ASIIN Accreditation Report

Bachelor's Degree Programmes
Electric Power Engineering
Radioengineering, Electronics and Telecommunications
Thermal Power Engineering

Master's Degree Programmes
Radioengineering, Electronics and Telecommunications
Thermal Power Engineering

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 Commit-tees (TC)[2]
Ba Electric Power Engineering	ASIIN, EUR-ACE® Label	n/a	02
Ba Radioengineering, Electronics and Telecommunications	ASIIN, EUR-ACE® Label	n/a	02
Ma Radioengineering, Electronics and Telecommunications	ASIIN, EUR-ACE® Label	n/a	02
Ba Thermal Power Engineering	ASIIN, EUR-ACE® Label	n/a	02
Ma Thermal Power Engineering	ASIIN, EUR-ACE® Label	n/a	02

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: 19 th -20 th of May 2014

at: Al-Farabi Kazakh National University, Almaty, Kazakhstan

Peer panel:

Prof. Dr. rer.nat. Madhukar Chandra, Technische Universität Chemnitz

Prof. Dr. rer. nat. Frank Obermeier, Bergakademie TU Freiberg

[1] ASIIN Seal for degree programmes; EUR-ACE® Label: European Label for Engineering Programmes

[2] TC: Technical Committee for the following subject areas: TC 01 – Mechanical Engineering/Process Engineering; TC 02 – Electrical Engineering/Information Technology); TC 03 – Civil Engineering, Surveying and Architecture; TC 04 – Informatics/Computer Science); TC 05 – Physical Technologies, Materials and Processes); TC 06 – Industrial Engineering; TC 07 – Business Informatics/Information Systems; TC 08 – Agronomy, Nutritional Sciences and Landscape Architecture; TC 09 – Chemistry; TC 10 – Life Sciences; TC 11 – Geosciences; TC 12 – Mathematics; TC 13 – Physics.

Dr. Klaus Pasemann, *former* Volkswagen Ms. Anastassiya Krasnyuk (student peer), Technical State University Karaganda
Representatives of the ASIIN headquarter: Thorsten Zdebel, Dr. Siegfried Hermes
Responsible decision-making committee: Accreditation Commission for Degree Programmes
Criteria used: European Standards and Guidelines, version 10.05.2005 ASIIN General Criteria, version 28.06.2012 Subject-Specific Criteria of Technical Committee 02 - Electrical Engineering/Information Technology as of 09.12.2011

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 (translation into € varies depending on currency rates)
B.Sc. Electric Power Engineering	Students can choose an individual educational trajectory in elective modules from the following areas: 1: Development activities 2: Industrial and technological activities 3: Research activities	Full time	8 Semester 151 KZ credits = 6.795 h US credits = 252 ECTS	Sep 2012 each year in Sep	?	650.000 kzt per year (for foreign students or if not covered by state grant)
B.Sc. Radioengineering, Electronics and Telecommunications	Students can choose an individual educational trajectory in elective modules: 1: Electronics 2: Radioengineering and telecommunications	Full time	8 Semester 151 KZ credits = 6.795 h US credits = 251 ECTS	Sep 2010 each year in Sep	?	620.000 kzt per year (for foreign students or if not covered by state grant)
M.Sc. Radioengineering, Electronics and Telecommunications	Students can choose an individual educational trajectory in elective modules: 1: Electronics 2: Radioengineering and telecommunications	Full time	4 Semester 59 credits (KZ/US) = 2.655 hours = 98 ECTS	Sep 2013 each year in Sep	?	650 000 kzt per year (for foreign students or if not covered by state grant)
B.Sc. Thermal Power Engineering	Students can choose an individual educational trajectory in elective modules from the following areas: 1: Thermal physics 2: Radio equipment 3: Nuclear physics	Full time	8 Semester 151 KZ credits = 6.795 h US credits = 252 ECTS	Sep 2012 each year in Sep	?	650.000 kzt per year (for foreign students or if not covered by state grant)
M.Sc. Thermal Power Engineering	Students can choose an individual educational trajectory in elective modules: 1: Thermal power engineering and thermotechnics 2: Thermo-physical processes in power energy	Full time	4 Semester 59 credits (KZ/US) = 2.655 hours = 98 ECTS	Sep 2012 each year in Sep	?	650 000 kzt per year (for foreign students or if not covered by state grant)

For the degree programme Ba Electric Power Engineering, the self-assessment report states the following **intended learning outcomes**:

Knowledge

Graduates of the educational program "5B071800 – Electric power engineering" should have knowledge in the following areas:

1. Basis of the legal system and the laws of the Republic of Kazakhstan, legal moral and ethical standards in the sphere of professional activity;
2. current and future directions of development of the power of computer technology, advanced software;
3. operating principles , characteristics and design features developed and used by means of electricity;
4. methods of theoretical and experimental research in the field of electric power;
5. principles of design, construction, installation and operation of electrical installations;
6. requirements of standardization, metrology and ensure life safety in the design and operation of power devices;
7. the main methods of marketing and management in the field of electric power;
8. rules and standards of design, construction , installation and operation of electric power facilities and systems;
9. theoretical and experimental research methods in order to create new directions in the field of electric power;
10. the necessary measures to ensure the safety of life and protection of the environment during production, construction and operation of electric power systems and installations;
11. the development, design, research and service elements and systems of electrical installations and systems;
12. skills in science, engineering and design, technological and patent documents;
13. Information technologies and their use in the operation of electrical installations as well as their use in the design of electrical systems modeling elements and complexes;
14. knowledge of and compliance with safety regulations, occupational health and life safety;
15. the main trends and directions of development of the power industry;
16. the main content of specific specializations in the field of power;
17. knowledge of the level of basic fundamental education, which would be sufficient for the development of specialized disciplines and the skills and abilities needed to solve engineering problems;
18. technology, tools, techniques and methods for the generation, transmission, distribution and consumption;

19. general principles of the structure and functioning of various types of power plants, power systems and networks, the state and prospects of development of electric power transmission process;
20. general principles of the structure and functioning of power systems industries (by industry), formulating and solving problems of energy use in the manufacture of Power Engineering and Technology;
21. electromagnetic and electromechanical transducers electrical energy, theory of electrical machines AC and DC;
22. knowledge of the physical foundations of materials science, physical processes: dielectric materials, electrical insulating fluids and solid organic and inorganic materials, semiconducting and superconducting materials;
23. knowledge of the theoretical foundations of technology relaying high-voltage electrical networks, protection microprocessor terminals, as well as supervisory and process control;
24. knowledge of modern systems of automated electric AC and DC;
25. knowledge of electro technology processes in plants: resistance heating , induction and dielectric heating, electric arc and electron- ion, plasma, electron beam and laser technology;
26. basic knowledge of lighting and photometry, light sources and lighting systems;
27. knowledge of alternative and renewable sources of energy, the Earth's non-oil energy resources and technologies for their use;
28. knowledge classification of cable products for the composition of the structural elements on insulation material, purpose and scope, the electric, magnetic and thermal field in the cables.

