AGREED
Vice-rector for Academic and Educational Affairs
_____ A.K. Mustafina
«__» _____2023

APPROVED
Rector
of JSC «International Information Technology University»
_____ A.K. Khikmetov
«20» 03 2023

EDUCATIONAL PROGRAM

8D06104 «Computer Systems and Software Engineering»

Code and classification of the field of education: 8D06 – Information and Communication Technology

Code and classification of training area: 8D061 – Information and Communication Technology

Group of educational programs: D094 – Information Technology

ISCED level: 8

NQR level: 8

ORC level: 8

Duration: 3 years

Number of credits: 180

AGREED
Executive director of
«KazRENA Association» ALE
_____ Tatybayev S.K.
«___»_____2023

AGREED
Executive director of
« KnewIT Programming School» LLC
_____ Bekaulov N.M.
«___»_____2023

Almaty, 2023

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List of abbreviations and notation

BC	Basic competence
BM	Base module
HE	Higher education
SCES	State compulsory education standard
EQF	European qualification framework
EEF	European Education Foundation
KSC	Knowledge, skills, cum-savvy
NCO	National Classification of Occupations
NQF	National Qualifications Framework
NQS	National qualifications system
HM	Humanitarian module
CM	Common module
EP	Educational program
GPM	General Professional Module
IQF	Industry Qualifications Framework
PS	Professional standard
PE	Postgraduate education
PC	Professional competence
PM	Professional module
SW	Software
WG	Working group
RK	The Republic of Kazakhstan
LO	Learning outcome
SM	Special module
QMS	Quality Management System
SEM	Socio-economic module
TVE	Technical and vocational education
TaVPE	Technical and vocational education and post-secondary education
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNESCO	Specialized agency of the United Nations Educational, Scientific and Cultural Organization
Cedefop	European Center for Development of Vocational Training
DACUM	from Eng. Developing curriculum
ECVET	European Credit System for vocational education and training
EQAVET	European Quality Assurance in Vocational Education and Training
ENQA	European Association for Quality Assurance in Higher Education / Europe-Skye association by to ensure qualities at higher education
ESG	Standards and Guidelines for Quality Assurance in the European Higher Education Area
FIBAA	International Agency (non-profit foundation) for accreditation and examination of the quality of higher education (Bonn, Germany)
IQM-HE	Internal Quality Management in Higher Education
TACIS	Technical Assistance for the Commonwealth of Independent States
WSI	WorldSkills International

1 Description of the educational program

The educational program 8D06104 «Computer Systems and Software Engineering» is designed to implement the principles of democratic education management, expanding the boundaries of academic freedom and the powers of educational institutions, which will ensure the adaptation of the system of technical and vocational education to the changing needs of society, the economy of the labor market. The flexibility of the program will take into account the abilities and needs of the individual, production and society.

The educational program is developed taking into account the needs of the labor market in the field of information and communication technologies. This educational program ensures the application of an individual approach to students, ensures the transformation of professional competencies from professional and qualification standards into learning outcomes. Student-centered learning is provided. This principle of education implies a shift in emphasis in the educational process from teaching to learning.

The fields of professional activities of graduates are higher educational institutions, research institutions, production of software development for information and computing systems for various purposes, software companies, IT departments of industrial enterprises, design organizations, public and private enterprises and organizations that develop, implement and use computer hardware and software in various fields, in other words almost all spheres of human activity.

2 The goal and objectives of the educational program

The goal of the EP is to train researchers in the field of software engineering, managers in the field of software development, highly skilled developers of software and information systems and software architects for the IT industry of Kazakhstan.

The objectives of the EP to:

1. Prepare researchers in the field of software development.
2. Train to conduct the research work related to the objects of professional activity, and to conduct the analysis of existing concepts, theories and approaches to the development of programs and corporate information systems.
3. Develop the ability to create new and improve existing methods and algorithms for data processing in information and computing system.
4. Teach to apply the obtained theoretical and practical knowledge in solving theoretical and practical problems in the field of ICT, carry out successfully management and research activities.
5. Instill skills independently and constantly acquire, develop and apply professional knowledge, skills and abilities to solve non-standard tasks (interdisciplinary, etc.).
6. Familiarize with the system analysis to solve complex technical problems and apply the results of the analysis for the greatest optimization of the software development process.
7. Teach to optimize the software development process.
8. Teach to summarize the results of research and analytical work in the form of a dissertation, scientific articles and papers for scientific conferences, reports, analytical notes, etc.

