

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE REPUBLIC OF
KAZAKHSTAN

M.O. Auezov SOUTH KAZAKHSTAN UNIVERSITY



«APPROVED»
Chairman of the Board-Rector
Ahmed-Zaki

03 2026

Educational program

6B06110 – Computer science

Registration number	6B06100028
Code and Classification of Education	6M06 Information and communication technologies
Code and Classification of Areas of Training	6M061 Information and communication technologies
Group of educational programs (EP)	B057 Information technologies
Type of EP	Acting EP
ISCE level	6
NQF level	6
IQF level	6
Language learning	English
The complexity of the EP	278 credits
Distinctive features of EP	- Double-degree
Partner University (JEP)	- Arizona State University (USA)
University Partner (DDEP)	-

Shymkent, 2026

Developers:

Full Name	Position	Signature
Shomanbayeva M.T.	Associate Professor	
Zhaidakbayeva L.K.	Associate Professor	
Karataev G.S.	Lecturer, Computer Science Department	
Alisher R.E.	Lecturer, Computer Science Department	
Adilbekova Duriya	Student of group EP-25-7a	
Kuralbai Asqar	Student of group EP-25-7a	
Nurmukhanbetova G.K.	Director of «KaztilDamu» LLP, The educational center, Cand.ped.sc.	
Arystanbekkyzy N.	Limited Liability Partnership "Rolab"	
Ashirbek Sh.	BESTON TRADING CO. LLP	
Irisbekov B.	LLP "Central Asian Trading Company"	
Suleymenova L.A.	Head of the Department "Informatics" of the O.Zhanibekov South Kazakhstan Pedagogical University, cand.tech.sc.	



The educational program has been updated taking into account the new model of inclusive education and agreed with the City department of employment and social protection. Deputy Head of the Department of Employment and Social Protection of Shymkent K.Kaldykarayev

The EP was considered at a meeting of the Academic Quality Committee of the Higher School of Natural Sciences and Pedagogy.

Minutes # 6 « 25 » 02 2026

Chairman of the Committee Tursynbayev A.Z.

The EP was considered and recommended for approval at Educational-methodical meeting of M. Auezov SKU

Minutes # 4 « 27 » 02 2026

Chairman of the UMS E.I. Imangaliev

The EP was approved by the decision of the Academic Council of the University

Minutes # 14 « 26 » 03 2026.

CONTENT

1.	Concept of the Educational program	4
2.	Passport of the Educational program	6
3.	Competencies of an Educational program graduate	9
3.1	Matrix for correlating learning outcomes in the EP as a whole with the competencies being developed	10
4.	Matrix of the influence of modules and disciplines on the formation of learning outcomes and information on labor intensity	11
5.	Summary table reflecting the volume of disbursed loans by EP modules	55
6.	Strategies, teaching methods and artificial intelligence, monitoring and assessment	56
7.	Educational and resource support for EP	57
	Approval sheet	58
	Appendix 1. Review from the employer	59
	Appendix 2. Expert conclusion	61
	Appendix 3. Professional standards	

1. Concept of the Educational program

Mission of the University	Generating new competencies, training a leader who translates research thinking and culture.
University Values	• Openness—open to change, innovation and cooperation. • Creativity – generates ideas, develops them and turns them into values. • Academic freedom – free to choose, develop and act. • Partnership – creates trust and support in a relationship where everyone wins. • Social responsibility – ready to fulfill obligations, make decisions and be responsible for their results.
Graduate Model	• Deep subject knowledge, their application and continuous expansion in professional activity. • Information and digital literacy and mobility in rapidly changing conditions. • Research skills, creativity and emotional intelligence. • Entrepreneurship, independence and responsibility for their activities and well-being. • Global and national citizenship, tolerance to cultures and languages.
The uniqueness of the educational program	The uniqueness of the EP 6B06110-"Computer Science" is to provide fundamental knowledge in the field of application programming, information and network security, information protection from viruses and network attacks, IT communications, computer systems architecture. Training students in this study program provides a wide range of opportunities for students in the following areas: solving applied problems from various fields, developing computer application software, programming in high-level languages based on modern programming paradigms. The level of training allows graduates to be in demand in various fields of activity using computers and information and communication technologies, IT technologies.
Academic Integrity and Ethics Policy	The university has taken measures to maintain academic integrity and academic freedom, protection from any type of intolerance and discrimination: • Rules of academic integrity (order No. 212 of October 10, 2022); • Anti-corruption standard (order No. 221 n/a dated 12/07/2021). • Code of Ethics (Order No. 212 of October 10, 2022)
Regulatory and legal framework for the development of EP	1. Law of the Republic of Kazakhstan “On Education”; 2. Model rules for the activities of educational organizations implementing educational programs of higher and (or) postgraduate education, approved by order of the Ministry of Education and Science of the Republic of Kazakhstan dated October 30, 2018 No. 595 with amendments and additions dated December 29, 2021. No. 614 3. Standard rules for admission to training in educational organizations implementing educational programs of higher and postgraduate education, approved by order of the Ministry of Education and Science of the Republic of Kazakhstan dated October 31, 2018 No. 600 with amendments and additions dated 06/02/2023. No. 252 4. State mandatory standards for higher and postgraduate education, approved by order of the Ministry of Education and Science of July 20, 2022 No. 2; 5. Rules for organizing the educational process in credit technology of

	education, approved by order of the Ministry of Education and Science of the Republic of Kazakhstan dated April 20, 2011 No. 152; with changes and additions from 09/23/2022. No. 79 6. Qualification reference book for positions of managers, specialists and other employees, approved by order of the Minister of Labor and Social Protection of the Population of the Republic of Kazakhstan dated December 30, 2020 No. 553. 7. Methodological recommendations for introducing ECTS principles into the educational process and expanding academic freedom. Appendix to the order of the Minister of Science and Higher Education. of the Republic of Kazakhstan dated February 12, 2024 No. 57 8. Guidelines for the development of educational programs for higher and postgraduate education, Appendix 1 to the order of the Director of the National Center for the Development of Higher Education of the Ministry of Education and Science of the Republic of Kazakhstan dated May 4, 2023 No. 601 Н/К
Organization of the educational process	• Implementation of the principles of the Bologna Process • Student-centered learning • Availability • Inclusivity
Quality assurance of EP	• Internal quality assurance system • Involvement of stakeholders in the development of the Educational Program and its evaluation • Systematic monitoring • Actualization of the content (updating)
Requirements for applicants	They are established in accordance with the Standard Rules for admission to training in educational organizations implementing educational programs of higher and postgraduate education by order of the Ministry of Education and Science of the Republic of Kazakhstan No. 600 dated October 31, 2018, with changes and additions dated June 2, 2023. No. 252
Conditions for the implementation of educational programs (EP) for persons with disabilities and special educational needs(SSN)	For students with SEN (special educational needs) and persons with disabilities (PSI), tactile PVC tiles, specially equipped toilets, a mnemonic diagram, and shower bars have been installed in educational buildings and student dormitories. Special parking spaces have been created. Crawler lift installed. There are desks for people with limited mobility (PLM), signs indicating the direction of movement, ramps. In the educational buildings (main building, building No. 8) there are 2 rooms with six working places adapted for users with disorders of the musculoskeletal system (DMS).For visually impaired users, the SARA™ CE Machine (2 pcs.) is available for scanning and reading books. The library website is adapted for the visually impaired. There is a special NVDA audio program with a service. The JIC website http://lib.ukgu.kz/ is open 24/7. An individual differentiated approach is provided for all types of classes and in the organization of the educational process.