Understanding

1. Operation of power plants and substations, electrical systems and networks, relay protection and automation of power systems ;
2. supply various industries, electrification and automation of agricultural production;
3. of alternative and renewable energy sources;
4. fact of Electro mechanics, electrical insulation and cable technology, electrotechnological installations and systems; lighting and light sources;
5. of electric vehicles, electric and automation systems;
6. the principles of organization, design companies and power devices.

Application

1. Operation studied technical facilities;
2. ability to formulate the main technical and economic requirements to the projected devices and systems;
3. design and development using modern components of electric power systems and individual devices;
4. mastery of skills in electronic and computer systems and networks;

5. ability to perform maintenance and quality control of the operation, improvement, modernization and improvement of technical and economic indicators : power plants and substations, electrical systems and networks, relay protection and automation of power systems, power companies of various industries, electricity from agriculture, electrical transport funds;
6. ability to carry out metrological verification of fixed assets measurements of electric power stations and substations, electrical systems and networks, relay protection and automation of power systems, power companies of various industries, electricity from agriculture, alternative and renewable energy, electrical engineering, electrical insulation and cable technology, electro technological plants and systems, lighting and light sources, electrical vehicles, electric vehicles, electric and automation systems.

Analysis

1. Has the skills of collecting, processing, analyzing and organizing information on a particular subject, the experiments and measurements,
2. calculate the required parameters and values of installation, operation and maintenance of power technological equipment, methods, theoretical and experimental research in the field of electric power and the creation of theoretical models.

Synthesis

1. Is able to develop projects of power plants and substations, electrical systems and networks, relay protection and automation of power systems, power companies of various industries, the electric drive and automation systems;
2. is able to carry out synthesis of results and technical reports on the information received, electrical design, installation and other schemes for different purposes.

Evaluation

1. Formed a specialist who knows how to work in a team with professional knowledge of the theoretical and practical skills in the field of electric power
2. proactive, able to adapt to the changing demands in the labor market and technology
3. knowing the economic characteristics of electricity infrastructure, management principles and practices, cost and pricing of products companies within the industry, their economic substance, possessing the technical and mathematical abilities, perceiving a lot of information, and the ability to compare and analyze the many isolated facts, to adopt and implement new in the workplace;
4. able to understand the most complex drawings and diagrams, constantly improve their knowledge and their application in practice.

The following **curriculum** is presented:

Title of modules	Course code	Title of courses	Credit	ECTS	Lec/prac/Lab	Sem.
SEMESTER 1						
1. State Compulsory Module (10 credits)	HRK1101	History of the Republic of Kazakhstan	2	3	1+1+0	1
	K(R)LPP1102	Kazakh (Russian) Language for Professional Purposes	3	5	0+3+0	1
	FLPP1103	Foreign Language for Professional Purposes	3	5	0+2+1	1
	PhSK1104	Philosophy of Scientific Knowledge	2	3	1+1+0	4
3. Vocational Modules (Professional compulsory module) (115 credits)	**3.2. Basic Professional Modules**		***69***	115		
	Module 1 Mathematics		***13***	22		
	MA1405	Mathematical analysis	***3***	5	1+2+0	1
	AGLA1406	Analytic geometry and linear algebra	***2***	3	1+1+0	1
	Module 2 Physics		***17***	28		
	Mech1410	Mechanics	***3***	5	1+1+1	1
	MPh1411	Molecular physics	***3***	5	1+1+1	1
6. Additional Types of Learning	PhT	Physical Training	8	13	0+0+2	1
SEMESTER 2						
3. Vocational Modules (Professional compulsory module) (115 credits)	**3.1 Natural Sciences (STEM) module**		**12**	**20**		
	ITE1401	Information technologies in electric utilities	***3***	5	1+0+2	2
	3.2. Basic Professional Modules		***69***	115		
	Module 1 Mathematics			CC		
	TFCV1407	The theory of function of a complex variable	***3***	5	1+2+0	2
	DIE1408	Differential and integral equations	***3***	5	1+2+0	2
	Module 2 Physics			CC		
	EM1412	Electricity and magnetism	***3***	5	1+1+1	2
	BVTA1414	Theoretical Physics Methods. Part 1. Basics of vector and tensor analysis	***2***	3	1+1+0	2
	Module 6 Computer Graph			CC		
	ECG1422	Engineering and computer graphics	***3***	5	1+1+1	2
4. Practice	Ed101	Educational	4	2		
6. Additional Types of Learning	PhT	Physical Training	8	13	0+0+2	2
SEMESTER 3						
2. Social and Communicative Module (4 credits)	PIC2201	Psychology of Interpersonal Communication	2	3	1+1+0	3
	TAPS2202	Theoretical and Applied Political Science	2	3	1+1+0	3
	EPSS2203	Ethics of Personal and Social Success	2	3	1+1+0	3
	CR2204	Culture and Religion	2	3	1+1+0	3
	GAS2205	General and Applied Sociology	2	3	1+1+0	3

