ASIIN Accreditation Report

Bachelor's and Master's Degree Programmes
Computer Science
Computer Science and Software
Information Systems
Mathematical and Computer Modeling

Provided by
al-Farabi Kazakh National University

Version: 01.07.2016

Table of Content

A About the Accreditation Process

Title of the degree Programme	Labels applied for [1]	Previous ASIIN accreditation	Involved Technical Committees (TC)[2]
Ba Computer Science	ASIIN, Euro-Inf® Label	n/a	04
Ma Computer Science	ASIIN, Euro-Inf® Label	n/a	04
Ba Computer Science and Software	ASIIN, Euro-Inf® Label	n/a	04
Ma Computer Science and Software	ASIIN, Euro-Inf® Label	n/a	04
Ba Information Systems	ASIIN, Euro-Inf® Label	n/a	04, 07
Ma Information Systems	ASIIN, Euro-Inf® Label	n/a	04, 07
Ba Mathematical and Computer Modeling	ASIIN, Euro-Inf® Label	n/a	04, 12
Ma Mathematical and Computer Modeling	ASIIN, Euro-Inf® Label	n/a	04, 12
Date of the contract: 25th of December 2012 **Submission of the final version of the self-assessment report:** 17th of February 2014 **Date of the onsite visit:** 16th - 17th of July 2014 **at:** al-Farabi Kazakh National University, Almaty, Kazakhstan			
Peer panel:			

[1] ASIIN Seal for degree programmes; Euro-Inf®: Label European Label for Informatics

[2] TC: Technical Committee for the following subject areas: TC 04 – Informatics/Computer Science); TC 07 – Business Informatics/Information Systems; TC 12 – Mathematics.

Kuanysh Amanbayev (student peer), South Kazakhstan State University named M. Auezov Prof. Dr. Andreas Griewank, Humboldt-Universität zu Berlin; Prof. Dr. Bettina Harriehausen-Mühlbauer, Darmstadt University of Applied Sciences; Prof. Dr. Vera Meister, Brandenburg University of Applied Sciences; Prof. Dr. Thomas Ottmann, University of Freiburg; Jürgen F. Schaldach, formerly T-Systems GEI GmbH
Representative of the ASIIN headquarter: Marie-Isabel Zirpel
Responsible decision-making committee: Akkreditierungskommission für Studiengänge
Criteria used: European Standards and Guidelines as of 10.05.2005 ASIIN General Criteria as of 28.06.2012 Subject-Specific Criteria of Technical Committee 04 – Informatics/Computer Science as of 09.12.2011 Subject-Specific Criteria of Technical Committee 07 – Business Informatics/Information Systems as of 09.12.2011 Subject-Specific Criteria of Technical Committee 12 – Mathematics as of 09.12.2011 Euro-Inf Framework Standards and Accreditation Criteria for Informatics Programmes as of 2011-06-29

In order to facilitate the legibility of this document, only masculine noun forms will be used hereinafter. Any gender-specific terms used in this document apply to both women and men.

B Characteristics of the Degree Programmes

a) Name & Final Degree	b) Areas of Specialization	c) Mode of Study	d) Duration & Credit Points	e) First time of offer & Intake rhythm	f) Number of students per intake	g) Fees
Ba Computer Science B.Sc.	Individual Educational Trajectories: • Theoretical informatics • High-performance computing • System administration	Full time	8 Semester 149 Kazakh credits = 6705 hours = 248 ECTS	September 2001, September		432000 kzt / year
Ma Computer Science M.Sc.	Individual Educational Trajectories: • Theoretical Computer Science • High-performance computing • Information Security of Systems and Networks	Full time	4 Semester 59 Kazakh credits = 2655 hours = 99 ECTS	September 2001, September		650000 kzt / year
Ba Computer Science and Software B.Sc.	Individual Educational Trajectories: • Design and development of software • High-performance systems • Real-time systems	Full time	8 Semester 149 Kazakh credits = 6705 hours = 248 ECTS	September 2010, September		432000 kzt / year
Ma Computer Science and Software M.Sc.	Individual Educational Trajectories: • Design and development of software • The organization and management of computer systems	Full time	4 Semester 59 Kazakh credits = 2655 hours = 99 ECTS	September 2010, September		650000 kzt / year
Ba Information Systems B.Sc.	Individual Educational Trajectories: • Theoretical Computer Science • Actuary Math • Databases • Information Security • Programming • Network Technologies	Fulltime	8 Semester 149 Kazakh credits = 6705 hours = 248 ECTS	April 2004, September		650000 kzt / year
Ma Information Systems M.Sc.		Fulltime	4 Semester 59 Kazakh credits = 2655 hours = 99 ECTS	April 2004, September		700000 kzt/ year
Ba Mathematical and Computer Modeling B.Sc.	Individual Educational Trajectories: • Mathematical Modeling • Computational mathematics and scientific computing • Computer modeling	Fulltime	8 Semester 150 Kazakh credits = 6750 hours = 250 ECTS	April 2003, September		600000 kzt / year

a) Name & Final Degree	b) Areas of Specialization	c) Mode of Study	d) Duration & Credit Points	e) First time of offer & Intake rhythm	f) Number of students per intake	g) Fees
Ma Mathematical and Computer Modeling M.Sc.		Fulltime	4 Semester 59 Kazakh credits = 2655 hours = 98 ECTS	April 2003, September		650000 kzt / year

For the degree programme Ba Computer Science, the self-assessment report states the following **intended learning outcomes**:

"I. Knowledge

1. Demonstrate knowledge and understanding of essential facts, concepts, principles, and theories relating to Computer Science.
2. Identify and analyze criteria and specifications appropriate to specific problems of Computer Science.
3. Define a computer-based system, process, component, or program to meet desired needs.
4. Define mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems.
5. Learn and implement the principles and concepts of information integrity, security and confidentiality.
6. Demonstrate a clear understanding of computer operating systems and network communication systems.
7. Determine requirements for systems in an application area such as databases, networks, robotics, or others.

II. Understanding

1. Identify, formulate, and solve engineering problems and to analyze a problem, and identify and define the computing requirements appropriate to its solution.
2. Evaluate abstract mathematical structures, mathematical techniques, and formal mathematical reasoning as they pertain to the area of computer science.
3. Compare and use basic concepts and techniques in computer organization, architecture and operating systems.
4. Compare and use basic concepts and techniques in algebra, calculus, probability, and other major topics.
5. Identify software components of the system structure, the properties of these components, the externally visible, and the relationship between them and evaluate the main problems related to the architectural concepts.

6. Deploy appropriate theory, internships, and tools for the specification, design, implementation and evaluation of software applications.
7. Classify of threats of information security and standard ways and means of their implementation.

Results of training programs
Application
1. Use current techniques, skills, and tools necessary for computing internship and engineering internship.
2. Apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems.
3. Apply design and development principles in the construction of software systems of varying complexity.
4. Implement, test, and deploy a computer-based system applying current and emerging methodologies and technologies.
5. Use algorithms and data structures that underlie all software development.
6. Use problem-solving skills to design, implement and test programs individually.
7. Find effective ways to solve the problems of computational mathematics, applied numerical methods for solving initial and boundary value problems for ordinary differential equations and partial differential equations.
8. Implement greedy approximation algorithms, the technical implementation of security models.

Analysis
1. Analyse strengths and weaknesses of software paradigms.
2. Compare paradigms of programming languages and be exposed to at least one language from each model.
3. Develop efficient algorithms for solving problems, analyze the efficiency of parallel computation to implement feature-rich applications.
4. Analyse the tradeoffs inherent in operating system design.
5. Integrate and apply the knowledge and skills you have learnt in the course to a large, self-directed project.
6. Distinguish between the different types and levels of testing (unit, integration, systems, and acceptance) for medium-size software products and related materials.
7. Debug and analyse highly concurrent code that spans multiple programs running on multiple cores and machines.

The synthesis

1. Compose current techniques, skills, and tools necessary for computing internship.
2. Estimate the local and global impact of computing on individuals, organizations, and society.
3. Create a computer-based system, process, component or program as well as design non-computing requirements.
4. Evaluate, verify, trouble-shoot, test and analyze an existing computer-based system, process, component or program.
5. Solve a problem, identify and define the computing requirements for its solution.
6. Employ the fundamental concepts and mechanisms which form the basis of the design of parallel computation models and algorithms.
7. Design, improve, develop, implement, support, extend, adapt and localize computer and information technologies.

Evaluation

1. Design and conduct experiments, as well as to analyze and interpret data.
2. Operate computer hardware and software systems effectively and efficiently.
3. Select appropriate security solutions to meet the needs of commonly encountered distributed programming scenarios.
4. Distinguish between the different types and levels of testing (unit, integration, systems, and acceptance) for medium-size software products and related materials.
5. Formulate what parallel techniques you can use to solve these problems.
6. Apply the different techniques, including internet-based ones.
7. Use the metrics of cost, speed-up and efficiency to analyze the performance of given parallel algorithms and compare between them and their sequential programs."

The following **curriculum** is presented:

Title of modules	Course code	**Title of courses**	Credit	**ECTS (hours)**	**Lec/prac/Lab.**	**Sem.**
1. State obligatory module (10 Credits)	HK1101	History of Kazakhstan	2	3/90	1+1+0	1
	KL(RI)PP1102	Kazakh language/Russian language / language of the professional purposes	3	5/135	0+2+1	1
	FLSP1103	Foreign language for specific purposes	3	5/135	0+2+1	1
	TPSK2104	The philosophy of scientific knowledge	2	3/90	1+1+0	4
2. Social and Communica-	Soc2201	Sociology	2	3/90	1+1+0	5
	PS2202	Political science	2	3/90	1+1+0	5

tive Module (4 credits)	FET2203	Fundamentals of Economic Theory	2	3/90	1+1+0	5
	ESD2204	Ecology and Sustaiable Development	2	3/90	1+1+0	5
	FLS2205	Fundamentals of Life Safety	2	3/90	1+1+0	5
	BOPSS2206	Basics of Occupational, personal and social success	2	3/90	1+1+0	5
	KL2207	Kazakh law	2	3/90	1+1+0	5
	LH2208	Local history	2	3/90	1+1+0	5
	Rel2209	Religious	2	3/90	1+1+0	5
3.1 Natural Sciences (STEM) module (12 credits)	ITFPP1301	Informational Technologies for the professional purposes	3	5/135	1+0+2	1
	Bio3302	Bioinformatics	3	5/135	2+1+0	5
	Phy 2303	Physics	3	5/135	2+0+1	4
	Geo 2304	Geoinformatics	3	5/135	2+1+0	4
Vocational Modules (115 credits)	**3.2. Basic and professional module**		***69***	115/3105		
	Module 1 Mathematical analysis					
	MA1405	Mathematical analysis - I	4	6/180	2+2+0	1
	MA1406	Mathematical analysis - II	4	6/180	2+2+0	2
	MA 1407	Mathematical analysis - III	3	5/135	2+1+0	3
	Module 2 Algebra and geometry and probability theory					
	AG 1408	Algebra and geometry - I	3	5/135	2+1+0	1
	AG 1409	Algebra and geometry - II	3	5/135	2+1+0	2
	TPMS 2410	Theory of probability and mathematical statistics	3	5/135	2+1+0	3
	Module 3 Numerical Methods					
	DE2411	Differential equations	3	5/135	2+1+0	3
	NM 2412	Numerical methods	3	5/135	2+0+1	4
	MORO2413	Methods of optimization and research of operations	3	5/135	2+1+0	3
	Module 4 Mathematical logic					
	TA 2414	Theory of algorithms	3	5/135	2+1+0	3
	ML 1415	Mathematical logic - I	3	5/135	2+1+0	1
	ML 1416	Mathematical logic - II	3	5/135	2+1+0	2
	Module 5 Programming					

	LTP 1417	Languages and technology of programming		4	6/180	2+0+2	2
	PP3418	Parallel programming		3	5/135	2+0+1	5
	SP2419	System Programming		3	5/135	2+0+1	4
	OOP 3420	Object-oriented programming		3	5/135	2+0+1	5
	Module 6 Algorithms						
	ADS 1421	Algorithms and data structures		3	5/135	2+0+1	2
	TLAM 2422	Theory of languages and automatic machine		3	5/135	2+1+0	3
	Module 7 Net						
	CN 2423	Computer Networks		3	5/135	2+0+1	4
	OS 2424	Operating systems		3	5/135	2+0+1	4
	Module 8 Databases						
	AISI4425	Artificial intellect systems		3	5/135	2+0+1	7
	TD 4426	Theory of databases		3	5/135	2+0+1	5
	3.3 Minor Modules (Modules for Individual Educational Trajectories **(IET))**						
	IET 1 Theoretical informatics	**IET 2 High-performance calculations**	**IET 3 System administration**	30	50/1350		
	WP 3501 Web programming	MC3501 Methods of calculations	DA 3501 Design of Algorithm	3	5/135	2+1+0	6
	DCN 3502 Design of computer networks	SP3502 Art of programming	DWA3502 Design of Web applications	3	5/135	2+1+0	6
	FIS 3503 Fundamentals of Information Security	MGCA 3503 Machine graphics and computer animation	IP 3503 Information protection	3	5/135	2+1+0	6
	CG3504 Computer graphics	CAA 3504 Construction and analysis of algorithms	DCSA 3504 Development of client-server applications	3	5/135	2+1+0	6
	FM 3505 Formal Methods	OPC3505 Organization of parallel calcu-	DA 3505 Distributed Architecture	2	3/90	1+1+0	6

		lations					
	SVT3506 Software verification and testing	IPPR 3506 Image processing and pattern recognition	LP 3506 Logic programming	3	5/135	2+1+0	6
	FP3507 Functional programming	MPP 3507 Multitask platforms of programming	RTS3507 Real-time systems	3	5/135	2+1+0	7
	PRT 3508 Pattern recognition technology	PDC3508 Parallel and distributed calculations	DPD3508 Data and process design (UML)	3	5/135	2+1+0	7
	ES 3509 Embedded Systems	TPL 3509 Theory of Programming Languages	MPSDIE 3509 Modeling of protection systems of data internetwork exchange	3	5/135	2+1+0	7
	TC3510 Theory of computability	SA3510 Software Architecture	TCSD3510 Technologies of cryptographic systems development	3	5/135	2+1+0	7
	3.4 Interdisciplinary Module			4	6/180		
	IE2601	Innovative entrepreneurship (by industry)		2	3/90	1+1+0	5
	NPL2602	Intellectual property law		2	3/90	1+1+0	5
	SWA2603	Spectral and wavelet analysis		2	3/90	1+1+0	5
	FET 2604	Finite element technique		2	3/90	1+1+0	5
4. Internship		Professional internship (by internship)		11			
	EP 101	Educational Internship		2			2
	PP201 PP302 PP403	Professional Internship		1 2 6			4 6 8
5. Final Certification	5.1	Writing and defense of Bachelor's thesis (diploma)		2	3/90		
6. Additional Types of Learning	6.1	Sport and Recreation		8	13/360	0+0+2	1,2,3,4
TOTAL				150 credits			

For the degree programme Ma Computer Science, the self-assessment report states the following **intended learning outcomes**:

"Knowledge

1. Demonstrate knowledge and understanding of essential facts, concepts, principles, and theories relating to Computer Science.
2, Identify and analyze criteria and specifications appropriate to specific problems of Computer Science.
3. Describe and analyze problems using formal methods.
4. Describe a variety of applications and services for mobile platforms.
5. Define the structure and features of cluster computing systems, identify management techniques in parallel computing cluster systems.
6. Identify the threat model, giving the mathematical evaluation of specific attacks and techniques to counter them.
7. Determine requirements for systems in an application area such as databases, networks, robotics, or others.

Understanding

1. Formulate, organize and formalize the problems associated with developing new directions in the field of computer science.
2. Identify vulnerabilities which compromise a vulnerable system, made in the development and operation of Web-based applications.
3. Identify, formulate, and solve engineering problems and to analyze a problem, and identify and define the computing requirements appropriate to its solution.
4. Evaluate abstract mathematical structures, mathematical techniques, and formal mathematical reasoning as they pertain to the area of computer science.
5. Explain encrypt techniques and verify the integrity of data transmitted between network nodes.
6. Interpret knowledge and experience in the field of computer science that is based on sound mathematical theory or set of approved approaches and methods.
7. Summarize new sophisticated methods of modeling, development and testing of software for their relevance and effectiveness.

Results of training programs

Application

1. Solve a wide range of well-known problems in theoretical computer science and tackle the implicit and unresolved problems.

2. Apply basic concepts in theoretical computer science, acquire the latest knowledge in the field of computer science and information technology.
3. Apply design and development principles in the construction of software systems of varying complexity.
4. Apply knowledge and experience in the field of computer science that is based on sound mathematical theory or a set of approved approaches and methods.
5. Apply mathematical foundations, algorithmic principles, and computer science theory to the modeling and design of computer-based systems.
6. Solve problems that are non-standard, poorly defined, or have more than one possible specification.
7. Implement, test, and deploy a computer-based system applying current and emerging methodologies and technologies.
8. Solve problems related to the design, development, deployment, and embedded real-time systems.

