1. PROGRAMME PROFILE

1- GENERAL INFORMATION	
Full name of the higher education institution and structural unit	State University of Trade and Economics Faculty of Information Technologies Department of Digital Economics and Systems Analysis
Level of higher education and title of qualification in the original language	First (Bachelor's) Level of Higher Education Qualification – Bachelor's Degree in Systems Analysis
Field of Knowledge	F Information technology
Subject Area	F4 Systems Analysis and Data Science
Name of study program	Big data analysis technologies
Restrictions on forms of study	No restrictions
Compliance with the higher education standard of the Ministry of Education and Science of Ukraine	Meets the standards of higher education of the Ministry of Education and Science of Ukraine (order No. 1245 of 11/13/2018)
Type of diploma and valume of educational programme	Bachelor's degree, single. Volume of the educational and professional programme - 240 credits of ECTS. The normative period of preparation is 3 years and 10 months
Availability of accreditation	Certificate of accreditation of the study and professional programme IK 44470624, valid until 01.07.2028, issued by the National Agency for Quality Assurance in Higher Education.
Cycle, level of higher education	NQF of Ukraine – level 6, FQ-EHEA – first cycle, EQF-LLL – level 6
Prerequisites for admission to the educational programme	Availability of complete general secondary education
Language(s) of training	Ukrainian
Programme validity period	Until the approval of the new edition of the study and professional programme
Internet address of permanent placement of the educational programme description	https://knute.edu.ua
2- PURPOSE OF THE EDUCATIONAL PROGRAMME	

To provide students with theoretical knowledge and practical skills and abilities sufficient to successfully perform comprehensive business analysis, forecasting, optimization and decision-making in complex systems of various natures based on the Data Science system methodology, artificial intelligence, machine learning, other mathematical methods and software tools using modern information technologies, fundamental and applied business analysis methods to solve data analysis problems in various fields of science, technology, finance, socio-economic and political spheres, global and local environmental problems and the national economy as a whole.

3- CHARACTERISTICS OF THE EDUCATIONAL PROGRAMME

Subject area

Subject: mathematical methods and information technologies for analysis, modelling, forecasting, design and decision-making regarding complex systems of various natures (information, economic, financial, social, technical, organizational, environmental, etc.).
Learning objectives: training specialists who are able to develop and apply methods and tools of systems analysis to solve complex problems in various fields of activity.
Theoretical content of the subject area: control theory and decision-making, mathematical and computer modelling, mathematical statistics, data analysis, operations research, optimization of systems and processes.
Methods, techniques and technologies: methods of mathematical modelling, data analysis, optimization and operations research, forecasting, risk assessment, management and decision-making theory, game and conflict theory, expert evaluation, sustainable development.
Tools and equipment: specialized software

Orientation of the educational program

Study and professional. Emphasis on readiness to work and acquire skills in information technology, mathematical and computer modelling of data of various natures, forecasting, optimization, systems analysis and decision-making, intellectual analysis and synthesis of data and knowledge.

Main focus of the educational programme

Special education in the field of business analysis and information technology, the ability to intellectually analyse, forecast, and make decisions in complex systems of various natures based on the Data Science system methodology.
Keywords: data analysis, artificial intelligence, expert systems, machine learning, data from systems of various natures (information, economic, financial, social, political, technical, organizational, environmental, etc.), systems approach, systems analysis, mathematical modelling, computer modelling, mathematical methods, information systems, information technology, decision-making, forecasting, business analytics, Data Science.

Programme features

In-depth study and knowledge of promising areas of intelligent data analysis, computer modelling of processes, artificial intelligence systems, expert decision-making systems at various stages of the creation and application of information systems.

4 – EMPLOYABILITY AND FURTHER EDUCATION OPPORTUNITIES FOR GRADUATES

Employability

Jobs in the field of information technology, communication and IT project management: IT companies, financial companies, consulting companies, government agencies. According to the classifier of professions ДК 003:2010 with amendments approved by the order of the Ministry of Economic Development and Trade of Ukraine dated February 15, 2019 No. 259:
1226.2 Head of structural unit (information protection area);
2121.2 Mathematician-Analyst in Operations Research;
2131.1 Researcher-consultant (computer systems);
2131.2 Data Administrator;
2131.2 Computer database analyst;
2149.2 Systems Analyst;
2412.2 Employment Analyst;
2433.1 Researcher-consultant (information analytics);
2433.2 Consolidated Information Analyst;
3121 Information technology specialist.