	HLS2206	Human Life Safety	2	3	1+1+0	3
	ESD2207	Ecology and Sustainable Development	2	3	1+1+0	3
	KL2208	Kazakhstan Law	2	3	1+1+0	3
	FE2209	Fundamentals of Economics	2	3	1+1+0	3
3. Vocational Modules (Professional compulsory module) (115 credits)	**3.1 Natural Sciences (STEM) module**		**12**	**20**		
	CPh2402	Computer physics	***3***	5	1+1+1	3
	3.2. Basic Professional Modules		***69***	115		
	Module 1 Mathematics		***13***	22		
	PThMS2409	Probability theory and mathematical statistics	***2***	3	1+1+0	3
	Module 2 Physics		***17***	28		
	Opt2413	Optics	***3***	5	1+1+1	3
	Module 3 Electrochemics		***6***	10		
	Elt2416	Electrochemistry	***3***	5	1+1+1	3
	Module 4 Electric technics		***6***	10		
	TBEE12418	Theoretical basics of Electrical Engineering 1	***3***	5	1+1+1	3
	Module 8 Labor protection		***5***	8		
	LP2427	Labor protection	***2***	3	1+1+0	3
6. Additional Types of Learning	PhT	Physical Training	8	13	0+0+2	3
SEMESTER 4						
1. State Compulsory Module (10 credits)	PhSK1104	Philosophy of Scientific Knowledge	2	3	1+1+0	4
3. Vocational Modules (Professional compulsory module) (115 credits)	**3.1 Natural Sciences (STEM) module**		**12**	**20**		
	GDPh2403	Gas Discharge Physics	***3***	5	1+1+1	4
	Module 2 Physics		***17***	28		
	ANPh2415	Atomic and Nuclear physics	***3***	5	1+1+1	4
	Module 4 Electric technics		***6***	10		
	TBEE22419	Theoretical basics of Electrical Engineering 2	***3***	5	1+1+1	4
	Module 6 Computer Graph		***10***	17		
	MPCSE2423	Mathematical problems and computer simulation in electric utilities	***4***	7	1+1+1	4
	CSN2424	Computer systems and networks	***3***	5	1+1+1	4
4. Practice	PP202	Professional	2	4		
6. Additional Types of Learning	PhT	Physical Training	8	13	0+0+2	4
SEMESTER 5						
3. Vocational Modules (Professional compulsory module) (115 credits)	**3.1 Natural Sciences (STEM) module**		**12**	**CC**		
	ARES3404	Alternative and renewable energy sources	***3***	5	2+1+0	5
	Module 5 Electronics		***6***	10		
	IE3420	Industrial electronics	***3***	5	1+1+1	5
	3.3 Modules for Individual Educational Trajectories (Professional elective module) (IET)		**30**	**50**		
	IET 1 **Develop-**	IET 2 **Industrial and** / IET 3 **Research activities**	**30**	**50**		

	ment activity	**technological activities**					
	APE3502 Analog and precision equipment 1+1+1	LTLS3502 Lighting technology and light source 1+1+1	VTE3502 Vacuum techniques and equipment 1+1+1	3	5		5
	AES3503 Automation of Electric utilities systems 1+1+1	EDCS3503 Electric drive and control systems 1+1+1	EAE3503 Engineering and automation in electric utilities 1+1+1	3	5		5
	SEU3504 Software in electric utilities 1+1+1	LST3504 Laser systems and technologies 1+1+1	BPPh04 Basics of plasma physics 1+1+1	3	5		5
	MSN3508 Material science and nanotechnology 1+1+0	NEU3508 Nanotechnology in electric utilities 1+1+0	PhCMNS3508 Physics and concepts of modern natural science 1+1+0	2	3		5
SEMESTER 6							
3. Vocational Modules (Professional compulsory module) (115 credits)	**Module 3 Electrochemics**			***6***	10		
	EMS3417	Electric utilities and Materials Science		***3***	5	1+1+1	6
	Module 5 Electronics			***6***	10		
	EM3421	Electrical machines		***3***	5	1+1+1	6
	Module 7 Electric utilities and electromechanics			***6***	10		
	Elt3425	Electric utilities		***3***	5	2+1+0	6
	3.3 Modules for Individual Educational Trajectories (Professional elective module) (IET)			**30**	**50**		
	IET 1 **Development activity**	IET 2 **Industrial and technological activities**	IET 3 **Research activities**	**30**	**50**		
	SW3501 Scientific writing (kaz+rus+eng) 0+1+0	**SW3501** Scientific writing (kaz+rus+eng) 0+1+0	**SW3501** Scientific writing (kaz+rus+eng) 0+1+0	1	2		6
	PRM3505 Programmable relay and microcontrollers 1+1+1	RPEE3505 Relay protection in electrical engineering 1+1+1	CADS3505 Computer-aided design systems 1+1+1	3	5		6
	CDS3507 Computer-aided design systems 1+1+1	BIE3507 Basics of impulse energetic 1+1+1	SEU3507 Software in electric utilities 1+1+1	3	5		6
	3.4 Interdisciplinary Module			4	7		
	IE3601	Innovative Entrepreneurship (tradewise)		2	3	1+1+0	6
	IPL3602	Intellectual Property Law		2	3	1+1+0	6
	MMEU3603	Management and marketing in electric utilities		2	3	1+1+0	6
	B3604	Bionanotechnology		2	3	1+1+0	6
	B3605	Biophysics		2	3	1+1+0	6

	IEU3606	Innovative electric utilities		2	3	1+1+0	6
4. Practice	Tr303	Training		2	6		
SEMESTER 7							
3. Vocational Modules (Professional compulsory module) (115 credits)	**Module 7 Electric utilities and electromechanics**			***6***	10		
	EEUE3426	Electromechanics and electric utilities equipment		***3***	5	2+1+0	7
	Module 8 Labor protection			***5***	8		
	SE4428	Sector economics		***3***	5	2+1+0	7
	3.3 Modules for Individual Educational Trajectories (Professional elective module) (IET)			**30**	**50**		
	IET 1 **Development activity**	IET 2 **Industrial and technological activities**	IET 3 **Research activities**	**30**	**50**		
	DTM4506 Digital techiques and microelectronics 1+1+1	PS4506 Power supply 1+1+1	IEST4506 Innovative energetic systems and technologies 1+1+1	3	5		7
	MSEU4509 Microprocessor systems in electric utilities 1+1+1	PCPSS4509 Power consumptions and power supply systems 1+1+1	TP4509 Thermonuclear power 1+1+1	3	5		7
	AE4510 Alternative energetics 1+1+1	HVT4510 High Voltage technics 1+1+1	BTE4510 Basic technologies of electrification 1+1+1	3	5		7
	PEF4511 Plasma energetic facilities 1+1+1	IHVPF4511 Impulse and high voltage plasma facilities 1+1+1	HPMM4511 High-tech processing methods of materials 1+1+1	3	5		7
SEMESTER 8							
4. Practice	Tr404	Training		4		8	
5. Final Certification	PPBD401	Preparation and Presentation of Bachelor's Dissertation (Diploma Project)		2	3		8
TOTAL				**151**			

For the degree programme Ba Thermal Power Engineering, the self-assessment report states the following **intended learning outcomes**:

Knowledge

1. Know the content, significance and economic substance of the current program;
2. own a culture of thinking, he knows its general laws, to be capable of writing and speaking correctly (logical) to issue its results;
3. have knowledge of basic professional relationship and management principles with regard to technical, financial and human factors;
4. know how to use the problem-solving methods, determining the optimal links between the parameters of different systems;
5. principles of operation, characteristics and design features of thermal power plants and systems;
6. the requirements of standardization, metrology and ensure life safety in the design and operation of power system devices and systems;
7. methods of design, construction, installation and operation of technical equipment of heat power and thermal processing systems.

