

Ministry of Education and Science of Ukraine
Ternopil Ivan Puluj National Technical University

**EDUCATIONAL AND PROFESSIONAL PROGRAM
SYSTEM ANALYSIS**

of the second level of higher education
in the specialty 124 "System Analysis"
field of knowledge 12 "Information Technology"
Qualification awarded: Master's Degree in System Analysis

APPROVED

ACADEMIC COUNCIL OF TNTU

Chairman of the Academic Council


/Mytnyk M.M./

(Minutes No. 6 of June 20, 2023)

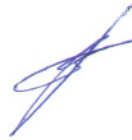


/Mytnyk M.M./

Ternopil, 2023

LETTER OF APPROVAL
educational and professional program

Head of the Department of Computer Science



Ihor BODNARCHUK

Dean of the Faculty of Computer Information Systems
and Software Engineering



Ihor BARAN

PREFACE

Developed by the working group of Ternopil Ivan Puluj National Technical University (specialty 124 "System Analysis") based on the standard of higher education (Order No. 331 of 18.03.2021 "On approval of the standard of higher education in the specialty 124 "System Analysis" for the second (master's) level of higher education") consisting of:

1. Mykhailo FRYZ – head of the working group, guarantor of the educational program, Ph.D., Associate Professor, Associate Professor of the Department of Computer Science;
2. Vasyl MARTSENIUK – Doctor of Technical Sciences, Professor, Professor of the Department of Computer Science;
3. Iryna STRUTYNSKA – Doctor of Economics, Professor, Professor of the Department of Computer Science;
4. Natalia MAYER-KHOMINSKA, Director of SkalHive LLC (with consent);
5. Iryna BAZAN is a student of the SAm-51 group.

Reviews and feedback from external stakeholders:

1. Sergiy KUTUZOV – Director of the Ternopil Branch of ELEKS LLC, Ternopil;
2. Natalia MAYER-KHOMINSKA – Director of SkalHive LLC, Ternopil.

1. Master's Program Profile in Specialty 124 "System Analysis"

1 – General information	
Full name of the higher education institution and structural unit	Ternopil Ivan Puluj National Technical University, Faculty of Computer Science Information Systems and Software Engineering, Department of Computer Science
Higher education degree and title of qualification in the original language	Master's, Master's in Systems Analysis
Official name of the educational program	Educational and professional program "System Analysis" of the second level of higher education in the specialty 124 System analysis of the field of knowledge 12 Information technology
Type of diploma and scope of educational program	Master's degree, single, 90 ECTS credits, term of study 1 year and 4 months
Availability of accreditation	National Agency for Quality Assurance in Higher Education, Minutes of the meeting No. 7(46) from 21.11.2023
Cycle/Level	NQF of Ukraine – Level 7, FQ-EHEA – Second Cycle, QF-LLL – Level 7
Prerequisites	Bachelor's and Master's degree (Specialist)
Language(s) of instruction	Ukrainian
Validity of the educational program	December 31, 2025
Internet address of permanent placement of the description of the educational program	https://tntu.edu.ua/storage/pages/00000120/op124m-eng.pdf
Basic concepts and their definitions	The program uses the basic concepts and their definitions in accordance with the Law of Ukraine "On Higher Education"
2 – Purpose of the educational program	
Training of professionals who are able to design complex information systems, develop new and apply existing methods of system analysis to solve complex problems in various fields of activity.	
3 - Characteristics of the educational program	
Subject area (field of knowledge, specialty)	Field of knowledge: 12 Information Technology, specialty 124 System Analysis Object: mathematical methods and information technologies of analysis, modeling, forecasting, design and decision-making regarding complex systems of various nature. Theoretical content of the subject area: theory of management and decision-making, mathematical and computer modeling of systems and processes, management of IT projects and IT products, data analysis, operations research, systems optimization. Methods, Techniques and Technologies: Methods of Mathematical and Computer Modeling, Data Mining, Artificial Intelligence, Business