Analysis

1. Collect, analyze and interpret complex experimental data and draw conclusions.
2. Plan, analyze and implement the nature of the research projects.
3. Develop efficient algorithms for solving problems, analyze the efficiency of parallel computation to implement feature-rich applications.
4. Combine knowledge from different fields and to solve complex problems.
5. Integrate and apply the knowledge and skills you have learnt in the course to a large, self-directed project
6. Use subject knowledge at the creative solution of problem situations in educational, educational and research, scientific activity.
7. Analyze, design and build the industry-standard solutions for servers and storage systems.

The synthesis

1. Synthesize algorithms of signal and image processing, analyze their quality and computational efficiency.
2. Organize and plan of the professional, scientific and scientific and pedagogical activity, and also collective activity.
3. Create a computer-based system, process, component or program as well as design non-computing requirements.
4. Evaluate, verify, trouble-shoot, test and analyze an existing computer-based system, process, component or program.

5. Integrate knowledge, to take out judgments on the basis of incomplete or limited information taking into account ethical and social responsibility for applications of these judgments and knowledge.
6. Generalize scientific information, to build the new scientific facts in a context of the general knowledge.
7. Locate, analyze, synthesize, and evaluate information, create and document algorithms.

Evaluation
1. Evaluate and choose the best components of complex software systems, and to assess the safety of these systems.
2. Conduct an asymptotic analysis of algorithms and comparative analysis of computational algorithms.
3. Estimate of design methods to make an argued choice for specific methodology for a concrete situation.
4. Distinguish between the different types and levels of testing (unit, integration, systems, and acceptance) for medium-size software products and related materials.
5. Design or redesign complex computerized systems in a structured way, to allow these systems to carry out their tasks in a correct and efficient way.
6. Carry out research assignments in a responsible scientific fashion and be able to report about the assignments.
7. Use the metrics of cost, speed-up and efficiency to analyze the performance of given parallel algorithms and compare between them and their sequential programs."

The following **curriculum** is presented:

Title of modules	Course code	**Title of courses**	Credit	**Unit (ECTS)**	**Lec/prac/Lab.**	**Sem.**
Semester 1						
Compulsory State Modules (8 credits)	**Compulsory State Module 1**					
	IFN 5201	History and Philosophy of Science	2	3	1+1+0	1
	Iya(p)5 202	Foreign language (Professional)	2	3	1+1+0	1
Compulsory Professional Modules (14 credits)	**Compulsory Professional Module 1**					
	AUS 5205	Algorithms and Their Complexity	2	3	1+1+0	1
	Compulsory Professional Module 2					
	OPNI	Organization and Planning of Scien-	3	5	2+1+0	1

	5206	tific Research				
	Compulsory Professional Module 3					
	TRPO 5207	Software Engineering	3	5	2+1+0	1
	Compulsory Professional Module 4					
	TRS 5208	Theory of Distributed Systems	3	5	2+1+0	1
Additional Types of Training	**Master's Research Work and Fulfillment of Dissertation**					
	NIRM I	Research Seminar I	1	2	1	
	Professional Internship		6			
	IP	Research internship	1	2	1,4	
Semester 2						
Compulsory State Modules (8 credits)	**Compulsory State Module 2**					
	Ped 5203	Pedagogics	**2**	3	1+1+0	2
	Psy 5204	Psychology	**2**	3	1+1+0	2
Compulsory Professional Modules (14 credits)	**Compulsory Professional Module 5**					
	TRO 5209	Theory of Pattern Recognition	3	5	2+1+0	2
Modules of Individual Educational Paths (20 credits)	**Modules for Individual Educational Trajectories (IET)**					
	IET1 6M060201 - Theoretical Computer Science	**IET2 6M060202 - High-performance computing**	**IET3 6M060203 - Information Security Systems and Networks**			
	TNO 5301 Theory of Reliability and Resiliency	SI 5301 The image signals	BCC 5301 Safety of e-Commerce	**2**	2	1+1+0	2
	PLGS 5302 LAN and WAN Networks Design	OV 5302 Cloud Computing	Bio 5302 Bioinformatics (in English)	**2**	2	1+1+0	2
	IZGS 5303 Identification of sound and image signals	POPR 5303 The Software of Parallel and Distributed Computing Systems (in English)	SZDOI 5303 Data Protection and Information Security of Web-Based Applications (in English)	**2**	2	1+1+0	2
	TV 5304 Computabil-	RVSR 5304 Development	RVRSSHD 5304 The	**2**	2	1+1+0	2

	ity Theory	and implementation of network solutions	development and implementation of solutions for servers and storage systems				
Additional Types of Training	**Master's Research Work and Fulfillment of Dissertation**						
	NIRM 2	Research Seminar2		1	2	2	
Semester 3							
Modules of Individual Educational Paths (20 credits)	**Modules for Individual Educational Trajectories (IET)**						
	IET1 6M060201 - Theoretical Computer Science	**IET2 6M060202 - High-performance computing**	**IET3 6M060203 - Information Security Systems and Networks**				
	MDAG 6305 Model-Driven Architecture and Program Generation	PNV 6305 Parallel Scientific Computing(in English)	MP 6305 Mobile Platforms	3	5	2+1+0	3
	MS 6306 Multiagent Systems	VSA 6306 High Performance Systems Architecture(in English)	KZIS 6306 Cryptographic Protection of Information in Networks (in English)	3	5	2+1+0	3
	MVSSRV 6307 Modeling embedded systems and real-time systems	MSGV 6307 Multiagent Systems & Grid Computing	PSSIR 6307 Programming Environments, Tools and Instruments for the Development of Cluster Systems (in English)	3	5	2+1+0	3
	TFYa 6308 Theory of Formal Languages	PPTCUDA 6308 Compute Unified Device Architecture Programming	PIZPO 6308 Design of Software Protection Infrastructure	3	5	2+1+0	3
Additional Types of Learning	**Professional Internship**			6			
	PP	Pedagogical Internship		3	5	3	
	Master's Research Work and Fulfillment of						

	Dissertation				
	NIRM 3	Research Seminar 3	4	6	3
Semester 4					
Additional Types of Learning	**Master's Research Work and Fulfillment of Dissertation**				
	NIRM 4	Research Seminar 4	4	6	4
	Professional Internship				
	IP	Research internship	2	C3C	4

For the degree programme Ba Computer Science and software, the self-assessment report states the following **intended learning outcomes**:

"Knowledge

1. mathematical models and the methods underlying modern means of protection of information in the sphere of network information technologies;
2. theoretical concepts of recognition of images, training and digital representation and processing of images;
3. principles of development and methods of design of program systems;
4. control methods of working capacity ASIP and C and diagnostics of its condition;
5. methods of control over design of program systems and the organization of groups of developers;
6. principles of design and creation of wire and wireless networks, network debugging;
7. logical models of calculation of reliability hardware and the software of automated information processing systems and management (ASIP and C).

Understanding

1. verify the correctness of an argument using propositional and predicate logic and truth tables;
2. summarize techniques for achieving synchronization in an operating system;
3. implement processes and threads as well as the different algorithms for process scheduling;
4. distinguish different styles of operating system design;
5. technologies of design of the software, methods of development of algorithms;
6. modern network technologies;
7. classification of threats of information security and standard ways and means of their implementation.

Results of training programs

Application

1. the basic principles of the organization of training and education at formation of the content of training and education at formation of the content of training and education;
2. various standard technologies and methods of design of human-computer interaction; to define conditions and restrictions of applicability of standard technologies of design of human-computer interaction; to apply principles of design of the ergonomic interface;
3. skills of creation of images of three-dimensional subjects on the plane and in space;
4. knowledge of information processes in a context of post-nonclassical science and ideas of developing human measured systems;
5. explanatory and bilingual terminological dictionaries, and also reference books in the specialty;
6. grammatical characteristics of scientific style in its oral and written forms;
7. skills of design and creation of wire and wireless networks, network debugging.

Analysis

1. analyse the tradeoffs inherent in operating system design;
2. integrate and apply the knowledge and skills you have learnt in the course to a large, self-directed project;
3. distinguish between the different types and levels of testing (unit, integration, systems, and acceptance) for medium-size software products and related materials;
4. debug highly concurrent code that spans multiple programs running on multiple cores and machines;
5. strengths and weaknesses of software paradigms;
6. modern problems of the organization of calculations on high-performance computing systems;
7. logical models of calculation of reliability hardware and the software of automated information processing systems and management (ASIP and C).

The synthesis

1. create algorithms of recognition of images and processing of images and the programs realizing these algorithms;
2. create programs with using high-performance architectures;
3. evaluate methods and approaches to software verification;

4. create message on the subjects connected with scientific work of the undergraduate;
5. create wire and wireless networks, execute network debugging;
6. analyze current trends of development of network technologies;
7. analyze mathematical methods of ensuring information security;
8. apply the basic principles of the organization of training and education at formation of the content of training and education;
9. apply skills of creation of images of three-dimensional subjects on the plane and in space.

Evaluation
1. select appropriate security solutions to meet the needs of commonly encountered distributed programming scenarios;
2. distinguish between the different types and levels of testing (unit, integration, systems, and acceptance) for medium-size software products and related materials;
3. formulate what parallel techniques you can use to solve these problems;
4. apply the different techniques, including internet-based ones;
5. use the metrics of cost, speed-up and efficiency to analyze the performance of given parallel algorithms and compare between them and their sequential programs;
6. redistribution of functions between the operator and hardware-software part ASIP and C, to define reliability of functioning of human-machine systems;
7. the system comparative analysis of reliable characteristics of various alternative options for justification of a choice of the most effective decision;
8. applied mathematical tools of statistics for an assessment of quality of functioning ASIP and C."

The following **curriculum** is presented:

Title of modules	Course code	**Title of courses**	Credit	**ECTS/ hours units**	**Lec/prac/Lab.**	**Sem.**
1. State obligatory module (10 Credits)	IRK1101	History of Kazakhstan	2	3/ 90	1+1+0	1
	POK(R)Ya1102	Kazakh language/Russian language / language of the professional purposes	3	5/135	0+2+1	1
	POIYa1103	Foreign language for specific purposes	3	5/135	0+2+1	1
	FNP2104	The philosophy of scientific knowledge	2	3/ 90	1+1+0	4
	PMK2201	Sociology	2	3/ 90	1+1+0	5

2. Social andCommunicative Module(4credits)	TPP2202	Political science	2	3/ 90	1+1+0	5
	ELSU2203	Fundamentals of Economic Theory	2	3/ 90	1+1+0	5
	KR2204	Ecology and Sustaiable Development	2	3/ 90	1+1+0	5
	OPS2205	Fundamentals of Life Safety	2	3/ 90	1+1+0	5
	BZhCh2206	Basics of Occupational, personal and social success	2	3/ 90	1+1+0	5
	EUR2207	Kazakh Law	2	3/ 90	1+1+0	5
	KP2208	Local history	2	3/ 90	1+1+0	5
	OE2209	Religious	2	3/ 90	1+1+0	5
3.1 Natural Sciences(STEM) module (12 credits)	IT1301	Informational Technologies for the professional purposes	3	5/135	1+0+2	1
	Rob3302	Robotics	3	5/135	2+1+0	5
	Fiz1303	Physics	3	5/135	2+0+1	4
	Mat 1304	Materials technology	3	5/135	2+1+0	4
Vocational Modules (115 credits)	**3.2. Basic and professional module**		***69***	115/3105		
	Module 1 Mathematical analysis					
	MA1401	Mathematical analysis - I	4	6/180	2+2+0	1
	MA1402	Mathematical analysis - II	4	6/180	2+2+0	2
	Module 2 Algebra and geometry and probability theory					
	AG1403	Algebra and geometry	3	5/135	2+1+0	1
	TVMS 1404	Theory of probability and mathematical statistics	3	5/135	2+1+0	3
	Module 3 Mathematical logic					
	ML 1405	Mathematical logic- I	3	5/135	2+1+0	1
	ML 1406	Mathematical logic - II	3	5/135	2+1+0	2
	Module 4 PHYSICS					
	MIK2407	Microelectronics	2	3/ 90	1+0+1	4
	Fiz1408	Physics - II	3	5/135	2+1+0	2
	Module 5 Programming					
	PAYa1410	Programming in Algorithmic Language	4	6/180	2+0+2	2
	TP 2411	Programming Technology	3	5/135	2+0+1	3

	SP2412	System Programming		3	5/135	1+1+1	4
	OS 2412	Operating systems		3	5/135	2+1+0	3
	Module 6 The computer system						
	MMUVT2413	Models and methods for managing computing		2	3/ 90	1+1+0	4
	TI2414	Information theory		2	3/ 90	1+1+0	3
	OVSS2415	Organization of computer systems and networks		3	5/135	2+1+0	4
	AKS 2416	Architecture of Computer Systems		3	5/135	2+1+0	4
	Module 7 Information Security						
	OIB3417	Fundamentals of Information Security		3	5/135	2+1+0	5
	IKS3418	Interfaces of computer systems		3	5/135	1+0+2	5
	IT3419	Internet Technologies		3	5/135	1+0+2	6
	KS2420	Computer Networks		3	5/135	2+0+1	3
	Module 8 Software development tools						
	ISRP3421	Development tools software		3	5/135	1+0+2	5
	EOP3422	Economics and Production Organization		3	5/135	2+1+0	6
	3.3 Minor Modules (Modules for Individual Educational Trajectories **(IET))**						
	IET 1 Design and development of software	**IET 2 High-performance systems**	**IET 3 Real-time systems**	30	50/1350		
	Design of operating systems DOS 3501	Organization of computing systems and networks OCSN 3501	Circuits and Signals CS 3501	3	5/135	2+1+0	6
	Database fundamentals DF 3502	Information and logical bases of computing systems design ILBCSD 3502	Electronic data storages EDS 3502	3	5/135	2+1+0	6
	VLSI Design VLSI D 3503	Circuitry C 3503	Embedded Systems ES 3503	3	5/135	2+1+0	6
	Verification and testing of computer sys-	Parallel programming PP 3504	Technology of program verification	3	5/135	2+1+0	6

	tems VTCS 3504		and computing systems TPVCS 3504				
	Object-oriented analysis and design OOAD 4505	Organization of parallel computations OPC 4505	Internet technologies IT 4505	3	5/135	2+1+0	7
	Web programming WP 4506	UML Modeling (English) UML M 4506	Object-oriented programming OOP 4506	3	5/135	2+1+0	7
	User interfaces design UID 4507	Organization and administration of cluster systems OACS 4507	Graphical user interfaces GUI 4507	3	5/135	2+1+0	7
	Software Architecture SA 4508	Cloud platforms CP 4508	Design of LAN and WAN networks DLANWANN 4508	3	5/135	2+1+0	7
	Software Modeling and analysis SMA 4509	Multitask programming platforms MPP 4509	Real-time systems RTS 4509	3	5/135	2+1+0	7
	Technologies of cryptographic systems development (in English) TCGSD 4510	Digital image processing DIP4510	Facilities of telecommunication systems protection FTS4510	3	5/135	2+1+0	7
	3.4 InterdisciplinaryModule			**4**	6/180		
	IP	Innovative entrepreneurship(by industry)		2	3/90	1+1+0	5
	IP	Intellectual property law		2	3/90	1+1+0	5
	SVA	Spectraland waveletanalysis		2	3/90	1+1+0	5
	MKE	Finite element technique		2	3/90	1+1+0	5
4. internship		Professional internship (by internship)		11			
	EP 101	Educational internship		2			2
	PP201 PP302 PP403	Professional internship		1 2 6			4 6 8
5. Final Certification	5.1	Writing and defense of Bachelor's thesis (diploma)		2	3/ 90		8

6. Additional Types ofLearning	6.1	Sport and Recreation	8	13 /3 60	0+0+2	1,2 ,3, 4
TOTAL			**150 credits**			

For the degree programme Ma Computer Science and Software, the self-assessment report states the following **intended learning outcomes**:

“Knowledge

1. knowledge of the principles of development and methods of design of program systems, methods of control over design of program systems and the organization of groups of developers, the state standards regulating process of development of program systems and their description;
2. knowledge of the principles of development and methods of design of program systems;
3. knowledge of the architecture of high-performance systems, the classification of architectures, based on consideration of the number of streams of instructions and data streams;
4. knowledge of the main regularities and the directions of development of informatics;
5. knowledge of the main receptions of algorithmization and representation of algorithms;
6. knowledge of the main approaches to design of reliable failure-safe computer systems;
7. knowledge of the principles, models and methods (formation of requirements, the analysis, synthesis and testing), used in an engineering cycle of development of systems of data storage (SDS).

Understanding

1. technologies of design of the software, methods of development of algorithms;
2. modern network technologies;
3. classification of threats of information security and standard ways and means of their implementation;
2. means and work methods with video adapters at low, average and high level;
3. a scope of cloudy technologies;
4. the theory, methods, algorithms of technologies for the solution of tasks from various subject domains;

5. the methods in area of high-performance calculating.

