



# **VITEBSK STATE TECHNOLOGICAL UNIVERSITY**

## *Information Systems and Technologies*

### **OVERVIEW REPORT OF HIGHER EDUCATION STUDY PROGRAMME**

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## INFORMATION ON EVALUATED STUDY PROGRAMME

Title of study programme	Information Systems and Technologies
Study area	Computer sciences
Study cycle	First
Study mode (length in years)	Full time (4), part time (5)
Volume of the study programme in ECTS credits	240
Degree and (or) Professional qualifications awarded	Bachelor

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## INTRODUCTION

The experts assessed the study programme and provided recommendations to coordinators for improving the study programme. During the updating of IST study programme experts and coordinators constantly communicated. The programme coordinators took into consideration the recommendations of experts and even some versions of the study programme were submitted. Evaluation of the study programme involve the analysis of:

- Aims and learning outcomes of the study programme “Information Systems and Technologies“;
- Corellation between learning outcomes and subjects of the IST study programme;
- Correlation between learning outcomes of the study programme and the educational standard approved by the Ministry of Education of the Republic of Belarus;
- Curriculum compliance with the aims of the project.

## I. ANALYSIS OF THE PROGRAMME

### 1.1. Programme aims and learning outcomes

**The main goal** of improving the quality of the Information Systems and Technologies programme: to form and develop the professional competencies for work in the field of developing and integration of information systems.

Learning outcomes are listed according to Dublin Descriptors: **K – knowledge, P – professional skills, R – research skills, S – social skills.**

#### **Main outcomes of the programme:**

1. Apply basic scientific and theoretical knowledge to solve practical problems. **K**
2. Develop data structures for use in information systems, operational analysis systems and intellectual systems. **P**
3. Perform modeling, design of software tools and documentation to support activities in various subject areas. **P**
4. Perform comprehensive testing of the developed software products and applied software. **P**
5. Plan and organize automated support of various activities. **P**
6. Build and optimize models of various systems and processes. **P**
7. Analyze perspectives and directions of development of information systems and technologies. **R**
8. Work independently and in a team. **S**
9. Generate new ideas focusing on creativity, critical thinking, communication and collaboration. **S**

The programme aims and learning outcomes are well defined and clear, they are based on the academic and professional requirements, public needs and the needs of the labour market.

Foreign experts provided methodology for formulating study goals and outcomes, presented examples and actively participated in the process of creation the goals and outcomes.

It was important for the coordinators that the goals and learning outcomes of the study programme comply with the educational standard approved by the Ministry of Education of the Republic of Belarus, and for the experts – that the goals and learning outcomes of the study programme comply with Bologna process requirements.

For this reason the correlation between learning outcomes of “Information Systems and Technologies“ and the educational standard approved by the Ministry of Education of the

Republic of Belarus was proposed to make for coordinators (Table 1). Correlation table is done and submitted in the description of the study programme.

**Table 1**

<b>Study programme learning outcomes</b>	<b>Belarusian standard</b>
1. Apply basic scientific and theoretical knowledge to solve practical problems.	apply the obtained basic scientific and theoretical knowledge to solve scientific and practical problems in the field of creation and improvement of innovative systems and technologies in industry and production
	implement an integrated approach to solving professional problems
	use the hardware and software of computer equipment
	own modern methods, languages and tools for designing and developing software
	plan and implement the main stages of scientific research and development work
	conduct research in the field of efficiency of design, technological and other solutions
	conduct production experiments
	provide consulting services on analysis and reengineering of business processes
	use expert systems to consult on various issues
	participate in the final certification of graduates of secondary special and higher educational institutions in this or related specialties
	use modern information technologies, tools and methods for their development
2. Develop data structures for use in information systems, operational analysis systems and intellectual systems.	use information technologies to improve the efficiency of processing initial data, perform mathematical calculations, maintain workflow
	create and maintain databases and data stores for use in information systems
	own technologies and tools for developing distributed data processing systems based on modern tool platforms
	develop requirements for the implementation and operation of replicable information systems and software developments
	develop models of databases and knowledge, data warehouses for use in information systems, operational analysis systems and artificial intelligence systems
	provide consulting services on the conduct of electronic business, the creation of databases and knowledge, marketing and advertising on the Internet
	to introduce into the activities of enterprises software systems, methods and means of knowledge management
3. Perform modeling, design of software tools and documentation to support activities in various subject areas.	conduct a survey and analysis of business processes of production and economic activities
	use modern computer systems for marketing and other research
	build mathematical models of production processes and evaluate the limits applicability of the results obtained
	use modern information technologies for calculating and forecasting the most important production indicators
	use computer technologies to analyze socio-economic phenomena based on real information
	develop technical and technological documentation, participate in the creation of standards and regulations
	prepare and implement quality standards for the production and development of software products
	design information systems and technologies to ensure production activities
	test, implement and operate information systems and technologies
	create technical documentation for the development of information systems
	develop technical and project documentation for specialized software designed to automate the solution of the main design and production tasks
	perform modeling and design of software tools to support activities in various subject areas

