

**MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
KYIV NATIONAL UNIVERSITY OF TRADE AND ECONOMICS**

EDUCATIONAL-PROFESSIONAL PROGRAM

«SOFTWARE ENGINEERING»

of the first level of higher education

specialty 121 Software Engineering

branch of knowledge 12 Information Technology

qualification: the degree of higher education bachelor

specialty «Software Engineering»

specialization «Software Engineering»

APPROVED BY THE ACADEMIC COUNCIL OF KNUTE

Chairman of academic council

_____/A. A. Mazaraki/

(protocol №__ from ____ 2019)

Educational program is put into effect in ____ 2019

Rector _____/A. A.Mazaraki /

(order №__ from ____ 2019)

Kyiv 2019

LETTER OF AGREEMENT
of educational-professional program

Agreed
The First Vice -Rector for
Scientific and Pedagogical Work

_____N. V. Pritulskaya
_____ 2019.

Agreed
Vice-Rector for Scientific and
Pedagogical Work

_____S. L. Shapoval
_____ 2019.

Agreed
Head of the Teaching Department
of KNUTE

_____K. V. Mostika
_____ 2019.

Agreed
Head of the Teaching and Methodical
Department of KNUTE

_____T. V.Bozhko
_____ 2019.

Agreed
Head of the Department of
Software Engineering and Cyber
Security

_____O. V. Krivoruchko
_____ 2019 .

Agreed
Representative of CSS

_____M. E. Antonevich
_____ 2019.

Agreed
Deputy Director of Certification
Teaching Centre «PROCOM»
Partnership

_____I. A.Stolyarchuk
_____ 2019.

Agreed
Head of Department of
«M.E.DOK» Partnership

_____M. O. Danilchenko
_____ 2019.

PREFACE

Developed by the working group in the composition:

1. Tsenzura N.A. – associate professor of the Department of Program Engineering and Cyber Security (head), c.t.s., ass. prof.;
2. Rassamakin V.Y. – associate professor of the Department of Program Engineering and Cyber Security, c.t.s., ass. prof.;
3. Rzaeva S.L. – associate professor of the Department of Program Engineering and Cyber Security, c.t.s., ass. prof.;
4. Kharchenko A.A. – dean of the Faculty of Accounting, Audit and Information Systems, c.t.s., ass. prof.;
5. Shchetinina O.K. – head of the Department of Higher and Applied Mathematics, doctor of physical and mathematical sciences, prof.;
6. Rasoulov R.A. – head of the Department of Engineering and Technical Disciplines, c.t.s., ass. prof.;
7. Latigina N.A. – head of the Department of Philosophy and Social Sciences, doctor of polit. sciences, prof.;
8. Chubayevsky V.I. – deputy director of the Department of Cyberpolicy of National Police of Ukraine, c.polit.s.;
9. Danilchenko M.A. – head of the Training Department of the company «Intellect-Service»;
10. Stepashkina K.V. – specialist of the Department of Program Engineering and Cyber Security;
11. Kolomiyets I.O. – student of the Faculty of Accounting, Audit and Information Systems, 4 course, group 7, specialty «Software Engineering»;
12. Ponomarenko Y.Y. – student of the Faculty of Accounting, Audit and Information Systems, 4 course, group 7, specialty «Software Engineering»;
13. Tkeshelashvili D.L. – student of the Faculty of Accounting, Audit and Information Systems, 4 course, group 7, specialty «Software Engineering».

Reviews of external stakeholders:

1. Danilchenko M.A. – head of the Training Department of the company «Intellect-Service», Kyiv.
- Stolyarchuk I.A. – deputy director of Certification Training Centre, partnership «Procom», Kyiv