2. PASSPORT OF THE EDUCATIONAL PROGRAM

Purpose of the EP	To train highly qualified specialists and development engineers in demand in the field of computer science, computer technology and IT technologies.
Tasks of the EP	The formation of socially responsible behavior in society, understanding the importance of professional ethical norms and following these norms; - providing lifelong learning skills and abilities that will enable them to successfully adapt to changing conditions throughout their professional career; - providing conditions for acquiring a high general intellectual level of development, mastering competent and developed speech, culture of thinking and skills of scientific organization of work in areas of activity using computers and information and communication technologies, IT technologies; - formation of the competitiveness of graduates in the fields using computer technology and IT technologies to ensure the possibility of their fastest possible employment in their specialty or continuing their studies in a master's degree; - establishing conditions for the development of in-demand knowledge and skills, as well as a conscious attitude towards enhancing the welfare of society and conserving the planet within the framework of the SDGs.
Harmonization of EP	• 6th level of the National Qualifications Framework of the Republic of Kazakhstan; • Dublin descriptors of the 6th level of qualification; • 1 cycle of a Framework for Qualification of the European Higher Education Area); • 6th Level of European Qualification Framework for Life long Learning).
Connection of the EP with the professional sphere	Professional standards approved by PNPP RK "Atameken": - "Software development", (No. 222, 12/05/2022), - "Database Administration" (No. 222, 12/05/2022), - "Creation and management of information resources" (No. 171, 07/17/2017), - "Providing software maintenance" (No. 222, 12/05/2022), - "Software developers and specialists in testing, WEB and multimedia applications" (No. 330, 12/05/2018). The sectorial framework of qualifications in the field of education, approved by Minutes No. 2 of the meeting of the sectorial tripartite commission on social partnership and regulation of social and labour relations under the Ministry of Education and Science of the Republic of Kazakhstan dated November 23, 2016.
Name of the degree awarded	After successful completion of this educational program, the graduate is awarded a Bachelor of Information Technology degree in the educational program 6B06110 "Informatics".
List of qualifications and positions	Primary Jobs Computer Science (Knowledge Processing Specialist, Information Security Specialist, System Analysts (General), IT Consultants and Business Analysts, Software Architects, Software Developers and Testers, Web and Mobile Application Developers and Testers, software maintenance professionals, information technology

	auditors, database administrator; database maintenance engineer, teacher of computer science in secondary and secondary specialized educational institutions (research institutions, design and design organizations) without presenting requirements for experience work in accordance with the qualification requirements of the Qualification Directory for the positions of managers, specialists and other employees, approved by order of the Minister of Labor and Social Protection of the Population of the Republic of Kazakhstan dated May 21, 2012 No. 201-ø-m.
Field of professional activity	research centers, government bodies, educational institutions and organizations of various forms of ownership, using mathematical methods and computer technologies to solve professional problems.
Objects of professional activity	information and communication technologies, computer systems and networks; mathematical and algorithmic models; high-speed computing systems; hardware and software for solving problems of science, education, engineering, economics and management.
Subjects of professional activity	- modern mathematical methods, methods of applied mathematics, computer science for solving problems of science, education, engineering, economics and management. - software and hardware for regional and global information networks, and the development of Internet technologies; - hardware for the development of modern operating systems based on the principles of reliability and fault tolerance, the design of real-time systems, processing, distributed data using parallel computers; - software for computer visualization of tasks of science and technology, animation of natural processes, abstract concepts in scientific research and educational activities.
Types of professional activity	• scientific research; • scientific - technological; • scientific production; • organizational and managerial; • educational.
Learning outcomes	LO1. Communicate freely in a professional environment and society in Kazakh, Russian and English, following the principles of academic honesty. LO2. Demonstrate socio-cultural and professional development, responsibility, ethical and economic thinking, collaboration skills and intercultural communication for responsible leadership in a team. LO3. Have information and computational literacy, the ability to generalize, analyze and perceive information, set goals and choose ways to achieve them. LO4. Solve professional problems in the field of IT management and information security, including protection against cyber threats and the development of secure solutions, using modern ICT, hardware and software, as well as intelligent systems and AI. LO5. Apply basic information processing algorithms to solving applied problems, evaluating the complexity of algorithms for programming, evaluating the accuracy of the results obtained and testing the program, choosing the most convenient technologies and application architectures for use.

	LO6. Apply application software packages and modern mathematical apparatus, relying on knowledge of natural sciences, mathematics and computer science, to solve problems of computational mathematics. LO7. Work in the tool environments of basic programming languages using professionally oriented software tools and integrated environments to create information and computer models of objects, phenomena, systems. LO8. Apply physical and mathematical apparatus and modern computer technologies to solve theoretical, fundamental and applied problems of mathematics, as well as problems of computer science. LO9. Develop, implement and test software for various platforms, including mobile ones, using formal methods and focusing on practical problems. LO10. Present the results of physical, mathematical, chemical and applied research in the form of specific recommendations understandable to specialists in the relevant field.
--	---

3. Competencies of an EP graduate

GENERAL COMPETENCIES (SOFTSKILLS). Behavioral skills and personal qualities	
SS 1. Competence in managing one's literacy	SS1.1. The ability of self-learn, self-develop and constantly update their knowledge within the chosen trajectory and in an interdisciplinary environment. SS1.2. The ability to express thoughts, feelings, facts and opinions in the professional field. SS1.3. The ability for mobility in the modern world and critical thinking.
SS 2. Language competence	SS2.1. The ability to build communication programs in the state, Russian and foreign languages. SS2.2. The ability for interpersonal social and professional communication in the conditions of intercultural communication.
SS 3. Mathematical competence and competence in the field of science	SS3.1. The ability and willingness to apply the educational potential, experience and personal qualities acquired during the study of mathematical, natural science, technical disciplines at the university to solve professional problems.
SS 4. Digital competence, technological literacy	SS4.1. The ability to demonstrate and develop information literacy through the mastery and use of modern information and communication technologies in all areas of their lives and professional activities. SS4.2. The ability to use various types of information and communication technologies: Internet resources, cloud and mobile services for searching, storing, protecting and disseminating information.
SS 5. Personal, social and academic competencies	SS5.1. The ability for physical self-improvement and focus on a healthy lifestyle to ensure full-fledged social and professional activities through the methods and means of physical culture. SS5.2. The ability to social and cultural development based on the manifestation of citizenship and morality. SS5.3 The ability to build a personal educational trajectory throughout life for self-development, career growth and professional success. SS5.4. The ability to successfully interact in a variety of socio-cultural contexts during study, work, home and leisure.
SS 6. Entrepreneurial competence	SS6.1. The ability to be creative and entrepreneurial in a variety of environments. SS6.2. The ability to work in a mode of uncertainty and rapidly changing task conditions, make decisions, allocate resources and manage your time. SS6.3. The ability to work with consumer requests.
SS 7. Cultural awareness and ability to express yourself	SS7.1. The ability to show worldview, civil and moral positions. SS7.2. The ability to be tolerant of the traditions and culture of other peoples of the world, to have high spiritual qualities.

PROFESSIONAL COMPETENCIES (HARDSKILLS).	
Theoretical knowledge and practical skills specific to this field	PC 1 - to use the basic knowledge of the natural sciences, mathematics and computer science, basic facts, concepts, principles of theories related to applied mathematics and computer science;
	PC 2 – to solve standard tasks of professional activity on the basis of information and bibliographic culture with the use of information and communication technologies and taking into account the basic requirements of information security.
	PC 3 – to develop algorithmic and software solutions in the field of system and application programming, mathematical, information and simulation models, to create information resources of global networks, educational content, application databases, tests and means of testing systems and tools for compliance with standards and initial requirements.
	PC 4 – to choose mathematical models, methods of computer technologies and decision support systems in scientific research, design activities, management of technological, economic, social systems and in the humanitarian fields of human activity..

3.1 Matrix for correlating learning outcomes in the EP as a whole with the competencies being developed

	LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9	LO10
SS1	+	+								+
SS2	+									+
SS3		+	+	+	+		+		+	
SS4			+	+	+	+	+	+	+	+
SS5	+	+								
SS6		+		+	+					+
SS7			+	+	+	+	+	+	+	
PC1			+	+	+	+	+	+	+	+
PC2								+		+
PC3			+	+	+	+	+	+	+	
PC4			+	+	+	+	+	+	+	

4. Matrix of the influence of modules and disciplines on the formation of learning outcomes and information on labor intensity

	Module	Cycle	Component	Name of the discipline	Brief description of the discipline	Quantity loans	Generated learning outcomes (codes)									
							LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9	LO10
1	Social Sciences Module	GED	OC	History of Kazakhstan	<i>The purpose</i> of the discipline is the formation of an objective idea of the history of Kazakhstan based on a deep understanding and scientific analysis of the main stages, patterns, and originality of the historical development of Kazakhstan. <i>Contents:</i> Ancient people and the formation of a nomadic civilization. Turkic civilization and the great steppe. Kazakh Khanate. Kazakhstan in the era of modern times. Kazakhstan as part of the Soviet administrative-command system. Declaration of Independence of Kazakhstan. State system, socio-political development, foreign policy and international relations. Methods and techniques of historical description for the analysis of the causes and consequences of events in the history of Kazakhstan.	5	v									
2				History of United States To 1865 (ASU)	<i>The objective</i> of this course is to develop a systemic understanding of the political, socioeconomic, and cultural development of the United States of America from the period of colonization to the end of the Civil War in 1865. <i>Course content:</i> study of the English	6	v									

					colonization of North America, the Revolutionary War, the formation of American statehood and the US Constitution, the country's territorial expansion, the development of the economy and political institutions, the problem of slavery, interregional tensions, and the causes, course, and consequences of the Civil War of 1861–1865. Particular attention is paid to the analysis of historical sources and key events that shaped the development of American society and government.												
3		GED	OC	Philosophy	<i>Purpose:</i> Formation of a holistic understanding of philosophy as a special form of knowledge of the world, its main sections, problems and methods of studying them in the context of future professional activity. Formation of students' philosophical reflection, skills of introspection and moral self-regulation. <i>Content.</i> The emergence of a culture of thinking. The subject and method of philosophy. Fundamentals of philosophical understanding of the world: questions of consciousness, spirit and language. Being. Ontology and metaphysics. Knowledge and creativity. Education, science, engineering and technology. Philosophy of man and the world of values. Ethics. Philosophy of values. The subject of aesthetics as a field of philosophical knowledge. Philosophy	6	v										