	<p>Analytics, Operations Optimization and Research, Forecasting, Risk Assessment, Management and Decision Theory, Game and Conflict Theory, Expert Evaluation, Sustainable Development.</p> <p>Tools & Equipment: Specialized Software</p>
Orientation of the educational program	The educational and professional program is focused on students' acquisition of professional knowledge, skills, abilities and other competencies for the successful implementation of professional activities.
The main focus of the educational program and specialization	Special education in the specialty "System Analysis". Keywords: decision support technologies, information resources of databases and knowledge, intelligent systems of information analysis, Internet technologies for processing information resources, digital transformation of business
Features of the program	<p>The program develops promising areas of computer modeling of the development of modern software complexes and decision support systems. Structural and object-oriented approaches to the design of software complexes are developing.</p> <p>Methods of system analysis are used for the processes of digital transformation of business.</p>
4 – Suitability of graduates of the educational program for employment and further education	
Employability	<p>Positions according to the Classifier of Professions of Ukraine. According to the Classifier of Professions DK 003: 2010, a master's degree in specialty 124 "System Analysis" is prepared for the following positions:</p> <p>1238 Project and program managers</p> <p>2121.2 Mathematician-analyst in operations research;</p> <p>2131.1 Researcher-consultant (computing systems);</p> <p>2131.2 Computer systems analyst;</p> <p>2131.2 Data Administrator;</p> <p>2131.2 Computer data bank analyst;</p> <p>2149.2 Systems analyst (except computer);</p> <p>2433.1 Researcher-consultant (information analytics);</p> <p>2433.2 Consolidated Information Analyst.</p> <p>2447 Professional in project and program management.</p>
Further education	Continuing education at the third (educational and scientific) level of higher education and acquiring additional qualifications in the adult education system
5 – Teaching and Assessment	
Teaching & Learning	Student-centered learning. Forms of study: lectures, practical classes, research laboratory work, course work and projects, independent work, consultations with teachers, preparation of master's thesis
Evaluation	Assessment of the academic performance of higher education applicants at the university is carried out according to a 100-point (rating) system, a national scale ("excellent", "good", "satisfactory", "unsatisfactory"; "credited", "not credited") and the European Credit Transfer and Accumulation System (ECTS – "A", "B", "C", "D", "E", "FX", "F"). Types of control: preliminary, current, summative, self-control. Rector's control is possible. Forms of control: written and oral exams, exams using the

	distance learning system, laboratory reports, essays, presentations, defense of the master's thesis.
6 – Programmatic Competencies	
Integral Competence	Ability to solve research and/or innovation problems in the field of system analysis
General Competencies (GC)	GC1. Ability to abstract thinking, analysis, and synthesis. GC2. Ability to communicate in a foreign language. GC3. Ability to search, process and analyze information from various sources. GC4. Ability to communicate with representatives of other professional groups of different levels (with experts from other fields of knowledge/types of economic activity). GC5. Ability to develop and manage projects.
Special (professional, subject) competencies	SC1. Ability to integrate knowledge and carry out system research, apply methods of mathematical and information modeling of complex systems and processes of various nature. SC2. Ability to design information systems architecture. SC3. Ability to develop decision support systems and recommendation systems. SC4. Ability to assess risks, develop risk management algorithms in complex systems of various nature. SC5. Ability to model, predict and design complex systems and processes based on methods and tools of system analysis. SC6. Ability to apply Data Science theory and methods to perform data mining in order to identify new properties and generate new knowledge about complex systems. SC7. Ability to manage IT workflows that are complex, unpredictable and require new strategic approaches. SC8. Ability to develop and implement scientific and applied projects in the field of information technology and related interdisciplinary projects. SC9. Ability to protect intellectual property rights, commercialize research and innovation results. SC10. Ability to self-education and professional development.
7 – Programmatic Learning Outcomes	
Knowledge, skills, communication	PH1. Specialized conceptual knowledge that includes modern scientific achievements in the field of system analysis and information technology and is the basis for original thinking and research. PH2. Build and study models of complex systems and processes using the methods of system analysis, mathematical, computer and information modeling. PH3. To apply methods of disclosure of uncertainties in the tasks of system analysis, to reveal situational uncertainties and uncertainties in the tasks of interaction, counteraction and conflict of strategies, to find a compromise in the disclosure of conceptual uncertainty. PH4. Develop and apply methods, algorithms and tools for forecasting the development of complex systems and processes of various nature.

	<p>PH5. Use risk assessment measures and apply them in the analysis of multifactorial risks in complex systems.</p> <p>PH6. Apply the methods of machine learning and data mining, the mathematical apparatus of fuzzy logic, game theory and distributed artificial intelligence to solve complex problems of system analysis.</p> <p>PH7. To develop intelligent systems in the context of weakly structured data of various nature.</p> <p>PH8. Identify and evaluate the parameters of mathematical models of control objects.</p> <p>PH9. Develop and apply models, methods, and algorithms for decision-making in the face of conflict, fuzzy information, uncertainty, and risk.</p> <p>PH10. Clearly and unambiguously convey your own knowledge, conclusions and arguments to specialists and non-specialists, in particular to students</p> <p>PH11. Freely present and discuss orally and in writing the results of research and innovation, other issues of professional activity in the state and English languages.</p>
8 – Resourcing of program implementation	
Main characteristics of staffing	All scientific and pedagogical workers who provide the educational and professional program "System Analysis" have scientific degrees and academic titles, have the necessary length of service and experience in scientific and pedagogical work, correspond to the profile and direction of disciplines
Main characteristics of logistics	Use of modern computer tools and specialized software on the basis of the Department of Computer Science.
Main characteristics of information and methodological support	The use of the ATutor distance learning environment of Ternopil Ivan Puluj National Technical University and the author's developments of scientific and pedagogical staff; textbooks and manuals with the stamp of the Academic Council of TNTU named after Ivan Pului.
9 – Academic mobility	
National Credit Mobility	On the basis of bilateral agreements between Ternopil Ivan Puluj National Technical University and technical universities of Ukraine.
International Credit Mobility	On the basis of bilateral agreements between Ternopil Ivan Puluj National Technical University and higher educational institutions of foreign partner countries.
Training of foreign applicants for higher education	Conditions have been created for the training of foreign applicants for higher education.

