

### 3. Educational programme.

Computer science (Bachelor's degree). Directors of the Bachelor's degree programme – Tyshchenko I.A., PhD, senior lecturer of the Department of Computer Sciences and Information Systems

#### 3.1. Profile of the educational programme "Information systems and technologies", Subject Area F6 "Information systems and technologies"

| 1 – General information                                                                                     |                                                                                                                                                                  |
|-------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Full name of the higher educational establishment and structural unit</b>                                | State University of Trade and Economics<br>Faculty of Information Technologies<br>Department of Computer Science and Information Systems                         |
| <b>Degree of higher education and the name of the qualification the language of the original</b>            | The first (bachelor) cycle of higher education<br>Qualification - Bachelor of Information Systems and Technology                                                 |
| <b>Discipline</b>                                                                                           | F Information technology                                                                                                                                         |
| <b>Subject Area</b>                                                                                         | F6 Information systems and technology                                                                                                                            |
| <b>Name of educational program</b>                                                                          | Intelligent information systems and technology                                                                                                                   |
| <b>Restrictions on forms of learning</b>                                                                    | There are no restrictions                                                                                                                                        |
| <b>Compliance with the standard of higher education of the Ministry of Education and Culture of Ukraine</b> | Meets the standards of higher education of the Ministry of Education and Culture of Ukraine (Order No. 1380 of 12.12.2018)                                       |
| <b>Type of diploma and the volume of the educational programme</b>                                          | Bachelor's diploma, single.<br>The volume of educational and professional program- 90 ECTS credits.<br>The regulatory period of preparation is 3 years 10 months |
| <b>Availability of accreditation</b>                                                                        | Certificate of accreditation of educational program № 8560, date of issue on 28.05.2024, valid until 01.07.2029.                                                 |
| <b>Cycle, higher education level</b>                                                                        | NQF of Ukraine – the 6 <sup>th</sup> level,<br>FQ-EHEA – the first cycle,<br>EQF-LLL – the 6 <sup>th</sup> level.                                                |
| <b>Prerequisites for entry into an educational program</b>                                                  | Availability of complete general secondary education                                                                                                             |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| <b>Language(s) of teaching</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Ukrainian, English                                                               |
| <b>The expiry of the educational program</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Prior to approval of the new version of the educational and professional program |
| <b>Internet address of the permanent placement of the educational programme</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <a href="https://knute.edu.ua/">https://knute.edu.ua/</a>                        |
| <b>2 - The purpose of the educational programme</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                  |
| To provide high-quality education in the field of information technology, essential for the development, implementation and research of intelligent information systems and technologies, and to foster the formation and development of general and professional competencies in the field of intelligent technologies, thereby ensuring graduates' competitiveness in the labour market. To prepare students with a particular interest in contemporary issues in the field of information technology, who are ready to pursue a Master's degree.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                  |
| <b>3 – Characteristics of the educational programme</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                  |
| <b><i>Subject area</i></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                  |
| <p><b>Objects of study:</b> theoretical and methodological foundations and instrumental means of creating and using information systems and technologies; assessment criteria and methods of ensuring quality, reliability, fault tolerance, survivability of information systems and technologies, as well as models, methods and means of optimization and decision-making in the creation and use of information systems and technologies</p> <p><b>Learning goals:</b> formation and development of general and professional competencies in information systems and technologies that contribute to the social stability and mobility of the graduate in the labor market; obtaining higher education for the development, implementation and research of information systems and technologies.</p> <p><b>Theoretical content of the subject area:</b> concepts and principles of information management, system integration and administration of information systems, IT project management, enterprise IT infrastructure architecture. Methods, techniques, approaches and technologies of fundamental and applied sciences, modeling.</p> <p><b>Tools and equipment:</b> computer equipment, control and measuring devices, software and technical complexes and tools, network equipment, specialized software, modern programming languages, etc.</p> |                                                                                  |
| <b><i>Orientation of the educational programme</i></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                  |
| Educational and professional, fundamental, applied                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                  |
| <b><i>The main focus of the educational programme</i></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                  |
| Higher education in the field of information technologies, specialty "Information systems and technologies". The main emphasis of the educational programme is on the training of specialists capable of solving complex tasks related to the design, creation and use of intelligent information systems and technologies using network                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                  |

technologies and intelligent data processing technologies, building the architecture of the IT infrastructure of enterprises and the administration of information systems.