					of freedom. Philosophy of art. Society and culture. Philosophy of history. Philosophy of religion. "Mangilik El" and "Modernization of public consciousness" is a new Kazakh philosophy.												
4	Module of Socio-Political Knowledge	GED	OC	Social and Political Studies	<i>The goal</i> is to develop knowledge about socio-political activity and explain socio-political processes and phenomena. <i>Content:</i> Socialization, identity, and deviant behavior: the role of an inclusive approach. Consideration of the socio-ethical values of societies. Understanding the characteristics of social, political, cultural, and psychological institutions in the context of their role in the modernization of Kazakhstani society. Decision-making to resolve conflict situations in society, including in professional circles. Research of political institutions and processes, methods of analysis and interpretation of ideas about politics, power, the state, and civil society. Understanding and applying methods and techniques of sociological and comparative analysis. Understanding the essence and content of the political situation in the modern world. Analysis and classification of the main political institutions.	6	v										
5		GED	OC	Cultural Studies and Psychology	<i>Purpose:</i> the formation of scientific knowledge of history, modern trends, current problems and methods for the development of culture and psychology,	6	v										

					the skills of a systematic analysis of psychological phenomena. <i>Contents:</i> Morphology, language, semiotics, anatomy of culture. Culture of nomads, proto-Turks, Turks. Medieval culture of Central Asia. Kazakh culture at the turn of the XVIII - XIX centuries, XX century. Cultural policy of Kazakhstan. State Program "Cultural Heritage". National consciousness, motivation. Emotions, intellect. The will of man, the psychology of self-regulation. Individual typological features. Values, interests, norms are the spiritual basis. The meaning of life, professional self-determination, health. Communication of the individual and groups. Socio-psychological conflict. Models of behavior in conflict.												
6		GED	EC	Technological, Social, and Sustainable System (ASU)	<i>The objective</i> of this course is to develop students' understanding of the interconnectedness of technological, social, and environmental systems, as well as skills for analyzing and solving complex sustainable development problems at the local, national, and global levels. <i>The course covers</i> the concepts of sustainable development and systems thinking, the interaction of technology, society, and the environment, and the impact of innovation on social and environmental processes. The course addresses issues of resource	6	v	v									

					management, sustainable infrastructure, digital transformation, social responsibility, environmental policy, and project sustainability assessment. Particular attention is paid to interdisciplinary approaches to developing solutions that ensure balanced economic, social, and environmental development.												
7	Socio-ethnic development module	GED	EC	Ecosystem and Law	<i>Purpose:</i> Formation of integrated knowledge in the field of economics, law, anti-corruption culture, ecology and life safety, entrepreneurship, scientific research methods. <i>Contents:</i> Fundamentals of safe interaction between man and nature, productivity of ecosystems and the biosphere. Entrepreneurial activity in conditions of limited resources, increasing the competitiveness of business and the national economy. Regulation of relations in the field of ecology and safety of human life. Knowledge and observance of Kazakh law, obligations and guarantees of subjects, state regulation of public relations to ensure social progress. Application of scientific research methods.			v									
8		GED	EC	Entrepreneurship and Financial Literacy	Purpose: Training skills in entrepreneurial activity organization, in managing personal and family financial resources, which are key to achieving			v									

					financial well-being. Content: Entrepreneurship: essence, contents and conditions of formation. Legal forms of entrepreneurship. Risks in entrepreneurship. Business planning in entrepreneurship. Organization of entrepreneurial transactions. Culture and ethics of entrepreneurship. Financing of entrepreneurial activity. The concept, goals and objectives of financial literacy. Money, settlements, and payments. Personal finance: income, expenses, budget. Taxes and taxation of individuals. Pensions and insurance. Banking services for the population. Bankruptcy of individuals and financial risks. Pyramid scheme and personal financial security.											
9		GED	OC	Kazakh (Russian) language	<i>Purpose:</i> the formation of communicative competence using the Kazakh (Russian) language in the socio-cultural, professional sphere and public life, improving the ability to write academic texts. <i>Content:</i> Levels A1, A2, B1, B2-1, B2-2 (B2, C1 Russian) are presented in the form of cognitive - linguoculturological complexes, consisting of spheres, topics, subtopics and typical situations of communication of the international standard: social and domestic , socio-cultural, educational and professional, modeled forms: oral and written	10	v	v								

					communication, written speech works, listening. Demonstration of understanding of the language material in texts on the educational program, knowledge of terminology and development of critical thinking.												
10		GED	OC	Foreign Language/ (English Composition I) (ASU)	<i>Objective:</i> To develop the fundamental academic writing and critical thinking skills necessary for success in university studies. <i>Content:</i> This course introduces students to the writing process: planning, drafting, revising, and editing. Students write essays in various academic genres, such as narrative, expository, and argumentative writing. Key areas of focus include thesis development, organization, clarity, grammar, and citation (APA/MLA). Students also practice critical reading and analytical work with academic texts. Peer reviews and instructor feedback contribute to skill development. By the end of the course, students will be able to write coherent, persuasive, and well-structured academic essays, tailored to a specific audience and supported by logical arguments and evidence.	6	v	v									
11		GED	OC	Foreign Language/ (English Composition II) (ASU)	Purpose: To introduce students to academic writing, critical thinking, and rhetorical analysis, with a focus on the processes of composition, argumentation, and information literacy. To develop foundational written communication	6	v	v									

					skills necessary for academic and professional success, particularly in the context of computer science and related technical disciplines. To enable students to analyze complex texts, construct logical arguments, and write for a variety of audiences and purposes, including technical and scientific fields. Contents: Introduction to academic writing and rhetoric. The writing process and critical reading. Rhetorical appeals (ethos, pathos, logos). Essay structure and thesis development. Research skills and information literacy. Integrating and citing sources (MLA/APA). Argumentative writing in a STEM context. Review and editing strategies. Technical writing: purpose and audience. Writing project proposals and reports. Visual and multimodal rhetoric. Writing for the digital environment. Advanced editing and proofreading techniques. Portfolio preparation and reflective writing. Submission of the final portfolio and course summary.												
12		OOD	OC	Physical Training	<i>Objective:</i> To develop social and personal competencies and the ability to purposefully use physical education tools and methods to maintain and improve health in preparation for professional activities; to withstand physical exertion, neuropsychic stress, and adverse factors in future work.	8	v										

					<i>Content:</i> Implementation of physical education, fitness, and training programs. A set of general developmental and specialized exercises. Sports (gymnastics, sports and outdoor games, track and field, etc.). Monitoring and self-monitoring during training, safety and self-insurance. Competition judging. Professional and applied physical training tools. Modern health systems: the breathing system according to A. Strelnikova, K. Buteyko, K. Dineika, joint gymnastics according to Bubnovsky.												
13		BD	UC	Communication Across Cultures and Global Engagement	Purpose: Define and explain the basic concepts and theories of intercultural communication. Analyze how cultural norms, values, and worldviews influence communication styles and behavior. Explore the fundamental principles of intercultural communication, emphasizing the role of culture in shaping communication practices, worldviews, values, and identity. Content: Introduction to Intercultural Communication and Globalization. Culture, Communication, and Worldview. Cultural Dimensions (Hofstede, Hall) and Their Impact on Communication. Identity, Language, and Perception in Cross-Cultural Contexts. Nonverbal Communication Across Cultures. Stereotypes, Prejudice, and	6		v									

