą studijų programą.

Multimedijos informacinės sistemos ir Inžinerinė ir kompiuterinė grafika yra pakankamai susietos ir aktualios savo turiniu. Tačiau Duomenų išgavimo technologijų programoje yra keletas aktualių dalykų duomenų išgavimo, verslo intelekto ir verslo procesų srityse, tačiau taipogi yra temų, tokių kaip mobilieji ryšiai, informacinės visuomenės politika ir IT paslaugų valdymas. Todėl specializacija yra tiesiog skirtingų tarpusavyje nesusijusių dalykų rinkinys. Tarptautinėje mokslinėje bendruomenėje, „duomenų išgavimas“ paprastai reiškia statistikos, duomenų bazių sistemų, dirbtinio intelekto ir mašininio mokymosi sankirtą. Specializacija privalo būti iš esmės peržiūrėta, kad būtų užtikrintas jos geresnis atitikimas duomenų išgavimo ir jos technologijų faktiniam pagrindui.

Pagrindinė programos taikymo sritis yra "į vartotoją orientuotos multimedijos informacinės sistemos". Tačiau į vartotoją orientuotos temos nėra deramai įtrauktos į programą, todėl ją reikėtų praplėsti, įtraukiant į ją vartotojų sąsajų, naudojimo ir vartotojo patirties dalykus. Be to, programa turėtų siūlyti studentams galimybę pasirinkti didesnę skaičių šiuolaikinių programavimo kalbų kaip tarp laisvai pasirenkamų dalykų, ypač tiems studentams, kurie atvyko iš kitų universitetų.

Mokymo procese naudojami įvairūs pedagoginiai metodai, tokie kaip žodiniai pristatymai, demonstravimai, diskusijos, grupiniai ir komandiniai darbai, situacijų analizė, testai ir rašto darbai. Kai kurių dalykų mokoma naudojant novatorišką studijavimo vaidmenų žaidimo pagrindu formą. Šis į studentą nukreiptas mokymas galėtų būti netgi plačiau taikomas. Bendrai vertinant, mokymo ir studijų metodai yra tinkami norint pasiekti programos mokymosi rezultatus.

Magistro darbo temos yra šiuolaikinės ir gerai atitinka skirtingų specializacijų profiliams. Galima būtų sukurti magistro darbą programos socialinio partnerio (pvz., įmonės) siūloma tema. Nagrinėti magistro darbai buvo kokybiški; tačiau atranka buvo ganėtinai maža.

Visi programos dėstytojai turi daktaro laipsnį, ir dauguma jų išspausdino savo mokslinius darbus per pastaruosius penkerius metus. Dėstytojai yra ganėtinai patyrę, daugelio jų pedagoginė patirtis viršija 10 metų. Daugelis dėstytojų taipogi dalyvavo tyrimų ir plėtros projektuose, tiesiogiai susijusiuose su studijų programa. Mokymo personalo kvalifikacijos yra pakankamos programos dėstyimo reikiamame lygyje užtikrinimui.

Programos personalo atžvilgiu kyla viena bauginanti problema: pilnu etatu dirbančių profesorių skaičius mažėjo, nuo 9 2006/2007 metais iki 6 2011/2012. Be to trys profesoriai yra virš 60 metų amžiaus. Reikėtų imtis priemonių, siekiant užtikrinti programos mokslinę kokybę, išlaikant dabartinį profesorių skaičių. Reikėtų dėti pastangas, kad studijų aplinka taptų labiau tarptautinė ir novatoriška, o studijų programa taptų platesnė savo turiniu, pasikvietus tarptautinius vizituojančius profesorius dėstyti dalykus.

Informacinių technologijų studijos vyksta Fundamentinių mokslų fakulteto patalpose. Fakultete yra pakankamas skaičius auditorijų, laboratorijų ir kitų programai reikalingų priemonių. Auditorijos aprūpintos stacionaria multimedijos įranga. Programos laboratorinis darbas vyksta specializuotose laboratorijose, turinčiose nuo 15 iki 20 darbo vietų. Visi kompiuteriai yra sujungti į Universiteto kompiuterių tinklą ir prie interneto. Studentai gali pasijungti savo asmeninius nešiojamus kompiuterius prie Universiteto tinklo, bei bibliotekos infrastruktūros, naudojant Virtualų privatų tinklą (VPN).