1. Profile of educational program in specialty
121 "Software Engineering"
(specialization "Software Engineering")

1-General information		
Full name of institution of higher education and structural unit	Kyiv National University of Trade and Economics Faculty of Accounting, Audit and Information Systems Department of Program Engineering and Cyber Security	
Degree of higher education and the name of the qualification in the language of	degree of higher education "Bachelor" specialty "Software Engineering" Specialization « Software Engineering»	
Official title of the educational program	« Software Engineering»	
Type of Diploma and Volume of Educational Program	–the first (Bachelor), unitary 240 ECTS Term of studies -3 years 10 months	
Availability of accreditation -	–	
Cycle / level	NRC of Ukraine - level 7, FQ for EHEA is the first cycle, EQF for LLL - 6 level	
Prerequisites	Full secondary education, elementary level of higher education	
Language(s) of teaching	Ukrainian	
Validity of the educational program	By the next scheduled update	
Internet address of the permanent placement of the description of the educational program	https://knute.edu.ua	
2- Purpose of the Educational Program		
Formation of a person capable to work successfully in the field of IT technologies on the basis of the acquired integral, general (instrumental, interpersonal, systemic) and professional competencies, on the basis of application of scientific and mathematical principles to carry out design, analysis, verification, validation, introduction and maintenance of computer software using different machine languages		
3 - Characteristics of the educational program		
Subject area (branch of knowledge, specialty, specialization (if available))	Branch of Knowledge 12 «Information Technologies» Specialty 121 "Software Engineering" Specialization "Software Engineering" Discipline of the cycle: required components 66,2%: general training - 32,5%; professional training - 33,7%; selective components - 25,%; general training – 7,5% professional training – 17,5%;; practical training and attestations - 8,8%.	
Orientation of the educational program	The program is focused on the educational, professional and applied direction of training.	

<p>The main focus of the educational program and specializations</p>	<p>Special.</p> <p>Higher education in speciality 121 "Software engineering" in the field of software. The program's orientation is based on well-known scientific results, taking into account the current state of IT technologies and programming. It focuses on topical specializations, within which further professional and scientific career is possible: a programmer (applied) and IT specialists.</p> <p>Keywords: programming, programming languages, Java, C ++, software testing, software design, software engineering, operating systems.</p>	
<p>Peculiarities of the program</p>	<p>The program creates the following chain: tasks, knowledge, skills, abilities, professional activity, professional context, work area, interests, professional styles, professional values, related professions, salaries. To disclose the essence of these components, a modular principle is used. The differences are in the ability to turn design specifications and formulation of problems and procedures into detailed logical structural schemes for coding in the programming language; to develop and write computer programs for storing, locating and searching specific documents, data and information.</p>	
<p>4 - Eligibility of graduates for employment and further training</p>		
<p>Eligibility for employment</p>	<p>The specialist can take initial positions (according to DK 003: 2010)): engineer-programmer; programmer (database); programmer applied; engineer of computer systems; computer software engineer., as well as a test programmer; web developer; Java programmer; programmer-producer (chief architect of the project); network and computer system administrators; network system and data transmission analysts ; analysts in the field of operations research /</p>	
<p>Further education</p>	<p>Study according to the master's degree program of level 8 of the NRC of Ukraine, the second cycle of FQ-EHEA and level 7 of the EQF-LLL.</p>	
<p>5 - Teaching and evaluation</p>		
<p>Teaching and learning</p>	<p>Student-centered studying, self-study, teaching through laboratory practice, problem, interactive, project, informational and computer, self-developing, collective and integrative, contextual teaching technologies.</p>	

Evaluation	<p>Types of control: - by levels: self-control, control at the level of the teacher, control at the level of the head of the department, control at the level of the dean's office, control at the level of the director, certification;</p> <p>Forms of control: oral and written questioning, testing, presentation of a scientific work, defense of term papers. Current control, final control - exams and credits, defense of graduation work</p>
6 - Program competencies	
Integral competence	Ability to solve complex specialized tasks and practical problems in the field of software engineering, characterized by complexity and incomplete certainty of conditions.
. General Competence (GC)	<p>GC 1. Basic concepts of the foundations of philosophy, psychology, pedagogy, which contribute to the development of the general culture and competence of socialization of the individual, propensity to aesthetic values, knowledge of national history and law,</p> <p>GC 2. Understanding the cause and effect relationships of the development of society and the ability to use them in professional and social activities.</p> <p>GC 3. Basic knowledge of the fundamental sections of mathematics, to the extent necessary for using mathematical apparatus of the corresponding field of knowledge, the ability to use mathematical methods in the chosen profession.</p> <p>GC 4. Ability to written and oral native language communication.</p> <p>GC 5. Ability to communicate in the field of information technologies in dialog mode in a diverse environment.</p> <p>GC 6. Understanding and perceiving ethical norms of behavior concerning other people and nature (principles of bioethics).</p> <p>GC 7. Creativity, the ability to system thinking.</p> <p>GB 8. Ability to communicate with non-specialists, have certain teaching skills and be able to make substantiated decisions.</p> <p>GB 9. Adaptability and sociability. Ability to provide assistance and advice to employees and public on practical questions concerning safety and emergency situations.</p>