Keywords: : intelligent information systems and technologies, computerisation, information systems design, artificial intelligence, algorithmisation, machine learning, applied programming technologies, systems programming, cross-platform programming, UML, C#, C++, Python, JavaScript, Kotlin, management, distributed server systems, pattern recognition and image processing.

### ***Features of the programme***

A distinctive feature of the 'Intelligent Information Systems and Technologies' programme is its curriculum, which takes into account current trends in the field of information technology, particularly those related to advances in the design and development of information systems based on network technologies and distributed server systems. In-depth study of intelligent data processing technologies, artificial intelligence, machine learning methods, and modern image recognition and image processing technologies. Qualification projects explore subject areas related to the development of information systems and management technologies in various spheres of commercial and economic activity, including those based on intelligent data processing and analysis technologies. The presence of a variable component of professionally-oriented disciplines for the 'Information Systems and Technologies' specialisation; practical training in state institutions, enterprises and organisations.

## **4 – EMPLOYABILITY AND FURTHER EDUCATION OPPORTUNITIES FOR GRADUATES**

### ***Employability***

Graduates of this educational and professional program of specialty "Computer Science" according to the National Classifier of Professions DK 003: 2010 can be employed for positions with the following professional name:

213 Computing professionals (computerization);  
2131 Professionals in the field of computing systems;  
2131.2 Computer systems developers;  
2131.2 System administrator.  
2132.2 Computer programs developers;  
2132.2 Engineer-programmer  
2132.2 Programmer (database)  
2132.2 Applied programmer  
2139.2 Administrator of networks and systems  
3121.2 Information technology specialist;  
3121.2 Computer programs specialist;  
3121.2 Software development specialist.

### ***Further Education Opportunities***

Have the right to continue their studies at the second (master's) higher education level. Acquisition of additional qualifications in the system of postgraduate education.

## **5 – Teaching and assessment**

### ***Teaching and learning***

Problem-oriented learning, self-study, training through practical training. Balanced combination of classrooms (lectures, laboratory classes, practical classes, independent work with information sources, teachers' consultations), distance learning and independent work on the basis of problem-oriented, interactive learning and self-study.

### ***Assessment***

The assessment of students' learning outcomes is carried out in accordance with the 'Regulations on the Assessment of Learning Outcomes of Students and Postgraduate Students at SUTE' and involves the following assessment methods: continuous assessment, final assessment, and certification.

Continuous assessment takes place during practical/laboratory sessions and is based on the results of independent assignments. It involves assessing students' theoretical knowledge during seminars and the practical skills they have acquired whilst carrying out laboratory/practical work.

Final assessment - control measures that provide for establishing the compliance (measurement, evaluation) of the learning results obtained by a person with the requirements of the educational program in the part of the relevant educational component, which is carried out at the university in the form of a test and an exam.

Students' academic performance at SUTE is assessed on a 100-point scale, where: 60–100 points represent academic performance that entitles the student to ECTS credits; 0–59 points represent unsatisfactory academic performance that does not entitle the student to ECTS credits.

## **6 – Programme competences**

### ***Integral competence***

The ability to solve complex specialized tasks and practical problems in the field of information systems and technologies, or in the learning process, characterized by complexity and uncertainty of conditions that require the application of theories and methods of information technologies.

### ***General competences (GC)***

|      |                                                                                                                                                              |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| GC 1 | Ability to abstract thinking, analysis and synthesis.                                                                                                        |
| GC 2 | Ability to apply knowledge in practical situations.                                                                                                          |
| GC 3 | Ability to understand the subject area and professional activity.                                                                                            |
| GC 4 | Ability to communicate a foreign language.                                                                                                                   |
| GC 5 | Ability to learn and master modern knowledge.                                                                                                                |
| GC 6 | Ability to search, process and summarize information from various sources.                                                                                   |
| GC 7 | Ability to develop and manage projects.                                                                                                                      |
| GC 8 | Ability to evaluate and ensure the quality of the work performed.                                                                                            |
| GC 9 | Ability to realize one's rights and responsibilities as a member of society, to realize the values of a civil (free democratic) society and the need for its |