Studijų programą studijuojantys asmenys gali naudotis Universiteto bibliotekos paslaugomis bei Fakulteto skaitykla. Bibliotekos ir skaityklos darbo sąlygos yra geros. Bibliotekoje yra deramas kompiuterizuotų darbo vietų skaičius, leidžiančių studentams ieškoti ir užsakyti studijoms skirtų knygų ir kitų publikacijų.

Universiteto bibliotekoje nebegalima naudotis Informatikos (Kompiuterių mokslo), ACM Skaitmeninės bibliotekos ir IEEE Xplore (IEEE skaitmeninės bibliotekos) mokslinių publikacijų centriniais skaitmeniniais šaltiniais. Universitetas turėtų imtis priemonių skubos tvarka gauti teises naudotis šiomis bibliotekomis, kurios yra būtinos ne tik atliekant mokslinius tyrimus Informatikos srityje, bet taipogi rašant Magistro darbus šioje srityje.

Studentų priėmimas į programą yra pagrįstas bendrais Universiteto principais ir reikalavimai yra gerai pagrįsti. Kasmet nuo 2009 iki 2012 metų buvo priimami 56 arba 57 studentai į Informacinių technologijų programą, beveik tiek pat, kiek buvo pirmą kartą stojančių studentų. Programa atrodo ganėtinai konkurencinga ir atranki; vidutiniškai tikrai 16 procentų iš visų stojančiųjų buvo atrinkta į programą 2009-2012 metais. Iš kitos pusės, bendras stojančiųjų skaičius nežymiai mažėjo pastaraisiais metais.

Siekiant remti studentų mobilumą, Fundamentinių mokslų fakultetas pasirašė Erasmus programos studentų ir dėstytojų mainų sutartis. Pagal savianalizės suvestinę, „keliauti

norinčių studentų skaičius yra didelis, visuomet vyksta konkursas į patraukliausias vietas“. Tai paprasčiausiai nėra tiesa: daugelis studentų nenori vykti studijuoti į užsienį pagal Erasmus mainų programą dėl kalbos, darbo ir asmeninių priežasčių. Todėl ypatingai pastaraisiais metais, Informacinių technologijų studentų, studijuojančių pagal Erasmus mainų programą, skaičius yra labai mažas. Studentai turėtų būti skatinami naudotis tarptautinių mainų siūlomomis galimybėmis.

Studijų programos valdymo taisyklės ir atsakomybės atitinka Universiteto statutams ir taisyklėms. Atsakomybės už programos vykdymo sprendimų priėmimą ir kontrolę yra aiškiai paskirstytos, o studijų proceso valdymas yra tinkamas.

Informacija ir duomenys apie programos vykdymą yra reguliariai renkami ir analizuojami, ir jų pagrindu sistematiškai atliekami patobulinimai: tiek studentai, tiek socialiniai partneriai turi savo atstovus studijų komitete ir tobulinant programą atsižvelgiama į jų pasiūlymus ir nuomones. Vidaus kokybės užtikrinimo priemonės, paremtos reguliariai vykdomomis studentų apklausomis ir studijų grįžtamojo ryšio sistema, taipogi yra veiksmingos.

### **III. REKOMENDACIJOS**

1. Duomenų išgavimo technologijų specializacija privalo būti iš esmės peržiūreta ir pakeista taip, kad ji geriau atitiktų faktinę duomenų išgavimo esmę, ypatingai tokių dalykų, kaip statistika, duomenų bazių sistemos, dirbtinis intelektas ir mašininis mokymasis atžvilgiu.
2. Programą reikia praplėsti vartotojų sąsajų, naudojimo ir vartotojo patirties dalykais. Be to, programa turėtų siūlyti studentams galimybę pasirinkti didesnę skaičių šiuolaikinių programavimo kalbų kaip tarp laisvai pasirenkamų dalykų.
3. Reikėtų imtis veiksmų, kad būtų išsaugotas dabartinis profesorių skaičius.
4. Reikėtų dėti pastangas, kad studijų aplinka taptų labiau tarptautinė, o studijų programa taptų platesnė savo turiniu, pasikvietus tarptautinius vizituojančius profesorius dėstyti dalykus.
5. Reikėtų imtis priemonių, kad būtų gautas abonentas Informatikos (Kompiuterinio mokslo), ACM Skaitmeninės bibliotekos ir IEEE Xplore (IEEE skaitmeninės bibliotekos) centrinių skaitmeninių mokslinių publikacijų šaltinių.
6. Studentai turėtų būti skatinami naudotis Erasmus programos siūlomų tarptautinių mainų siūlomomis galimybėmis.