Professional competence of the specialty (PC)	<p>PC 1. Ability to develop specifications of user requirements for software, to analyze requirements, to develop a specification of software requirements, to perform their verification and certification.</p> <p>PC 2. Basic ideas about the basis of software modeling, types of models, basic concepts of UML's unified language modeling.</p> <p>PC 3. Contemporary ideas about the structure and architecture of the software, methods of software design;</p> <p>PC 4. Ability to analyze, design and prototype human-machine interface.</p> <p>PC 5. Ability to use hardware capabilities.</p> <p>PC 6. Ability to use the capabilities of operating systems, office software products.</p>
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	<p>PC 7. Ability to ensure the protection of programs and data from unauthorized actions.</p> <p>PC 8. Ability to use the legislative and regulatory framework of the state, as well as the requirements of international standards to realize professional activity.</p> <p>PC 9. The ability to use information and communication technologies to find new information, create databases, analyze distributed information systems and communication channels based on analysis of information flows and their optimization.</p> <p>PC 10. The ability to design and construct specialized expert systems and solve artificial intelligence (AI) tasks, knowledge representation, machine learning, understanding of natural language and programming in AI languages.</p> <p>PC 11. The ability to design web-based software products, create dynamic sites, and be able to work with DBMSs.</p> <p>PC 12. Ability to develop client scripts in JavaScript, be able to use the object model of a web document, use XML and JSON data formats.</p> <p>PC 13. Ability to determine whether the object-oriented programming technology is optimal for the solution of a particular task and to choose the language, programming system and the tool environment; to develop the structure of the classes necessary for the solution of the problem in accordance with the object-oriented programming technology.</p> <p>PC 14. Ability to execute code development of a given program; correct syntactical and semantic errors (to fix the program).</p> <p>PC 15. Ability to master the basics of the construction and functioning of modern computer data transmission systems, classification and characteristics of the data transfer medium, coding and modulation of data, concepts, models and standards of computer networks, OSI reference model, protocols, standards of communication protocols.</p>
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7. Program learning outcomes	
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	<p>PLO 1. The ability to use information and communication technologies to find new information, create databases, analysis of distributed information systems and communication channels based on analysis of information flows and their optimization.</p> <p>PLO 2. Ability to analyze requirements, develop specification of software requirements, perform their verification and certification.</p> <p>PLO 3. Ability to model various aspects of the system for which the software is created.</p> <p>PLO 4. Ability to design components of architectural solution, human-machine interface.</p> <p>PLO 5. To know the basics of software design, methods and technologies of organization and application of data, methods and technologies of object-oriented programming.</p> <p>PLO 6. Ability to create clear, concise, and accurate technical documentation in accordance with current standards.</p> <p>PLO 7. Ability to develop high-quality software with providing the required documentation of the development process and the subsequent testing.</p>
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PLO 8. Ability to use the capabilities of hardware, operating systems, office and network software systems sheets to implement the front page of the sites.

PRN 9. Ability to ensure the security of programs and data from unauthorized actions..

PLO 10. To choose the basic methods and methods of information protection in accordance with the requirements of the current standards regarding the criteria of security of information technologies, applying a systematic approach and knowledge of the fundamentals of the theory of information security.

PLO 11. Knowledge of models, methods and means of construction and protection of wireless data transmission networks.

PLO 12. To carry out security settings for Windows and Linux operating systems.

PLO 13. Assess the security of IT systems and networks.

PLO 14. Assess the possibility of penetration into the IT system and the network by exploiting existing vulnerabilities.

PLO 15. Ability to apply knowledge in the field of information technology and the Internet.

PLO 16. Ability to apply creative abilities that characterize the readiness to create fundamentally new ideas that are different from traditional ones; to think systematically.

PLO 17. To be able to protect information systems against computer viruses.

PLO 18. To be able to ensure the implementation and enforcement of policies in ITS, procedures and rules.

PLO 19. To be able to orientate in the schemes of algorithms, programs, data and systems.

PLO 20. To be able to use Internet resources for solution of experimental and practical tasks in the field of professional activity.

PLO 21. Ability to design activity in the professional sphere, the ability to build and use models to describe objects and processes, to carry out their qualitative analysis.

PLO 22. Ability to build web resources in accordance with the principles and technology of creating web pages, HTML marking language, language of style descriptions and other techniques.

PLO 23. Ability to work in vector graphic editor CorelDraw, raster graphic editor Adobe Photoshop, system of automated designing AutoCAD

PLO 24. Be able to apply the hypertext markup language and cascading style sheets to implement the front page of the sites.