3 Requirements for the results of the mastering of the educational program

After the completion of the educational program a PhD student must be able to:

– determine the scope of research and set research objectives;

– propose the implementation of research tasks by generating hypotheses regarding the corresponding models, algorithms and architectures in software and / or hardware with a focus on programming and computing;

– substantiate the results obtained during the study;

– experiment with software and / or hardware configurations, interpret and predict results;

– analyze the behavior and reaction of the computing environment (virtual machines, distributed software, etc.);

– create and evaluate algorithms and models for various software and / or hardware computing environments;

– analyze structured and unstructured data using various methods and models of analytical processing.

4 Passport of the educational program

4.1 General information

№	Field name	Note
1	Code and classification of the field of education	8D06 – Information and Communication Technology
2	Code and classification of training areas	8D061 – Information and Communication Technology
3	Group of educational programs	D094 – Information Technology
4	Name of the educational program	Computer Systems and Software Engineering
5	Type of EP	c) Innovative EP
6	Goal of EP	Training researchers in the field of software engineering, managers in the field of software development, highly skilled developers of software and information systems and software architects for the IT industry of Kazakhstan
7	ISCED level	8th level
8	NQF level	8th level
9	IQF level	8th level
10	Distinctive features of EP	a) No
	Partner university (SOP)	
	Partner university (PDD)	
11	List of competencies	PC1: The ability to use the knowledge gained, as well as modern research methods and the latest achievements in the field of computer technology and software for the original development and application of ideas in the context of scientific research. PC2: The ability to formalize research tasks, develop software products for their implementation and manage their implementation. PC3: The ability to apply the acquired knowledge to solve practical problems in the field of ICT. PC4: The ability to develop software architectures with a high level of continuity and quality of complex software development using advanced ICT solutions. PC5: The ability to conduct analysis to solve complex software (technical) problems and ensure the implementation of the most optimal solutions. PC6: The ability to summarize the results of research and analytical work in the form of a dissertation, a scientific article, papers at scientific and technical conferences, a report, an analytical note, etc. .

12	Learning outcomes	LO1: Determine the scope of research and set research objectives; LO2: Propose the implementation of research tasks by generating hypotheses regarding the corresponding models, algorithms and architectures in software and / or hardware with a focus on programming and computing; LO3: Substantiate the results obtained during the study; LO4: Experiment with software and / or hardware configurations, interpret and predict results; LO5: Analyze the behavior and reaction of the computing environment (virtual machines, distributed software, etc.); LO6: Create and evaluate algorithms and models for various software and / or hardware computing environments; LO7: Analyze structured and unstructured data using various methods and models of analytical processing.
13	Form of study	Full-time
14	Language of instruction	Russian, English
15	Number of credits	180 ECTS credits
16	Awarded academic degree	PhD
17	Availability of application to the license for the direction of training	License number 0064060, date of application issue 19th of March, 2019
18	Accreditation of EP	Yes
	Name of accreditation body	ASIIN, Germany, https://www.asiin.de/en/
	Duration of accreditation	07.12.2018- 30.09.2024
19	Information about the courses	1 Basic disciplines (BD) – 23 credits 1.1 University component – 9 credits 1.2 Electives – 14 credits 2 Profession disciplines (PD) – 22 credits 2.1 University component – 14 credits 2.2 Electives – 8 credits 3 Doctoral research work, including internships and doctoral dissertations – 123 credits 4 Writing and defending a doctoral dissertation – 12 credits

4.2 Matrix of correlation of learning outcomes of the educational program with competencies

	LO1	LO2	LO3	LO4	LO5	LO6	LO7
PC1	V	V	V				
PC2						V	
PC3				V		V	V
PC4					V		
PC5				V		V	V
PC6			V				

4.3 Information about courses

№	Name of the course	Short description of the course	Number of credits	Formed competencies (codes)
1.	Research methods	The study of types of scientific research, the methodology of scientific knowledge, research, the drawing conclusions, writing scientific articles and papers for conferences, summarizing the results of research work in a dissertation, its structure and content.	4	PC1, PC6 LO1, LO2, LO3
2.	Academic writing	The acquisition of skills necessary for the effective writing of scientific papers of various categories (thesis, article, report, report, dissertation), taking into account the grammatical, stylistic and punctuation features of written scientific speech.	5	PC6 LO3
3.	Fundamentals of distributed intellectual systems	The study of the main features of the analysis and design of systems using a distributed approach. The study of mathematical and system methods and development models of distributed intelligent systems, as well as approaches used to optimize systems and operations.	4	PC3, PC5 LO4
4.	Theory and models of the high-performance computer systems	The study and analysis of various architectures of high-performance computer systems. The study of methods and algorithms for parallel computing to solve problems of optimization of IT-processes. The study and evaluation of the main parameters of parallel programs, such as acceleration, efficiency and scalability.	4	PC3, PC4, PC5 LO4, LO5
5.	Model Driven Software Engineering	The study of a new modern approach to software development - model-driven architecture.	4	PC2, PC3, PC5 LO6
	Algorithmic fundamentals of intelligent systems	The study and analysis of algorithms and tools for the design and development of intelligent systems and applications using hardware.		PC2, PC3, PC5 LO6
6.	Big Data technologies and big systems	The study of the latest advances in the analysis, storage and processing of big data.	4	PC3, PC 5 LO7
	Information and knowledge management	Such concepts as levels of knowledge and extracted data, analytical tools for mining and operational processing of information are considered.		PC3, PC 5 LO7
7.	Teaching practice	The practice is aimed at consolidating, expanding, deepening and systematizing knowledge on the methods of teaching special and professional disciplines.	10	LO2, LO4, LO5
8.	Research practice	Experience is gained in the study of a topical scientific problem, information sources on the topic being developed, methods of modeling and researching information processes are being studied. Methods of analysis and processing of static data; information technologies used in scientific research, software products related to the professional sphere; requirements for the design of scientific and technical documentation are considered.	10	LO1, LO2, LO3