	be able to develop technical documentation for the projected software, taking into account the results of research and development work
4. Perform comprehensive testing of the developed software products and applied software.	monitor the efficiency of the use of computer facilities and information systems
	test the developed software products and applied software for compliance with technical requirements and quality requirements
	conduct research in the use of information systems and technologies, improve methods for designing and developing programs for their testing, evaluation and implementation
	calculate and analyze the effectiveness, risk assessment, reliability of software development and implementation projects of information technologies
	carry out experimental and technological work when mastering new technologies, pilot-industrial testing and testing of materials and products being developed
5. Plan and organize automated support of various activities.	use decision support systems to improve the effectiveness of management activities
	carry out engineering and reengineering of business processes
	evaluate the efficiency and justify the choice of information systems, computer networks and telecommunications for the tasks to be accomplished
	conduct a systematic analysis of problem situations
	plan and organize automated support of economic activity of enterprises in the production and non-production spheres, various forms of ownership
	develop strategies for the development of enterprises and organizations based on the introduction of modern information technologies
	develop, adapt and optimize the applied automated control systems and production support systems to improve the quality and reliability of the provision of implementing processes
	use modern approaches to organizing the introduction and effective use of information systems and technologies in production and supporting processes
	monitor compliance with occupational safety, safety, fire and environmental safety standards when working with computers and information systems and technologies
	offer and justify the selection of technical, software tools and systems for the automation of production activities and management processes
	own principles and basic skills in the development and adaptation of corporate information systems
	develop software systems for automated support of human activities and other systems in the economy and other subject areas
	participate in the creation of modern information technologies and automation of management activities
	provide consulting services on the introduction and use of integrated automation systems for the company's production activities
	provide consulting services on the rating of production facilities and processes
	provide consulting services to automate workflow
develop automated training courses and other means of automating the learning process	
6. Build and optimize models of various systems and processes.	have the skills to organize research, information support, and system and comparative analysis
	apply the methods of mathematical statistics when processing experimental data in their field of scientific research
	possess receptions and be able to conduct a system analysis of production and other processes and problem situations
	organize and conduct a comprehensive examination of business plans for investment projects using modern mathematical and instrumental methods
	on the basis of analysis and monitoring of production processes and management processes, create conditions for their development and improvement, aligning real technological processes with existing standards, regulations, rules and norms