|                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                | sustainable development, the rule of law, the rights and freedoms of a person and a citizen in Ukraine.                                                                                                                                                                                                                                                                                                                   |
| GC10                                                           | Ability to preserve and multiply moral, cultural, scientific values and achievements of society based on an understanding of the history and patterns of development of the subject area, its place in the general system of knowledge about nature and society and in the development of society, techniques and technologies, use different types and forms motor activity for active recreation and healthy lifestyle. |
| GC 11                                                          | Ability to make decisions and act in compliance with the principle of inadmissibility of corruption and any other manifestations of non-integrity.                                                                                                                                                                                                                                                                        |
| <b><i>Special (professional, subject) competences (SC)</i></b> |                                                                                                                                                                                                                                                                                                                                                                                                                           |
| SC 1                                                           | Ability to analyze the object of design or operation and its subject area.                                                                                                                                                                                                                                                                                                                                                |
| SC 2                                                           | Ability to apply standards in the field of information systems and technologies when developing functional profiles, building and integrating systems, products, services and elements of the organization's infrastructure.                                                                                                                                                                                              |
| SC 3                                                           | Ability to design, develop, debug and improve system, communication and software and hardware of information systems and technologies, the Internet of Things (IoT), computer-integrated systems and system network structure, their management.                                                                                                                                                                          |
| SC 4                                                           | Ability to design, develop and use the means of implementing information systems, technologies and information communications (methodical, informational, algorithmic, technical, software and others).                                                                                                                                                                                                                   |
| SC 5                                                           | Ability to evaluate and take into account economic, social, technological and environmental factors at all stages of the life cycle of information and communication systems.                                                                                                                                                                                                                                             |
| SC 6                                                           | Ability to use modern information systems and technologies (production, decision support, intelligent data analysis, and others), cyber security methods and techniques when performing functional tasks and duties.                                                                                                                                                                                                      |
| SC 7                                                           | Ability to apply information technologies during the creation, implementation and operation of the quality management system and to estimate the costs of its development and maintenance.                                                                                                                                                                                                                                |
| SC 8                                                           | Ability to manage the quality of products and services of information systems and technologies during their life cycle.                                                                                                                                                                                                                                                                                                   |
| SC 9                                                           | Ability to develop business solutions and evaluate new technological proposals.                                                                                                                                                                                                                                                                                                                                           |
| SC10                                                           | Ability to select, design, deploy, integrate, manage, administer and support information systems, technologies and information communications, services and infrastructure of the organization.                                                                                                                                                                                                                           |
| SC 11                                                          | Ability to analyze, synthesize and optimize information systems and technologies using mathematical models and methods                                                                                                                                                                                                                                                                                                    |

|                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SC 12                                  | Ability to manage and use modern information and communication systems and technologies (including those based on the use of the Internet).                                                                                                                                                                                                                                                                                                             |
| SC 13                                  | Ability to conduct computational experiments, compare the results of experimental data and obtained solutions.                                                                                                                                                                                                                                                                                                                                          |
| SC 14                                  | Ability to form new competitive ideas and implement them in projects (startups).).                                                                                                                                                                                                                                                                                                                                                                      |
| SC 15                                  | Ability to apply intelligent information technologies to process various types of data using machine learning methods, neural networks, computer vision technologies and artificial intelligence                                                                                                                                                                                                                                                        |
| SC 16                                  | The ability to programmatically develop artificial intelligence technologies for the automation of management processes in intelligent information systems.                                                                                                                                                                                                                                                                                             |
| <b>7 – Programme learning outcomes</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| PLO 1                                  | <b>Know</b> linear and vector algebra, differential and integral calculus, theory of functions of many variables, theory of series, differential equations for functions of one and many variables, operational calculus, theory of probabilities and mathematical statistics to the extent necessary for the development and use of information systems, technologies and information communications, services and infrastructure of the organization. |
| PLO 2                                  | <b>Apply</b> knowledge of fundamental and natural sciences, system analysis and modeling technologies, standard algorithms and discrete analysis when solving problems of designing and using information systems and technologies.                                                                                                                                                                                                                     |
| PLO 3                                  | <b>Use</b> basic knowledge of informatics and modern information systems and technologies, programming skills, technologies for safe work in computer networks, methods of creating databases and Internet resources, technologies for developing algorithms and computer programs in high-level languages with the use of object-oriented programming for solving problems of designing and using information systems and technologies.                |
| PLO 4                                  | <b>Conduct</b> a system analysis of design objects and justify the choice of structure, algorithms and methods of information transmission in information systems and technologies.                                                                                                                                                                                                                                                                     |
| PLO 5                                  | <b>Argue</b> the choice of software and technical means for creating information systems and technologies based on the analysis of their properties, purpose and technical characteristics, taking into account system requirements and operating conditions; <b>have skills</b> in debugging and testing software and technical means of information systems and technologies.                                                                         |
| PLO 6                                  | <b>Demonstrate</b> knowledge of the modern level of information systems technologies, practical programming skills and the use of applied and specialized computer systems and environments with the aim of implementing them in professional activities.                                                                                                                                                                                               |
| PLO 7                                  | <b>To justify</b> the choice of the technical structure and to <b>develop</b> the appropriate software that is part of the information systems and technologies.                                                                                                                                                                                                                                                                                        |