2. List of components of the educational and professional program and their logical sequence

2.1. List of EP components

Code	Components of the educational program (academic disciplines, course projects (works), practices, qualification work)	Number of credits	Form of final control
Required components of the EP			
General Training Cycle			
OK1	Ethics of Professional Activity and Fundamentals of Pedagogy	4	Credit
OK2	Foreign Language for Professional Purposes	4	Credit
OK3	Intellectual Property	4	Credit
Vocational training cycle			
OK4	Consolidated information resources of databases and knowledge	4	Credit
OK5	Models, technologies of design and management of information systems	4	Exam
OK6	Data Warehouses	4	Exam
OK7	Information Management Technologies	4	Exam
OK8	Decision Support Technologies	4	Exam
OK9	Project management of systems with consolidated information	4,5	Exam
OK10	Digital Transformation	4	Credit
Practical training			
OK11	Professional practice	9	Differential Credit
OK12	Practice on the topic of qualification work	7,5	Differential Credit
OK13	Master's thesis defense	1,5	
OK14	Performance of master's thesis	7,5	
The total amount of mandatory components:		66,0	
Selective components of EP			
Applicants for higher education choose educational components from the proposed list at the link (Tab "Elective disciplines"): https://dl.tntu.edu.ua/users/browse_elective.php			
Semester 2		16	
Semester 3		8	
Total sample components:		24	
THE TOTAL AMOUNT OF THE EDUCATIONAL PROGRAM		90	

3. Form of certification of higher education applicants

Certification of graduates of the educational program in the specialty 124 "System Analysis" is carried out in the form of public defense of the master's thesis and ends with the issuance of a standard document on awarding him a master's degree with the qualification: Master in System Analysis.

The qualification work should provide for the solution of a complex problem of a research and/or innovative nature in the field of system analysis.

The qualification work should not contain academic plagiarism, fabrication, falsification.

The qualification work must be published on the official website of the higher education institution or its subdivision, or in the repository of the higher education institution.

Disclosure of qualification papers containing restricted information shall be carried out in accordance with the requirements of the law.

4. Matrix of correspondence of program competencies to the components of the educational program

Integral Competence														
	OK1	OK2	OK3	OK4	OK5	OK6	OK7	OK8	OK9	OK10	OK11	OK12	OK13	OK14
GC1				+	+		+	+		+	+	+	+	+
GC2		+							+		+	+	+	+
GC3			+			+	+			+	+	+	+	+
GC4	+	+									+	+	+	+
GC5					+		+		+		+	+	+	+
SC1				+	+					+	+	+	+	+
SC2					+					+	+	+	+	+
SC3						+		+			+	+	+	+
SC4							+		+	+	+	+	+	+
SC5					+	+			+	+	+	+	+	+
SC6				+		+					+	+	+	+
SC7					+		+	+	+	+	+	+	+	+
SC8					+		+		+	+	+	+	+	+
SC9	+		+								+	+	+	+
SC10	+		+						+	+	+	+	+	+

5. Matrix for the provision of program learning outcomes (RN) with the relevant components of the educational program

	OK1	OK2	OK3	OK4	OK5	OK6	OK7	OK8	OK9	OK10	OK11	OK12	OK13	OK14
PH1			+	+	+	+	+	+	+	+	+	+	+	+
PH2				+	+	+	+	+	+	+	+	+	+	+
PH3				+				+	+		+	+	+	+
PH4					+	+	+		+	+	+	+	+	+
PH5							+		+		+	+	+	+
PH6				+	+	+		+			+	+	+	+
PH7				+		+	+				+	+	+	+
PH8					+		+				+	+	+	+
PH9				+				+	+		+	+	+	+
PH10	+	+	+								+	+	+	+
PH11	+	+	+								+	+	+	+