Results of training programs

Application

1. explanatory and bilingual terminological dictionaries, and also reference books in the specialty;
2. grammatical characteristics of scientific style in its oral and written forms;
3. knowledge of information processes in a context of post-nonclassical science and ideas of developing human measured systems;
4. skills of design and creation of wire and wireless networks, network debugging;
5. the basic principles of the organization of training and education at formation of the content of training and education;
6. various standard technologies and methods of design of human-computer interaction; to define conditions and restrictions of applicability of standard technologies of design of human-computer interaction; to apply principles of design of the ergonomic interface;
7. skills of creation of images of three-dimensional subjects on the plane and in space.

Analysis

1. strengths and weaknesses of software paradigms;
2. modern problems of the organization of calculations on high-performance computing systems;
3. logical models of calculation of reliability hardware and the software of automated information processing systems and management (ASIP and C);
4. reliability ASIP and C by introduction of structural, temporary and information redundancy at minimum possible expenses;
5. algorithms of recognition of images and processing of images and creation of the programs realizing these algorithms;
6. a technique of effective coding according to Huffman; coding of data in Humming's noiseproof code;
7. infrastructure of cloud computing.

The synthesis

1. create algorithms of recognition of images and processing of images and the programs realizing these algorithms;
2. create programs with using high-performance architectures;
3. evaluate methods and approaches to software verification;

4. create message on the subjects connected with scientific work of the undergraduate;
5. create wire and wireless networks, execute network debugging;
6. analyze current trends of development of network technologies;
7. analyze mathematical methods of ensuring information security;
8. apply the basic principles of the organization of training and education at formation of the content of training and education;
9. apply skills of creation of images of three-dimensional subjects on the plane and in space.

Evaluation
1. redistribution of functions between the operator and hardware-software part ASIP and C, to define reliability of functioning of human-machine systems;
2. the system comparative analysis of reliable characteristics of various alternative options for justification of a choice of the most effective decision;
3. applied mathematical tools of statistics for an assessment of quality of functioning ASIP and C;
4. preliminary processing of images;
5. modern means of support of network technologies;
6. the main methods, ways and means of receiving, storage, information processing;
7. methods of creation of the interface of graphic programs."

The following **curriculum** is presented:

Title ofmodules	Course code	Title of courses	Credit	ECTS/ hours units	Lec/prac/Lab.	Sem.
1.Compulsory State Modules (8 Credits)	IFN 5201	History and Philosophy of Science	2	3/ 90	1+1+0	1
	Iya(p)5202	Foreign language (Professional)	2	3/ 90	1+1+0	1
	Ped 5203	Pedagogics	2	3/ 90	1+1+0	2
	Psy 5204	Psychology	2	3/ 90	1+1+0	2
2. Compulsory Professional Modules(14credits)	TVV 5205	Technology of high-performance computing	2	3/ 90	1+1+0	1
	OPNI 5206	Organization and Planning of Scientific Research (English language)	3	5/135	2+1+0	1
	ST 5207	Network Technology	3	5/135	2+1+0	1
	TRO 5208	Theory of pattern recognition	3	5/135	2+1+0	1
	POPRVS5209	Software of parallel and distributed computing systems	3	5/135	2+1+0	2
3.Modules of Individual Educational Paths (20 credits)	**Modules of Individual Educational Paths (Modules for Individual Educational Trajectories (MIOT))**					
	MIOT 1 Design and development of software	**MIOT 2 The organization and management of computer systems**				
	MMRO 5301 Methods and models of pattern recognition	AVS 5301 The architecture of high-performance systems	2	3/ 90	1+1+0	2
	PPO 5302 Software Design (on English)	RVSR 5302 Development and implementation of network solutions	2	3/ 90	1+1+0	2
	TNOPO 5303 Theory of software reliability and fault tolerance (on english)	POPRVS 5303 Software of parallel and distributed computing systems	2	3/ 90	1+1+0	2
	KM 5304 Computing modeling	VKS 5304 Verikatsiya computer systems	2	3/ 90	1+1+0	2
	MI 6305 Research Methods (on english)	CKMV 6305 Supercomputer Simulation and Visualization in Scientific Research	3	5/135	2+1+0	3
	SZDOI 6306 Data protection systems and information security of Web-applications	TI 6306 Information Theory	3	5/135	2+1+0	3
	RVRSSHD 6307 The development and im-	PASZ 6307 Design of anti-virus protection	3	5/135	2+1+0	3

	plementation of solutions for servers and storage systems					
	TPPS 6308 The technology of software design	OV 6308 Cloud computing	3	5/135	2+1+0	3
4. Additional Types of Training	**4.1 Master's Research Work and Fulfillment of Dissertation**		7	11/370		
	NIRM I NIRM 2 NIRM 3 NIRM 4	Research Seminar	1 1 1 4	2/45 2/45 2/45 6/180		1 2 3 4
	4.2 Professional internship (by internship)		6	10/270		
	PP IP	Pedagogical internship Research internship	3 3	5/135 5/135		3 1, 2
5. Final Attestation	5.1	Complex Examination	1	2/45		5
	5.2	Dissertation Fulfillment and Defence	3	5/135	5	5
TOTAL			**59 credits**			

For the degree programme Ba Information Systems, the self-assessment report states the following **intended learning outcomes**:

"I. Knowledge

1. Necessary knowledge of social science, philosophy etc.
2. Basic knowledge in mathematics that is sufficient for use in information systems
3. Knowledge of programming languages and algorithms
4. Knowledge of basics of Theoretical Computer Science that is sufficient as introductory to research in the field
5. Knowledge of Information Systems in general for being able to use in real life

II. Understanding

1. Understanding basic principles of analysis, algebraic structures, geometry etc. needed for use in programming, computer science and information systems
2. Understanding basic principles of algorithms reading, writing, analyzing and implementing
3. Understanding other fields of science related to Information Systems (Geo computer science, accounting etc.)

Training Outcomes

1. Application

Being able to construct algorithms and write programs in any field and using any tools like new or existing DBMS, Programming Languages, Development Environments etc.

Being able to construct and manage new or existing Information Systems in business companies. Demonstrate design and coding procedures and solutions to achieve the objectives

Interpret the theoretical aspects of the basic terms of data and information

Being able to translate the tasks given in business companies into Scope Statement. Manage projects.

2. Analysis

Evaluate IT activities of organizations and their departments

Being able to do basic financial analysis (i.e. current financial state, reports, forecasting, financial data management etc.)

Being able to analyze algorithms effectiveness

3. The synthesis

Plan and deploy small and medium business devices and networking solutions

Create a strategy for the analysis of work processes and automating them

Construct new algorithms and analyze effectiveness

4. Evaluation

Evaluate the significance and adequacy of the designed solutions and forecasting information”

The following **curriculum** is presented:

Title of modules	Course code	**Title of courses**	Credit	**ECTS credits**	**Lec/prac/Lab.**	**Sem.**
1. State Compulsory Module (10 credits)	IRK1101	History of the Republic of Kazakh-stan	2	3	1+1+0	1
	POK(R)Ya1102	Kazakh (Russian) Language for Professional Purposes	3	5	0+3+0	1
	POIYa1103	Foreign Language for Professional Purposes	3	5	0+2+1	1
	FNP2104	Philosophy of Scientific Knowledge	2	3	1+1+0	4
2. Social and Communicative Module (4 credits)	PMK3201	Psychology of Interpersonal Communication	2	3	1+1+0	5
	TPP3202	Theoretical and Applied Politology	2	3	1+1+0	5
	ELSU3203	Ethics of Personal and Social Success	2	3	1+1+0	5
	KR3204	Culture and Religion	2	3	1+1+0	5
	OPS3205	General and Applied Sociology	2	3	1+1+0	5
	BZhCh3206	Human Life Safety	2	3	1+1+0	5
	EUR3207	Ecology and Sustainable Development	2	3	1+1+0	5
	KP3208	Kazakh Law	2	3	1+1+0	5
	OE3209	Fundamentals of Economics	2	3	1+1+0	5
3.1 Natural Sciences **(STEM)** module (12 credits)	ITCP1301	Information Technologies for Professional Purposes	***3***	5	1+2+0	1
	Piz1302	Physics	***3***	5	2+0+1	2
	TELC2303	Electric Circuits Theory	***3***	5	2+1+0	4
	BIOI3304	Bioinformatics	***3***	5	1+2+0	5
Vocational Modules (80 credits) and IETs (19 credits)	**3.2.** Basic Professional Modules		***80***	133		
	Module 1 Mathematical Analysis					
	MAT1401	Mathematical Analysis I	4	6	2+2+0	1

	MAT1402	Mathematical Analysis II	4	6	2+2+0	2
	Module 2 Algebra and Geometry					
	AG1403	Algebra and Geometry I	3	5	2+1+0	1
	AG1404	Algebra and Geometry II	3	5	2+1+0	2
	Module 3 Fundamental Mathematics					
	TVMS2405	Probability Theory and Mathematical Statistics	3	5	2+1+0	3
	DU2406	Differential Equations	3	5	2+1+0	3
	MO3407	Optimization Methods	3	5	2+1+0	5
	IO2408	Operation Research	2	3	2+1+0	4
	Module 4 Databases					
	TBD3409	Database Theory	3	5	2+1+0	5
	ASD1410	Algorithms and Data Structures	3	5	2+1+0	2
	Module 5 Mathematical Logic					
	ML1411	Mathematical Logic I	3	5	2+1+0	1
	ML1412	Mathematical Logic II	3	5	2+1+0	2
	ML2413	Mathematical Logic III	3	5	2+1+0	3
	Module 6 Programming Basics					
	YaTP1414	Programming Languages and Technologies	4	6	2+1+1	2
	TA2415	Algorithms Theory	3	5	2+1+0	3
	OZI2416	Information Security Essentials	3	5	1+1+1	3
	Module 7 Theoretical Computer Science					
	TYaA2417	Automata and Language Theory	3	5	2+1+0	4
	TI3418	Theoretical Computer Science	3	5	2+1+0	5
	SII3419	Artificial Intelligence Systems	3	5	2+1+0	6
	Module 8 Computer Networks					
	KS2420	Computer Networks	3	5	2+0+1	3
	PKS2421	Computer Systems Modeling	3	5	2+0+1	3

	OIS2422	Information Systems Fundamentals		3	5	2+0+1	4
	Module 9 Programming						
	PP3423	Parallel Programming		3	5	2+0+1	5
	OOP2424	Object-Oriented Programming - I		3	5	2+0+1	4
	OOP3425	Object-Oriented Programming – II		3	5	0+2+1	6
	OOP4426	Object-Oriented Programming – III		3	5	1+1+1	7
	3.3 Minor Modules (Modules for Individual Educational Trajectories **(IET1 – IET3)**						
	IET 1 Theoretical Computer Science	**IET 2 Actuary Math**	**IET 3 Databases**	19	32		
	SW 2501 Scientific writing (kaz/rus/eng) 4semester 1+0+0	SW 2501 Scientific writing (kaz/rus/eng) 4semester 1+0+0	SW 2501 Scientific writing (kaz/rus/eng) 4semester 1+0+0	1	2		6
	VA3501 Randomized Algorithms 2+1+0	SAEB3501 Statistical Analysis in Economics and Business 2+1+0	OERS3501 ERP Systems Basics 1+0+2	3	5		6
	ETV3502 Computation Theory Basics 2+1+0	AM3502 Actuary Math – I 2+1+0	UD3502 Data management 2+0+1	3	5		6
	SA4503 Algorithmic Complexity 2+1+0	MAFD4503 Methods of Statistical Analysis of Financial Data 2+1+0	OT4503 OLAP Technology 2+0+1	3	5		7
	OS4504 Randomness Ba-	FM4504 Financial	UDBOV4504	3	5		7

	sics 2+1+0	Mathematics 2+1+0	Remote Databases and Cloud Computing 2+0+1				
	AD4505 Data Analysis 2+1+0	TRNP4506 Risk Theory and its Application 2+1+0	PHP4507 Stored Procedures Programming 2+0+1	3	5		7
	PVSP4506 Parallel Computing and Petri Nets 2+1+0	AM4508 Actuary Math. II 2+1+0	ABD Database Administration 2+0+1	3	5		7
	3.4 Minor Modules (Modules for Individual Educational Trajectories **(IET4 – IET6)**						
	IET 4 Information Security	**IET 5 Programming**	**IET 6 Network Technologies**	19	32		
	SW 2501 Scientific writing (kaz/rus/eng) 4semester	SW 2501 Scientific writing (kaz/rus/eng) 4semester	SW 2501 Scientific writing (kaz/rus/eng) 4semester	1	2		6
	TCh3501 Numeric Theory 2+1+0	MMRO3501 Methods and Models of Software Development 2+0+1	OKPM3501 Commutation and Interrouting Basics 2+0+1	3	5		6
	OKK3502 Classical Crypthography	PES3502 Programming in ERP Sys-	TRSBS3502 Technol-	3	5		6

	Basics 2+1+0	tems 2+0+1	ogies of Distributed WAN and WLAN 2+0+1				
	OK4503 Cryphtoanalysis Basics 2+1+0	TPI4503 Technologies of Games Programming 2+0+1	ASI4503 IS Network Technologies 2+0+1	3	5		7
	Kom4504 Combinatorics 2+1+0	TPMS4504 Mobile Systems Programming Technology 2+0+1	RMMK4504 Router Configuration and Multilevel Commutation 2+0+1	3	5		7
	IB4507 Information Security 2+1+0	PHPM4507 MS SQL Stored Procedures Programming 2+0+1	PPKS4507 Networks Modeling and Supporting 2+0+1	3	5		7
	PKFS4508 Crypthographic Systems Programming 2+0+1	PWPIS4508 IS Web Applications Programming 2+0+1	BSK4508 Network Communications Security 2+0+1	3	5		7
	3.4 Interdisciplinary Module			8	12		
	INPR3601	Innovative Entrepreneurship (tradewise)		2	3	1+1+0	6
	IP3602	Intellectual Property Law		2	3	1+1+0	6
	EM3603	Econometrics		2	3	1+1+0	6

	UP3604	Projects Management	2	3	1+1+0	6
	BUIA3605	Accounting and Audit	2	3	1+1+0	6
	GI3606	Geoinformatics	2	3	1+1+0	6
	LYA3607	Latin Language	2	3	1+1+0	6
4. Internship		Professional internship (by types of internship)	Minimum of 10 credits			
	UP101	Academic Internship	2			2
	PP201	Industrial Internship	1			4
	PP302	Industrial Internship	1			6
	PP403	Industrial Internship	6			8
5. Final Certification	5.1	Thesis Preparation and Defense	2	3		
6. Additional Types of Learning	6.1	Physical Education	8	12	0+0+2	1,2,3,4
TOTAL			Minimum of 248 ECTS credits			

For the degree programme Ma Information Systems, the self-assessment report states the following **intended learning outcomes**:

"I. Knowledge

1. Oral and written communication skills.
2. Basic knowledge in psychology and pedagogy.
3. Understanding project management frameworks and tools.
4. Basic knowledge in organization of scientific research.
5. Advanced knowledge of network infrastructures, protocols and network components, the means and modes of transmission, transformation and presentation of information in networks.
6. Basics of: algebra, geometry, analysis and differential equations.
7. The inside of multicore and multiprocessor systems. Intelligent agents – definitions, basic knowledge.

8. Understanding of the distributed databases. Principles of database systems, models of data, basic operations on the data, the basics of database design.
9. Basics of artificial intelligence – neural networks, other ways of machine learning. Regular grammar, statistical analysis of texts.

II. Understanding

1. Being able to model and use project management effectively.
2. Organizing, planning and doing research.
3. Networking protocols and components, the means and modes of transmission, transformation and presentation of information in networks.
4. Understanding how to model and program Intelligent Agents.

Training Outcomes

Application

1. Ability to classify software projects.
2. Ability to carry out installation and configuration of network hardware.
3. Ability to apply project management software.
4. Being able to carry out independent research.
5. Practical skills in computer modeling.
6. Ability to solve systems of linear equations and apply determinants, theorems in mathematical analysis and differential equations.
7. Parallelizing algorithms on a level of processors.
8. Being able to model and program Intelligent Agents.
9. Ability to design and build a database of information applications using modern database on different hardware platforms in various subject areas.
10. Ability to program very simple artificial intelligence – basic text recognition (letters recognition). Being able to analyze some types of sentences.

2. Analysis

1. Design skills and data management, the application of the software.
2. Design information model a particular domain, the use of modern database to handle database, to represent data using different models, objectives and content of operational (OLAP) analysis. Types of multidimensional OLAP-systems."