|       |                                                                                                                                                                                                                                                                                                  |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PLO 8 | <b>Apply</b> the rules for the design of project materials of information systems and technologies, <b>know</b> the composition and sequence of project work, taking into account the requirements of the relevant regulatory and legal documents for implementation in professional activities. |
| PLO 9 | <b>Carry out</b> a system analysis of the enterprise's architecture and its IT infrastructure, develop and improve its elemental base and structure.                                                                                                                                             |
| PLO10 | <b>Understand and take into account</b> social, ecological, ethical, economic aspects, requirements of labor protection, industrial sanitation, fire safety and existing state and foreign standards during the formation of technical tasks and solutions.                                      |
| PLO11 | <b>To demonstrate the ability to develop</b> a technical and economic rationale for the development of information systems and technologies and to be able to evaluate the economic efficiency of their implementation.                                                                          |
| PLO12 | <b>Apply</b> machine learning methods, neural networks, computer vision and artificial intelligence technologies when solving problems involving intelligent data processing.                                                                                                                    |
| PLO13 | <b>Apply</b> software solutions based on artificial intelligence to automate management processes in intelligent information systems and technologies.                                                                                                                                           |

## **8 – Resource support for programme implementation**

### ***Staff support***

The implementation of the educational programme is provided by teachers who have the scientific degrees of candidate and doctor of sciences.

The participation of foreign specialists and practitioners in the teaching of the disciplines of the cycle of professional training is possible.

### ***Material and technical support***

The basis of material and technical support consists of specialized computer laboratories with modern hardware and software resources that ensure high-quality training of bachelors under the educational program "Information Systems and Technologies". Students are fully provided with material resources for study and research. At their service:

- more than 30 thousand m<sup>2</sup> of educational buildings;
- dormitories;
- 470 seats in the SUTE reading rooms, including in the SUTE multimedia library, where access to SCOPUS, Web of Science scientometric databases is provided;
- 2,000 PC workstations with access to the Internet + WiFi. All computer equipment is equipped with basic software, special software is installed on the computers in the laboratories of the departments, necessary for conducting classes and completing tasks by students;
- distance learning laboratory, which hosts 966 educational courses;
- an electronic platform for student communication based on Microsoft Office 365, etc.

### ***Informational and educational and methodological support***

Documents regulating admission and training at SUTE are on the official website. Programs, work programs, syllabus disciplines and evaluation criteria for educational



components are posted on the corporate distance learning platform. Open access of higher education applicants to information and educational resources through information systems of educational process management and other Web services:

- Moodle distance learning systems (provides independent and individual training, control), Office 365 resources;
- availability of free access to the Internet and email;
- information systems "MIA: Education", "load-distribution", management of Web resources of SUTE;
- Library Fund Management System - almost 1.5 million names of educational and scientific literature at the Library of SUTE;
- Optima - Workflow electronic document management system;
- corporate information environment in the form of a "personal office" of the user of the SUTE web portal.