8 - Resource support for the implementation of the program

Personnel Support	<p>Project team: 3 candidates of science</p> <p>All the developers are on the payroll of Kyiv National University of Trade and Economics Scientific and pedagogical staff with scientific degrees and / or academic degrees, as well as highly skilled specialists, are involved in realization of the program. In order to raise the professional level, all scientific and pedagogical employees take an internship every five years</p>	
Material and technical provision	The use of laboratories, computer and specialized lecture-halls of KNUTE	
Information and educational-methodical provision	Existing distance learning system MOODLE and the MS Office 365 environment ensures independent and individual student work	
9.Academic mobility		
National Credit Mobility	The organization of bachelors` credit mobility (except for the 1 st year). The project company “ERAM SYSTEM”, the “Ukrainian Institute of Intellectual Property”, the Center for Certified Training “Procom”, educational program “Pearson Education”, Corporation “Parus”, and the group of companies “BGS Solutions”.	
International Credit Mobility	. The organization of bachelors` credit mobility (except for the 1 st year). The University of Pari Es Cretey project (Paris, France), Business School “Audense” (Nantes, France, Grenoble Alps University, Grenoble, France), University of Central Lancashire (Preston, UK), Hohenheim University (Stuttgart, Germany).	
Teaching for foreign applicants of higher education	Foreseen	

2. List component of the educational program and their logical consistency

2.1. List component of EP

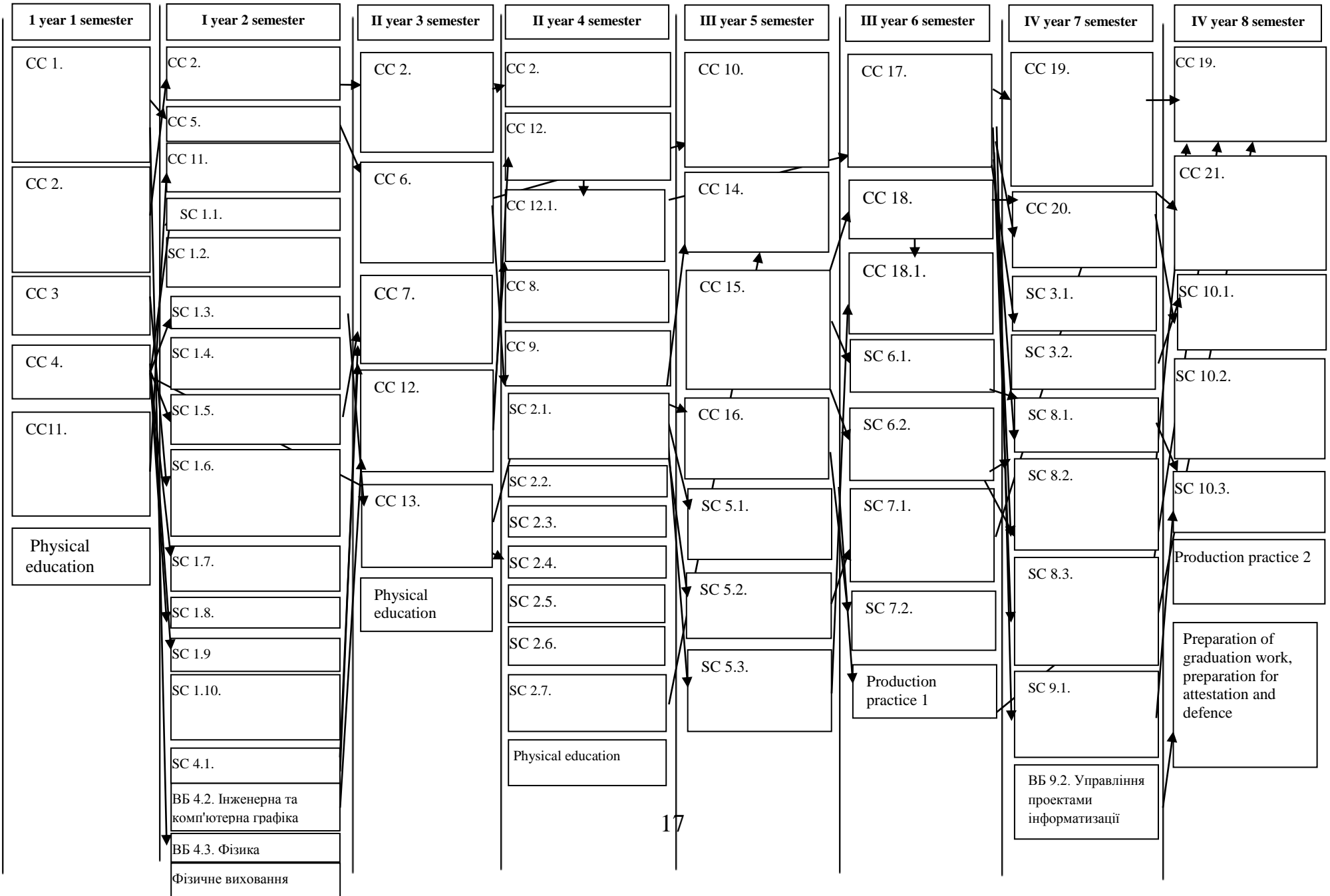
Code N / A	Components of the educational program (academic disciplines, course projects (works, practice, final qualification work))	Number of credits	Form of final control
1	2	3	4
1. Compulsory components of EP			
CC 1.	Linear algebra and analytic geometry	6	Exam
CC 2.	Foreign language for professional orientation	24	Exam
CC 3.	Jurisprudence	6	Exam
CC 4.	Philosophy	6	Exam
CC 5.	Mathematical analysis	6	Exam
CC 6.	Computer discrete math	6	Exam
CC 7.	Safety of life	6	Exam
CC 8.	Economy of the enterprise	6	Exam
CC 9.	Probability Theory and Mathematical Statistics	6	Exam
CC 10.	Empirical methods of software engineering	6	Exam
	Physical education		Credit
CC 11.	Fundamentals of Software Engineering	12	Exam
CC 12.	Object-Oriented Programming	12	Exam
CC 12.1	Coursework on Object-Oriented Programming		