Further Education Opportunities

The possibility of studying at the second (master's) level of higher education. Obtaining additional qualifications in the postgraduate education system.

5- TEACHING AND ASSESSMENT

Teaching and learning

Problem-based learning, self-study, learning through practical training.

Assessment

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 provides for the following control measures: current and final control, certification.
Current control is carried out during practical/laboratory classes and based on the results of completing independent work tasks. It involves assessing the theoretical preparation of students during work in seminar classes and acquired practical skills during the completion of laboratory/practical work tasks.
Final control - control measures that provide for establishing compliance (measurement, evaluation) of the learning outcomes obtained by a person with the requirements of the educational program in terms of the relevant educational component, which is carried out at the university in the form of a test and exam.
Student learning outcomes at SUTE are assessed on a 100-point scale, where:
60-100 points - learning outcomes that give the student the right to obtain ECTS credits; 0-59 points – unsatisfactory learning results that do not give the student the right to obtain ECTS credits.

6- PROGRAMME COMPETENCES

Integral competence

The ability to solve complex specialized tasks and practical problems of systems analysis in professional activities or in the learning process, which involve the application of theoretical principles and methods of systems analysis and information technologies, theories and methods of Data Science, artificial intelligence, machine learning, business analysis, data engineering and are characterized by complexity and uncertainty of conditions.

General competencies (GC)

GC01	Ability for abstract thinking, analysis and synthesis
GC02	Ability to apply knowledge in practical situations

GC03	Ability to plan and manage time
GC04	Knowledge and understanding of the subject area and understanding of professional activity
GC05	Ability to communicate in the state language orally and in writing
GC06	Ability to communicate in a foreign language
GC07	Ability to search, process and analyse information from various sources
GC08	The ability to be critical and self-critical
GC09	Ability to adapt and act in a new situation
GC10	Ability to work autonomously
GC11	Ability to generate new ideas (creativity)
GC12	Ability to work in a team
GC13	Ability to work in an international context
GC14	Ability to evaluate and ensure the quality of work performed
GC15	The ability to exercise 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, and the rights and freedoms of man and citizen in Ukraine.
GC16	The ability to preserve and multiply the moral, cultural, scientific values and achievements of society based on understanding 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, technology and engineering, to use various types and forms of physical activity for active recreation and leading a healthy lifestyle.
GC16′	The ability to make decisions and act in accordance with the principle of non-acceptance of corruption and any other manifestations of dishonesty.
Subject specific competences (SSC)	
SC17	The ability to use systems analysis as a modern interdisciplinary methodology based on applied mathematical methods and modern information technologies and focused on solving problems of analysis and synthesis of technical, economic, social, environmental and other complex systems.
SC18	The ability to formalize problems described in natural language, including using mathematical methods, and to apply general approaches to mathematical modelling of specific processes.
SC19	The ability to build mathematically correct models of static and dynamic processes and systems with lumped and distributed parameters, taking into account the uncertainty of external and internal factors.
SC20	The ability to determine the main factors that influence the development of physical, economic, and social processes, to identify stochastic and uncertain indicators in them, to formulate them in the form of random or fuzzy quantities, vectors, and processes, and to investigate the dependencies between them.
SC21	The ability to formulate optimization problems when designing control and decision-making systems, namely: mathematical models, optimality criteria, constraints, management objectives; to choose rational methods and algorithms for solving optimization and optimal control problems.
SC22	Ability to computerize mathematical models of real systems and processes; design, apply and maintain software tools for modeling, decision-making, optimization, information processing, and data mining.