Provision of publicity information on educational programs, degrees of higher education and qualification: implementation of the information policy of SUTE publication on the official website of SUTE information packages of ECTS, educational programs, schedule of classes, as well as all components of providing the educational process to be published under the Law of Ukraine "On Higher Education". Ensuring an effective system of prevention and identification of academic plagiarism in the scientific works of SUTE workers, higher education applicants (checking for plagiarism of all graduation qualifications, publications, publishing the text of the dissertation research on the official site of SUTE), compliance with the Ethical Code of Scientist Ukraine. The electronic repository of the University contains full -text access to the scientific and educational literature of SUTE, manuscripts of qualification works and theses for degrees. For the convenience of higher education applicants, a catalog of disciplines has been developed at the university, so students have the right to choose selective educational components.

## **9 – Academic mobility**

### ***National credit mobility***

National credit mobility is carried out in accordance with the concluded contracts, memoranda on cooperation between SUTE and other institutions of higher education (scientific institutions) of Ukraine in accordance with the legislation.

### ***International credit mobility***

The University has concluded cooperation between SUTE and foreign higher education institutions, which carry out partnership and training of students under international programs and projects within the Erasmus+Program.

### ***Education of foreign students of higher education***

Foreign students of higher education are guaranteed all rights and freedoms in accordance with the current legislation of Ukraine and the University Charter. Education of foreign students of higher education is conducted on general terms with additional language training.



### 3.2. List of components of the educational programme and their logical sequence

| Code<br>n/a                                       | Educational components of the program                             | Number of<br>credits |
|---------------------------------------------------|-------------------------------------------------------------------|----------------------|
| 1                                                 | 2                                                                 | 3                    |
| <b>Compulsory components</b>                      |                                                                   |                      |
| CC 1.                                             | Fundamentals of information systems theory                        | 6                    |
| CC 2.                                             | Discrete mathematics                                              | 6                    |
| CC 3.                                             | Jurisprudence                                                     | 6                    |
| CC 4.                                             | Higher mathematics                                                | 6                    |
| CC 5.                                             | Foreign language for professional use                             | 24                   |
| CC 6.                                             | Probability theory and mathematical statistics                    | 6                    |
| CC 7.                                             | Intelligent information systems and technologies                  | 6                    |
| CC 8.                                             | Algorithmization and programming                                  | 6                    |
| CC 9.                                             | Organization of databases and knowledge                           | 6                    |
| CC 10.                                            | Optimization methods and models                                   | 6                    |
| CC 11.                                            | Systems theory and system analysis                                | 6                    |
| CC 12.                                            | Simulation modeling                                               | 6                    |
| CC 13.                                            | Numerical methods of programming                                  | 6                    |
| CC 14.                                            | Applied programming technologies                                  | 6                    |
| CC 15.                                            | System programming                                                | 6                    |
| CC 16.                                            | Java Script programming                                           | 6                    |
| CC 17.                                            | Design of information systems                                     | 6                    |
| CC 18.                                            | Machine learning                                                  | 6                    |
| CC 19.                                            | Artificial Intelligence                                           | 6                    |
| CC 20.                                            | Raid data arrays and distributed server systems                   | 6                    |
| CC 21.                                            | Cross-platform programming                                        | 9                    |
| CC 22.                                            | Computer technologies of online startup design and administration | 6                    |
| CC 23.                                            | Pattern recognition systems and image processing                  | 6                    |
| CC 24.                                            | Practical training                                                | 12                   |
| CC 25.                                            | Preparation for certification                                     | 3                    |
| CC 26.                                            | Preparation of qualifying work and defense                        | 6                    |
| <b>The total volume of compulsory components:</b> |                                                                   | <b>180</b>           |
| <b>Elective Components</b>                        |                                                                   |                      |
| EC 1.                                             | Educational component 1                                           | 6                    |
| EC 2.                                             | Educational component 2                                           | 6                    |
| EC 3.                                             | Educational component 3                                           | 6                    |
| EC 4.                                             | Educational component 4                                           | 6                    |