Understanding

1. Understand the nature and social significance of the future profession;
2. understand the basic problems of disciplines that define specific area of student's activities, see their relationship in a holistic system of knowledge;
3. theoretical and experimental research methods in order to design new perspective heat power plants and systems;
4. understand contemporary issues and research opportunities/challenges related to energy and sustainability and engage in lifelong learning in the field and in the fundamentals of other related disciplines;
5. understand rules and standards for design, construction, installation and operation of heat power systems;
6. the necessary measures to ensure the life safety and protect the environment during production, construction and operation of thermal power plants and systems.

Application

1. Use advanced techniques, skills, and modern scientific and engineering software tools for professional internship;
2. chose the methods, instruments, and the preparation of schemes for measuring key characteristics of thermal processing equipment;
3. calculate circuits and components of major equipment, auxiliary circuits, calculation of protection and automation devices of electric power facilities;
4. establish the parameters of the optimal mode of equipment operation;
5. estimate the components of electrical equipment and its parameters, diagrams of electric power facilities;
6. develop the technical documentation.

Analysis

1. formulate the objectives of the project (program), identify priorities for solving problems;
2. use computer technology for processing the results of measurements, use the methods of standardization and certify products;
3. analyze manufacturing and financial activities at heat power plants, computerization of administrative and economic problems;
4. calculate and analyze the flow of liquids and gases and heat transfer, calculate heat exchangers;
5. analysis and synthesis of automatic control systems.

Synthesis

1. Identify and address current and future heat power engineering problems related to energy sources, generation, conversion, transmission, utilization, efficiency, protection, and control;
2. find a compromise between the different requirements (to cost, quality, safety and terms of performance) for both long-term and short-term planning;
3. design, calculate and control of systems of energy production and distribution;
4. develop a program plan for internal control and audit
5. formulate the objectives of the project (program), identify priorities for solving problems;
6. apply a multi-disciplinary approach to conceive, plan, design, and implement solutions to thermal engineering problems in the field of energy and sustainability.

Evaluation

1. Determine the results of work on account of the presence and movement of assets and liabilities, capital and reserves;
2. estimate the value of technical and scientific research, service to society, leadership and life-long learning required to further their career aspirations;
3. assess productive and non-productive costs for providing a high level of product quality to meet international standards;
4. measure and evaluate errors of measurement of thermal power equipment mode characteristics;
5. evaluate the impact of solutions to energy problems in a global, economic, environmental, and societal context.

The following **curriculum** is presented:

Title of modules	Course code	Title of courses	Credit	ECTS/ hours	Lec/prac/Lab.	Sem.
Semester 1						
1. State Compulsory Module (10 credits)	HRK1101	History of the Republic of Kazakhstan	2	3/90	1+1+0	1
	K(R)LPP1102	Kazakh (Russian) Language for Professional Purposes	3	5/135	0+3+0	1
	FLPP1103	Foreign Language for Professional Purposes	3	5/135	0+2+1	1
2. Vocational Modules (115 credits)	**3.1. Natural Sciences (STEM) module** (6 credits)					
	Pr1301	Programming	3	5/135	1+0+2	1
	Mat1302	Mathematics	3	5/135	1+2+0	1
	3.2. Basic Professional Modules					
		Module 1. Mechanics				
	Mech1401	Mechanics	3	5/135	2+1+0	1
	PWMF1402	Physics Workshop on Mechanics	3	5/135	0+1+2	1
6. Additional types of learning	PhT	Physical Training	2	3/90	0+0+2	1
Semester 2						
1. Vocational Modules (115 credits)	**3.1. Natural Sciences (STEM) module** (6 credits)					
	Chem1303	Chemistry	3	5/135	1+1+1	2
	3.2. Basic Professional Modules					
		Module 2. Molecular Physics				
	MPh1403	Molecular Physics	3	5/135	2+1+0	2
	PWMP1404	Physics Workshop on Molecular Physics	3	5/135	0+1+2	2
		Module 7. Foundations of Mathematics				
	MA1413	Mathematical analysis	3	5/135	1+2+0	2
	AGLA1414	Analytical Geometry and Linear Algebra	2	3/90	1+1+0	2
		Module 14. Protection of Labour and safety at enterprises				
	LP1425	Labor Protection	2	3/90	1+1+0	2
4. Internship	EP101	Educational Practice	2	3/90		2
6. Additional Types of Learning	PhT	Physical Training	2	3/90	0+0+2	2
Semester 3						
2. Social and Communicative Module (4 credits)	PIC2201	Psychology of Interpersonal Communication	2	3/90	1+1+0	3
	TAPS2202	Theoretical and Applied Political Science	2	3/90	1+1+0	3
	EPSS2203	Ethics of Personal and Social Success	2	3/90	1+1+0	3
	CR2204	Culture and Religion	2	3/90	1+1+0	3
	GAS2205	General and Applied Sociology	2	3/90	1+1+0	3
	HLS2206	Human Life Safety	2	3/90	1+1+0	3
	ESD2207	Ecology and Sustainable Development	2	3/90	1+1+0	3
	KL2208	Kazakhstan Law	2	3/90	1+1+0	3
	FE2209	Fundamentals of Economics	2	3/90	1+1+0	3
3. Vocational Modules (115 credits)	**3.2. Basic Professional Modules**					
		Module 3. Electricity and Magnetism				
	EM2405	Electricity and Magnetism	3	5/135	2+1+0	3
	PWEM2406	Physics Workshop on Electricity and Magnetism	3	5/135	0+1+2	3
		Module 8. Mathematical Equations				