SC23	The ability to use modern information technologies for computer implementation of mathematical models and prediction of the behavior of specific systems, namely: object-oriented approach in the design of complex systems of various nature, applied mathematical packages, application of databases and knowledge.
SC24	Ability to organize work on the analysis and design of complex systems, the creation of relevant information technologies and software.
SC25	The ability to present mathematical arguments and conclusions with clarity and precision and in forms that are appropriate for the audience, both orally and in writing.
SC26	The ability to design experimental and observational studies and analyse the data obtained in them.
SC27	The ability to systematically analyse one's professional and social activities, to evaluate the accumulated experience
SC28	*Ability to understand and skilfully use Data Science theory and methods.*
SC29	*Ability to develop and implement business intelligence problem models using computer modelling tools.*
SC30	*Ability to use data analysis software (programming languages, analytical platforms) to conduct mathematical and methodological research.*
7-PROGRAMME LEARNING OUTCOMES	
PLO 01	To know and be able to apply in practice differential and integral calculus, Fourier series and integral, analytical geometry, linear algebra and vector analysis, functional analysis and discrete mathematics to the extent necessary to solve typical problems of systems analysis.
PLO 02	Be able to use standard schemes to solve combinatorial and logical problems formulated in natural language, apply classical algorithms to verify properties and classify objects, sets, relations, graphs, groups, rings, lattices, Boolean functions, etc.
PLO 03	Be able to determine probability distributions of stochastic indicators and factors that affect the characteristics of the studied processes, investigate the properties and find the characteristics of multidimensional random vectors and use them to solve applied problems, formalize stochastic indicators and factors in the form of random variables, vectors, and processes.
PLO 04	Know and be able to apply basic methods of qualitative analysis and integration of ordinary differential equations and systems, partial differential equations, including equations of mathematical physics.
PLO 05	Know the basic principles of the theory of metric spaces, Lebesgue measure and integral theory, the theory of bounded linear operators in Banach and Hilbert spaces, apply the techniques and methods of functional analysis to solve problems of controlling complex processes under uncertainty.
PLO 06	Know and be able to apply the basic methods of formulating and solving problems of systems analysis in conditions of uncertainty of goals, external conditions and conflicts.

PLO 07	Know the basics of optimization theory, optimal control, and decision-making theory, and be able to apply them in practice to solve applied control problems and design complex systems.
PLO 08	Possess modern methods of developing programs and software complexes and making optimal decisions regarding the composition of software, algorithms of procedures and operations.
PLO 09	Be able to create effective algorithms for computational problems of systems analysis and decision support systems.
PLO 10	Know the architecture of modern computer systems and computer networks.
PLO 11	Know and be able to apply database and knowledge management systems and information systems in practice.
PLO 12	Apply methods and tools for working with data and knowledge, methods of mathematical, logical-semantic, object and simulation modelling, technologies of system and statistical analysis.
PLO 13	Design, implement, test, implement, maintain, and operate software tools for working with data and knowledge in computer systems and networks.
PLO 14	Understand and apply statistical modelling and forecasting methods in practice, evaluate source data.
PLO 15	Understand Ukrainian and foreign languages at a level sufficient for processing professional information and literary sources, professional oral and written communication, and writing texts on professional topics.
PLO 16	Understand and exercise your rights and responsibilities as a member of society, be aware of the values of a free democratic society, the rule of law, and the rights and freedoms of man and citizen in Ukraine.
PLO 17	To preserve and multiply the achievements and values of society based on an understanding of the place of the subject area in the general system of knowledge, to use various types and forms of physical activity to lead a healthy lifestyle.
PLO 18	*Have sufficient knowledge of mathematical models and data analytics methods, modelling languages, and software tools to perform practical business analysis tasks.*
PLO 19	*Possess mathematical methods for developing and researching algorithms for solving business analytics problems, modelling objects and processes, and developing algorithms for system functioning.*

8 – RESOURCE SUPPORT FOR PROGRAMME IMPLEMENTATION

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Staffing

Specialists who train bachelors in the educational program "Big Data Analysis Technologies" must have professional knowledge and professional skills in the field of data analysis, mathematical modelling and modern information technologies.

Foreign specialists and practitioners may participate in teaching professional training disciplines.