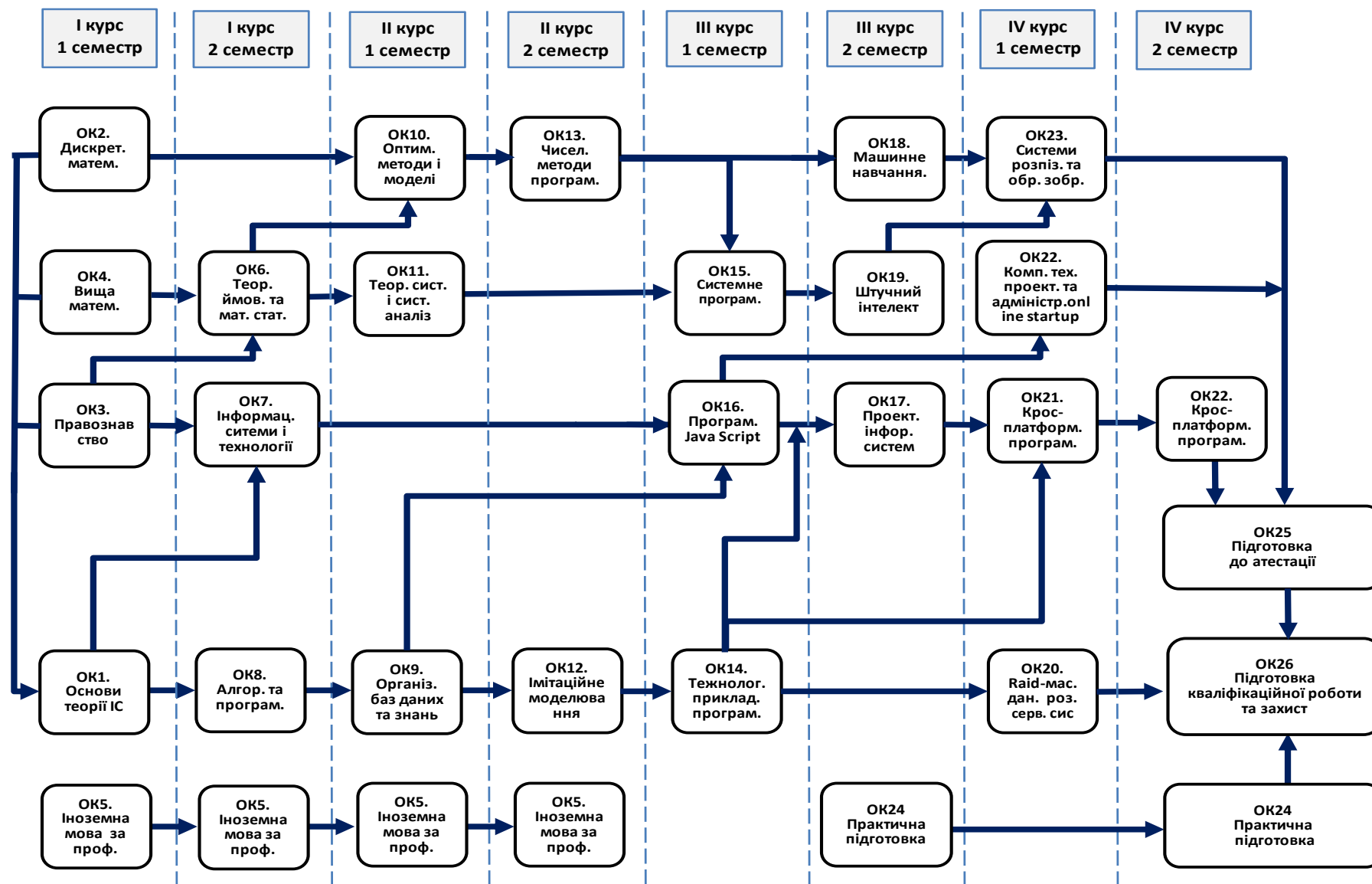
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|-------------------------------------------------|--------------------------|------------|
| EC 5.                                           | Educational component 5  | 6          |
| EC 6.                                           | Educational component 6  | 6          |
| EC 7.                                           | Educational component 7  | 6          |
| EC 8.                                           | Educational component 8  | 6          |
| EC 9.                                           | Educational component 9  | 6          |
| EC 10.                                          | Educational component 10 | 6          |
| <b>The total volume of elective components:</b> |                          | <b>60</b>  |
| <b>TOTAL SCOPE OF THE EDUCATIONAL PROGRAMME</b> |                          | <b>240</b> |

Higher education students choose elective disciplines through the personal cabinet of the portal "MIA: Education". The description of the disciplines and their preecutions are presented in the catalog of SUTE disciplines.