The following **curriculum** is presented:

Title of modules	Course code	Title of courses	Credit	ECTS credits	Lec/prac/Lab.	Sem.
1. State Compulsory Module (8 credits)	IFN 5101	History and Philosophy of Science	2	3	1+1+0	1
	Iya(p)5102	Foreign language (professional)	2	3	1+1+0	1
	Psy 5104	Psychology	2	3	1+1+0	2
	Ped 5103	Pedagogy	2	3	1+1+0	2
2. Compulsory Professional Modules (14 credits)	AIS 5201	Information systems architecture	2	3	1+1+0	1
	OPNI 5202	Organization and planning of research (English language)	3	5	2+1+0	1
	UDIS 5203	Data Management Information Systems	3	5	2+1+0	1
	AMPIS 5204	Analysis, modeling and design of Information Systems	3	5	2+1+0	1
	PDT 5205	Data transmission and Telecommunications	3	5	2+1+0	2
3. Modules of Individual Educational Trajectories (20 credits)	**3.2.** Basic Professional Modules		***20***	33		
	Module 1 Mathematical Foundations of Information Systems					
	MBCS 5301	Mathematical Foundations of Information Systems	2	3	1+1+0	2
	MOSZI 5302	Mathematical Foundations of Information Security Systems	2	3	1+1+0	2
	Module 2 Distributed Programming					
	PV 5303	Parallel Computing	2	3	1+1+0	2
	IA 5304	Intelligent Agents	2	3	1+1+0	2
	Module 3 Databases					
	ERPS 6305	ERP systems	3	5	2+1+0	3
	RBD 6306	Distributed data bases	3	5	2+1+0	3
	Module 4 Artificial Intelligence					
	OII 6307	Foundations of Artificial Intelli-	3	5	2+1+0	3

		gence				
	SA 6308	Semantic Analysis	3	5	2+1+0	3
4. The research work and the implementation of a student thesis (7 credits)	NIRM I	Scientific Seminar I	1	2	1+1+1	1
	NIRM II	Scientific Seminar II	1	2	2+1+0	2
	NIRM III	Scientific Seminar III	1	2	2+1+0	3
	NIRM IV	Scientific Seminar IV	4	6	2+1+0	4
5. Professional internship (6 credits)	PP	Educational Internships	3	5		3
	IP	Research Internship	3	5	2+1	4
5. Final Attestation (4 credits)	KE	Comprehensive exam	1	2		4
	ZD	Clearance and defense of the thesis	3	5	0+0+2	4
TOTAL			Minimum of 98 ECTS credits			

For the degree programme Ba Mathematical and Computer Modeling, the self-assessment report states the following **intended learning outcomes**:

“Knowledge

1. theoretical principles of mathematical modeling of physical, natural, medical, chemical and biological processes;
2. programming languages of high level, interactive programming of computer graphics;
3. computer modeling and animation; computer facilities, system administration, computer networks, operating systems, applied and specialized programs;
4. the principles of experimental research work;
5. students will develop and demonstrate habits of effective thought, including the ability to reason analytically (through modes such as inductive reasoning, deductive reasoning, and mathematical induction), to distinguish "possible" from "necessary," to recognize assumptions, to identify logical fallacies, and to develop coherent arguments;
6. students will demonstrate facility with axiomatic reasoning, including the ability to write clear, rigorous mathematical proofs;
7. students will make effective use of abstraction and inductive reasoning as key characteristics of the language and structure of mathematics and abstract data types in

object-oriented programming. Through the study of more than one computer modeling language, students will distinguish between syntax (the concrete) and semantics (the abstract).

Understanding

1. about the newest opening of natural sciences, prospects of their use for creation of technical devices;
2. about mathematical modeling of physical, chemical, biological, atmospheric and other processes;
3. about numerical methods of the solution of problems of algebra, the analysis and mathematical physics;
4. about creation of algorithms of programming, a database, computer model; about application of information technologies for the solution of professional tasks;
5. students will be able to design and use valid mathematical models and use them to solve realistic problems, employing techniques from physics, computer algorithms, and mathematics.

Results of training programs

Application

1. applying modern achievements in computing technologies and the software to solve the problems;
2. offering new ideas and applying in professional activity basic knowledge from areas of mathematical and computer modeling, information technologies and others;
3. mathematical modeling of processes and objects on the basis of the analysis of a current state of a problem;
4. debugging of the knowledge-intensive software;
5. application of mathematical methods for numerical calculations;
6. programming in highly-level object-oriented languages;
7. students will be able to organize, connect, and communicate mathematical and algorithmic ideas.

Analysis

1. possession of methods of mathematical modeling in the analysis of global problems on the basis of knowledge of fundamental mathematical disciplines and computer sciences;
2. the analysis and development of decisions in concrete subject domains;
3. analyze an economic and scientific situation on adequacy of a subject of the project, its relevance;

4. represent algebraic expressions in multiple ways.
5. analyze the numerical data in a table for trends, patterns and interrelationships.

Evaluation

1. collecting and processing of the scientific materials necessary for solution of specific practical objectives;
2. studying of scientific and technical information, domestic and foreign experiment on scope of research;
3. preparation of data for the reviews, reports and scientific publications, and others."

The following **curriculum** is presented:

Title of Module	Code	Title of courses	Credits	Unit (ECTS)	Layout	Semester
1. State compulsory module (10 credits)	HRK1101	History of Republic Kazakhstan (1991-2013 years)	2	3	1+1+0	1
	POK(R)L1102	Professional-oriented Kazakh (Russian) language	3	5	0+2+1	1
	POFL1103	Professional-oriented Foreign language	3	5	0+2+1	1
	PSK2104	The philosophy of scientific knowledge	2	3	1+1+0	4
2. Social and communicative module (4 credits)	PIC3201	Psychology of Interpersonal Communication	2	3	1+1+0	5
	TAPS3202	Theoretical and Applied Political Science	2	3	1+1+0	5
	EPSS3203	Ethics of personal and social success	2	3	1+1+0	5
	CR3204	Culture and Religion	2	3	1+1+0	5
	GAS3205	General and Applied Sociology	2	3	1+1+0	5
	FLS3206	Fundamentals of Life Safety	2	3	1+1+0	5
	ESD3207	Ecology and Sustainable Development	2	3	1+1+0	5
	KL3208	Kazakh law	2	3	1+1+0	5
	FE3209	Fundamentals of Economics	2	3	1+1+0	5

3. Block vocational modules (115 credits)	**3.1 Natural science (STEM) module**		**12**	**20**		
	ITPP1301	Information Technology for professional purposes	3	5	1+0 +2	1
	TPQM2302	Theoretical Physics. Quantum Mechanics	3	5	2+1 +0	4
	FK3303	Physical Kinetics	3	5	2+1 +0	6
	Ther4304	Thermodynamics	3	5	2+1 +0	7
	3.2. Basic vocational modules		***69***	***115***		
		Module-1. Mathematical analysis				
	MA1301	Mathematical analysis – I	4	6	2+2 +0	1
	MA1302	Mathematical analysis – II	4	6	2+2 +0	2
	MA2303	Mathematical analysis – III	3	5	2+1 +0	3
		Module-2. Algebra and Geometry				
	AGLA1301	Analytical geometry and linear algebra 1	3	5	2+1 +0	1
	AGLA1302	Analytical geometry and linear algebra 2	3	5	2+1 +0	2
	DGTA2303	Differential Geometry and tensor analysis	2	3	1+1 +0	3
		Module-3. Differential equations control theory				
	PTMS2301	Probability Theory and Mathematical statistics	3	5	2+1 +0	2
	DE2302	Differential equations	3	5	2+1 +0	3
	MPE2303	Mathematical Physics Equations	3	5	2+1 +0	4
	COM3304	Computations and Optimisation Methods	2		1+1 +0	4
		Module-4. Mechanics				
	TM2301	Theoretical Mechanics	3	5	2+1 +0	3
	CM3302	Continuum Mechanics	3	5	2+1 +0	5
		Module-5. Computational Mathematics				
	NM2301	Numerical methods– 1	3	5	2+0 +1	3
	NM2302	Numerical methods – 2	3	5	2+0 +1	4
		Module-6. Mathematical Modeling				
	IMM3301	Introduction to Mathematical Modeling	2	3	1+0 +1	5
	MCMBPhM	Mathematical and computer modeling in bio-	2	3	1+0	6

	4302	physics and medicine			+1	
	MCMPhP4303	Mathematical and computer modeling of physical processes	3	5	2+1+0	7
		Module-7. Administration and Programming				
	Pro1301	Programming	3	5	1+0+2	2
	SAOS2302	System Administration operating systems	3	5	1+0+2	2
	OOPC2303	Object-oriented programming in C++	3	5	1+0+2	3
	PP2304	Parallel Programming	3	5	2+0+1	4
		Module-8. Компьютерная графика и базы данных				
	3DM3301	3D-modeling	3	5	1+0+2	6
	PCG3302	Programming in computer graphics	2	3	1+0+1	6
	FRDBD3303	Fundamentals of relational database design	3	5	1+0+2	6
	3.3 Modules individual educational trajectories (IET)/ OC			**30**		
	IET 1. Mathematical Modeling	**IET 2. Computational mathematics and scientific computing**	**IET 3. Computer modeling**			
	Scientific writing (kaz/rus/eng) 1+0+0	**Scientific writing (kaz/rus/eng)** 1+0+0	**Scientific writing (kaz/rus/eng)** 1+0+0	1 (2 ECTS)	5	
	SVA 2501 Spectral and wavelet analysis 1+1+0	GA2501 Graphs and Algorithms 1+0+1	MT 2501 Mobile technology 1+0+1	2 (3 ECTS)	4	
	MMHPC 3502 Models and methods for highly productivetion calculations 2+0+1	MCMA3502 Monte-Carlo methods and their applications 2+1+0	DTPSSG3502 DTP systems and scientific graphics 1+0+2	3 (5 ECTS)	5	
	MMGF2503 Mathematical modeling of geophysics 2+0+1	NSNBVP32503 The numerical solution of nonlinear boundary value problems 2+0+1	CIS3503 Cryptography and Information Security 1+0+2	3 (5 ECTS)	5	
	SMTPh3504	ODS3504	ADC3504	3	5	

		Spectral Methods in Theoretical Physics 2+0+1	The Organization of distributed systems 2+0+1	Application Development in C# 1+0+2	(5 ECTS)	
		MMBPGE3505 Mathematical modeling biological processes and Genetic Engineering 1+2+0	SC32505 Scientific computing 2+0+1	PJ23505 Programming in Java 2 1+0+2	3 (5 ECTS)	6
		MMChP3506 Mathematical modeling of chemical processes 2+0+1	NMCGS3506 Numerical methods for Curvilinear Grid 2+0+1	WT3506 Web technology 1+0+2	3 (5 ECTS)	6
		MMPhTP4507 Mathematical modeling of physical and technological processes 2+0+1	FET4507 Finite element technique 2+0+1	MFCG4507 Mathematical Foundations of Computer Graphics – II 1+0+2	3 (5 ECTS)	7
		CFD4508 Computational fluid dynamics 2+0+1	CFD4508 Computational fluid dynamics 1+2+0	DBMS4508 Database Management Systems 1+0+2	3 (5 ECTS)	7
		MNDDM4509 Modeling the nonlinear dynamics of deformable media 1+2+0	NSR4509 Numerical solution of the rheology 2+0+1	CDPACAD4509 Computer design and programming in AutoCAD 1+0+2	3 (5 ECTS)	7
		MMTPh4510 Mathematical models in theoretical physics 2+0+1	PPDDM4510 Parallel programming and distributed data management 2+0+1	OSPP4510 Operating systems for professional purposes 1+0+2	3 (5 ECTS)	7
	3.4 Interdisciplinary module		**4**	**6**		
		Innovative entrepreneurship (by industry)	2	3	1+1+0	3
		Intellectual property law	2	3	1+1+0	3
		Molecular biology	2	3	1+1+0	3
		Physical chemistry	2	3	1+1+0	3
4. Internship	4.1	Professional internship (by internship)				
	EP110	Educational Internship – I	**2**	3		2

	1					
	EP1102	Educational Internship – II	**2**	3		4
	PP3201	Professional Internship	**2**	3		6
	PP4202	Professional Internship	**5**	8		8
5. Final Certification	5.1	Writing and Presentation of Bachelor's dissertation (Diploma Project)	2	3		
6. Additional Forms of training	6.1	Sport and Recreation	8	13		
TOTAL			**150**			

For the degree programme Ma Mathematical and Computer Modeling, the self-assessment report states the following **intended learning outcomes**:

"Knowledge

1. know modern methods of mathematical modeling
2. knowledge of methods of mathematical, computer and algorithmic modeling with the analysis of problems of natural science
3. knowledge of modern algorithms of computational mathematics
4. know modern numerical methods
5. knowledge of the peculiarities of modeling the chemical, physical, biological, bio-medical and economic processes
6. know the parallel programming
7. Students will be prepared to pursue their postgraduate interests, including graduate study, teaching, and private or government employment
8. have advanced knowledge within one of the mathematical areas algebra, analysis/differential geometry or applied mathematics
9. have a solid knowledge about fields close to the chosen main area.

Understanding

1. understand how to apply simulation techniques to solve a specific task
2. understand the general principles of modeling
3. to be able to apply the methods of mathematical modeling for the solution of problems of physics
4. understanding of the principles governing the mathematics, computer Modeling and/or statistics they have encountered.

Results of training programs

Application

1. interpret the theoretical aspects of the basic terms of mathematical and computer modeling
2. illustrate the results of solution of physical and mathematical tasks
3. solve situational problems of mathematics
4. students will demonstrate a Masters-level understanding of basic mathematical concepts, including the ability to

(a) apply mathematical concepts to solve problems in various areas of pure and applied mathematics,

(b) locate mathematical methods as needed in order to solve problems, and

(c) to communicate effectively the solution to a mathematical problem.

Analysis

1. possession of methods of mathematical modeling in the analysis of global problems on the basis of physical laws
2. the analysis and development of decisions in concrete Master's subject domain;
3. analyze an economic and scientific situation on adequacy of a subject of the project, its relevance
4. analyze any problem and determine the mathematical methods of its solution
5. analyze the results of solving the problems

Evaluation

1. can enter complicated problem issues, uncover structures and formulate precise problems, find suitable analytical and/or numerical solution methods, and interpret the solutions
2. can use existing literature in an active way to understand the work of other scientists, and as support to solve own mathematical problems."

The following **curriculum** is presented:

Title of Module	Code	Discipline name (modules) and type of activity	Credits	Unit (ECTS)	Lay out	Se-meste r
1. State compulsory module (8 credits)	IFN 5201	History and Philosophy of Science	2	3	1+1 +0	1
	Iya(p)5202	Foreign language (Professional)	2	3	1+1 +0	1
	Ped 5203	Pedagogics	2	3	1+1 +0	2
	Ped 5204	Psychology	2	3	1+1 +0	2
2. Compul-sory Pro-fessional Modules - (14 credits)	MMMM 5301	Mathematical modeling modern methods	2	3	1+1 +0	1
	OPSR 5302	Organization and Planning of Scientific Re-search	3	5	2+1 +0	1
	MCMMCh P 5303	Mathematical and computer modeling of chemical processes	3	5	2+0 +1	1
	MCMUNP hP 5304	Mathematical and computer modeling of unsteady nonlinear physical processes	3	5	2+0 +1	1
	MCMAPP M 5305	Mathematical and computer modeling of atmospheric processes and problems of meteorology	3	5	1+2 +0	2
3. Modules of Individual Educational Paths – 20 credits	**3.1 Module 1 (Individual Educational Paths 1)**					
	MCMTA 5301	Monte-Carlo methods and their applications	2	3	1+0 +1	2
	FETPHMT 5302	The finite element method in problems of heat and mass transfer	2	3	1+0 +1	2
	3.2. Module 2 (Individual Educational Paths 1)					
	MTPP 5303	Modern technologies of parallel programming	2	3	1+0 +1	2
	PDA 5304	The analysis and development of algorithms	2	3	1+0 +1	2
	3.3. Module 3 (Individual Educational Paths 1)					
	MCMMBP 6305	Mathematical and computer modeling of med-ical and biological processes	3	5	2+0 +1	3
	TBNCMMP hM 6305	Theoretical basis for numerical calculating the motion of multiphase media	3	5	2+0 +1	3
	3.4. Module 4(Individual Educational Paths 1)					
	MMHPC 6307	Models and methods for highly productivetion calculations	3	5	2+0 +1	3
	CFD 6308	Computational Fluid Dynamics	3	5	2+0 +1	3
	3.1 Module 1 (Individual Educational Paths 2)					
	MFCG 5301	Mathematical Foundations of Computer Graphics	2	3	1+0 +1	2
	CMRGP 5302	Computer modeling and rendering in graphic packages	2	3	1+0 +1	2

	3.2 Module 2 (Individual Educational Paths 2)					
	TDS 5303	The theory of difference schemes	2	3	1+0 +1	2
	AChCM 5304	The numerical solution of nonlinear boundary value problems	2	3	1+0 +1	2
	3.3 Module 3 (Individual Educational Paths 2)					
	IIPPMF 6305	Inverse and Ill-posed problems of mathematical physics	3	5	2+0 +1	3
	NMSPHMT MB 6306	Numerical methods for solving problems of heat and mass transfer with a moving boundary	3	5	2+0 +1	3
	3.3 Module 4 (Individual Educational Paths 2)					
	NDEPHHES 6307	The numerical decision of engineering problems of hydrodynamics on high-efficiency systems	3	5	2+0 +1	3
	NSR 6308	Numerical solution of the rheology	3	5	2+0 +1	3
4. Additional Types of Training	NIRM	**4.1 Master's Research Work and Fulfillment of Dissertation**	7			
	NIRM I	Research Seminar I	**1**	2		1
	NIRM II	Research Seminar II	**1**	2		2
	NIRM III	Research Seminar III	**1**	2		3
	NIRM IV	Research Seminar I V	**4**	6		4
		4.2 Professional Practice	6			
	PP	**Pedagogical Practice**	**3**	5		3
	IP	**Research practice**	**1**	2		1
	IP	**Research practice**	**2**	3		4
Final Attestation	**KE**	**Complex Examination**	**1**	2		
	ZD	**Dissertation Fulfillment and Defence**	**3**	5		
\TOTAL			**59 credits (98 ECTS)**			

C Peer Report for the ASIIN Seal[3]

1. Formal Specifications

Criterion 1 Formal Specifications

Evidence:

- Self-Evaluation-Report

Preliminary assessment and analysis of the peers:
The formal specifications of the programmes are defined in the self-evaluation-report as presented in the table ahead. Up to now the degree programmes are offered only in a fulltime mode, but the auditors learned that the university deliberates whether part-time study should be established in future. They would encourage such an offer in light of the corresponding student demand.