Material and technical support

The basis of material and technical support is specialized computer laboratories with modern hardware and software resources, which ensure high-quality training of bachelors in the educational program "Big Data Analysis Technologies"
Information and education and methodological support
General scientific and special sources of information on system analysis and data analysis, educational and methodological and monographic literature, information resources of the distance learning system and the Internet.
9- ACADEMIC MOBILITY
National credit mobility
National credit mobility is carried out in accordance with concluded academic mobility agreements.
International credit mobility
International credit mobility is implemented through the conclusion of agreements on international academic mobility (Erasmus+), on double graduation, on long-term international projects that involve student training, issuing a double diploma, etc.
Foreign students training
Conditions and features of the educational program in the context of teaching foreign citizens: knowledge of the Ukrainian language at a level not lower than B1.

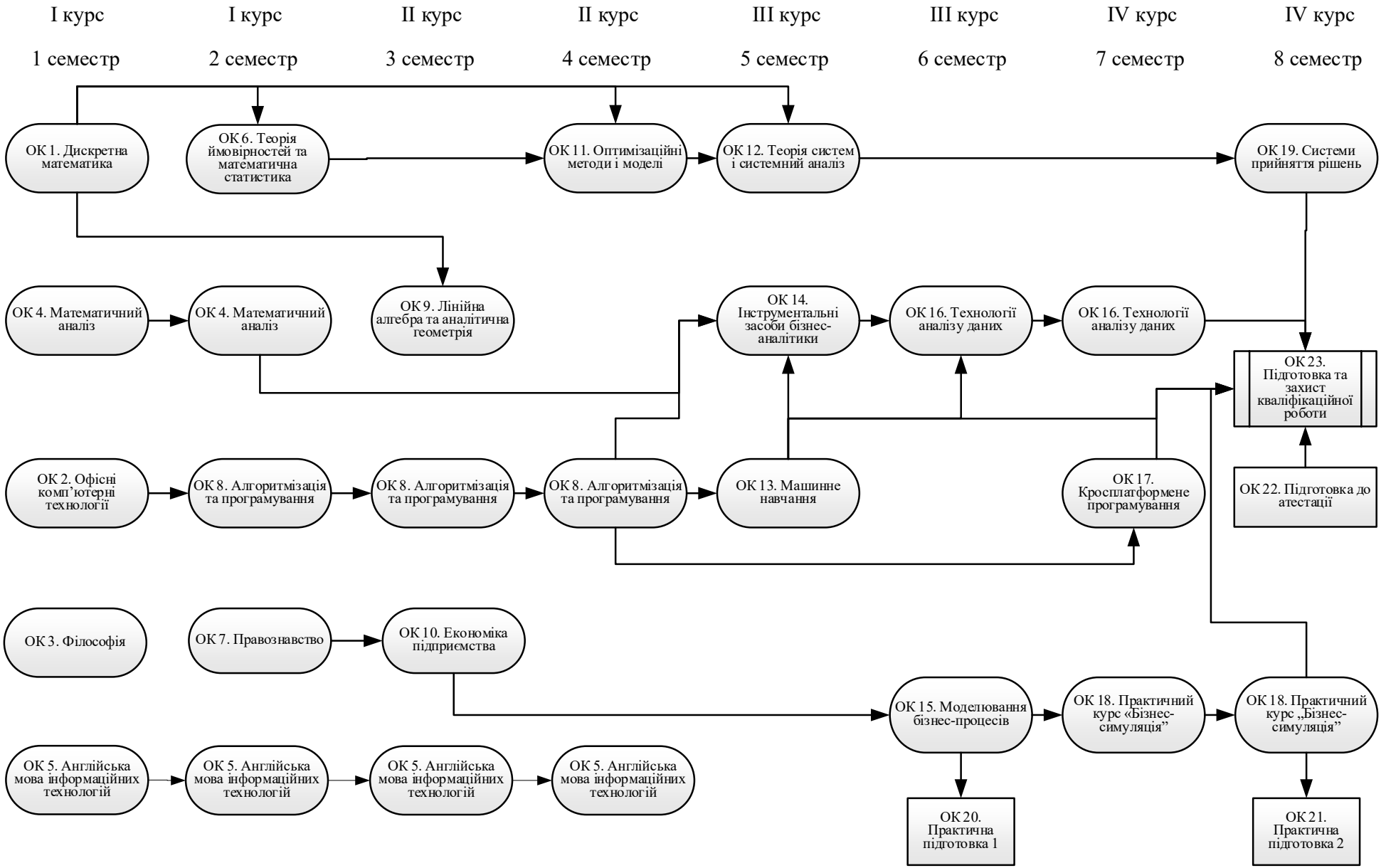
2. 2. LIST OF EDUCATIONAL PROGRAMME COMPONENTS AND THEIR LOGICAL SEQUENCE

2.1 List of educational programme components

Code	Educational components of the programme	ECTS credits	Control form
Compulsory components			
CC 1.	Discrete mathematics	6	Exam
CC 2.	Office computer technologies	6	Exam
CC 3.	Philosophy	6	Exam
CC 4.	Mathematical analysis	12	Exam
CC 5.	English language for information technology	24	Exam
CC 6.	Probability theory and mathematical statistics	6	Exam
CC 7.	Jurisprudence	6	Exam
CC 8.	Algorithmization and programming	18	Exam
CC 9.	Linear algebra and analytic geometry	6	Exam
CC 10.	Economics and business finance	6	Exam
CC 11.	Optimization methods and models	6	Exam
CC 12.	Systems theory and system analysis	6	Exam