### **3.3. FORMS OF ATTESTATION OF HIGHER EDUCATION STUDENTS**

The attestation is carried out in the form of public final qualification work. Qualification work involves solving a complex specialized task or practical problem in the field of modern information systems and technologies, characterized by complexity and uncertainty of conditions and requires the use of theories and methods of information technologies. There should be no academic plagiarism, falsification in qualification work. Qualification work should be published on the official website of the higher education institution or its structural unit, or in the repository of higher education institution.

## Structural and logical scheme of educational programme



### 3.4. . Matrix of correspondence of programme competences to compulsory components of the educational programme

| Components / Competencies | CC 1 | CC 2 | CC 3 | CC 4 | CC 5 | CC 6 | CC 7 | CC 8 | CC 9 | CC 10 | CC 11 | CC 12 | CC 13 | CC 14 | CC 15 | CC 16 | CC 17 | CC 18 | CC 19 | CC 20 | CC 21 | CC 22 | CC 23 | CC 24 | CC 25 | CC 26 |   |
|---------------------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---|
| GC 1                      |      | •    |      | •    |      | •    |      |      |      | •     | •     | •     |       |       |       |       |       |       |       |       |       |       |       | •     | •     | •     |   |
| GC 2                      | •    | •    |      |      |      |      | •    | •    | •    | •     | •     |       | •     | •     | •     | •     | •     |       |       | •     | •     | •     |       | •     | •     | •     |   |
| GC 3                      |      |      |      |      |      |      | •    |      | •    | •     | •     |       |       | •     | •     |       | •     |       |       | •     | •     |       | •     | •     | •     | •     |   |
| GC 4                      |      |      |      |      | •    |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |   |
| GC 5                      |      |      |      | •    |      | •    | •    |      |      |       | •     |       |       |       |       | •     | •     | •     | •     |       |       | •     |       |       | •     | •     | • |
| GC 6                      |      |      |      |      | •    |      | •    |      |      |       |       |       |       |       |       |       | •     | •     | •     |       |       | •     |       | •     | •     | •     |   |
| GC 7                      |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       | •     |       |       |       |       | •     |       |       | •     | •     |   |
| GC 8                      |      |      |      |      |      |      | •    |      |      |       |       |       |       | •     |       |       | •     |       |       |       |       | •     |       |       | •     | •     |   |
| GC 9                      | •    |      | •    |      |      |      | •    |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |   |
| GC 10                     | •    |      | •    |      |      |      | •    |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | •     |   |
| GC 11                     |      |      | •    |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |   |
| SC 1                      | •    |      |      |      |      |      | •    |      |      | •     | •     | •     |       |       |       |       | •     |       |       | •     |       | •     |       | •     | •     | •     |   |
| SC 2                      |      |      |      |      |      |      | •    |      |      |       | •     | •     |       |       |       |       | •     |       |       | •     | •     |       |       |       | •     | •     |   |
| SC 3                      | •    |      |      |      |      |      | •    | •    | •    |       |       | •     |       | •     | •     | •     | •     |       |       | •     | •     | •     | •     | •     | •     | •     |   |
| SC 4                      | •    |      |      |      |      |      | •    | •    | •    |       | •     |       |       | •     | •     | •     | •     | •     | •     |       | •     | •     |       | •     | •     | •     |   |
| SC 5                      | •    |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       | •     |       |       |       |       |       |       |       | •     | •     |   |
| SC 6                      | •    |      |      |      |      |      | •    |      |      |       |       | •     |       |       |       |       |       | •     | •     | •     | •     |       | •     | •     | •     | •     |   |
| SC 7                      |      |      |      |      |      |      |      |      |      |       | •     |       |       |       |       |       | •     |       |       |       |       | •     |       |       | •     | •     |   |
| SC 8                      |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       | •     |       | •     |       |       | •     |       |       | •     | •     |   |
| SC 9                      |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       | •     |       |       |       |       | •     |       |       | •     | •     |   |
| SC 10                     |      |      |      |      |      |      |      |      |      |       |       |       | •     |       |       |       | •     |       |       | •     |       |       |       | •     | •     | •     |   |
| SC 11                     |      |      |      |      |      |      |      |      |      | •     | •     |       |       |       |       |       |       |       |       | •     |       |       |       | •     | •     | •     |   |
| SC 12                     |      |      |      |      |      |      | •    |      |      |       |       |       |       |       |       | •     | •     |       |       | •     | •     | •     | •     | •     | •     | •     |   |
| SC 13                     |      | •    | •    | •    |      | •    |      |      |      |       |       | •     | •     |       |       |       |       |       |       |       |       |       |       |       | •     | •     |   |
| SC 14                     |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       | •     |       |       |       |       | •     |       |       | •     | •     |   |