5 Curriculum of the educational program

Code of the discipline	Name of the discipline	Total			including							Credits distribution by year and semester					
					including				Self-study			number of weeks					
		Total credits	Semester	Total hours	Auditory	Lectures	Practical	Laboratory	Total	With teacher	Self-study (not in auditory)	15	15	15	15	15	15
												2020-2021		2021-2022		2020-2023	
												1	2	3	4	5	6
	Theoretical training																
	Basic disciplines (BD)																
	1) Mandatory component (MC)																
RW8001	Academic writing	5	1	150	45	15	30		105	15	90	5					
RM8301	Research methods	4	1	120	30	15	15		90	15	75	4					
	Total BD MC	**9**	1	**270**	**75**				**195**			**9**					
	2) University component (UC)																
SFT8301	Fundamentals of distributed intellectual systems	4	1	120	30	15	15		90	15	75	4					
PP8301	Teaching practice	10	2	300					300	30	270		10				
	Total BD UC	**14**		**420**					**390**			**4**	**10**				
	Total BD MC, UC	**23**		**690**	**75**				**585**			**13**	**10**				
	Professional disciplines (PD)																
	1) University component (UC)																
SFT8302	Theory and models of the high-performance computer systems	4	1	120	30	15	15		90	15	75	4					
PP8302	Research practice	5	2	150					150	15	135		5				
PP8302	Research practice	5	4	150					150	15	135				5		
	Total PD UC	**14**		**420**	**30**				**390**			**4**	**5**		**5**		
	2) Elective courses (EC)																
DV1	**Elective 1**	4	1	120	30	15	15		90	15	75	4					

SFT8305	Model Driven Software Engineering		1															
SFT8303	Algorithmic fundamentals of intelligent systems		1															
DV2	**Elective 2**	4	1	120	30	15	15		90	15	75	4						
ANL8302	Big Data technologies and big systems		1															
ANL8303	Information and knowledge management		1															
	Total PD EC	**8**		**240**	**60**				**180**			**8**						
	Total PD UC, EC	**22**		**660**	**90**				**570**			**12**	**5**		**5**			
	Research work	123																
RW8001	Doctoral research work, including internships and doctoral dissertations	5	1	150					150	15	135	5						
RW8002	Doctoral research work, including internships and doctoral dissertations	15	2	450					450	15	435		15					
RW8005	Doctoral research work, including internships and doctoral dissertations	30	3	900					900	15	885			30				
RW8004	Doctoral research work, including internships and doctoral dissertations	25	4	750					750	15	735				25			
RW8005	Doctoral research work, including internships and doctoral dissertations	30	5	900					900	15	885					30		
RW8006	Doctoral research work, including internships and doctoral dissertations	18	6	540					540	15	525						18	
	Total research work	**123**		**3690**					**3690**			**5**	**15**	**30**	**25**	**30**	**18**	
	Final State attestation (FSA):	12																
RW8007	Writing and defending a doctoral dissertation	12	6	360					360	90	270						12	
	Total FSA	**12**		**360**					**360**	**90**	**270**						**12**	
	TOTAL	**180**		**5400**	**210**				**5205**	**90**	**270**	**30**	**30**	**30**	**30**	**30**	**30**	

6 Developer approval sheet

The title of the educational program: 8D06104 «Computer Systems and Software Engineering»

№ п/п	Position, degree, last name and initials of a developer of the educational program	Date	Signature	Note
1	PhD, head of the «CE» department, assistant professor Chinibayeva T.T.	15.03.2023		
2	Cand. of Phys. & Math. sc, associate professor of the «CE» department S.Z.Sapakova	15.03.2023		