					Ethnocentrism. Conflict and Negotiation in Intercultural Settings. Midterm Reflection and Group Discussion. Communication in Global Teams and Virtual Environments. Ethics and Social Responsibility in Global Technology Projects. Case Studies: Technology and Cross-Cultural Miscommunication. Cultural Adaptation and Intercultural Competence Development. International Collaboration in STEM Fields. Final Project Preparation: Intercultural Communication Plan..												
14		BD	UC	Public Speaking and Presentations	Purpose: Learn the foundational skills needed for effective public speaking and professional presentations. Prepare computer science students to present complex technical content to a variety of audiences, including stakeholders, developers, and non-specialists. Content: Introduction to Public Speaking and Course Overview. Speech Anxiety and Strategies for Building Confidence. Audience Analysis and Message Design. Speech Structure: Introductions, Bodies, and Conclusions. Research and Supporting Evidence in Technical Contexts. Visual Aids and Slide Design (e.g., PowerPoint, Prezi). Delivery Techniques: Voice, Movement, and Eye Contact. Informative Speech: Technical Topic Presentation. Persuasive Speaking and Argumentation. Team Presentations	6	v	v									

					and Collaborative Communication. Speaking Ethically and Professionally in STEM Fields. Handling Q&A Sessions and Impromptu Speaking. Conference-Style Presentation Preparation. Final Project Rehearsals and Peer Critique.												
15		OOD	OC	Information and communication technologies (in English)	<i>Purpose:</i> formation of the ability to critically evaluate and analyze processes, methods of searching, storing and processing information, methods of collecting and transmitting information through digital technologies. The development of a new "digital" thinking, the acquisition of knowledge and skills in the use of modern information and communication technologies in various activities. <i>Contents:</i> introduction and architecture of computer systems. Software. Os. Human interaction with computers. Database systems. Database management. Networks and telecommunications. Cyber protection. Internet technologies. Cloud and mobile technologies. Multimedia technologies. Smart technologies. Electronic technologies. Electronic business. Electronic control.	5			v	v		v					
16		BD	UC	Introduction to Engineering	<i>Objective:</i> To develop students' understanding of engineering, the main areas of engineering, design principles, and engineering problem solving, as well as to develop teamwork, technical	4			v	v							

					thinking, and professional communication skills. <i>Content:</i> To explore the role of engineering in modern society, engineering design, and the life cycle of technical systems. The course covers the fundamentals of engineering analysis, problem solving methods, design thinking, engineering ethics, safety, and sustainable development. Particular attention is paid to the use of digital technologies, working with technical documentation, and completing practical and team projects aimed at developing and evaluating engineering solutions in various fields of engineering and technology..													
17	Basics of Mathematical Sciences	BD	UC	Digital Design Fundamentals	<i>Purpose:</i> To introduce the principles of digital logic and the basic structures used in designing digital systems. The course focuses on real-world applications in embedded systems, computer architecture, and hardware/software integration. To provide experience with digital logic modeling and prototyping tools using FPGAs. To teach how software interacts with hardware and how computations are physically implemented at the circuit level. <i>Content:</i> Introduction to digital systems, binary/hex math. Number systems and Boolean algebra. Logic gates and combinational circuits. Karnaugh maps and logic minimization.	6			v	v								

					Arithmetic circuits (adders, subtractors, ALUs). Combinational building blocks (decoders, encoders, muxes). Introduction to sequential logic. Counters and shift registers. Finite State Machines (FSMs). HDL introduction (Verilog or VHDL). Modular design with HDL. FPGA architecture and tools (e.g., Xilinx, Quartus). Real-time applications and timing analysis. Final project work. Project presentations and course review.											
18		BD	UC	Discrete Mathematical Structures	Purpose: To introduce fundamental concepts of discrete mathematics that form the theoretical basis of computer science. These include logic and proof methods, set theory, functions and relations, algorithms and complexity, elementary number theory, combinatorics, recursion, and graph theory. Particular attention is paid to the application of these concepts to computing, such as data structures, programming language semantics, database theory, and algorithm design. Content: Introduction to Discrete Mathematics; Logic and Propositional Calculus. Predicate Logic; Quantifiers; Logical Equivalence. Methods of Proof: Direct, Contrapositive, Contradiction, Mathematical Induction. Set Theory: Operations, Power Sets, Cartesian Products. Functions: Injective, Surjective, Bijective; Inverse Functions. Relations: Properties, Equivalence Relations, Partial	6									v	v

				Orders. Algorithms: Definition, Complexity (Big-O), Pseudocode. Recursion and Recurrence Relations. Number Theory: Divisibility, GCD, Prime Numbers, Modular Arithmetic. Applications of Number Theory in Cryptography. Counting Principles: Rule of Sum and Product, Permutations and Combinations. Advanced Counting: Pigeonhole Principle, Inclusion-Exclusion. Graph Theory: Terminology, Representations, Isomorphism. Graph Algorithms: BFS, DFS, Shortest Paths, Spanning Trees. Trees, Binary Trees, Applications in Data Structures and Parsing.															
19		BD	UC	Chemistry and Society (SCIT)	Purpose: Provide a conceptual and practical introduction to chemistry, focusing on its relevance to everyday life and impact on society. Develop interdisciplinary knowledge and demonstrate how computational methods interact with chemical data analysis, environmental modeling, and the design of sustainable systems. Content: Atomic structure, periodic table. Chemical bonding and molecular structure. Chemical reactions and stoichiometry. Energy and thermochemistry. States of matter, gas laws. Solutions, concentrations, and solubility. Acids, bases, and pH. Organic chemistry and biomolecules. Nuclear chemistry and	6											v		v

					radiation. Green chemistry and sustainability. Chemistry of water and air pollution. Renewable and non-renewable energy sources. Materials chemistry: semiconductors, batteries, nanotech. Final project presentations and course review.												
20		BD	UC	Chemistry and Society Laboratory (ASU)	The goal of the "Chemistry and Society Laboratory (ASU)" course is to develop students' understanding of the role of chemistry in modern society, practical skills in conducting chemical experiments, analyzing chemical processes, and assessing their impact on the environment, human health, industry, and sustainable development. Content: This course examines the relationship between chemistry and social processes through laboratory research and the analysis of real-life situations. Students study the fundamentals of chemical safety, the properties of substances and materials, environmental chemistry, water and air quality, and the chemical aspects of energy, nutrition, medicine, and household technologies. Particular attention is paid to experimental work, interpreting research results, environmental issues, and applying chemical knowledge to solving social and technological problems. Students develop skills in scientific thinking, working with	2										v	v

					data, and making informed decisions based on chemical information.												
21		BD	UC	Calculus for Engineers I (ASU)	Purpose: Understand the foundational concepts of limits, continuity, and derivatives. Apply differential calculus to analyze the behavior of functions, especially in physics and engineering contexts. Content: Introduction to Calculus; Real numbers, functions, and graphs. Limits and continuity: concepts, formal definitions, algebraic techniques. The derivative: definition, rules, and geometric interpretation. Differentiation techniques: product, quotient, chain rule. Applications of derivatives: velocity, acceleration, optimization. Curve sketching using first and second derivatives. Implicit differentiation; related rates. Midterm review and exam. Introduction to integration; Riemann sums and definite integrals. Fundamental Theorem of Calculus; indefinite integrals.	6									v		v
22		BD	UC	Calculus for Engineers II (ASU)	Purpose: Strengthen the analytical foundation required for subjects such as algorithms, graphics, modeling, machine learning, and numerical methods. Provide students with analytical skills that are directly applicable to modern computing systems. Content: Review of definite integrals and substitution. Integration by parts; trigonometric integrals. Trigonometric substitution and partial fractions. Improper integrals and	6									v		v

					convergence. Applications: area, volume, arc length. Surface area and center of mass. Parametric equations: curves, velocity, acceleration. Polar coordinates and graphing. Calculus in polar coordinates (area, arc length). Sequences: definitions, limits, monotonicity. Series and convergence tests (Integral, Comparison). Ratio and Root tests; absolute vs conditional convergence. Power series and interval of convergence. Taylor and Maclaurin series; approximations. Final review and project/application module.										
23		BD	UC	Calculus for Engineers III (ASU)	Objective: to teach students to master geometric and analytical concepts in three-dimensional space, perform vector calculations, study multivariable functions, and apply integral calculations in various coordinate systems. In addition, students will learn to effectively use multivariable calculation methods in solving real-life and engineering problems. Content: Perform vector operations in a three-dimensional coordinate system, construct equations of lines and planes; Solve geometric problems using scalar and vector products; Describe curves in space, calculate arc length and curvature; Create a motion model using vector functions and analyze motion in space; Calculate the limit, discontinuity, and partial	6					v		v		

					derivatives of multivariable functions; Use the gradient, directed derivative, and chain rule; Find extrema of multivariable functions and master the method of Lagrange multipliers; Calculate double and triple integrals in rectangular, polar, cylindrical, and spherical coordinates; Analyze vector fields, calculate linear and surface integrals; Understand integral theorems using Green's, Stokes', and divergence theorems; Use theoretical knowledge to solve real-world applied and engineering problems.												
24		BD	EC	Physics I: Mechanics (ASU)	Purpose: Review the fundamental concepts of mechanics required for scientific and engineering disciplines, including Newtonian mechanics, kinematics, energy, momentum, rotational motion, gravity, and harmonic vibrations. Introduce analytical and methodological approaches to solving problems that underlie many areas of computing, such as simulation, graphics, robotics, and algorithmic modeling. Content: Introduction to mechanics, vectors, units. 1D kinematics, velocity, acceleration. 2D kinematics, projectile motion. Newton's laws of motion. Applications of Newton's laws (friction, drag). Circular motion and centripetal force. Work and kinetic energy. Potential energy, energy conservation. Linear momentum, collisions. Center of mass,	6										v	v