CC 13.	Machine learning	9	Exam
CC 14.	Business intelligence tools	6	Exam
CC 15.	Business process modelling	6	Exam
CC 16.	Data analysis technologies	12	Exam
CC 17.	Cross-platform programming	6	Exam
CC 18.	Practical course "Business Simulation"	9	Exam
CC 19.	Decision-making systems	6	Exam
CC 20.	Intership 1	3	Credit
CC 21.	Intership 2	6	Credit
CC 22.	Preparation for the attestation	3	Attestation
CC 23.	Preparation of qualification work and defence	6	Defence
Total volume of compulsory components		**180**	
Optional components			
OC 1.	Educational component 1	6	Exam
OC 2.	Educational component 2	6	Exam
OC 3.	Educational component 3	6	Exam
OC 4.	Educational component 4	6	Exam
OC 5.	Educational component 5	6	Exam
OC 6.	Educational component 6	6	Exam
OC 7.	Educational component 7	6	Exam
OC 8.	Educational component 8	6	Exam
OC 9.	Educational component 9	6	Exam
OC 10.	Educational component 10	6	Exam
Total volume of optional components		**60**	
TOTAL VOLUME OF EDUCATIONAL PROGRAMME		**240**	

Students choose compulsory course through their personal account on the portal "MIA: Education". Descriptions of courses and their prerequisites are presented in the Catalogue of Academic Disciplines of SUTE

2.2 **Structural and logical scheme of the study program**



3. FORM OF ATTESTATION OF GRADUATES

Attestation is carried out in the form of public defence of qualification work. The qualification work should involve the solution of a complex specialized problem or a practical problem of system analysis with the application of theoretical provisions and methods of system analysis and/or information technologies and should be characterized by complexity and uncertainty of conditions. There can be no academic plagiarism, falsification, or plagiarism in the qualification work. The qualification work must be posted on the website of the higher education institution, or its structural unit, or the repository of the higher education institution.