The auditors learned that the maximum of expected intakes per study year is specified by the national ministry of education: The ministry gives a limit of students who can enroll in the study programmes. The number of students enrolled in the degree programmes declined during the last years due to an increase of the threshold score necessary for the admission to the university. The auditors noted that tuition fees are charged but that, in fact, most of the students receive state scholarships or research grants, which also free them of tuition fees. Enrolment on a fee base is possible but only very few students pay the fees themselves.

The names of the degree programmes have been discussed intensively during the audit visit. The peers assessed the English names of the Bachelor's and the Master's degree programmes Computer Science and Software as not yet convincing. Contrary to what the name might suggest the intended learning outcomes are not in the field of Software/Software Engineering but in the field of management of hardware and software systems. According to the university this misunderstanding is due to a translation error. The auditors stated that the name of the degree programmes has to reflect the curriculum and the intended learning outcomes and that the university has to ensure that published translations are correct. Against the background of the explanation of the universi-

[3] This part of the report applies also for the assessment for the European subject-specific labels. After the conclusion of the procedure, the stated requirements and/or recommendations and the deadlines are equally valid for the ASIIN seal as well as for the sought subject-specific label.

ty and the curriculum the experts suggested to take the name “Information technology” into consideration when considering a new English name. According to the terminology used in the ACM/IEEE guidelines for curricula in the field of computing the term “Information Technology” appears to be the most appropriate one for the study programme under consideration. Regarding the Bachelor’s and Master’s degree programme Mathematical and Computer Modeling the experts stated that the name is not misleading but the English translation could be improved (e.g. “Computational sciences”). Another alternative would be simply Numerical Modeling, since numeric encompass mathematical and computer aspects.

All other formal information like final degree, standard period of study as well as the first time of offer of the programmes were clearly defined. The Kazakh credit points and the conversion into ECTS credit points is not always understandable as the auditors indicated. In some cases 1 ECTS seemed to be equivalent to 12 hours, in the other case equivalent to 35 hours.

Further discussion is pointed out in the chapters below (learning outcomes, curriculum credit points).

Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 1:

The auditors appreciated the indication of the university that the name of the degree programme “Mathematical and Computer Modeling” is considered to be changed.

The peers evaluated the requirements of the criterion as fulfilled apart from the name of the degree programmes Computer Science and Software: The name of the study programmes does not reflect the curriculum and intended learning outcomes. The published translations must be correct.

2. Degree programmes: Concept & Implementation

Criterion 2.1 Objectives of the degree programmes

Evidence:

- Self-Evaluation Report

Preliminary assessment and analysis of the peers:

The programmes under review aim at education of computer science, mathematics and computer Modeling as well as information systems corresponding to the qualifications of

the European Qualifications Framework level 6 and 7 respectively. The panel considered these objectives to be convincing.

Criterion 2.2 Learning Outcomes of the degree programmes

Evidence:

- Self-Evaluation Report
- Discussions with representatives of the university [objectives, classification]

Preliminary assessment and analysis of the peers:
The self-assessment reports presented a list of objectives and intended learning outcomes for the degree programmes. The subject-specific learning outcomes of every programme distinguish between *knowledge*, *understanding*, *application*, *analysis*, *synthesis* and *evaluation*. The goals, objectives and intended learning outcomes are made available to the students through a booklet that provides detailed information on the departments. Furthermore the university sends information material to high-school graduates. The students confirmed that all required information on the degree programmes is posted on the intranet, and every student can login and download all information and documents needed.

The peers took into account the objectives and learning outcomes of each degree programme as a whole. However, as they did not fully understand the intended learning outcomes and the difference between the four degree programmes, they asked for clarification.

During the discussions the peers learned that the students of the Bachelor's and Master's degree programme Mathematical and Computer Modeling shall be enabled to design and use mathematical models of physical, natural, medical, chemical and biological processes to solve realistic problems. The degree programmes were developed as a consequence of an environmental disaster which made quantitative simulation of geophysical and biological processes necessary. The peers considered the stated learning outcomes to be convincing. However, they noted that some aspects are missing that are central to mathematical modeling and should still be worked into the intended learning outcomes section, especially as there are at least two courses that refer to these aspects. These are: Understanding of Modeling and data errors of various kinds and their propagation through models and algorithms, Calculation of Input/output Sensitivities, conditioning of models and algorithms, Parameter identification and data assimilation, regularization of illconditioned problems and statistical uncertainty of observational data. The peers commented that the stated intended learning outcomes need to be updated in this regard.

When assessing the stated learning outcomes of the Bachelor and Master's degree programme Information Systems the auditors noted that the description of the three pillars business administration, informatics and the specific core fields of information systems, one would expect to be part of a degree programme called "Information systems", were described only in a very unspecific manner. Notably, business administration did not seem to be an important part of the degree programme. However, the auditors learned in the discussion that the department is guided by learning outcomes defined internationally for degree programmes in the field of information systems, such as in the ASIIN - Subject-specific criteria for Bachelor's and Master's degree programmes in Information Systems or the ACM guidelines. Accordingly, students shall acquire competences not only in informatics and information systems but also in business administration. The peers commented that the stated intended learning outcomes need to be updated in accordance with the actual objectives.

The auditors asked about the distinction between the learning outcomes of the degree programmes Computer Science and Computer Science and Software. They learned that the Bachelor's and Master's degree programmes in Computer Science and Software have their focus rather on hardware and engineering, and that students shall be enabled to take over their professional career for example as system administrator. This explanation reinforced the impression of the peers that the name of these programmes does not properly reflect the curriculum and the intended learning outcomes.

In general, type and level of objectives and learning outcomes of the degree programmes seem to reflect the level of European first and second cycle programmes. Overall, the audit team found that the learning outcomes have been described sufficiently and transparently, yielding a sound basis for the assessment of the students' and graduates' knowledge, skills and competences. According to the audit team, the learning outcomes reflect the level of the qualification sought and are achievable, valid, and reflect currently foreseeable developments in the subject area. However, for the degree programmes Information Systems, Computer Science and Computer Science and Software they have to be redrafted to be more programme-specific and distinctive thereby clarifying the acquired competences of the graduates. In particular, the auditors questioned the learning outcomes of the individual educational trajectories that are not mentioned in the descriptions so far.

Not least taking into account the above reservations regarding the objectives and learning outcomes described for the programmes under review, the peers questioned whether the learning outcomes would be adequately implemented via the syllabus/curricular content and the teaching methods adopted (cf. Curriculum).

The faculty has applied for the *Euro-Inf-Label*, requiring the application of the ASIIN - Subject-specific criteria (SSC) for Bachelor and Master's degree programmes in Informatics/Computer Science. The SSC describe formal, algorithmic and mathematic competences as well as analysis, design and implementation competences the students should acquire in the degree programmes. Furthermore, technical competences as well as methodological competences are described. Also project management competences are mentioned. The auditors ascertained that the intended learning outcomes of the programmes under review are basically in line with the SSC. However, they doubted whether the objectives and learning outcomes of the Bachelor's and Master's degree Mathematical and Computer Modeling are in line with the SSC. They were convinced that the graduates of these degree programmes know important applications of informatics but they do not see yet that they possess fundamental understanding of central concepts and methods of computer science in general.

Criterion 2.3 Learning outcomes of the modules/module objectives

Evidence:

- cf. module descriptions

Preliminary assessment and analysis of the peers:

The modules are described in module handbooks which are available for students on the website. The auditors confirmed that the module descriptions are detailed and provide all relevant information required to comprehend which knowledge, skills and competences students are expected to acquire in the individual modules. The intended learning outcomes and the prerequisites, the student workload, the contents of the modules and the examinations for achieving them are clearly understandable to students. However, the auditors noted that some module descriptions were missing, e.g. the descriptions of the final theses and the internships. Furthermore, the university referred in the discussion to modules which would lead to the achievement of soft skills. All of these descriptions have to be added. The auditors discussed also the naming of some of the modules. They noted that the names did not always provide correct information about the intended learning outcomes and the content of the modules, in some cases the names seemed to be even misleading (e.g. Databases and Interfaces of computer systems). For reason of transparency the auditors deemed it necessary to rename the modules so that they reflect the content and the intended learning outcomes.

Criterion 2.4 Job market perspectives and practical relevance

Evidence:

- Self-assessment report
- Overview of jobs and companies of graduate employment

Preliminary assessment and analysis of the peers:

The peers deemed the practical elements included in the programmes to be partly sufficient in order to prepare students for dealing with industry-related problems and tasks. They understood that the students have to complete professional internships in the Bachelor and Master's degree programmes. Tasks and intended learning outcomes are agreed previously between enterprises and department. Supervisors are available within the enterprise as well as in the university. After completion the students write a report that has to be defended in front of students and teachers in the university.

The objective of the pedagogical internship in the Master's degree programmes is to train the students in teaching: typically, Master's students read lecturers for the Bachelor's degree programmes under supervision of the respective professors.

However, the peers would recommend including a project in the curricula to give students an idea of a software lifecycle and hence to enhance their professional qualification.

The self-assessment reports of all degree programmes provided a list of potential and actual employers of graduates. The auditors learned that graduates of the degree programmes under review have very positive job market perspectives. In some cases a contract of employment is already offered upon completion of the internship. Additionally, graduates have the possibility to work as a high school teachers.

The departments receive feedback from employers regarding the curriculum on a regular basis through a standing committee with representatives from the most import private companies and government organizations. The auditors understood that content and structure of the curriculum is based on the requests from these employers. Generally, the auditors appreciated the liaison with the industry. However, the peers asked to bear in mind that academic education should not mean immediate response to each particular need of the variety of employers. Rather, the university must weigh the longterm interest of its students and the development of science and technology on an international level also taking into account social needs and risks.

Criterion 2.5 Admissions and entry requirements

Evidence:

- "University-wide Academic Policies and Procedures of al-Farabi Kazakh National University"

Preliminary assessment and analysis of the peers:

The auditors discussed the admission rules and procedures with the university representatives. The programme coordinators explained that the selection of the applicants is made by the Ministry of Education and Science; more specifically, admission for the bachelor degrees is carried out by the admission rule developed by the Ministry of Education and Science of Kazakhstan based on article number 4 of the Law on Education. It was further explained that educational grants are awarded to students on a competitive basis in accordance with gained scores on the Unified National Test (UTN). This UTN is taken by all high school graduates and the score received qualifies a high school graduate to apply for university admission. The UTN has five subjects; four of them are core subjects such as Maths, History of Kazakhstan, Russian and Kazakh languages, and the fifth one is an elective subject that is selected based on the programme fields. Minimum score of the UNT that allows applying for higher education institutions is 60, but for the degree programmes under review the minimum score is 70, so that the admitted students are among the best formally qualified for a successful completion of studies. The Ministry of Education and Science defines the quantity of educational grants for each academic degree programme. Altogether the auditors judged that the admission requirements were reasonable for maintaining the quality of the Bachelor´s degree programmes.

The auditors discussed with the representatives of the university to what extent the admission requirements for the Master's degree programmes have an impact on the quality of the degree programmes. Admission for the Master's degree programmes is defined by the admission rule developed by the Ministry of Education and Science of Kazakhstan based on article number 4 of the Law on Education. Educational grants for Master's degree programmes are awarded to students on a competitive basis. Bachelor graduates have to take entrance exams which comprise a foreign language test and a subject specific written exam which includes theoretical questions and an essay. The peer group concluded that this was an appropriate approach to secure the quality of the academic standard.

However, when assessing the curricula they noted that several modules in the Master's degree programmes would be typically classified as modules of Bachelor's degree programmes (e.g. Algorithms and their Complexity, Introduction to Databases, Software Engineering). The university explained that graduates of other universities do not always

possess the required competences. For that reason some of the contents of the Bachelor's degree programmes are repeated in the Master's degree programmes. Nevertheless, as the extent to which Bachelor level module were included in all Master's degree programmes was significant, the peers concluded that compensation of missing prerequisites in general should not impact the level of the programme. When defining the modules of Master level programmes, the university has to ensure that students possess the necessary competences. While some limited compensation might be acceptable during the first semester, overall, the necessary competences should be ensured upon admission. This would not prevent individual students from improving their competences on their own.

As for the recognition of qualifications gained from other institutions of higher education, in particular abroad, competences are taken into consideration. The university explained that they check the diploma supplement or transcripts of records to assess whether the competences are in accordance with the ones that are imparted in the degree programmes under review.

Criterion 2.6 Curriculum/Content

Evidence:

- Curriculum overview in the self-evaluation-report

Preliminary assessment and analysis of the peers:
The auditors assessed the curricula of the programmes under review against the programme objectives provided in the self-assessment report as well as against the stipulations of the Subject-Specific Criteria.

In general, they highly appreciated that the field of mathematics is trained comprehensively and that graduates of the degree programmes possess sound knowledge in mathematics. They also noted that the university informs prospective students in advance that mathematics is a central part of the degree programmes and is more important than in similar programmes at other universities. Furthermore, the auditors perceived high satisfaction with the degree programmes among the students.

Notwithstanding, the auditors wondered whether the curricula facilitate the achievement of the intended learning outcomes. More specifically, the objective of the Bachelor's degree programmes is to impart fundamental knowledge and skills in the respective subject specific field. Regarding the degree programmes Computer Science and Computer Science and Software the auditors questioned whether the modules in these Bachelor's degree programmes impart knowledge in the basic fields of computer science. According to the SSC, modules designed to introduce the core subjects of computer sciences would be theoretical informatics, algorithms and data structures; databases and information sys-

tems; operating systems; communication systems; computer architecture; programming technology and software engineering. The auditors have no doubt that all these core subjects are integral parts of the Bachelor's *and* Master's degree programmes taken together and that graduates of the *Master's* degree programmes possess these required competences. However, as not all of the graduates of the Bachelor's degree programmes continue to study also the Master's degree programmes, the auditors deemed it necessary to provide a sound introduction in the basic fields of computer science already in the Bachelor's degree programmes – in line with the SSC. Therefore, the compulsory curriculum must cover the core areas of the field of computer science (in particular theory of computation, algorithms and data structures, programming methodology and languages and computer elements and architecture) to ensure that all graduates acquire the intended fundamental competences.

Regarding the Master's degree programmes, the auditors emphasized that the modules on the Master's level should be based on knowledge accumulated during the Bachelor's studies but lead to higher levels of knowledge, skills, and competence in the cognitive domain. Assessing the degree programmes under review, the auditors had the impression that several modules in the Master's degree programmes would be typically classified as modules of Bachelor's degree programmes and vice versa (particularly the "compulsory professional modules"). Therefore, they considered it necessary to revise the curricula to the effect that fundamental modules are part of the Bachelor's degree programmes while advanced and in-depth modules are part of the Master's degree programmes so that the contents of the modules correlate with the intended qualification level.

In comparison with the degree programmes "Computer Science", the curriculum of the Bachelor's and Master's degree programme Computer Science and Software contains more physics, robotics, engineering, programming and modules in the field of management of software and hardware systems. The auditors acknowledged this curriculum and the difference to the degree programmes in Computer Science in general. But as stated above, the names of the programmes have to be revised and adapted so that the English name reflects the curriculum and the intended learning outcomes. Furthermore, and in line the SSC, the peers would recommend including a project in the curriculum to give students an idea of a software lifecycle and hence to enhance their professional qualification.

Regarding the Bachelor's and the Master's degree programmes Information Systems the auditors noted that the share of business administration in the curriculum is very limited although the university said that they are guided by learning outcomes defined internationally for degree programmes in the field of information systems. Accordingly, students should acquire competences not only in informatics and information systems but also in

business administration. During the discussions the auditors learned that business administration had been an integral part of the curriculum but was removed some time ago. Students are now taught mathematical fundamentals and programming instead. IT management, business administration and assembler programming are not components of the compulsory curriculum. The auditors questioned especially how knowledge in ERP systems could be imparted without teaching basic principles of business administration. To assure that all graduates acquire the intended fundamental competences internationally expected to be part of a degree programme called “Information systems”, the peers deemed it necessary that the compulsory curriculum covers the core areas of the field of business administration and general IT management as well.