					systems of particles. Rotational kinematics and dynamics. Angular momentum, conservation principles. Gravitation, Kepler's laws Simple harmonic motion. Review and preparation for final assessment.												
25		BD	EC	University Physics Laboratory I (ASU)	Goal: To develop students' practical skills in the experimental study of mechanical phenomena, develop their ability to conduct physical measurements, analyze experimental data, and apply the laws of mechanics to explain and solve physical and engineering problems. Content: This course involves laboratory work on the main areas of classical mechanics. Students study the kinematics and dynamics of translational and rotational motion, Newton's laws of motion, forces and their interactions, work and energy, momentum, conservation laws, oscillatory processes, and the mechanical properties of materials. Students master methods of measuring physical quantities, working with modern laboratory equipment and digital measurement systems, processing experimental data, estimating errors, and preparing scientific reports. Particular attention is paid to developing research skills, critical thinking, and the application of experimental methods in	2										v	v

					the natural sciences and engineering.												
26		BD	EC	University Physics II: Electricity and Magnetism (ASU)	The goal is to develop students' fundamental knowledge of the laws of electrical and magnetic phenomena, skills in the mathematical analysis of physical processes, and the application of the laws of electrodynamics to solve theoretical and practical problems in science and engineering. Content. This course covers the main areas of electricity and magnetism. Subjects include electric charges and fields, Coulomb's law, electric potential, flux and Gauss's law, capacitance and dielectrics, electric current and resistance, and direct and alternating current (DC) electrical circuits. Magnetic fields, the Lorentz force, Ampere's law, electromagnetic induction, Faraday's law, inductance, electromagnetic oscillations, and the fundamentals of Maxwell's equations are discussed. Particular attention is paid to solving physical problems, mathematical modeling of electromagnetic processes, and the application of acquired knowledge in engineering, technology, and the natural sciences.	6										v	v
27		BD	EC	Physics Laboratory II (SCIT)	The purpose is to develop practical skills in the experimental study of electrical, magnetic and optical phenomena, to develop the ability to carry out physical measurements, analyze experimental data	2										v	v

					and apply scientific research methods to study physical processes. Contents. The discipline involves performing laboratory work in the sections of electricity, magnetism, electromagnetic induction and optics. The characteristics of electric and magnetic fields, the properties of electrical circuits, the phenomena of electromagnetic induction, the propagation of light, interference, diffraction and polarization are studied. Students master methods for experimental research of physical phenomena, working with modern laboratory equipment and digital measuring systems, processing measurement results, assessing errors and preparing scientific reports. Particular attention is paid to the development of research competencies, critical thinking and skills in the application of experimental methods in natural sciences and engineering.											
28		BD	UC	Computing Ethics	Purpose: Explore key ethical theories, professional standards, and practical examples to critically analyze how computer technology decisions affect individuals, organizations, and global communities. Content: Introduction to Ethics in Computing. Ethical Theories and Moral Reasoning. Professional Ethics and Codes of Conduct. Privacy,	2			v	v						

					Data Collection, and Consent. Intellectual Property and Open Source Ethics. Cybersecurity and Ethical Hacking. Bias and Fairness in Algorithms. Social Media, Misinformation, and Ethics. AI, Automation, and Responsibility. Accessibility, Inclusion, and the Digital Divide. Whistleblowing and Organizational Ethics. Legal and Regulatory Frameworks in Tech. Global Impacts and Environmental Considerations. Case Study Discussions and Ethical Debates. Final Reflections and Course Wrap-Up											
29		BD	UC	Probability and Statistics for Engineering Problem Solving	Purpose: Introduce students to probability and statistics, with a focus on engineering problem solving and data-driven decision making. Teach students the fundamental concepts of probability theory, random variables, distributions, estimation, hypothesis testing, regression, and statistical quality control. Emphasize computational applications, modeling, data modeling, and the use of statistical software tools. Content: Introduction to Probability and Statistics for Engineers. Descriptive Statistics and Data Visualization. Basic Probability Concepts and Rules. Discrete Random Variables and Distributions (e.g., Binomial, Poisson). Continuous Distributions (e.g., Normal, Exponential). Joint Probability	6									v	v

					Distributions and Independence. Expectation, Variance, and Covariance. Central Limit Theorem and Sampling Distributions. Confidence Intervals for Means, Proportions, and Variances. Hypothesis Testing: z-tests, t-tests, chi-square tests. Simple and Multiple Linear Regression. Analysis of Variance (ANOVA). Statistical Quality Control: Control Charts and Process Capability. Engineering Case Studies Using Statistical Modeling.												
30	Fundamentals of programming and databases	BD	UC	Applied Linear Algebra	Purpose: To introduce the practical and theoretical foundations of linear algebra, with an emphasis on applications related to computer science and engineering. To give students an understanding of how linear algebra underlies fields such as computer graphics, data science, machine learning, cryptography, and network theory. Content: Introduction to Linear Systems and Row Reduction. Matrix Algebra and Inverses. Vector Spaces, Subspaces, and Linear Independence. Basis and Dimension; Rank and Nullity. Linear Transformations and Matrix Representations. Matrix Factorizations: LU Decomposition. Determinants and Their Properties. Eigenvalues, Eigenvectors, and Diagonalization. Applications of Eigenvectors (Markov Chains, Dynamical Systems). Orthogonality and Inner Product Spaces.										v		v

					Gram-Schmidt Process and QR Factorization. Least Squares Problems and Approximation Methods. Singular Value Decomposition (SVD). Computational Linear Algebra in Python (NumPy, SciPy)												
31		BD	UC	Data Structures and Algorithms	Define data structures such as heaps, balanced trees, and hash tables. Construct and clearly define a data structure useful for modeling a given problem. Combine fundamental data structures and algorithmic techniques to construct a comprehensive algorithmic solution to a given problem. Contents: Fundamental data structures, including lists, stacks, queues, trees, hash tables, and heaps. Algorithms for sorting, searching, graph traversal, and tree processing are covered. Particular attention is paid to the efficiency of algorithms and their application to solving practical problems. Students learn methods of complexity analysis, the construction of abstract data types, and the implementation of algorithms using the programming languages of their choice.	6			v		v						
32		PD	UC	Distributed Software Development	Purpose: Introduce the principles, methodologies, and tools used in the design and implementation of distributed software systems. Learn to design and develop software that runs on multiple computers connected by a network, addressing issues such as concurrency,	6			v	v							

					data consistency, fault tolerance, scalability, and security. Content: Introduction to Distributed Systems and Architectures. Inter-Process Communication and Remote Invocation (RPC, gRPC). RESTful Web Services and API Design. Data Serialization: JSON, Protocol Buffers, and Message Formats. Concurrency, Threads, and Synchronization in Distributed Systems. Middleware and Message Queues (e.g., RabbitMQ, Kafka). Fault Tolerance, Replication, and Consensus Algorithms. Midterm Project Review and Architecture Critique. Distributed Databases and CAP Theorem. Security in Distributed Software: Authentication, Authorization, and Encryption. Microservices Architecture and Containerization with Docker. Cloud Platforms and Infrastructure as a Service (AWS, Azure, GCP). DevOps, CI/CD Pipelines, and Distributed Deployment. Scalability, Load Balancing, and Monitoring Tools.												
33		BD	UC	Introduction to Programming Languages	Purpose: To introduce programming language paradigms, syntax, semantics, and implementation strategy. The course emphasizes understanding the basic principles of modern programming languages and explores procedural, object-oriented, functional, and logical languages. Understand the principles of	6			v	v							

					interpreters, compilers, and translation systems. Develop the ability to effectively learn new languages based on basic principles. Content: Introduction to Programming Languages and Paradigms. Formal Syntax and Semantics: BNF, EBNF, Parse Trees. Variable Binding, Scope, and Environments. Data Types, Type Checking, and Type Systems. Control Structures and Flow Control. Procedures, Parameters, and Recursion. Memory Management: Stack vs Heap, Static vs Dynamic Allocation. Midterm Review and Exam Introduction to Object-Oriented Languages. Functional Programming Concepts (LISP/Scheme)											
34		BD	UC	Object-Oriented Programming and Data Structures (QTRS)	Purpose: Learn students to design, implement, and analyze modular, reusable, and maintainable software using advanced Java features, including inheritance, polymorphism, interfaces, and exception handling. To prepare Computer Science majors for upper-division coursework in algorithms, software design, and systems development. Content: Review of Java basics, static vs dynamic methods, arrays. Introduction to OOP: classes, objects, encapsulation. Inheritance and polymorphism. Abstract classes and interfaces. Exception handling and I/O streams. Recursion and recursive problem-solving. Lists: singly and doubly	6					v		v			

					linked lists. Stacks and queues: ADTs, applications. Trees: binary trees, tree traversal algorithms Binary search trees and efficiency analysis. Hashing and hash tables: implementation and collision handling. Sorting algorithms and time complexity. Introduction to graphs and adjacency structures Group project development and peer code review. Final presentations, code walkthroughs, and comprehensive review.												
35		BD	UC	Principles of Programming	Purpose: Apply core programming constructs such as variables, conditionals, loops, and functions in solving computational problems. Design, implement, and test object-oriented programs using classes and objects. Use arrays and lists to store, process, and manipulate data efficiently. Trace and debug code systematically using development tools and techniques. Content: Introduction to Programming and Development Environments (e.g., Java, Python) to Variables, Data Types, Input/Output, and Expressions. Control Flow I: Conditionals (if, else) and Boolean Logic. Control Flow II: Loops (for, while) and Nested Structures. Methods and Functions: Parameters, Return Values, Scope. Introduction to Object-Oriented Programming: Classes and Objects. Constructors, Encapsulation, and the this Keyword.	6			v					v		v	