	<p>identify the causes of ineffective forms and processes of activity and poor quality of products, including software, to analyze and develop corrective and preventive actions aimed at improving and improving them</p> <p>create functional, information and logistic models of business processes</p> <p>analyze activities and determine the economic effectiveness of scientific research</p> <p>provide consulting services on other issues related to the use of information technology to improve the efficiency of production and economic activities of enterprises and organizations</p>
7. Analyze perspectives and directions of development of information systems and technologies.	<p>develop business plans for technological tasks</p> <p>be able to write out correctly various documents and state the results of research</p> <p>possess methods and methods of adjustment, adaptation, and modernization of existing information systems and technologies</p> <p>analyze the prospects and directions of development of information systems and technologies</p> <p>carry out the choice of the optimal variant of design, construction, carrying out of research works</p> <p>analyze and evaluate the objects of activity, have knowledge in the field of engineering and process reengineering, be able to justify and make decisions in the field of transformation and development of activities based on the development and implementation of modern information technologies</p> <p>develop business plans for the creation of new information technologies</p> <p>evaluate the competitiveness and cost-effectiveness of the technologies being developed</p>
8. Work independently and in a team.	<p>be able to work independently and constantly improve their professional level</p> <p>have a high level of citizenship and patriotism, know the rights and observe the duties of a citizen</p> <p>have the ability to social interaction and interpersonal communication</p> <p>know and observe the norms of a healthy lifestyle</p> <p>have the ability to criticize and self-criticize</p> <p>be able to work in a team</p> <p>use knowledge of the fundamentals of sociology, physiology and psychology of work</p> <p>be able to find the right solutions in emergency situations</p> <p>ensure the training of personnel in safety regulations and carry out timely knowledge testing</p> <p>as a part of a group of specialists and independently carry out scientific research and development projects in the current areas of development of information systems and technologies</p> <p>work with legal literature and labor legislation</p> <p>organize the work of small teams of performers in order to achieve their goals, to plan wage funds</p> <p>monitor and maintain labor and production discipline</p> <p>draw up documentation (work schedules, instructions, plans, applications, business letters, etc.), as well as reporting documentation on established forms</p> <p>interact with specialists of related profiles</p> <p>negotiate, develop contracts with other interested parties</p> <p>draw up contracts for the implementation of research and development, as well as an agreement on joint activities for the development of new technologies</p> <p>prepare drafts of license agreements on the transfer of rights to use intellectual property</p>
9. Generate new ideas focusing on creativity, critical thinking, communication and collaboration.	<p>be able to create and use objects of intellectual property in their activities</p> <p>formulate and propose new ideas</p> <p>organize the work on the preparation of scientific articles, communications, abstracts and applications for inventions and personally participate in it</p> <p>conduct educational work on general professional and special disciplines with students of secondary special and higher educational institutions training</p>

	specialists in this or related specialties
	collect, analyze and evaluate the collected data
	develop, submit and coordinate the materials submitted
	prepare reports, presentations and presentations
	use global information resources
	use modern means of telecommunications

In the final version of the study programme “Information Systems and Technologies“ the goal and learning outcomes are in compliance with legal acts and other documents establishing academic and professional requirements for the qualifications of specialists trained.

The correlation between learning outcomes and subjects was done too (Table 2). It is commendable that all the subjects in the study plan, not just updated during the project, were presented in correlation with the study programme outcomes. In the evaluation of the relationship it has been observed that the subjects correlate with the outcomes of the study programme, are related and include all learning outcomes.

**Table 2**

Courses	Study programme learning outcomes								
	1 (K)	2 (P)	3 (P)	4 (P)	5 (P)	6 (P)	7 (R)	8 (S)	9 (S)
Integrated module “Philosophy“						+		+	
Integrated module “Economics“	+					+			
Integrated module “Political Science“	+					+			
Integrated module “History“	+					+			
Higher Mathematics	+					+			
Physics	+					+			
English Language				+			+		
Theory of Probability and Mathematical Statistics	+					+			
Multimedia Creation and Processing Technologies	+						+		
Special chapters of Higher Mathematics	+					+			
Fundamentals of Computerization in Automation Systems			+			+			
Management of IT Projects			+					+	
Foreign Language				+			+		
Principles of algorithmization and programming		+	+	+					
Security of Vital Activity						+		+	
Business and Law Basics in Information Technologies						+		+	
Principles of Information Security	+						+		
Operational Systems			+					+	
Computer Networks	+						+		
Object-oriented programming			+			+			+
Programming of Network Applications			+					+	
Databases	+	+							
Technology of machine-building and tool engineering	+				+				
Computer systems for finite elements calculations	+					+			
Visual Software Development Tools			+				+	+	
Intelligent databases and decision support in computer aided design	+	+				+			
Principles of computer aided engineering design					+		+		
Optimization of project design	+				+				+
Automation of process design						+	+		

English for Specific Purposes								+	+
Software development for mobile devices			+					+	
Structure and operation of electronic computing machine and peripherals	+							+	
Psychology of Information Perception				+					+
Web – technologies	+		+						+
Theoretical Principles of Electrical Engineering	+								
Electronic Devices					+			+	
Law in the IT sphere						+			+
Microtechnology of automation systems			+		+			+	
Programming Technologies			+					+	
Technical equipment of automation					+			+	
Metrology, methods and devices for technical measurements	+				+				
Systems of Computer Graphics	+							+	
Software Testing				+	+				
Artificial Intelligence	+								+

#### Integrated courses

The programme aims and learning outcomes are consistent with the type and level of studies and the level of qualifications offered. The name of the programme, its learning outcomes, content and the qualifications offered are compatible with each other.