Upon implementing the described proposals for modification the peers have no doubt that the requirements of the Euro-Inf-Label can be met by the degree programmes in Computer Science, Computer Science and Software as well as Information Systems (however, the peers were not sure how databases are taught in the Bachelor’s and Master’s degree programmes Information Systems). But as mentioned above, the majority of the auditors do not see curricula and intended learning outcomes of the Bachelor’s and Master’s degree programmes Mathematical and Computer Modeling in line with the criteria. Core subjects of informatics such as theoretical informatics, algorithms and data structures; databases and information systems; operating systems; communication systems; computer architecture; programming technology and software engineering as well as software engineering projects are not part of the curricula and are not foreseen to achieve the intended learning outcomes.

The auditors understood that the curricula consist of compulsory and of elective courses. Minor modules, so called “Individual Educational Trajectories”, are selected by the students in the Bachelor’s degree programmes and should not be changed for the Master’s degree programmes. The students are advised by the university teachers regarding the elective courses.

The auditors learned that all modules are offered in Kazakh language and Russian. Some modules are also offered in English in which case students have to pass a test in English. During the discussions with the students, the peer group noted that not all of them found it easy to converse in English despite the fact that English competences are defined as a learning outcome. Part of the intended learning outcomes is also the students’ ability to work in an international context. Consequently, the auditors concluded that advice and assistance in oral and written English (especially with regard to publications in international journals) should be provided.

Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 2:

The peers deemed the relevant aspects of the said criterion partly met.

They maintained their concern that some aspects are missing in the intended learning outcomes. Therefore the qualifications profiles should be updated to be more programme-specific and distinctive thereby clarifying the acquired competences of graduates, and the intended areas of professional work in the respective programme.

Also the module descriptions have to be updated and missing descriptions have to be added. The names of the modules have to reflect the content and the intended learning outcomes.

The peers recommended including a project in the curricula (at least in the Bachelor's degree programme Computer Science and Software) to give students an idea of a software lifecycle and hence to enhance their professional qualification. They appreciated the indication of the university to add such a project in the curricula.

The peers insisted on the requirement that the modules have to correlate with the intended qualification level. Compensation of missing prerequisites should not impact the level of teaching and learning in the Master's degree programme. When defining the modules of Master level programmes, the university has to ensure that students possess the necessary competences.

The auditors were pleased to hear that the university is planning to limit mathematical subjects in order to fit more computer science/business administration disciplines. They also thanked the University for providing a comparison between the requirements of the SSC and the curricula of the degree programmes Computer Science and Computer Science and Software. The peers came to the conclusion that regarding the Bachelor's degree programme Computer Science the curriculum already covers some core areas of the field of computer science (in particular theory of computation, algorithms and data structures, programming methodology and languages). Only the field computer elements and architecture is not covered so far. The course "Informational Technologies for the professional purposes" cannot be found in the module descriptions. Regarding the Bachelor's degree programme Computer Science and Software the curriculum does not cover the field Theoretical informatics and Computer Architecture sufficiently. Also Algorithm and Data Structure is covered only by the course "Algorithms and Their Complexity" in the Master's degree programme and not in the Bachelor's degree programme. According to the experts it is so far not ensured that all graduates acquire the intended fundamental competences.

The auditors maintained their concern that the share of business administration and general IT management in the curriculum of the degree programmes Information Systems is up to now very limited. They punctuated that the compulsory curriculum must cover the core areas of the field of business administration and general IT management to ensure that all graduates acquire the intended fundamental competences on international level.

Eventually the auditors insisted on the recommendation that advice and assistance in oral and written English should be provided (especially with regard to publications in international journals).

3. Degree Programme: Structures, Methods & Implementation

Criterion 3.1 Structure and modularity

Evidence:

- Curriculum overview in the self-evaluation-report
- Module descriptions

Preliminary assessment and analysis of the peers:
As already mentioned above, the peers ascertained that the Master's degree programmes incorporate also a significant number of modules which are at undergraduate level (cf. Curriculum).

Regarding the possibility for students to spend some time abroad without loss of time the peers took note that, in general, there are opportunities for study visits at other HEIs. In the discussion with the students the auditors also learned that all students have the opportunity to go abroad and that they are even financed to some extent. Furthermore, cooperation agreements with universities abroad exist and are regularly made use of. The auditors appreciated this information.

Concerning the modularity the auditors understood that the "modules" in the study plans are large packages containing several courses and extending over several semesters (e.g. modules of individual educational paths, compulsory professional modules). These blocks are labeled "modules" in the translations used by the university. However, the smaller units called "courses" in the curricular plans would rather fit the understanding of a "module" in the sense of the Bologna process, i.e. a coherent and comprehensive unit of teaching and learning. The auditors therefore imposed upon the university to carefully ensure that translations are consistent and correctly made and that the terms are in line

with the typical terminology as used in the European Higher Education Area. Also the module descriptions have to be reworked in this regard.

Criterion 3.2 Workload and credit points

Evidence:

- "University-wide Academic Policies and Procedures of al-Farabi Kazakh National University"
- Module descriptions
- Discussions with students

Preliminary assessment and analysis of the peers:

The peers acknowledged that every compulsory part of the programmes is credited (including the internships), differentiating student workload in time for courses as well as guided and unguided self studies. As noted in chapter 1, there was some confusion concerning the comparison between the Kazakh credit system and ECTS. The university spoke about different workloads without clearly separating them – the one referring staff and the one referring students. As some peers understood, the Kazakh credit system takes into account the workload of the staff and not of the students. Mistakes in the conversion caused wrong data to be provided in the module descriptions. However, the students explained that the work load was reasonable and acceptable to them. The students seemed to be able to finish their studies within the standard period of time. Furthermore, the auditors noted that the number of students dropping out of university without having completed their studies is extremely low. The students emphasized that exams can be repeated several times and that they receive a lot of individual support from their supervisors. The advisors even inform the parents in case the students fail to turn up in courses or fail an examination. The auditors noted that the almost perfect completion rate compares very favourably with the rather significant drop out rates in science curricula in other Western countries. However, they also commented that the situation cannot be strictly compared due to different prevailing concepts of data privacy and academic freedom.

Criterion 3.3 Educational methods

Evidence:

- Discussion with teaching staff
- Module descriptions

Preliminary assessment and analysis of the peers:
The module descriptions provided a suitable overview of the "type of teaching" that is applied. The lecturers explained that they use a number of different teaching methods. While a majority of classes is taught in the form of classical lectures and presentations, seminars and a variety of projects were also used. This means that students have to carry out projects and present the results at the end of the course. The grade is based on how they complete the given task and on how the results are presented. The auditors appreciated furthermore that students have several possibilities to participate in scientific projects which are financed by the government or private institutions. The students expressed their satisfaction referring to this. In addition, the auditors welcomed the "pedagogical internships" conducted in the Master's degree programmes: under the supervision of staff members, students read lectures for Bachelor's courses and hence gain practical teaching experience. The auditors welcomed the different teaching methods and concluded that the teaching methods and tools support the achievement of the learning outcomes at the intended level.

As explained in the SSC, informatics systems are typically developed in environments outside the subject's field of expertise. Above all, intensive and sustained communication is therefore required in collaboration with clients and users as well as within the development team. Hence a key focus of the curriculum should lie on imparting and training in communicative and interdisciplinary competence. The university stated that programming courses are conducted in teams but that teamwork itself is not part of the assessment. Furthermore, there is neither reflection foreseen at the end of a teamwork phase nor theoretical background of social competences provided. In the case of internships credits are awarded for working in a team, but the auditors were not able to assess these internships in detail because of missing module descriptions. However, to meet the requirements of the SSC (and therewith also the requirements for Euro-Inf) social competences, such as project management competences, the capacity for teamwork and communication must be fostered within the degree programmes Computer Science, Computer Science and Software and Information Systems. This would not mean that such competences are acquired only "on the go" but that they must be explicitly taught and assessed, whether in specific modules included for this purpose or in the frame of subject-related modules.

The auditors acknowledged that in all degree programmes so-called "Modules for Individual Educational Trajectories" were offered to allow students to develop an individual focal area of competence.

The ratio of taught contact hours to self-study was properly indicated in the module descriptions. The auditors considered the ratio of contact time to individual self-study time to be adequate.

Criterion 3.4 Support and advice

Evidence:

- Self-assessment report
- Discussions with students and teaching staff

Preliminary assessment and analysis of the peers:
The students confirmed that a well developed system of tutorials was in place and that each student had a scientific advisor who supported them in case of problems. Advice was also offered for designing the individual study plan and for selecting the "Individual Educational Trajectories". Overall, students expressed a high level of satisfaction during their discussion with the peers. The auditors could see that sufficient resources were available for offering individual support, supervision and advice to students.

Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 3:

The peers considered the criteria to be partly fulfilled.

They confirmed the requirement that the term "module" must be employed in the sense of a comprehensive learning and teaching entity as it is usually applied in the context of the Bologna process. Also the module descriptions have to be reworked in this regard.

The auditors insisted also on the requirement of the SSC that social competences, such as project management competences, the capacity for teamwork and communication must be fostered within the degree programmes Computer Science, Computer Science and Software and Information Systems.

4. Examination: System, Concept & Implementation

Criterion 4 Exams: System, concept & implementation

Evidence:

- "University-wide Academic Policies and Procedures of al-Farabi Kazakh National University"
- Module descriptions

Preliminary assessment and analysis of the peers:
The peers gained the impression that type, organization and distribution of examinations are designed to support the attainment of the intended learning outcomes by the time the degree is completed. While most exams are written, in seminar-type courses students have to carry out projects and present the results at the end of the course. The grade is based on how successfully they complete the given task and on how the results are presented. In general, examinations are organized with midterms and final exams. Students who failed exams have the possibility to repeat them either in the following semester or immediately following the semester in the winter or summer session. The panel had no indication that this procedure would interfere with individual students´ progress.

The auditors questioned the purpose of the described state comprehensive exam which takes place at the end of the degree programmes when students have completely finished all courses. This state comprehensive exam, in the form of an oral exam, may range over the content of all the modules taught in the programme. As the achievement of the intended learning outcomes per module is assessed through module specific exams in all modules, it is not clear which additional achievement the state comprehensive exam would assess. The achievement of overarching competences is to be assessed in the final thesis. From the point of view of the peers, such an additional cumulative examination at the end of a study programme is also in contradiction to the basic concept of the Bologna reform emphasizing course related exams.

Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 4:

The peers evaluated the requirements of the criterion as partly fulfilled. According to the majority of the peers the examination organization has to guarantee that the examinations accompany study and take place only on a course related basis.

5. Resources

Criterion 5.1 Staff involved

Evidence:

- Staff handbook in the self-evaluation-report
- Discussion with members of the university management

Preliminary assessment and analysis of the peers:
In the discussion with the peers, the members of the university management related the still ongoing transformation process of al-Farabi University into a research institution after being a more educationally oriented university during the Soviet Union. Concerning scientific staff, this is to be achieved by a results-based management approach, which appears in individual agreements on objectives and individual reporting, taking into account the research performance and the educational performance. The auditors understood in the discussion with the university that traditionally there was an institutional separation between universities and research institutions. However, taking into consideration the European Qualification Framework, a Master's degree programme (such as the Master's degree programmes under review) should be based on recent research and development and should impart knowledge in the subject specific field of research. This is even more so as the university classifies itself as a research institution. One way to ensure research-based teaching at Master's level would be to increase the possibility for teachers to act as researchers and developers in their subject fields.

There are fixed ratios of students to teaching staff required by the Ministry of Education. Generally, the approximate ratio is 8:1 at bachelors´ level and 4:1 at masters´ level, which seems to be favorable. However, in the discussion with the teaching staff the auditors learned that the teaching load seems to be very high. According to the lecturers met, all of their working time is spent for the purpose of teaching and student supervision. Conducting research work in parallel with teaching was considered to be hardly possible. Only few teachers were involved in research and publishing in international journals. In the discussion with members of the university management the auditors understood that research sabbaticals are approved on a regular basis, but in the meeting with the teachers they learned that in practice nobody had this opportunity in the last three years. Thus the auditors concluded that in order to guarantee in a sustainable manner that the master's degree programmes can be implemented on a relevant research basis and reflect the fields of research of the departments, staff must be able to better combine teaching load with research work for the purpose of enabling the staff to conduct research and development. Sabbaticals should be conducted on a regular basis. The university must clarify its policy to this regard, how the policy is implemented and must demonstrate which teaching staff is involved in current and relevant research activities.

Regarding the Bachelor's degree programmes the auditors considered the staff resources available as sufficient in quantity and quality for the successful implementation of the programmes. But when assessing the staff handbook they noted that remarkably few of the teachers have an academic background in the field of informatics. Most of them have their background in mathematics or physics. The auditors understood that mathematics is

by tradition strongly represented in Kazakhstan and that computer science might be a new field in the universities. Against this background the auditors also better comprehended the orientation of the curricula which is dominated by mathematics and application of mathematics. However, regarding the Bachelor degree programmes Computer Science, Computer Science and Software and Information Systems the staff should be complemented by members that have an academic background in the field of computer science/information systems. This would ensure that the core areas of the study fields would be taught by qualified and specialized personnel. The auditors appreciated that the university is willing to make available resources to ensure that international teachers come to al-Farabi University and contribute to capacity-building in the field of computer science.

Criterion 5.2 Staff development

Evidence:

- Discussion with members from the university management
- Discussion with members from the faculty management
- Discussion with teaching staff

Preliminary assessment and analysis of the peers:
The auditors were informed that didactical training courses were offered to all lecturers at al-Farabi University and that staff members can obtain certificates on their pedagogical competences. On an annual basis a scientific conference is organized where teachers discuss educational methods and their international experience referring to this. Furthermore, mutual attendance of respective teachers to courses conducted by another is organized. Overall, the audit team considered the opportunities to be sufficient to meet the respective criteria.

Criterion 5.3 Institutional environment, financial and physical resources

Evidence:

- Visitation of the laboratories
- Lists of equipment in the self-evaluation-report

Preliminary assessment and analysis of the peers:
In the discussion with the university the auditors discussed the financial basis of the programmes. They understood that the university receives state funding. Another part of the budget needed is financed by industry. The auditors gained the impression that the financing of the programmes is assured, at least for the accreditation period.

The audit team had the possibility to visit the relevant laboratories. The peers had the impression that a good infrastructure for the study in general is provided, especially in the field of high performance computing. However, it did not become clear to the auditors to which extent access to required software and international journals was available. Some teachers stated that no licences, for example in the field of business application/systems applications, were available. Others informed the panel that the university offers all licences and software asked for. Overall, the auditors felt that the accessibility of relevant international journals could be improved, or at least needs to be made transparent to all teaching staff and students, not least in light of the above-mentioned need for improving the research opportunities.

The university has cooperation agreements with universities abroad. The auditors appreciated particularly the close cooperation with Keele University (UK) as an integral part of the degree programmes Mathematical and Computer Modeling. The auditors welcomed furthermore that all students have the opportunity to go abroad and that they are even financed to some extent.

Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 5:

The peers regarded the requirements of the criteria as partly fulfilled. Regarding the Master's degree programmes the accessibility of relevant international journals should be improved and needs to be made transparent to all teaching staff and students. Also the staff must be enabled to better combine teaching load with research work. The University must clarify how the policy regarding sabbaticals is implemented.

The auditors understood that the system of Kazakh education did not have degrees that have "Computer Science or Information Systems" in their names. The teachers are all called Doctor/Candidate of Physical-Mathematical Sciences. Still the auditors would recommend complementing the staff by members that have a clear academic profile in the field of informatics/information systems. They should work, publicize and conduct projects in the respective field.

6. Quality Management: Further Development of Degree Programmes

Criterion 6.1 Quality assurance & further development

Evidence:

- "University-wide Academic Policies and Procedures of al-Farabi Kazakh National University"
- Discussion with students

Preliminary assessment and analysis of the peers:
The quality assurance policy and the different procedures are elaborated in the "University-wide Academic Policies and Procedures of al-Farabi Kazakh National University". The Methodological Bureau of Faculties is in charge of the overall quality control and quality assurance like "improvement of planning and organization of the educational process" or "improving the quality of teaching". The Office of the Registrar is responsible for the registration services and all kinds of monitoring duties.

At the end of each semester, lecturers are assessed by students and other staff members; the data is analysed and made available to the Management and the Head of Department and has also an effect on the rating (and thereby on the salary) of the teachers. The students confirmed that evaluation questionnaires are handed out and are completed anonymously. But they were not informed about the results and therefore felt almost unable to assess whether there were any improvements derived from the evaluation results. Thus, the feedback loops of quality management activities could not yet be considered closed.

Criterion 6.2 Instruments, methods and data

Evidence:

- Data about exam results, pass rates, student numbers, student progress

Preliminary assessment and analysis of the peers:
Overall, the auditors concluded that the data collected and the tools foreseen put the university in a position to check whether its aims in general and the objectives of the programmes in particular are achieved.