4. MATRIX OF CORRESPONDENCE OF PROGRAMME COMPETENCES TO COMPULSORY COMPONENTS OF THE EDUCATIONAL PROGRAMME

Component / Competences		CC1	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
General	GGC01	+		+	+		+		+	+	+			+		+	+	+		+				
	GC02						+				+	+	+	+		+	+	+	+	+	+	+	+	+
	GC03						+					+	+								+	+	+	+
	GC04		+										+	+		+					+	+	+	+
	GC05													+							+	+	+	+
	GC 06					+															+	+	+	+
	GC07	+	+		+				+	+	+		+	+		+			+		+	+	+	+
	GC08			+															+		+	+	+	+
	GC09												+		+				+		+	+	+	+
	GC10		+										+				+		+		+	+	+	+
	GC11			+											+						+	+	+	+
	GC12												+					+	+		+	+	+	+
	GC13					+							+								+	+	+	+
	GC14		+				+											+			+	+	+	+
	GC15							+													+	+	+	+
	GC16			+																	+	+	+	+
	GC16′	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Subject specific	SC17						+							+		+			+		+	+	+	+
	SC18	+			+		+		+	+			+	+		+		+	+	+	+	+	+	+
	SC19	+			+				+	+									+		+	+	+	+
	SC20									+					+				+		+	+	+	+
	SC21		+				+												+		+	+	+	+
	SC22		+								+		+		+	+	+	+	+	+	+	+	+	+
	SC23		+				+				+		+	+	+	+	+		+	+	+	+	+	+
	SC24										+						+				+	+	+	+
	SC25	+			+				+	+											+	+	+	+
	SC26															+				+	+	+	+	+
	SC27												+	+							+	+	+	+
	SC28										+		+		+	+				+	+	+	+	+
	SC29												+			+				+	+	+	+	+
	SC30										+		+		+	+	+			+	+	+	+	+

5. MATRIX OF PROVISION OF PROGRAM LEARNING OUTCOMES BY COMPALSORY COMPONENTS OF THE EDUCATIONAL PROGRAM

Component Program learning outcome	CC1	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
PLO 01	+			+				+						+						+	+	+	+
PLO 02	+								+											+	+	+	+
PLO 03									+										+	+	+	+	+
PLO 04				+										+						+	+	+	+
PLO 05				+																+	+	+	+
PLO 06											+	+						+		+	+	+	+
PLO 07						+						+						+		+	+	+	+
PLO 08										+							+			+	+	+	+
PLO 09										+		+					+	+		+	+	+	+
PLO 10		+								+							+			+	+	+	+
PLO 11		+								+					+		+			+	+	+	+
PLO 12												+		+	+		+		+	+	+	+	+
PLO 13		+								+		+			+		+	+	+	+	+	+	+
PLO 14									+		+	+		+	+	+			+	+	+	+	+
PLO 15					+															+	+	+	+
PLO 16							+													+	+	+	+
PLO 17			+																	+	+	+	+
PLO 18	+			+		+			+				+	+	+	+			+	+	+	+	+
PLO 19										+				+	+		+		+	+	+	+	+

Developed by a working group consisting of

1. Andrii Roskladka – Head of the Department of Digital Economy and System Analysis, Doctor of Sciences (Economics), Professor – head of a working group

2. Serhii Mitsenko, PhD in Technical Sciences, Associate Professor, Associate Professor Head of the Department of Digital Economy and System Analysis, Director of the Bachelor's degree programme

3. Oleh Pursky – Head of the Department of Computer Science and Information Systems, Doctor of Sciences (Physics and Mathematics), Professor

4. Volodymyr Kulazhenko – Associate Professor of the Department of Digital Economy and System Analysis, PhD in Economics, Associate Professor

5. Polina Rumyantseva – 3rd year student of the educational program "Information Technology and Business Analytics (Data Science)".

Reviews and feedback from external stakeholders:

1. Maksym Sharafutdinov – Development Director of Centre Research & Development, Business Analyst

2. Olga Lugova – Business Analyst, Manager of UKRAINIAN ODOO ASSOCIATION (UA ODOO)

Appendix

LIST OF RECOMMENDED OPTIONAL COMPONENTS

Code	Educational components	ECTS credits
OC 1.	Business technologies	**6**
OC 2.	Economic analysis	**6**
OC 3.	Simulation modeling	**6**
OC 4.	Distributed data processing tools	**6**
OC 5.	Information systems and technologies in the economy	**6**
OC 6.	Computer data visualization systems	**6**
OC 7.	Computer data processing technologies	**6**
OC 8.	Marketing analysis	**6**
OC 9.	Data modeling under uncertainty	**6**
OC 10.	Organization of computer networks	**6**
OC 11.	Cybersecurity Basics	**6**
OC 12.	Forecasting socio-economic processes	**6**
OC 13.	Web application development technologies	**6**
OC 14.	Database and data warehouse design and administration technology	**6**
OC 15.	Digital systems and technologies	**6**