### 3.5 Matrix of provision of programme learning outcomes with corresponding compulsory components of the educational programme

| Components /<br>Programme<br>learning<br>outcomes | CC 1 | CC 2 | CC 3 | CC 4 | CC 5 | CC 6 | CC 7 | CC 8 | CC 9 | CC 10 | CC 11 | CC 12 | CC 13 | CC 14 | CC 15 | CC 16 | CC 17 | CC 18 | CC 19 | CC 20 | CC 21 | CC 22 | CC 23 | CC 24 | CC 25 | CC 26 |
|---------------------------------------------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| PLO 1                                             |      | •    |      | •    |      | •    |      |      |      |       |       |       | •     |       |       |       |       |       |       |       |       |       |       |       |       | •     |
| PLO 2                                             |      | •    |      | •    |      | •    |      | •    |      | •     | •     | •     | •     |       |       |       | •     |       |       |       |       |       |       |       | •     | •     |
| PLO 3                                             | •    |      |      |      |      |      | •    | •    | •    |       |       |       | •     | •     | •     | •     | •     |       |       | •     | •     | •     | •     | •     | •     | •     |
| PLO 4                                             |      |      |      |      |      |      | •    | •    |      |       | •     |       |       |       |       |       | •     |       |       |       |       |       |       | •     | •     | •     |
| PLO 5                                             | •    |      |      |      |      |      | •    | •    | •    |       | •     |       |       | •     | •     | •     | •     |       | •     | •     | •     |       | •     | •     | •     | •     |
| PLO 6                                             | •    |      |      |      |      |      | •    | •    | •    |       |       |       |       | •     | •     | •     |       | •     | •     | •     | •     |       | •     | •     | •     | •     |
| PLO 7                                             | •    |      |      |      |      |      |      | •    | •    |       | •     | •     |       | •     | •     | •     | •     | •     | •     | •     | •     |       |       | •     | •     | •     |
| PLO 8                                             |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       | •     |       |       |       |       | •     |       | •     | •     | •     |
| PLO 9                                             |      |      |      |      |      |      |      |      |      |       | •     |       |       |       |       |       |       |       |       | •     |       |       |       | •     | •     | •     |
| PLO 10                                            | •    |      |      |      |      |      | •    |      |      |       |       |       |       |       |       |       | •     |       |       |       |       |       |       | •     | •     | •     |
| PLO 11                                            |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       | •     |       |       |       |       | •     |       | •     | •     | •     |

### 3.6. LIST OF RECOMMENDED ELECTIVE COMPONENTS

| Code   | Educational components                                      | ECTS credits |
|--------|-------------------------------------------------------------|--------------|
| EC 1.  | Computer System Architecture                                | 6            |
| EC 2.  | Safety of life                                              | 6            |
| EC 3.  | Economics of the enterprise                                 | 6            |
| EC 4.  | Electrical Engineering and the Fundamentals of Electronics  | 6            |
| EC 5.  | Information Systems and Technologies in the Economy         | 6            |
| EC 6.  | Basics of cybersecurity                                     | 6            |
| EC 7.  | Psychology                                                  | 6            |
| EC 8.  | Theory of Algorithms                                        | 6            |
| EC 9.  | Information theory and coding                               | 6            |
| EC 10. | Technologies for distributed systems and parallel computing | 6            |
| EC 11. | Soft skills technologies                                    | 6            |
| EC 12. | Technologies for creating software products                 | 6            |
| EC 13. | Physics                                                     | 6            |
| EC 14. | Philosophy                                                  | 6            |
| EC 15. | Communication English Tailored Course                       | 6            |
| EC 16. | Web technologies                                            | 6            |