	DIE2415	Differential and Integral Equations	2	3/90	1+1+0	3
		Module 9. Professional Foreign Language				
	FLBP2417	Foreign Language. Basics of professional communication	3	5/135	0+3+0	3
		Module 10. Methods of Theoretical Physics				
	FVTA2418	Fundamentals of Vector and Tensor Analysis at the Theoretical Physics	2	3/90	1+1+0	3
	MMP2419	Methods of Mathematical Physics	2	3/90	1+1+0	3
6. Additional Types of Learning	PhT	Physical Training	2	3/90	0+0+2	3
Semester 4						
1. State Compulsory Module (10 credits)	PSK1104	Philosophy of Scientific Knowledge	2	3/90	1+1+0	4
3. Vocational Modules (115 credits)	**3.1. Natural Sciences (STEM) module** (6 credits)					
	ARE 2304	Alternative and Renewable Energy	3	5/135	1+1+1	4
	3.2. Basic Professional Modules					
		Module 4. Optics				
	Opt2407	Optics	3	5/135	2+1+0	4
	PPWO2408	Physics Workshop on Optics	3	5/135	0+1+2	4
		Module 8. Mathematical Equations				
	TCV2416	The Theory of Complex Variable	2	3/90	1+1+0	4
		Module 9. Professional Foreign Language				
	FLBP2417	Foreign Language. Basics of professional communication	3	5/135	0+3+0	4
		Module 12. Measurement Procedure				
	MPTM2422	Metrology and Physical and Technical Measurements	3	5/135	1+0+2	4
6. Additional Types of Learning	PhT	Physical Training	2	3/90	0+0+2	4
4. Internship	EP101	Educational Practice	2	3/90		4
Semester 5						
3. Vocational Modules (115 credits)	**3.2. Basic Professional Modules**					
		Module 5. Atomic Physics				
	APh 3409	Atomic physics	3	5/135	2+1+0	5
	PWAPh3410	Physics Workshop on Atomic physics	3	5/135	0+1+2	5
		Module 11. Theoretical Physics				
	EQM3420	Electrodynamics and Quantum Mechanics	3	5/135	1+2+0	5
	3.3 Module's for Individual Educational Trajectories (IET)					
	IET 1. Applied Thermal Physics	**IET 2. Radio Equipment** / **IET 3. Nuclear Physics**				
	PhEC3502 Physics of Energy Conservation 1+ 1+1	CMP3502 Condensed-matter Physics 1+ 1+1 / EEEM 3502 Engineering Ecology and Environmental Manage-	3	5/135		5

			ment 1+ 1+1				
	CSTP3503 Computer Simulation of Thermophysical Problems 1+ 1+1	TSI3503 Transfer and Security of Information 1+ 1+1	FED 3503 Fundamentals of Engineering Drawing 1+ 1+1	3	5/135		5
	MCAP3504 Methods of Calculation of Aerohydrodyna mic Plants 2+1+0	PFSE3504 Physical Foundations of Solid State Electronics 2+1+0	CMD3504 A Computerized Mechanical Design 2+1+0	3	5/135		5
Semester 6							
3. Vocational Modules (115 credits)	**3.2. Basic Professional Modules**						
		Module 6. Nuclear Physics					
	NPh3411	Nuclear physics		3	5/135	2+1+0	6
	PWNP3412	Physics Workshop on Nuclear physics		3	5/135	0+1+2	6
		Module 13. Thermophysical Problems					
	PRGL3423	Physics of a real gas and liquid		2	3/90	1+0+1	6
	3.3 Module's for Individual Educational Trajectories (IET)						
	IET 1. Applied Thermal Physics	**IET 2. Radio Equipment**	**IET 3. Nuclear Physics**				
	TPM3505 Thermophysical Properties of Matters under Low Temperatures 1+1+1	SE3505 Semiconductors Electronics 1+1+1	NEM 3505 Nuclear Electronics and Microprocess ors 1+1+1	3	5/135		6
	CHME3506 Convective Heat-mass Exchange 1+1+1	CDE3506 Chaotic dynamics in electronics 1+1+1	GUIAE 3506 Graphical User Interfaces and Automation of the Experiment 1+1+1	3	5/135		6
	3.4. Interdisciplinary module			4	6/180		
	FLST3601	Foreign Language. Scientific and Technical Translation		2	3/90	0+1+1	6
	FLSP3602	Foreign Language for Special Purposes		2	3/90	0+1+1	6
	IE3603	Innovative Entrepreneurship (tradewise)		2	3/90	0+2+0	6
	IPL3604	Intellectual Property Law		2	3/90	0+2+0	6
4. Internship	PT303	PracticeTraining		2	3/90		6
Semester 7							
	3.2. Basic Professional Modules						
		Module 11. Theoretical Physics					
	TSM4421	Thermodynamics and Statistical Mechanics		2	3/90	1+1+0	7
		Module 13. Thermophysical Problems					

3. Vocational Modules (115 credits)	VF4424	Viscous flow		2	3/90	1+0+1	7
	3.3 Module's for Individual Educational Trajectories (IET)						
	IET 1. Applied Thermal Physics	**IET 2. Radio Equipment**	**IET 3. Nuclear Physics**				
	SW4501 Scientific writing (kaz/ru/eng) 0+1+0	SW4501 Scientific writing (kaz/ru/eng) 0+1+0	SW4501 Scientific writing (kaz/ru/eng) 0+1+0	1	1.66/45		7
	PCE4507 Physics of Combustion and Explosion 1+1+1	CSAE4507 Computer Simulation of Analog Electronic Systems 1+1+1	NRD 4507 Nuclear Radiation Detectors 1+1+1	3	5/135		7
	PTPS4508 Plasma Technology in Power System 1+1+1	CCE4508 Computer Circuit Engineering 1+1+1	NSRWST 4508 Nuclear Safety and Radioactive Waste Storage Technology 1+1+1	3	5/135		7
	AE4509 Applied Thermal Physics 1+1+1	PLIC4509 Programmable logic integrated circuits 1+1+1	FIENP 4509 Formulation and Implementation Experiments in Nuclear Physics 1+1+1	3	5/135		7
	CrC4510 Cryoengineering and Cryotechnology 1+2+0	DE4510 Digital Electronics 1+2+0	DPATPP 4510 Design Principles of Atomic and Thermonuclear Power Plants 1+2+0	3	5/135		7
	SRFCC4511 3D Simulation of Reacting Flows in Combustion Chambers 1+1+0	OE4511 Optoelectronics 1+1+0	APEA 4511 Automation Physics Experiments at Accelerators 1+1+0	2	3/90		7
Semester 8							
4. Internship	PT404	PracticeTraining		6	10/270		8
5. Final	PPBD40	Preparation and Presentation of Bachelor's		2	3/90		8

certification	1	Dissertation (Diploma Project)				

For the degree programme Ma Thermal Power Engineering, the self-assessment report states the following **intended learning outcomes**:

Knowledge

1. The basis of the legal system and laws of the Republic of Kazakhstan in the field of engineering;
2. current and future developments of heat power and heat processing systems;
3. principles of operation and design features of heat power plants and systems;
4. basics of marketing and management in the field of heat power engineering;
5. rules and standards for design, construction, installation and operation of thermal power systems and equipment;
6. methods of theoretical and experimental research in the field of power.