1	2	3	4
CC 13.	Computer Architecture	6	Exam
CC 14.	Operating systems	6	Exam
CC 15.	Architecture and design of software	6	Exam
CC 16.	Electronic document circulation	6	Exam
CC 17.	Standardization and metrology of software	6	Exam
CC 18.	Databases	6	Exam
CC 18.1.	Coursework in databases		
CC 19.	Modeling of financial and economic activity of an enterprise	9	Exam
CC 20.	Internet Programming	6	Exam
CC 21.	Technology development and testing software	6	Exam
Total amount of compulsory components:		159	
2. Selective components of EP			
SC1.1	Aesthetics	6	Exam
SC1.2	History of economics and economic thought	6	Exam
SC 1.3	History of Ukraine	6	Exam
SC 1.4	History of ukrainian culture	6	Exam
SC 1.5	Cultural heritage of Ukraine	6	Exam
SC 1.6	National interests in national geopolitics and geoeconomics	6	Exam
SC 1.7	Public speaking	6	Exam
SC 1.8	Religious studies	6	Exam
SC 1.9	World Culture	6	Exam
SC 1.10	Ukrainian Language (for professional orientation)	6	Exam

1	2	3	4
SC 2.1	Diplomatic and business protocol	6	Exam
SC 2.2	Business ethics	6	Exam
SC 2.3	Logic	6	Exam
SC 2.4	Politology	6	Exam
SC 2.5	Psychology	6	Exam
SC 2.6	Sociology	6	Exam
SC 2.7	Social leadership	6	Exam
SC 3.1	Contractual law	6	Exam
SC 3.2	Information law	6	Exam
SC 4.1	Electrical engineering	6	Exam
SC 4.2	Engineering and computer graphics	6	Exam
SC 4.3	Physics	6	Exam
SC 5.1	Human-machine interaction	6	Exam
SC 5.2	Java technology	6	Exam
SC 5.3	WEB-design and WEB-programming	6	Exam
SC 6.1	Expert systems	6	Exam
SC 6.2	Methods and means of data transfer	6	Exam
SC 7.1	Computer network organization	6	Exam
SC 7.2	Artificial intellect	6	Exam
SC 8.1	Algorithms and data structures	6	Exam
SC 8.2	Economics and information business organization	6	Exam
SC 8.3	Software project management	6	Exam
SC 9.1	Modeling of economic processes	6	Exam
SC 9.2	Information projects management	6	Exam

1	2	3	4
SC 10.1	Security of information systems and networks	6	Exam
SC 10.2	Software modeling and analysis	6	Exam
SC 10.3	Models and data structures	6	Exam
Total amount of selective components		60	
3. Practical training			
Production practice 1		6	Credit
Production practice 2		6	Credit
4. Attestation			
Preparation of graduation work ,preparation to attestation and defence		9	Defence
TOTAL VOLUME OF THE EDUCATIONAL PROGRAM		240	

2.2. Структурно-логічна схема ОП



3. The form of certification for higher education applicants

The certification of graduates of the educational program "Software Engineering", the field of knowledge 12 "Information Technologies", specialty 121 "Software Engineering" is carried out in the form of the final qualification work defence and is finished by getting the diploma of the established standard for obtaining the qualification: degree of higher education "Bachelor", specialty "Software Engineering", specialization "Software Engineering"

The certification is carried out openly and publicly.