					Arrays and Array Processing.												
36		BD	UC	Introduction to Software Engineering	Purpose: Introduce fundamental software engineering concepts and techniques. Students gain hands-on experience with the software development life cycle (SDLC), including requirements analysis, system design, implementation, testing, deployment, and maintenance. Content: Introduction to Software Engineering & SDLC. Software Process Models: Agile, Scrum, Waterfall. Requirements Gathering and Specification. System Modeling: UML, Use Cases, and Diagrams. Software Architecture and Design Principles. Design Patterns and Component-Based Design. Midterm Project Planning and Milestone Review. Implementation Strategies and Version Control (e.g., Git). Software Testing: Unit, Integration, System Testing. Test-Driven Development and Continuous Integration. Software Quality Assurance and Metrics. Software Maintenance, Refactoring, and Evolution. Project Management Tools and Team Collaboration. Final Project Completion and Code Review. Final Presentations and Course Wrap-Up.	6							v			v	
37		BD	UC	Principles of Programming Language	Purpose: To study the fundamental concepts underlying the design, implementation, and evaluation of programming languages. To enable students to critically evaluate and select	6				v					v		v

					languages for various application domains, and to understand how language features affect software design and development. Content: Introduction to Programming Languages; History and Evolution. Language Design Criteria; Programming Paradigms Overview. Syntax and Semantics; BNF, Parse Trees, Operational Semantics. Lexical Analysis; Scoping Rules and Environments. Data Types and Type Systems: Static vs. Dynamic Typing. Control Structures: Sequencing, Selection, Iteration. Subprograms and Parameter Passing Mechanisms. Memory Management: Stack, Heap, Garbage Collection. Functional Programming: Lambda Calculus, Higher-Order Functions. Functional Programming in Scheme. Logic Programming and Prolog. Object-Oriented Programming Concepts and Examples. Concurrency and Parallelism in Language Design. Exception Handling and Event-Driven Programming. Language Evaluation and Comparative Analysis; Final Review.											
38		BD	UC	Computer Organization and Assembly Language Programming	Purpose: An introduction to the fundamental principles of computing and the intricacies of assembly language programming. Learn computer science (CS), gaining a deep understanding of the underlying hardware architecture that supports software execution. Contents:	6					v		v			

					Explore the structure and function of the major components of a computer, including the central processing unit (CPU), memory systems, input/output (I/O) devices, and instruction set architecture. Through hands-on assembly language programming (often using a modern architecture such as ARM or RISC-V as a prime example), students gain invaluable experience with low-level programming, memory management, and hardware/software interactions. This course serves as an important bridge between the theoretical foundations of computer science and the practical realities of hardware operation, preparing students for advanced study in areas such as operating systems, computer architecture, and embedded systems.											
39		BD	UC	Introduction to Theoretical Computer Science	Purpose: This course provides an introduction to theoretical concepts in computer science. The course focuses on the study of abstract computing devices without being tied to a particular programming language and/or computing platform. Contents: A regular language that models computing machines with finite fixed memory, and a class of regular languages used for pattern-matching languages. Context-free languages that facilitate declarative descriptions of the syntax of a language.	6			v	v						

					Computability theory, which considers intrinsic limits on what a computer can solve (decidability). Complexity theory, which helps us measure the time and memory used to solve a problem.											
40	Computer Science and Methodological basics of teaching Computer Science	BD	EC	Foundations of Machine Learning	Purpose: To introduce the theoretical foundations and practical applications of machine learning. To prepare students to apply machine learning methods in various fields and to further study artificial intelligence and data science. Content: Introduction to Machine Learning: Definitions and Applications. Linear Algebra and Probability Refresher. Supervised Learning and Generalization Theory. Linear Regression and Logistic Regression. Decision Trees and Ensemble Methods (Bagging, Boosting, Random Forests). Support Vector Machines and Kernel Methods. Neural Networks: Basics and Feedforward Architectures. Unsupervised Learning: Clustering and Dimensionality Reduction. k-Means, Hierarchical Clustering, PCA, and t-SNE. Model Evaluation, Cross-Validation, and Hyperparameter Tuning. Bias, Variance, and Regularization Techniques (L1, L2). Introduction to Deep Learning and Modern Architectures. Ethical Aspects of Machine Learning and Interpretability.	6								v		v
41		BD	UC	Information Assurance	Purpose: A comprehensive introduction to the principles and practices of	6			v	v						

					information security and cybersecurity. The course covers the fundamental concepts needed to protect computer systems and networks from threats and vulnerabilities. Students study threat modeling, risk assessment, cryptography, secure software design, access control mechanisms, and policy development. Content: Introduction to Information Assurance and Cybersecurity. Threats, Vulnerabilities, and Risk Management. Security Models and the CIA Triad. Cryptography Fundamentals: Symmetric and Asymmetric Encryption. Hash Functions, Digital Signatures, and Certificates. Secure Software Development and Secure Coding Practices. Midterm Review and Applied Lab: Threat Modeling. Access Control Models and Authentication Mechanisms. Network Security: Firewalls, VPNs, and IDS/IPS. Operating System and Database Security. Cybersecurity Policies, Standards (NIST, ISO), and Compliance. Legal and Ethical Issues in Cybersecurity. Incident Response, Forensics, and Disaster Recovery. Security Auditing and Risk Assessment Workshop. Final Projects, Case Studies, and Course Wrap-Up.												
42		BD	UC	Operating	Purpose: Introduce the fundamental concepts, design principles, and implementation techniques of modern	6			v	v							

				systems	operating systems. Explore the major components and functions of an operating system, including process and thread management, memory allocation, scheduling algorithms, file systems, I/O systems, and system security. Content: Introduction to Operating Systems; OS History and Architecture. Processes and Threads; Process States and Context Switching. CPU Scheduling Algorithms: FCFS, SJF, Round Robin, Priority. Concurrency and Synchronization; Critical Sections and Semaphores. Deadlocks: Detection, Prevention, Avoidance. Inter-Process Communication (IPC); Message Passing and Shared Memory. Memory Management Basics; Contiguous Allocation and Paging. Virtual Memory; Page Replacement Algorithms. File Systems: Structure, Allocation, Directory Management. File Access Methods; File and Disk I/O Systems. Input/Output Systems and Device Management. Security and Protection: Access Control, Authentication, Malware. Virtual Machines and Containers. Case Study: Linux Kernel Internals.											
43		PD	UC	Computer Networks	Purpose: Introduce students to the design, implementation, and operation of computer networks. Review the principles, architecture, protocols, and technologies that enable interaction	6					v	v				

					between computing systems, including multilayer network models (OSI and TCP/IP), error detection and correction, routing and switching, congestion control, network security, and wireless networks. Content: Introduction to Computer Networks and Internet Architecture. Network Models: OSI and TCP/IP. Application Layer Protocols: HTTP, FTP, DNS. Transport Layer: TCP and UDP, Congestion and Flow Control. Network Layer: IP, Routing Algorithms, IPv4/IPv6. Data Link Layer: Ethernet, ARP, Switching. Error Detection, MAC Protocols, and Wireless Networks. Network Addressing, NAT, and DHCP. Socket Programming and Client-Server Communication. Network Performance, QoS, and Traffic Analysis. Firewalls, VPNs, and Secure Communications. Wireless, Mobile, and Sensor Networks. Emerging Trends: SDN, IoT, and Cloud Networking.											
44		PD	UC	Foundations of Data Visualization	Purpose: To introduce students to the theoretical and practical foundations of data visualization. To teach principles of visual perception, design, and interaction to effectively communicate complex data. Students learn to design, implement, and evaluate visual representations of data sets in a variety of domains using modern tools and libraries. Content: Introduction to Data	6			v							