As mentioned above, the peers pointed out that the current quality assurance system does not fully implement a closed cycle. This should be a concern of the further development of the quality assurance mechanisms.

Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 6:

The auditors insisted on the requirement that feedback loops in the student evaluation must be organized.

7. Documentation & Transparency

Criterion 7.1 Relevant Regulations

Evidence:

- "University-wide Academic Policies and Procedures of al-Farabi Kazakh National University"

Preliminary assessment and analysis of the peers:
The peers found that all aspects of admission, examinations, academic standing, progress, probation and disqualification, Fees, grading policy, examinations, and quality management were regulated in the "University-wide Academic Policies and Procedures of al-Farabi Kazakh National University".

Criterion 7.2 Diploma Supplement and Certificate

Evidence:

- No Diploma Supplements or Transcripts of Records were provided

Preliminary assessment and analysis of the peers:
With regard both to the objective of al-Farabi University of fostering convergence with the European Higher Education Area as well as the requirements of the ASIIN seal, the peers stated the necessity of providing a diploma supplement to the graduates. This document should describe the awarded qualification and the educational system of Kazakhstan – in this way fostering comprehensibility and comparability between the educational systems. In detail, the Diploma Supplement has to provide information about the study aims and (generic) learning objectives, nature, level, context, content and status of the studies specifically for each programme, the success of the graduate as well as about the composition of the final grade. In addition to the national grade, a grading table in line with the ECTS Users' Guide needs to be foreseen. In as far as the Diploma Supplement has been made available by the university management, a model for each programme under review should be submitted with the comments on this report.

Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 7:

The auditors received the Diploma Supplement of the Bachelor's degree programme Mathematics. They concluded that it shows how the final grade is calculated and which subjects are part of the study programme including the individual grades. However, a model for each programme under review has to be provided. The Diploma Supplement has to give information also about the study aims and (generic) learning objectives specifically for each programme. In addition to the national grade, a grading table in line with the ECTS Users' Guide needs to be foreseen.

D Additional Documents

Diploma Supplement for each programme

E Comment of the Higher Education Institution (25.08.2014)

The institution provided a detailed statement as well as the following additional document:

Diploma Supplement of the Bachelor’s degree programme Mathematics.

F Summary: Peer recommendations (29.08.2014)

Taking into account the additional information and the comments given by al-Farabi Kazakh National University the peers summarize their analysis and **final assessment** for the award of the seals as follows:

Degree Programme	ASIIN seal	Subject-specific Label	Maximum duration of accreditation
Ba Computer Science	With requirements	Euro-Inf®	30.09.2019
Ba Computer Science and Software	With requirements	Euro-Inf®	30.09.2019
Ba Information Systems	With requirements	Euro-Inf®	30.09.2019
Ba Mathematical and Computer Modeling	With requirements	~~Euro-Inf®~~	30.09.2019
Ma Computer Science	With requirements	Euro-Inf®	30.09.2019
Ma Computer Science and Software	With requirements	Euro-Inf®	30.09.2019
Ma Information Systems	With requirements	Euro-Inf®	30.09.2019
Ma Mathematical and Computer Modeling	With requirements	~~Euro-Inf®~~	30.09.2019

Requirements

For all degree programmes

A 1. (ASIIN 2.2) The qualifications profiles ("learning outcomes" at programme level) have to be more programme-specific and distinctive thereby clarifying the acquired competences of graduates, and the intended areas of professional work in the respective programme.

A 2. (ASIIN 2.3) The module descriptions have to be updated. Missing descriptions have to be added. The names of the modules have to reflect the content and the intended learning outcomes.

A 3. (ASIIN 2.5, 2.6) The modules have to correlate with the intended qualification level. Compensation of missing prerequisites should not impact the level of teaching and learning in the Master's degree programme.

A 4. (ASIIN 3.1) The term "module" must be employed in the sense of a comprehensive learning and teaching entity as it is usually applied in the context of the Bologna process.

A 5. (ASIIN 4) The examinations process has to guarantee that the examinations accompany study and take place only on a course related basis.

A 6. (ASIIN 6.1) Feedback loops in the student evaluation must be organized.

A 7. (ASIIN 7.2) An English diploma supplement has to be provided as a separate document, specifying the qualification achieved.

For the Ba Computer Science and Software

A 8. (ASIIN 1, 2.2, 2.6) The name of the study programme has to reflect the curriculum and intended learning outcomes and the published translations must be correct.

For the BaMa Information Systems

A 9. (ASIIN 2.6) The compulsory curriculum must cover the core areas of the field of business administration and general IT management to ensure that all graduates acquire the intended fundamental competences on international level.

For the Ba Computer Science and Ba Computer Science and Software

A 10. (ASIIN 2.6) The compulsory curriculum must cover the core areas of the field of computer science (in particular computer elements and architecture in both degree programmes and theory of computation and algorithms and data structures in Ba Computer Science and Software) to ensure that all graduates acquire the intended fundamental competences.

For the BaMa Computer Science, BaMa Computer Science and Software, BaMa Information Systems

A 11. (ASIIN 3.3) To enhance the professional qualification of the graduates, social competences, such as project management competences, the capacity for teamwork and communication must be fostered within the degree programmes.

For the Master's degree programmes

A 12. (ASIIN 5.1) For the purpose of enabling staff to conduct research and development, staff must be enabled to better combine teaching load with research work. The university must clarify how the policy regarding sabbaticals is implemented.

A 13. (ASIIN 5.3) The accessibility of relevant international journals should be improved and needs to be made transparent to all teaching staff and students.

Recommendations

For all degree programmes

E 1. (ASIIN 2.6) It is recommended to provide advice and assistance in oral and written English (especially with regard to publications in international journals).

For the Ba Computer Science and Software

E 2. (ASIIN 2.6) To enhance the professional qualification of the graduates it is recommended to conduct a capstone project.

For the BaMa Computer Science, Computer Science and Software and Information Systems

E 3. (ASIIN 5.1) The staff should be complemented by members that have an academic background in the field of informatics/information systems.

G Comment of the Technical Committees

Technical Committee 04 – Informatics/Computer Science (05.03.2014)

Assessment and analysis for the award of the ASIIN seal:

The Technical Committee fully agreed with the requirements and recommendations proposed by the majority of the peers.

Assessment and analysis for the award of the Euro-Inf® Label:

The Technical Committee deemed that the intended learning outcomes of the degree programmes Computer Science, Computer Science and Software and Information Systems comply with the Subject-Specific Criteria of the Technical Committee 04 - Informatics. Regarding the Bachelor's and Master's degree programmes Mathematical and Computer Modeling the Technical Committee agreed with the assessment of the majority of the peers: It deemed that both degree programmes do not comply with the Subject-Specific Criteria of the Technical Committee 04 – Informatics as it is rather a degree programme in the field of Numerical Modeling and not in the field of Informatics/Computer Science.

The Technical Committee 04 – Informatics/Computer Science recommended the award of the seals as follows:

Degree Programme	ASIIN seal	Subject-specific Label	Maximum duration of accreditation
Ba Computer Science	With requirements	Euro-Inf®	30.09.2019
Ba Computer Science and Software	With requirements	Euro-Inf®	30.09.2019
Ba Information Systems	With requirements	Euro-Inf®	30.09.2019
Ba Mathematical and Computer Modeling	With requirements	~~Euro-Inf®~~	30.09.2019
Ma Computer Science	With requirements	Euro-Inf®	30.09.2019
Ma Computer Science and Software	With requirements	Euro-Inf®	30.09.2019

Degree Programme	ASIIN seal	Subject-specific Label	Maximum duration of accreditation
Ma Information Systems	With requirements	Euro-Inf®	30.09.2019
Ma Mathematical and Computer Modeling	With requirements	~~Euro-Inf®~~	30.09.2019

Technical Committee 07 – Business Informatics/Information Systems (03.09.2014)

Assessment and analysis for the award of the ASIIN seal:

The Technical Committee considered that the Bachelor's and Master's degree programmes Information Systems cannot be accredited until the core areas of the field of business administration and general IT management are covered by the compulsory curriculum and are interlinked with the field of informatics. Therefore the Technical Committee recommended a suspension of the procedure and drafted a condition to be met for resumption:

"(ASIIN 2.6) The University has to provide evidence that the compulsory curriculum covers the core areas of the field of business administration and general IT management to ensure that all graduates acquire the intended fundamental competences on international level. Business administration and general IT management have to be interlinked with the field of informatics."

Furthermore the Technical Committee suggested as an additional requirement that when transforming Kazakh credit points into ECTS points, the provisions of the ECTS User's Guide are respected, namely that one credit point is awarded for 25-30 hours student workload:

A 8. "(ASIIN 3.2) The transformation of the Kazakh credit points into ECTS points must correspond to the ECTS User's Guide so that one credit point is awarded for 25-30 hours student workload."

The Technical Committee 07 – Business Informatics/Information Systems recommended the award of the seals as follows:

Degree Programme	**ASIIN seal**	**Subject-specific Label**	**Maximum duration of accreditation**
Ba Information Systems	Suspension	Euro-Inf®	
Ma Information Systems	Suspension	Euro-Inf®	

Technical Committee 12 – Mathematics (18.09.2014)

Assessment and analysis for the award of the ASIIN seal:

The Technical Committee discussed the procedure. They noted that there was considerable criticism regarding the degree programmes which is reflected in the requirements and recommendations. Thus, the Technical Committee underlined that the university should keep in mind the detailed analysis regarding the individual degree programmes when implementing the requirements 1, 2 and 3.

The Technical Committee 12 – Mathematics recommended the award of the seals as follows:

Degree Programme	ASIIN seal	Subject-specific Label	Maximum duration of accreditation
Ba Mathematical and Computer Modeling	With requirements	~~Euro-Inf®~~	30.09.2019
Ma Mathematical and Computer Modeling	With requirements	~~Euro-Inf®~~	30.09.2019

H Decision of the Accreditation Commission (26.09.2014)

Assessment and analysis for the award of the subject-specific ASIIN seal:

The Accreditation Commission discussed the procedure and made minor editorial amendments to the wording of some requirements and recommendations. It deleted requirement 5 as there is no ASIIN-criterion that would be infringed by conducting the state comprehensive exam. As the graduates have also the option to work as a high school teacher a state examination at the end of the study seemed to be reasonable.

The Accreditation Commission discussed in detail the Bachelor's and Master's degree programme Information Systems. It realized that a degree programme "Information Systems" can have two fundamental orientations. The one the experts and the Technical Committee had in mind when assessing the degree programmes is geared to IS 2010 - *Curriculum Guidelines for Undergraduate Degree Programs in Information Systems* by ACM/AIS and to the *Subject-Specific Criteria of Technical Committee 07 – Business Informatics/Information Systems.* Based on these, the three pillars business administration, informatics and the specific core fields of information systems must be part of the learning outcomes and of the curricula. The other possibility would be a degree programme in Information Systems understood as a principally technical discipline in the fields of informatics that would deal with software and hardware systems that support data-intensive applications and enables graduates, for example to plan, develop or execute technical information systems. As the Accreditation Commission was in doubt about the orientation the university wants to choose for the programmes, it did not consider itself to be in a position to decide on the degree programmes. Hence, the Accreditation Commission decided to confer with the university again in order to determine what the university's own objectives are and which understanding of "Information Systems" the university wants to follow. The answer of the university shall be discussed again by the Technical Committees and be resubmitted to the Accreditation Commission in the December meeting.

Assessment and analysis for the award of the Euro-Inf® Label:

The Accreditation Commission deemed that the intended learning outcomes of the degree programmes Computer Science and Computer Science and Software comply with the Subject-Specific Criteria of the Technical Committee 04 - Informatics. Concerning the degree programmes Mathematical and Computer Modeling the Accreditation Commis-

sion was in line with the Technical Committee Informatics and deemed that the intended learning outcomes of the degree programmes do not comply with the Subject-Specific Criteria of the Technical Committee 04 – Informatics. The decision in the degree programmes Information Systems was postponed.

The Accreditation Commission for Degree Programmes decided to award the following seals:

Degree Programme	ASIIN seal	Subject-specific Label	Maximum duration of accreditation
Ba Computer Science	With requirements for one year	Euro-Inf®	30.09.2020
Ba Computer Science and Software	With requirements for one year	Euro-Inf®	30.09.2020
Ba Information Systems	Postponed	Euro-Inf® postponed	
Ba Mathematical and Computer Modeling	With requirements for one year	Euro-Inf® not awarded	30.09.2020
Ma Computer Science	With requirements for one year	Euro-Inf®	30.09.2020
Ma Computer Science and Software	With requirements for one year	Euro-Inf®	30.09.2020
Ma Information Systems	Postponed	Euro-Inf® postponed	
Ma Mathematical and Computer Modeling	With requirements for one year	Euro-Inf® not awarded	30.09.2020

Requirements

For all degree programmes

A 1. (ASIIN 2.2) The qualifications profiles (“learning outcomes“ at programme level) have to be more programme-specific and distinctive, thereby clarifying the acquired competences of graduates and the intended areas of professional work in the respective programme.

A 2. (ASIIN 2.3) The module descriptions must be updated according to the comments made in the accreditation report. Missing descriptions have to be added. The names of the modules have to reflect the content and the intended learning outcomes.

A 3. (ASIIN 2.5, 2.6) The modules have to correlate with the intended qualification level. Compensation of missing prerequisites should not impact the level of teaching and learning in the Master’s degree programme.

A 4. (ASIIN 3.1) The term “module” must be employed in the sense of a comprehensive learning and teaching entity as it is usually applied in the context of the Bologna process.

A 5. (ASIIN 6.1) There must be a feedback to the stakeholders (students and teaching staff) about the results of the teaching evaluation.

A 6. (ASIIN 7.2) A programme-specific Diploma Supplement has to be prepared and handed out to students on a regular basis providing information about the objectives, intended learning outcomes, structure and level of the degree, as well as about an individual’s performance. It must also explain the educational system of Kazakhstan in order to foster comprehensibility and comparability between the educational systems.

A 7. (ASIIN 3.2) The transformation of the Kazakh credit points into ECTS points must correspond to the ECTS regulation that one credit point is awarded for 25-30 hours student workload.

For the Ba Computer Science and Software

A 8. (ASIIN 1, 2.2, 2.6) The name of the study programme has to reflect the curriculum and intended learning outcomes and the published translations must be correct.

For the Ba Computer Science and Ba Computer Science and Software

A 9. (ASIIN 2.6) The compulsory curriculum must cover the core areas of the field of computer science to ensure that all graduates acquire the intended fundamental competences.

A 10. (ASIIN 3.3) To enhance the professional qualification of the graduates, social competences, such as project management competences, the capacity for teamwork and communication must be fostered within the degree programmes.

For the Master’s degree programmes

A 11. (ASIIN 5.1) For the purpose of enabling staff to conduct research and development, staff must be enabled to better combine teaching load with research work. The university must clarify how the policy regarding sabbaticals is implemented.

A 12. (ASIIN 5.3) The accessibility of relevant international journals should be improved and made transparent to all teaching staff and students.

Recommendations

For all degree programmes

(ASIIN 2.6) It is recommended to provide advice and assistance in oral and written English (especially with regard to publications in international journals).

For the Ba Computer Science and Software

E 4. (ASIIN 2.6) To enhance the professional qualification of the graduates it is recommended to conduct a capstone project.

For the BaMa Computer Science and Computer Science and Software

E 5. (ASIIN 5.1) The staff should be complemented by members that have an academic background in the field of informatics/information systems.

I Comment of the Higher Education Institution (20.10.2014)

The institution provided the following statement:

“According to your reply regarding “Information Systems” specialty we would like to explain the situation and to show the changes we made.

As we have mentioned during ASIIN visit to Almaty, our curriculum was dramatically changing according to the needs of business. We have a so-called “Employers Committee” where each employer says what he would like to see in the curriculum. From their side, they hold some responsibilities for the employment of our student.

Moreover, we tried to be the most “mathematical” university that offers “Information Systems” program. That is why we have included more mathematical disciplines than required by any standard.

Since passing the accreditation process at ASIIN is one of our mandatory goals, we would be happy to change the curriculum to meet the ACM standard in “Information Systems”. We had a meeting held by the vice-rector of our university, with dean of our faculty, chair of “Information Systems” and professors of the same department. Here are the changes we made to the “Information Systems” curriculum:

1. We have removed “Fundamentals of Economics” (OE3209) from “Social and Communicative Module”. Students had a chance to choose this discipline, now we made it obligatory.
2. We have replaced “Mathematical Logic III” (ML2413), Semester III by “Fundamentals of Economics”. Now all students have to pass this course and now this course is 3 credits instead of 2.
3. We have replaced “Mathematical Logic I” (ML1411), Semester I by “Discrete Mathematics”
4. We have replaced “Mathematical Logic II” (ML1412), Semester II by “Risk Management”
5. We have replaced “Theoretical Computer Science” (TI3418), Semester V by “Information Systems Management”
6. We have replaced “Parallel Programming” (PP3423), Semester V by “Application Planning”
7. We have replaced “Object Oriented Programming III” (OOP4426), Semester VII by “Project Management”
8. We have replaced “Automata and Language Theory” (TYaA2417), Semester IV by “Information and Business Analysis”

9. We have replaced “Operation Research” (IO2408), Semester IV by “Information Systems Design”

Therefore, we have added business-oriented disciplines and decreased the amount of mathematical disciplines. Moreover, since by many universities “Discrete Mathematics” is a prerequisite for master degrees in “Information Systems” and “Computer Science”, we decided to replace “Mathematical Logic I” to “Discrete Mathematics”.