### 1.2. Curriculum Design, Study process and Student Performance

The study programme was upgraded introducing 16 new innovative courses (79 credits, 33%), defining new goals, outcomes and skills of the study programme as well as formulating principles of organization in implementation and innovative methods (Table 3).

**Table 3**

No	Courses EN	VSTU need to integrate during the project	In curriculum	Credits
1.	Law in the IT sphere / Право в IT сфере	3	Law in the IT sphere	3
2.	Intellectual Property and Protection of Information / Интеллектуальная собственность и защита информации	3	Business and Law Basics in Information Technologies	4,5
3.	Psychology of Information Perception / Психология восприятия информации	3	Psychology of Information Perception	3
4.	Management of IT Projects / Управление ИТ проектами	3	Management of IT Projects	3
5.	Multimedia Creation and Processing Technologies / технологии создания и обработки мультимедиа	6	Multimedia Creation and Processing Technologies	6
6.	Computer Networks / Компьютерные сети	3	Computer Networks	4
7.	Web Technologies / веб технологии	3	Web – technologies	4
8.	English for Specific Purposes / Профессиональный английский	8	1.5 English Language (4 credits), 3.18 English for Specific	8

			Purposes (4 credits)	
9.	Software development for mobile devices / разработка программного обеспечения для мобильных устройств	<b>0</b>	Software development for mobile devices (in addition)	2
10.	Principles of algorithmization and programming /принципы алгоритмизации и программирования	<b>7</b>	Principles of algorithmi-zation and programming	7,5
11.	Operational Systems / операционные системы	<b>3</b>	Operational Systems	3
12.	Object-oriented programming / объектно-ориентированное программирование	<b>9</b>	Object-oriented programming (8+1 including course work)	9
13.	Microtechnology of automation systems / микротехнологии в автоматизированных системах	<b>4</b>	Microtechnology of automation systems	4
14.	Systems of Computer Graphics / системы компьютерной графики	<b>4</b>	Systems of Computer Graphics	4
15.	Programming Technologies / технологии программирования	<b>7</b>	Programming Technologies	7
16.	Metrology, methods and devices for technical measurements / метрология, методы и устройства для технических измерений	<b>7</b>	Metrology, methods and devices for technical measurements	7
	<b>ECTS</b>	<b>73</b>		<b>79</b>

Without the 15 newly integrated courses (73 credits, 30%), 1 course is integrated in addition (Software development for mobile devices) – 2 ECTS credits.

So instead of the 73 credits that VSTU need to integrate during the project, 79 credits are allocated in the study programme plan for the courses to be integrated. This will let achieve higher competencies in the training of the specialists of this area.

The curriculum design meets legal requirements. Newly integrated study courses are spread evenly, their themes are not repetitive. The content of the courses is consistent with the type and level of the studies. The content and methods of the courses are appropriate for the achievement of the intended learning outcomes. The content of the newly integrated study courses reflects the latest achievements in science and technologies.

The experts of Alytaus kolegija evaluate newly integrated courses descriptions and the methodological material presenting their conclusions and recommendations. Conclusions about course descriptions have already been written and submitted to course developers, methodological material is being prepared.

The relationship was maintained during the preparation of the courses between the learning outcomes of the programme, learning outcomes of the courses and study methods.

## II. RECOMMENDATIONS

1. To publicize the study programme on TV, press, university website.
2. To collaborate with stakeholders, constantly review goals and learning outcomes of the study programme, implement innovations and new technologies.
3. To publicize the program in the international space in order to attract foreign students who can study in the Erasmus+ programme.
4. To promote students' research skills and engage in research activities.
5. Create freely accessible learning material for the new courses, adapt it to teaching foreign students.
6. Acquire e-learning equipment and provide opportunities for virtual mobility.