Understanding

1. Theoretical and experimental research methods in order to design new perspective heat power plants and systems;
2. advanced concepts of fundamental sciences and engineering to identify, formulate and solve complex heat power engineering problems;
3. understand contemporary issues and research opportunities/challenges related to energy and sustainability and engage in lifelong learning in the field and in the fundamentals of other related disciplines;
4. have a scientific understanding of a healthy lifestyle, have abilities and skills of physical self-improvement;
5. methods and tools for optimization of thermal power plants and systems.

Application

1. Experience in use of applied software and information resources used to get new information Thermal Power Plants design;
2. apply decisions in complex engineering tasks involving high degree of uncertainty and lack of information basing on the acquired knowledge and criteria;
3. select and apply the methods for technological determination of water and fuel quality indexes;
4. develop mathematical models of industrial heat and power systems and their elements, write the software for the use of mathematical models as a research tool;
5. apply the methods of analysis, synthesis and optimization of processes;
6. develop the technical documentation.

Analysis

1. Formulate the objectives of the research projects, identify relevance and novelty for solving problems;
2. develop and use the automated experiment conduction;
3. modeling and optimize of thermal technological processes, facilities;

4. analyze economic and financial benefits from applying results of theoretical and experimental researches to real industrial and power engineering sectors;
5. distinction between scientific tools used in thermal engineering problems in the field of energy and sustainability.

Synthesis

1. Formulate the objectives of the projects, identify priority scientific directions and their relevance;
2. identify and address current and future investigations related to energy sources, generation, conversion, transmission, utilization, efficiency, protection, and control;
3. apply a multi-disciplinary approach to conceive, plan, design, and implement solutions to thermal engineering problems in the field of energy and sustainability;
4. organize conferences, debates, special courses and round-table discussions on issues in the field of energy and sustainability;
5. use an advanced approach to design and conduct experiments, and to analyze and interpret data;
6. propose and choose optimal scientific methods of learning to achieve goals;
7. communicate effectively in written and oral form, both, individually and as a member of a multidisciplinary team, and thus to put forward the scientific findings at national and international levels successfully.

Evaluation

1. Estimate the value of technical and scientific research, service to society required to further their career aspirations;
2. technical and economic calculation of alternative options for production, introduction of new techniques and technologies, and modernization of facilities;
3. protect the received digital data, applied methods and techniques;
4. evaluate the impact of results of experimental and theoretical investigations to energy problems in a global, economic, environmental, and societal context.

The following **curriculum** is presented:

Title of modules	Course code	Title of courses	Credit	ECTS/ hours	Lec/prac /Lab.	Sem.
Semester 1						
1. Compulsory State Modules - 8 credits		**Compulsory State Module 1**				
	IFN 5201	History and Philosophy of Science	2	3/90	1+1+0	1
	Iya(p)5202	Foreign language (Professional)	2	3/90	0+2+0	1
		Compulsory State Module 2				
	Ped 5203	Pedagogics	2	3/90	1+1+0	2
	Psy 5204	Psychology	2	3/90	1+1+0	2
2.Compulsory Professional Modules - 14 credits		**Compulsory Professional Module 1**				
	IATT 5205	Information systems in Thermal Power Engineering and heat technologies	3	5/135	1+2+0	1
		Compulsory Professional Module 2				

	OPNI 5206	Organization and Planning of Scientific Research	3	5/135	2+1+0	1
		Compulsory Professional Module 5				
	MNNS 5209	Methods of writing scientific articles	2	3/90	1+1+0	1
3. Modules of Individual Educational Paths - 20 credits		**6M071701 – Thermal Power Engineering and thermotechnics**				
	TPT 5301	Heat Power Engineering and Applied Thermal Physics	3	5/135	1+2+0	1
		6M071702 – Thermo-physical processes in Power Energy				
	VETM 5301	Types of energy consumption and its combustion methods	3	5/135	1+2+0	1
3.Additional Types of Training		**Master's Research Work and Fullfilment of Dissertation**				
	NIRM I	Research Seminar I	1	1.66/45		1
		Professional Practice				
	PP	Pedagogical Practice	3	5/135		3
Semester 2						
2.Compulsory Professional Modules - 14 credits		**Compulsory Professional Module 3**				
	TTNI 5207	Theory and Techniques of a scientific experiment	3	5/135	1+2+0	2
		Compulsory Professional Module 4				
	NPTT 5208	Scientific and technical problems and power system thermotechnology	3	5/135	1+2+0	2
3. Modules of Individual Educational Paths - 20 credits		**6M071701 – Thermal Power Engineering and thermotechnics**				
	KMNI 5302	Computer modeling for scientific research	3	5/135	1+2+0	2
	EPOP 5303	Ecological problems of environmental industry	2	3/90	1+1+0	2
		6M071702 – Thermo-physical processes in Power Energy				
	MNIT 5302	Methods of research in heat power engineering	3	5/135	1+2+0	2
	MMTO 5303	Management and marketing in the thermal power industry	2	3/90	1+1+0	2
3.Additional Types of Training		**Master's Research Work and Fullfilment of Dissertation**				
	NIRM II	Research Seminar II	1	1.66/45		2
Semester 3						
3. Modules of Individual Educational Paths - 20 credits		**6M071701 – Thermal Power Engineering and thermotechnics**				
	OV 6304	Fundamentals of wind Energy	2	3/90	1+1+0	3
	ASUT 6305	Automated control systems of thermo-technical processes and attitudes	3	5/135	1+2+0	3
	ENBT 6306	Operational reliability and safety of thermal processing systems	2	3/90	1+1+0	3
	MRTK 6307	3D modeling of reacting flows in combustion chambers	3	5/135	1+2+0	3
	PBP 6308	Problems of waste production and their solutions	2	3/90	1+1+0	3
		6M071702 – Thermo-physical processes in Power Energy				
	MMTO 6304	Perspective directions of wind power	2	3/90	1+1+0	3
	PSE 6305	Industrial power systems	3	5/135	1+2+0	3
	EChT 6306	The electrical part of the power system	2	3/90	1+1+0	3
	VEGZh 6307	Computer experiment on the com-	3	5/135	1+2+0	3