J Decision of the Accreditation Commission (05.12.2014)

Assessment and analysis for the award of the subject-specific ASIIN seal:

The Accreditation Commission discussed the procedure. Based on the statement of the university the Accreditation Commission came to the conclusion that the orientation of the degree programmes is geared to IS 2010 - *Curriculum Guidelines for Undergraduate Degree Programs in Information Systems* by ACM/AIS and to the *Subject-Specific Criteria of Technical Committee 07 – Business Informatics/Information Systems.* Based on these, the three pillars business administration, informatics and the specific core fields of information systems must be part of the learning outcomes and of the curricula. The Accreditation Commission saw that the university initiated already several changes regarding the degree programmes (at least the Bachelor's programme). But the Commission has not been able to assess these changes without any module descriptions. Also it did not become clear whether the new curriculum has already been approved. Altogether the Accreditation Commission came to the decision to suspend the accreditation procedure and to set up two conditions to be met for resumption: One concerning the curriculum and one concerning the qualification profile.

Assessment and analysis for the award of the Euro-Inf® Label:

The Accreditation Commission suspended the decision regarding the Bachelor's and Master's degree programmes Information Systems.

The Accreditation Commission for Degree Programmes decided to award the following seals:

Degree Programme	ASIIN seal	Subject-specific Label	Maximum duration of accreditation
Ba Information Systems	Suspension	Suspension	
Ma Information Systems	Suspensions	Suspension	

For the BaMa Information Systems

Condition to be met for resumption

1. (ASIIN 2.6) The university has to provide evidence that the compulsory curriculum covers the core areas of the field of business administration and general IT management to ensure that all graduates acquire the intended fundamental competences on international level. Business administration and general IT management have to be interlinked with the field of informatics. Missing module descriptions have to be added.
2. (ASIIN 2.2) The qualification profiles ("learning outcomes" at programme level) have to be more programme-specific and distinctive thereby clarifying the acquired competences of graduates, and the intended areas of professional work in the respective programme.

Possible Requirements

A 1. (ASIIN 2.3) The existing module descriptions must be updated according to the comments made in the accreditation report. The names of the modules have to reflect the content and the intended learning outcomes.

A 2. (ASIIN 2.5, 2.6) The modules have to correlate with the intended qualification level. Compensation of missing prerequisites should not impact the level of teaching and learning in the Master's degree programme.

A 3. (ASIIN 3.1) The term "module" must be employed in the sense of a comprehensive learning and teaching entity as it is usually applied in the context of the Bologna process.

A 4. (ASIIN 4) The examinations process has to guarantee that the examinations accompany study and take place only on a course related basis.

A 5. (ASIIN 6.1) There must be a feedback to the stakeholders (students and teaching staff) about the results of the teaching evaluation.

A 6. (ASIIN 7.2) A programme-specific Diploma Supplement has to be prepared and handed out to students on a regular basis providing information about the objectives, intended learning outcomes, structure and level of the degree, as well as about an individual's performance. It must also explain the educational system of Kazakhstan in order to foster comprehensibility and comparability between the educational systems.

A 7. (ASIIN 3.2) The transformation of the Kazakh credit points into ECTS points must correspond to the ECTS regulation that one credit point bases on 25-30 hours student workload.

A 8. (ASIIN 3.3) To enhance the professional qualification of the graduates, social competences, such as project management competences, the capacity for teamwork and communication must be fostered within the degree programmes.

For the Master's degree programme

A 9. (ASIIN 5.1) For the purpose of enabling staff to conduct research and development, staff must be enabled to better combine teaching load with research work. The university must clarify how the policy regarding sabbaticals is implemented.

A 10. (ASIIN 5.3) The accessibility of relevant international journals should be improved and needs to be made transparent to all teaching staff and students.

Possible Recommendations

E 1. (ASIIN 2.6) It is recommended to provide advice and assistance in oral and written English (especially with regard to publications in international journals).

E 2. (ASIIN 5.1) The staff should be complemented by members that have an academic background in the field of informatics/information systems.

K Fulfillment of Requirements (11.12.2015)

The accreditation commission discusses the procedure and follows the recommended resolution of the peers and the technical committees, thus considering requirements 1 to 5 for all programmes, and 8, 10, 11 for the respective programmes as *not* fulfilled.

Statement:

Requirement 1/all programmes:

The requirement is not fully fulfilled as the Bachelor programmes "Computer Science" and "Computer Science and Software" are missing a concise description of the learning outcomes. Furthermore, the qualification profiles should be more programme-specific and distinctive. The description of the employability in the Master's programme "Mathematical and Computer Modeling" is inconsistent.

Requirement 2/all programmes:

Indeed, the revised module handbooks seem to roughly correspond to the respective requirement. However, content, learning objectives, bibliography etc. do often not correspond with each other. It should be critically noted that the module handbooks in the version submitted are hardly manageable. A table of contents, possibly linked to its published version, or some other kind of clear structuring in each of the module handbooks would be badly needed to make this important information source usable.

Requirement 3/4/all programmes and 8/10/respective programmes:

In order to examine the fulfillment of above mentioned requirements the fulfillment of the requirement 2 is necessary.

Requirement 5/all programmes:

The university did provide hardly manageable documents where the table of content did not match with the content. The questionnaires were partly illegible. Furthermore the evaluation process and feedback loops weren't described.

Concerning requirement 11/Master's degree programmes:

The university did not provide any information on the implemented policy regarding research and sabbaticals.

In terms of requirements 6 and 7 the accreditation commission takes note of the additional information provided by the ASIIN head-office:

As the diploma supplements do not contain information about the overall learning objectives, the commission assesses requirement 6 against the vote of the peer panel and the technical committees to be not fulfilled. Furthermore the commission decides that the obviously incorrect usage of the relative ECTS-marks shouldn´t be considered for this requirement but mentioned in the covering letter to the HEI.

The HEI has put into force plausible rules for the conversion of national credit points into ECTS credit points. Apparently, it has even established a conversion table but does not follow its conversion factor on the level of the module descriptions. There is rarely any match between the alleged student workload and the allocated ECTS credit points in the module descriptions. Therefore, the commission assesses requirement 7 against the vote of the peer panel and the technical committees to be not fulfilled.

The Accreditation Commission took the following decision:

Degree Programme	**ASIIN seal**	**Subject-specific Label**	**Maximum duration of accreditation**
Ba Computer Science	Requirements 1, 2, 3, 4, 5,6,7, 10 not fullfilled	Euro-Inf®	30.09.2020/6 month prolongation
Ba Computer Science and Software	Requirements 1, 2, 3, 4, 5, 6, 7, 8, 10 not fullfilled	Euro-Inf®	30.09.2020/6 month prolongation
Ba Mathematical and Computer Modeling	Requirements 1, 2, 3, 4, 5,6,7 not fullfilled	Euro-Inf® not awarded	30.09.2020/6 month prolongation
Ma Computer Science	Requirements 1, 2, 3, 4, 5, 6,7, 11 not fullfilled	Euro-Inf®	30.09.2020/6 month prolongation
Ma Computer Science and Software	Requirements 1, 2, 3, 4, 5, 6, 7, 11 not fullfilled	Euro-Inf®	30.09.2020/6 month prolongation
Ma Mathematical and Computer Modeling	Requirements 1, 2, 3, 4, 5, 6, 7, 11 not fullfilled	Euro-Inf® not awarded	30.09.2020/6 month prolongation

L Fulfilment of Requirements (01.07.2016)

Analysis of the peers and the Technical Committees (09.06.2016)

Preliminary remarks

The English translations of two study program titles have changed.

Title in Russian	Previous title	New title	Degrees applied for ASIIN
Математическое и компьютерное моделирование	Mathematical and Computer Modelling	Applied and Computational Mathematics	Bachelor, Master
Вычислительная техника и программное обеспечение	Computer Science and Software	Computer Engineering	Bachelor, Master
Информатика	Computer Science	Computer Science	Bachelor, Master
Информационные системы	Information Systems	Information Systems	Bachelor, Master

Remark al-Farabi:

The faculty decided to study ACM Standards for Computer Science, Computer Engineering, Information Systems, Information Technology and Software Engineering. The faculty came to the conclusion that the current translation of the program titles is misleading. Therefore, the faculty changed the titles. In order to show the relationship of programs with ACM standards they attached a document combining each program to each standard in order to make a clear distinction between the programs. In addition to the ACM standards, they analyzed the curriculum structure and content of academic programs at US, European and Asian universities.

Peers comment:

The peers highly appreciate the renaming of the English translation of the study programs. The peers confirm that the new English program titles follow the common international terminology and the curriculum seems to better align to the ACM/IEEE recommendations. Overall, the peers conclude that the new program titles (English translation), their intended learning outcomes and the content correspond now much better with each other.

Requirements

For all degree programmes

A 1. (ASIIN 2.2) The qualifications profiles ("learning outcomes" at programme level) have to be more programme-specific and distinctive, thereby clarifying the acquired competences of graduates and the intended areas of professional work in the respective programme.

Peers	fulfilled: Explanation: The peers acknowledge the detailed description of the qualifications profiles for each study program which are now more programme-specific. The description of the qualification profiles of "Computer Engineering" and "Computer Science" still show many identical learning outcomes, however the curricula and intended areas of professional work are distinctive and programme-specific. These less distinctive descriptions of the qualification profiles might be caused due to the translation into English and assessed only as a minor inaccuracy by the peers. They assess the requirement as fulfilled and recommend to include the following indication to the HEI. "The university should take notice that in the course of the reaccreditation procedure the peers will check, if the English wording of the qualification profiles of "Computer Engineering" and "Computer Science" improved."
Technical committees 4	fulfilled
Technical committees 12	fulfilled

A 2. (ASIIN 2.3) The module descriptions must be updated according to the comments made in the accreditation report. Missing descriptions have to be added. The names of the modules have to reflect the content and the intended learning outcomes.

Peers	fulfilled Explanation: The module descriptions are updated. The names of the modules reflect the content and the intended learning outcomes. Content, learning outcomes and literature are described adequately even if there are still redundant and generic parts.
Technical committees 4	fulfilled
Technical com-	fulfilled

mittees 12	

A 3. (ASIIN 2.5, 2.6) The modules have to correlate with the intended qualification level. Compensation of missing prerequisites should not impact the level of teaching and learning in the Master's degree programme.

Peers	fulfilled: Explanation: According to the module descriptions the intended learning outcomes correlate with the intended qualification level.
Technical committees 4	fulfilled
Technical committees 12	fulfilled

A 4. (ASIIN 3.1) The term "module" must be employed in the sense of a comprehensive learning and teaching entity as it is usually applied in the context of the Bologna process.

peers	fulfilled: Explanation: According to the module descriptions and curricula the term "module" is now used as a comprehensive learning and teaching entity.
Technical committees 4	fulfilled
Technical committees 12	fulfilled

A 5. (ASIIN 6.1) There must be a feedback to the stakeholders (students and teaching staff) about the results of the teaching evaluation.

peers	fulfilled: Explanation: The university provided a well defined quality insurance paper including feedback loops to the stakeholders. In order to assess if the feedback loops are implemented in the future the peers recommend including the following indication to the HEI. "The university should take notice that in the course of the reaccreditation procedure the peers will check, if the feedback loops to the stakeholders are put into practice."
Technical com-	fulfilled

mittees 4	
Technical committees 12	fulfilled

A 6. (ASIIN 7.2) A programme-specific Diploma Supplement has to be prepared and handed out to students on a regular basis providing information about the objectives, intended learning outcomes, structure and level of the degree, as well as about an individual's performance. It must also explain the educational system of Kazakhstan in order to foster comprehensibility and comparability between the educational systems.

Peers	fulfilled: Explanation: The programme-specific Diploma Supplements now include information on the objectives, intended learning outcomes, structure and level of the degree, the individual student performance as well as the explanation of the educational system of Kazakhstan. The peers note that there are still some inconstancies between the module handbook and the modules stated in the Diploma Supplements. E.g. the Diploma Supplement for the Bachelor programme "Computer Engineering" lists the course "Probability Theory and Mathematical Statistics – Module 9 Probability and Statistics and Human-Computer Interaction" in the 3rd semester. According to the module descriptions module 9 is titled „Combinatorial Logic and Digital Systems" which consists of the two courses „Combinatorial logic circuits" and „Digital signal Processing". Whereas the course "Probability Theory and Mathematical Statistics" is listed as a course of module 2 "Discrete Structures and Probability Theory" which makes sense. Even if there are still some inconstancies probably caused by copy and paste the peers assess this requirement as fulfilled. In order to prove if the programme-specific Diploma Supplements will be handed out to the students on a regular basis the peers recommend including the following indication to the HEI. "The university should take notice that in the course of the reaccreditation procedure the peers will check, if the Diploma Supplements will be handed out to the students."
Technical committees 4	fulfilled
Technical committees 12	fulfilled

A 7. (ASIIN 3.2) The transformation of the Kazakh credit points into ECTS points must correspond to the ECTS regulation that one credit point is awarded for 25-30 hours student workload.

Peers	fulfilled: Explanation: According to the module descriptions the ECTS calculations seems correct.
Technical committees 4	fulfilled
Technical committees 12	fulfilled

For the Ba Computer Science and Software

A 8. (ASIIN 1, 2.2, 2.6) The name of the study programme has to reflect the curriculum and intended learning outcomes and the published translations must be correct.

Peers	fulfilled: Explanation: The peers highly appreciate the renaming of the English translation of the study program. The peers confirm that the new English program title follow the common international terminology and the curriculum seems to better align to the ACM/IEEE recommendations. Overall, the peers conclude that the new program title (English translation), their intended learning outcomes and the content correspond now much better with each other.
Technical committees 4	fulfilled

A 10. (ASIIN 3.3) To enhance the professional qualification of the graduates, social competences, such as project management competences, the capacity for teamwork and communication must be fostered within the degree programmes.

Peers	fulfilled: Explanation: Project management competences are imparted in the module “Foundation of Software engineering” and the work in teams is included in various modules. Additionally, various topics on social issues and communication will be imparted in the so called “Social and communicative module”.

Technical committees 4	fulfilled

For the Master's degree programmes

A 11. (ASIIN 5.1) For the purpose of enabling staff to conduct research and development, staff must be enabled to better combine teaching load with research work. The university must clarify how the policy regarding sabbaticals is implemented.

Peers	Partly fulfilled Explanation: The University has provided a Research Policy paper regulating the research process of scientists. Scientists conduct research based on the projects funded by the Ministry of Education and Science and other funds. The university does not have a policy for sabbaticals. As the university is not autonomous, the planning of human resources is regulated by the government.
Technical committees 4	fulfilled Explanation: The university has provided a Research Policy paper regulating the research process of scientists. The Technical Committee criticizes that the requirement A 11 should have been a recommendation and questions if and in which way the HEI can prove the fulfillment of the requirement. The Technical Committee argues that sabbaticals are not covered by the ASIIN criteria. Also, it sees that there seems to be no culture of extensive research at the HEI, so that the programmes cannot fulfill the requirement on programme level only. Therefore, the Technical Committee suggests again having the requirement deleted or replaced by a comment to the HEI.
Technical committees 12	fulfilled

Decision of the Accreditation Committee (01.07.2016)

The accreditation commission discusses the procedure and follows the recommendations of the peers and the technical committees. Thus, all remaining requirements are fulfilled.

Regarding requirement A 11: The university has provided a Research Policy paper regulating the research process of scientists. As no policy for sabbaticals is in place this part of the requirement is considered redundant.

The Accreditation Committee decides to extend the accreditation term as follows:

Degree Programme	ASIIN-Siegel	Fachlabel	Akkreditierung bis
Ba Computer Science	All requirements fulfilled*	Euro-Inf®	30.09.2019
Ba Computer Engineering	All requirements fulfilled*	Euro-Inf®	30.09.2019
Ba Applied and Computational Mathematics	All requirements fulfilled*	Euro-Inf® not awarded	30.09.2019
Ma Computer Science	All requirements fulfilled*	Euro-Inf®	30.09.2019
Ma Computer Engineering	All requirements fulfilled*	Euro-Inf®	30.09.2019
Ma Applied and Computational Mathematics	All requirements fulfilled*	Euro-Inf® not awarded	30.09.2019

“The university should take notice that in the course of the reaccreditation procedure the peers will check, if the English wording of the qualification profiles of “Computer Engineering“ and “Computer Science“ improved.”

“The university should take notice that in the course of the reaccreditation procedure the peers will check, if the feedback loops to the stakeholders are put into practice.”

“The university should take notice that in the course of the reaccreditation procedure the peers will check, if the Diploma Supplements will be handed out to the students.”