					Visualization and Its Role in Computer Science. Perception, Cognition, and Design Principles. Data Types and Visual Encodings. Visualization Tools and Frameworks (e.g., D3.js, Plotly, Tableau). Color Theory, Typography, and Layout Design. Data Transformation and Preprocessing for Visualization. Visualization of Temporal and Spatial Data. Interactive Visualizations and User Interfaces. Dashboard Design and Real-Time Visualization. Storytelling with Data and Presentation Techniques. Evaluating and Critiquing Visualizations. Accessibility and Ethics in Visualization.											
45		PD	UC	Introduction to Human-Computer Interaction	Purpose: The course aims to develop students' ability to design, prototype, and evaluate user-centered interfaces by applying principles of usability, cognitive modeling, accessibility, and human-computer interaction in practical computing contexts. Content: Introduction to HCI and usability principles . Human capabilities, cognitive models, and user behavior. User-centered design process and requirement gathering. Prototyping techniques and interaction styles. Interface design guidelines and heuristic evaluation. Usability testing methods and data analysis. Accessibility and universal design. Ethical considerations in HCI. Final project presentations and interface	6			v	v						

					evaluation.												
46		PD	UC	Introduction to Artificial Intelligence	Purpose: The goal of this course is to provide students with foundational knowledge of artificial intelligence, including search, reasoning, learning, and planning, with emphasis on practical applications and ethical considerations. . Content: Introduction to AI: History, Definitions, and Applications. Intelligent Agents and Environments. Problem Solving and Uninformed Search. Heuristic Search and A* Algorithm. Constraint Satisfaction Problems. Game Playing and Adversarial Search. Knowledge Representation with Logic. Logical Inference and Reasoning. Planning and Decision Making. Introduction to Machine Learning. Supervised and Unsupervised Learning. Neural Networks and Deep Learning. Natural Language Processing. Robotics, Perception, and Vision. Ethical Implications and Future of AI	6					v	v					
47		PD	UC	Computer Systems Security (ASU)	Purpose: To develop students' knowledge and practical skills in ensuring computer system security, protecting data and information resources, and understanding modern threats and methods for countering cyberattacks. Content: Study of the fundamental principles of information security, threat models, and computer system vulnerabilities. Authentication and												

					authorization mechanisms, cryptographic data protection methods, and the security of operating systems, networks, and web applications are covered. Particular attention is paid to risk management, attack detection and prevention, personal data protection, secure software development, and the legal and ethical aspects of cybersecurity. This course includes practical assignments on analyzing and ensuring the security of computer systems.											
48		PD	UC	Introduction to Animation (ASU)	<i>Purpose:</i> To develop students' fundamental knowledge and practical skills in animation, creative thinking, artistic perception, and the ability to create animated projects using modern digital technologies. <i>Content:</i> Study of the history and principles of animation, the fundamentals of visual storytelling, composition, movement, and character design. The course examines traditional and digital methods of creating 2D and 3D animation, as well as the stages of animation project production, including concept development, storyboarding, modeling, animation, editing, and visual effects. Particular attention is paid to the use of specialized software, the creation of original animated works, and an analysis of current trends in the animation and digital media industries.	6				v	v					

49		BD	UC	Industrial Practice	<i>Purpose:</i> To develop students' skills in practically applying the theoretical knowledge acquired at the university (programming, networking, database management, and information systems) within a real-world production environment—specifically in specialized IT companies, digitalization departments of enterprises, or educational organizations. To enhance professional competencies in an actual workplace and adapt future specialists to the labor market. <i>Content:</i> During the industrial internship, the student studies the operation of the enterprise's information systems. Acting as an IT specialist (or an Informatics teacher/engineer), they perform the following tasks: installing software products, configuring computer networks, managing databases, or preparing digital learning materials. The student also participates in solving specific production tasks or project assignments for the organization. Based on the completed work, an internship logbook is maintained, and a detailed internship report is prepared.	4			v	v							v
50		PD	UC	Computer Science Capstone Project I	<i>Purpose:</i> to apply knowledge in a software development team project: identifying problems, collecting requirements, planning, communication, ethics and accounting under the guidance	6			v	v							

					of mentors. Content: The course covers team building, topic selection, and project idea development. Students conduct interviews, collect requirements, create functional specifications, and design architecture. Flexible methodologies, technology and risk assessment, and iteration planning are being studied. Interface layouts, prototyping, and preparation of a testing strategy are performed. Attention is paid to documentation and standards of technical writing. The course ends with an analysis and presentation of the project, including an expert assessment and presentation of the implementation plan.												
51		PD	UC	Computer Science Capstone Project II	Purpose: to apply knowledge in a software development team project: identifying problems, collecting requirements, planning, communication, ethics and accounting under the guidance of mentors. Content: The course covers team building, topic selection, and project idea development. Students conduct interviews, collect requirements, create functional specifications, and design architecture. Flexible methodologies, technology and risk assessment, and iteration planning are being studied. Interface layouts, prototyping, and preparation of a testing strategy are performed. Attention is paid	6			v	v							

					to documentation and standards of technical writing. The course ends with an analysis and presentation of the project, including an expert assessment and presentation of the implementation plan.													
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

5. Summary table reflecting the volume of disbursed loans by EP modules

Course of training	semester	Amount of the mastered modules	Amount of the studied disciplines			Amount of KZ credits						Total in hours	Total KZ credits	Amount	
			Compulsory component	University component	Optional component	Theoretical training	Physical education	Training practice	Production practice	Pre-diploma practice	Final attestation			exam	differential credit
1	1	3	2	3	1	33						990	33	6	-
	2	2	3	5	-	37	4					1230	41	5	3
2	3	3	2	5	-	32	4					1080	36	5	2
	4	3	3	4	-	36						1080	36	5	2
3	5	3	1	4	-	32			4			1080	36	6	1
	6	2		5	-	36						1080	36	5	1
4	7	1		4	-	30						900	30	5	
	8	2		4	-	18				6	6	900	30	5	
Итого		7	11	34	1	254	8	-	4	6	6	8340	278	42	9

6. Strategies, teaching methods and artificial intelligence, monitoring and assessment

Learning strategies	Student-centered learning: The student is the center of teaching/learning and an active participant in the learning and decision-making process. Practice-oriented training: orientation to the development of practical skills.
Teaching methods	Conducting lectures, seminars, various types of practices with: • the use of innovative technologies; • problem-based learning; • case study; • work in a group and creative groups; • discussions and dialogues, intellectual games, olympiads, quizzes; • reflection methods, projects, benchmarking; • Bloom's taxonomies; • presentations; • * rational and creative use of information sources: • * multimedia training programs; • * electronic textbooks; • * digital resources. • * machine learning methods Organization of independent work of students, individual consultations.
Monitoring and evaluation of the achievability of learning outcomes	Current control on each topic of the discipline, control of knowledge in classroom and extracurricular classes (according to syllabus). Assessment forms: • survey in the classroom; • testing on the topics of the academic discipline; • control works; • protection of independent creative works; • discussions; • trainings; • colloquiums; • essays, etc. Boundary control at least twice during one academic period within the framework of one academic discipline. Intermediate certification is carried out in accordance with the working curriculum, academic calendar. Forms of conducting: • exam in the form of testing; • oral examination; • written exam; • combined exam; • project defense; • protection of practice reports. Final state certification.

7. Educational and resource support for EP

Information Resource Center	There are 6 subscriptions, 16 reading rooms, 2 electronic resource centers (ERC) in the structure of the EIC. The network infrastructure of the EIC is based on 180 computers with Internet access, 110 automated work places, 6 interactive whiteboards, 2 video doubles, 1 video conferencing system, 3 A-4, 3 format scanners. EIC software - AIBS "IRBIS-64" under MS Windows (basic set of 6 modules), stand-alone server for uninterrupted operation in the IRBIS system. The library fund is reflected in the electronic catalog available to users on the site http://lib.ukgu.kz on-line 24 hours 7 days a week. Thematic databases of their own generation have been created: "Almamater", "Proceedings of SKSU scientists", "Electronic archive". Online access from any device in 24/7 mode via an external link http://articles.ukgu.kz/ru/pps. Working with catalogs in electronic form. EC consists of 9 databases: "Books", "Articles", "Periodicals", "Proceedings of the teaching staff of SKSU", "Rare Books", "Electronic Fund", "SKGU in Print", "Readers", "SKR". The EIC provides its users with 3 options for accessing its own electronic information resources: from the "Electronic Catalog" terminals in the catalog hall and in the EIC subdivisions; through the information network of the university for faculties and departments; remotely on the library website http://lib.ukgu.kz/. Open access to international and republican resources: "SpringerLink", "Polpred", "Web of Science", "EBSCO", "Epigraph", to electronic versions of scientific journals in the public domain, "Zan", "RMEB", "Adebiet", Digital library "Aknurpress", "Smart-kitap", "Kitap.kz", etc. For people with special needs and disabilities, the library website has been adapted to the work of visually impaired users.
Material and technical base	The material and technical base of the Department of Informatics includes the following classrooms and computer classes for undergraduate students: - there are 3 computer classes for laboratory work, one of them with an interactive whiteboard; - lecture halls; - STEM center. <i>Practice bases for students</i> 1. Gymnasium school No. 26 named after Zhambyl, Shymkent 2. SMCE "Higher College of New Technologies" named after Manap Utebayev" 3. Water Resources-Marketing LLP 4. KazTilDamu LLP 5. South Kazakhstan College of Humanities and Economics 6. M. Auezov SKU, laboratory "Mechatronics and Robotics" 7. "Alem" Printing House

APPROVAL SHEET

according to Education Program «6B06110 – Computer science»

Director of the Department
of Academic Affairs and
Quality of the Educational
Process



A. Naukenova

Director of the DAsC



U. Nazarbek

REVIEW

on the educational program
6B06110 - "Computer science",

developed in M. Auezov SKU, Shymkent

1. Brief description of the enterprise and its business profile

RSE M. Auezov South Kazakhstan University is a leading multidisciplinary university in the Turkestan region. In the structure of the university there is a Natural Science and Pedagogical Higher School, on the basis of which the proposed EP is supposed to be implemented. The department "Computer science" is determined responsible for the implementation of EP.