		bustion of liquid and solid fuels				
	UIZM 6308	Removal and use of ash and slag materials on thermal power plants	2	3/90	1+1+0	3
3.Additional Types of Training		**Master's Research Work and Fullfilment of Dissertation**				
	NIRM II	Research Seminar III	1	1.66/45		3
		Professional Practice				
	PP	Pedagogical Practice	3	5/135		3
Semester 4						
3.Additional Types of Training		**Master's Research Work and Fullfilment of Dissertation**				
	NIRM IV	Research Seminar IV	4	6/180		4
		Professional Practice				
	IP	Research practice	2	3/90		4
4. Finalcertification	KE	Complex Examination	1	1.66/45		4
	ZD	Dissertation Fullfilment and Defence	3	5/135		4
TOTAL			**59 credits**			

For the degree programme Ba Radioengineering, Electronics and Telecommunications, the self-assessment report states the following **intended learning outcomes**:

Knowledge

7. Know theoretical basics of fundamental sciences as relevant to his (her) profession and
8. specialization; essence; main achievements and development trends of contemporary radioengineering, electronics and telecommunications;
9. know fundamentals of the physical sciences, mathematics, and engineering fundamentals to the solution of Radioengineering and telecommunications problems;
10. know contemporary issues while continuing to engage in lifelong learning
11. know major scientific and technical problems and prospects of the development of science and technology, the relevant specialized training, their relationship with adjacent areas;
12. know principles of operation of computer software applications used in radio, electronics engineering technology such as CAD, spread sheets, word processing, and basic programming;
13. know fundamentals of general physics, meaning of physical laws, explanation and mathematical description of the laws;
14. know structure and algorithms of basic mathematical methods for the description of systems of different physical nature;
15. know main laws of electricity and magnetism, theory of construction of different electric circuits, basic rules for construction of electrical circuits on practice and rules of operation with them;
16. know basic principles of information theory, structure and algorithms for information proceeding and informational security by use of methods of theory of information and informational entropy;

17. know basic principles of constructing of schemes used in Radioengineering, methods for their description, meaning of basic parameters for characteristics of Radioengineering systems of different types;
18. know basic rules for construction of electrical circuits and methods for design of the circuits by use of modern methods of computer simulation, methods for calculation of parameters of circuits;
19. know basic methods for signal processing represented in digital form, know fundamentals of entropic, correlation, spectral, wavelet analyses and principles of application of these methods of analyses for signal processing.

Understanding

1. Understand the role and impact of telecommunications in a broader societal and global context;
2. develop an understanding of contemporary technical and professional issues in the internship of Radioengineering, electronics and telecommunications;
3. understand the professional and ethical responsibilities incumbent upon the practicing radio engineer;
4. understand why he/she learns what he/she learns and have multiple opportunities to provide that during his/her university education;
5. understand role of physical and mathematical laws in telecommunication systems and operation of digital electronic devices, meaning of basic physical laws;
6. understand basic principles of operation of electrical circuits and meaning of algorithms for developing of the electrical circuits;
7. understand meaning of basic laws and statements of theory of information and informational entropy and their role for the description of telecommunication systems;
8. understand of bases of electronic and measuring technics, fundamentals of microprocessor technics, bases of Radioengineering and telecommunication;
9. understand basic principles of operation of circuit design of analogue electronic devices and fundamentals of circuit design of digital devices.

Application

1. Apply practical skills to function competently in a laboratory setting, making measurements, operating technical equipment, critically examining experimental results, and properly reporting on experimental results, including their potential for improvement;
2. apply practical skills to design and conduct experiments in Radioengineering and electronics, and to analyze and interpret the data generated by those experiments;
3. apply skills for working effectively on multi-disciplinary teams involving people from diverse backgrounds;
4. demonstrate ability to design and integrate systems, components or processes to meet desired needs within realistic constraints;
5. apply the modern information technology for solving of problems in radioengineering, electronics and telecommunications by use of modern computer methods for information collection, storage and treatment;

6. illustrate and explain own results of research activity;
7. apply physical laws for the description of different processes in telecommunication systems, choose corresponding methods for the description;
8. apply different mathematical methods for solving problems, at first problems in telecommunication systems;
9. apply practical skills to function competently in a laboratory setting, making measurements, operating technical equipment, critically examining experimental results, and properly reporting on experimental results, including their potential for improvement.

Analysis

1. Analyze the scientific and technical information on the subject of experiments for the preparation of surveys, reports and scientific publications, participation in the reporting of the assignment;
2. verify compliance with development projects and technical documentation of regulatory documents;
3. identify and define problems in radio and computer engineering, and to generate and evaluate solutions to those problems;
4. classify the existing types and grades of radio components, their designations and appointments in relation to the tasks with the use of databases and literature;
5. analyze, plane, organize and conduct scientific studies; use the knowledge of higher education psychology and pedagogy in practical activities;
6. analyze the information problems in various branches of radioengineering, electronics and telecommunications;
7. analyze experimental data and choose a methods for the description of the phenomena under investigation;
8. analyze choice of method for the mathematical description of real processes in telecommunication systems;
9. identify and define problems in radio and computer engineering, and to generate and evaluate solutions to those problems.

Synthesis

1. Develop systematic renovation of knowledge during professional activities, including active search for and use of new information;
2. recognize and respond to the need for life-long learning for a successful career in Radioengineering, electronics and telecommunications;
3. ability to approach engineering problems and effects of their possible solutions within a well structured, ethically responsible and professional manner;
4. write a term paper on an approved topic, speech on defense;
5. make a plan on finding the bibliographic research;
6. make a plan or algorithm for the description of a physical phenomena or process;
7. synthesize skills acquired in the course of research practice;
8. examine the professional literature and other scientific and technical information, the achievements of domestic and foreign science and technology in the field.