2. The relevance and demand for EP

The training of specialists in the educational program 6B06110- " Computer science " is very relevant in the light of the further development of the field of information and communication technologies in the framework of the program "Digital Kazakhstan". Its focus on meeting current and future needs for highly qualified specialists in information technology will undoubtedly contribute to the development of the economy due to the wide use of modern scientific and technological progress in the field of modeling various processes and the use of information technologies, informatization and automation of production management and business functions.

3. Learning outcomes and competencies, their relationship with the demands of the labor market

The results of training and competence laid down in EP, the provided theoretical knowledge, practical skills and professional skills fully comply with modern qualification requirements for bachelor qualifications specialists.

4. Availability of components that develop practical skills

Academic disciplines of educational program of basic and specialized training provide the formation of the necessary practical skills of a specialist with fundamental knowledge in mathematics, possessing computer methods of collecting, storing and processing information used in his professional activities, able to assess the perspective of the methods used to solve tasks, competitive in the domestic and international labor markets.

5. The content of the educational program (modules, disciplines)

The proposed educational program contains all the necessary elements for the effective organization of the educational process - it regulates the objectives, expected results, content, conditions and technologies for the implementation of the educational process, assessment of the quality of training a specialist with a bachelor's degree. Includes curriculum, work programs of training courses, modules and disciplines, related materials: practical training programs, academic calendar, educational and methodical complexes of disciplines.

The content of the curriculum is fully consistent with the focus of training, thought out and competently staffed with content. The disciplines included in the plan cover the whole range of topical issues and problems according to the profile of training, are fully capable of forming the necessary specialized knowledge, skills and abilities in the field of information technologies.

The distribution of disciplines by study periods is rationally and logically verified. There are all kinds of educational activities for the preparation of highly qualified specialists possessing the skills of research work - theoretical training, work experience, writing and defense of the thesis. The planned volume and time resource for academic disciplines and types of training meet the qualification requirements for the level of graduates.

In accordance with the credit technology of education, the curriculum includes mandatory academic disciplines, as well as disciplines of the university component and an optional component. Compulsory disciplines provide the formation of general and professional competencies. The disciplines of the university component and the component of choice expand and deepen the training of students, contribute to obtaining additional competencies, knowledge and skills necessary to ensure the graduate's competitiveness with the requirements of the labor market.

6. The quality of filling information about the disciplines

The composition of educational modules covers all relevant areas of training specialists in the field of information technology. The content of the table "Information about disciplines" of the educational program includes the following information: module name, cycle, type of discipline, name of the discipline and its brief description, number of credits, codes of learning outcomes, and also correspond to the adopted competence model of the graduate.

7. Conclusion on the EP

Based on the above, I consider it possible to assert that the goals and content of the presented educational program correspond to the modern qualification requirements of training bachelors specializing in information technology in the educational program 6B06110-“Computer Science”

Head of the Department of
"Technique and Information Technologies"
of the Central Asian Innovation University,
Cand. Tech. Sc., docent

E.Zh. Tenizbayev

Expert conclusion

on the educational program
6B06110 - "Computer Science"

1. The relevance of the EP

The development of information and telecommunication technologies is impossible without appropriate staffing. The relevance of the educational program is due to the need to prepare bachelor-informatics for the southern region and neighboring countries. This EP corresponds to the updated content of secondary education in Kazakhstan, i.e. is aimed at successful student learning and is based on expected results, which are determined by educational areas and reflect the student's ability to find and apply knowledge to solve practical problems.

2. Compliance of EP with formulated objectives, consistent with the mission of the university, the needs of employers and students

The educational program 6B06110 - "Computer Science" formulates the concept of the educational program, the goals and objectives of training, the requirements for the organization of the educational process and the applicants, the learning outcomes of the EP, and also describes the qualification characteristics of the graduate of the educational program, its key and professional competencies, information about disciplines. The list of academic disciplines and their content meets the current qualification requirements for specialists in the areas of information technology and computer science.

The selection of academic disciplines, the requirements laid down in relation to the formed knowledge, practical skills and professional competencies are fully consistent with the mission of the university "Forming the country's intellectual elite through generating new knowledge and transforming the university into a entrepreneurial university", meet the needs of employers and students.

3. Compliance with the National Framework of Qualifications of the Republic of Kazakhstan

The objectives and content of the EP correspond to level 6 of the National Qualifications Framework of the Republic of Kazakhstan.

4. Reflection in the OP of learning outcomes and competencies based on Dublin descriptors laid down in professional standards / industry framework

The OP is harmonized with the Dublin descriptors, the 1st cycle of the Qualifications Framework for the European Higher Education Area (A Framework for the European Higher Education Area), and also the 6th level of the European Qualifications Framework for Lifelong Learning.

5. Compliance with the classification of training areas with higher education

The educational program corresponds to the direction 6B061-ICT of the classifier areas of training staff with higher education.

6. The structure and content of the EP, the application of the modular principle of their construction

In accordance with the credit technology of education in the EP, a modular construction principle is laid. The curriculum includes disciplines of the university component and disciplines of the component of choice. The disciplines of the university component ensure the formation of general and professional competencies. Elective component disciplines broaden and deepen the training of students, contribute to obtaining additional competencies, knowledge and skills necessary to ensure the graduates' competitiveness with the requirements of the labor market.

The composition of educational modules covers all relevant areas of training highly qualified specialists in the field of information technologies that are competitive in the domestic and international labor markets.

7. The presence in the OP of components to prepare for professional activities, developing key competencies, intellectual and academic skills, reflecting the changing requirements of society, including the implementation of the presidential program for mastering three languages: Kazakh, Russian and English.

The content of the EP corresponds to the focus of training, thought out and well-equipped with meaningful content. The included academic disciplines cover the whole range of topical issues and problems and problems according to the profile of training, are fully able to form the necessary specialized knowledge, skills and abilities of information technologies, suggest mastering Kazakh, Russian and English languages.

8. The logical sequence of disciplines and the reflection of the basic requirements in the curricula and training programs

The distribution of disciplines by study periods is rationally and logically verified. There are all kinds of educational activities for the preparation of highly qualified specialists possessing the skills of research work - theoretical training, work experience, writing and defense of the diploma work. The planned volume and time resource for academic disciplines and types of training meet the qualification requirements for the level of graduates.

Structural parts of the educational program are interconnected, successive, aimed at achieving the planned comprehensive result and are disclosed deeply and in full.

The methodological equipment of the educational program contributes to the successful solution of tasks for the key directions of training, education and development of students.

9. Reflection in the EP of the system of accounting of the academic load of students and teachers in loans, its compliance with the parameters of the credit system of education.

The content of the EP fully complies with the requirements of the credit technology of education, including in the part of accounting for the academic load of teachers and students in credits. Provides 244 credit.

10. Presence in programs of industrial practice for fixing the theoretical material expressed in the academic load in credits

The educational program provides for conducting the following types of practices: study practice in the amount of 1 credits, production practice I in the amount of 3 credit, production practice II in the amount of 3 credits, teaching practice in the amount of 4 credits and pre-diploma practice in the amount of 8 credits.

11. Qualifications obtained as a result of the mastering of EP

For the mastering of the EP, a graduate is awarded a bachelor's degree in the field of Computer Science in the educational program 6B06110 - "Computer Science".

12. Recommendations

In accordance with the above, it is possible to assert that the goals and content of the EP correspond to the modern requirements for the training of bachelors specializing in information and communication technologies.

It is recommended to accept the presented educational program for implementation.

Chairman of the Expert Committee,
Dean of the Graduate School of Natural Sciences and Pedagogy
of M. Auezov South Kazakhstan University

Madiyarov N.K.,

Members of the Expert Committee:

Isayev E.B.

Abdyrayimov R.