Evaluation

1. Ability to use techniques, skills and modern engineering tools necessary for engineering practice;
2. discuss the modern system of organizing and financing scientific research;
3. communicate effectively, as orally as in writing, in the field of Radioengineering and Electronics;
4. ability to express problems, methods for their solving, and findings in written and oral forms;
5. integrate knowledge to cope with the complexities and make judgments based on incomplete or limited information, based on ethical and social responsibility for the use of these judgments and knowledge;
6. discuss processes in a physical system and estimate obtained results;
7. demonstrate a broad education and knowledge of contemporary issues in a global and societal context, as necessary to develop professional and ethical responsibility, including responsibility to employers and to society at large;
8. ability to describe communication systems and channels and make a plan for presentaion and information about the considered system.

The following **curriculum** is presented:

Title of modules	Course code	Title of courses	Credit	ESTC/hours	Lec/Prac/Lab	Sem
1. State Compulsory Module (10 credits)	HRK1101	History of the Republic of Kazakhstan	2	3/90	1+1+0	1
	L(R)LPP1102	Kazakh (Russian) Language for Professional Purposes	3	5/135	0+3+0	1
	FLPP1103	Foreign Language for Professional Purposes	3	5/135	0+2+1	1
	PSK1104	Philosophy of Scientific Knowledge	2	3/90	1+1+0	4
2. Social and Communicative Module (4 credits)	PIC2201	Psychology of Interpersonal Communication	2	3/90	1+1+0	3
	TAPS2202	Theoretical and Applied Political Science	2	3/90	1+1+0	3
	EPSS2203	Ethics of Personal and Social Success	2	3/90	1+1+0	3
	CR2204	Culture and Religion	2	3/90	1+1+0	3
	GAS2205	General and Applied Sociology	2	3/90	1+1+0	3
	HLS2206	Human Life Safety	2	3/90	1+1+0	3
	ESD2207	Ecology and Sustainable Development	2	3/90	1+1+0	3
	FE2208	Fundamentals of Economics	2	3/90	1+1+0	3
	KL2209	Kazakh Law	2	3/90	1+1+0	3
3. Vocational Modules (115 credits)	**3.1 Natural Sciences (STEM) module**		12	20/540		
	ITRTTC1301	Information Technologies in Radio Technics and Telecommunications	*3*	5/135	1+1+1	1
	MA1302	Mathematical Analysis	3	5/135	1+2+0	2
	RP2303	RadioPhysics	3	5/135	2+1+0	4
	RECM1304	Radio Electronic Computer Metods	3	5/135	1+1+1	2
	Basic Professional Modules		69	115/3105		
		Module 1 Physics				
	MMP1401	Mechanics and Molecular Physics	3	5/135	1+1+1	1
	EM1402	Electricity and Magnetism	2	3/90	1+1+0	2
	PEM1403	Internship of Electricity and Magnetism	2	3/90	0+0+2	2
	Opt2404	Optics	3	5/135	1+1+1	3

	Module 2. Mathematics					
AGLA1405	Analytic Geometry and Linear Algebra		3	5/135	1+2+0	1
PTMS1406	Probability theory and mathematical statistics		2	3/90	1+1+0	2
TFCV2407	Theory of functions of a complex variable		3	5/135	1+2+0	3
	Module3 **Theory of Electric Circuits**					
TEC12408	Theory of Electric Circuits 1		3	5/135	1+1+1	3
TEC12409	Theory of Electric Circuits 2		3	5/135	1+1+1	4
	Module 4. Information Theory					
IET2410	Information and Entropy Theory		3	5/135	1+2+0	3
SOS3411	Self-Oscillating Systems		3	5/135	1+1+1	2
LP1412	Labour Protection		2	3/90	1+1+0	1
	Module 5 Fundamentals of Radioengineering					
BEMT2413	Bases of Electronic and Measuring Technics		3	5/135	1+2+0	2
FMT2414	Fundamentals of Microprocessor Technics		3	5/135	1+2+0	4
BRETC3415	Bases of Radioengineering and Telecommunication		3	5/135	2+1+0	5
	Module 6. Circuit Design					
CDAED2416	Circuit Design of Analogue Electronic Devices		3	5/135	1+1+1	3
CDDD2417	Circuit Design of Digital Devices		3	5/135	1+1+1	4
	Module7. Digital Signal Processing					
DSP2418	Digital Signal Processing		3	5/135	1+2+0	4
PDSP2419	Internship of Digital Signal Processing		2	3/90	0+0+2	4
	Module 8. Programming					
PLW3420	Programming in LabView		3	5/135	1+1+1	5
PLD3421	Programmable Logic Devices		3	5/135	2+1+0	6
PPLD3422	Internship of PLD		3	5/135	0+1+2	6
	Module 9. Communication Systems					
TEC2423	Theory of Electrical Communication		2	3/90	1+1+0	5
TWC3424	Technology of Wireless Communications		3	5/135	2+1+0	5
AFDEWT4425	Antenna-Feeder Devices and Electromagnetic Waves Transmission		3	5/135	1+1+1	7
3.3 Modules for Individual Educational Trajectories (IET)			30	50/1350		
	IET 1 Electronics	**IET 2 Radioengineering and Telecommu-nications**	30	50/1350		
SW3501 SW3501	Scientific Writing	Scientific Writing	1	2/45	0+1+0	6
SM3502 MRM3502	Standardization and Metrology	Metrology and Radio Measurement	2	3/90	1+1+0	6
PBOE3503 RA3503	Physical Bases of OptoElectronics	Radiotechnical Apparatuses	3	5/135	1+2+0	5
TMEWA3504 MISTS3504	Tools and Methods of Electronic Warfare Activity	Methods of Information Security in Telecommunication Systems	3	5/135	1+2+0	5

	PTMM3505 MCCS3505	Physical and Technological Methods of Microelectronics	Multi-channel communication systems	3	5/135	1+2+0	6
	SEHF3506 TDC 3506	Semiconductor Electronics High Frequencies	Technology of Digital Communications	3	5/135	1+2+0	6
	SRP4507 ISRT4507	Statistical Radio Physics	Introduction to Statistical Radio Technics	3	5/135	2+1+0	7
	Nan4508 NTRTT4508	Nanoelectronics	Nanotechnology in Radiotechnics and Telecommunications	3	5/135	2+1+0	7
	IES4509 ME4509	Intelligent Electronic Systems	Microwave Electronics	3	5/135	1+1+1	7
	FCADES4510 BMRD4510	Fundamentals of Computer-aided Design of Electronic Systems	Basics of Modeling of Radiodevices	3	5/135	1+0+2	7
	RL4511 GSW4511	Radiolocation	Global Systems of Waves	3	5/135	1+2+0	7
	3.4 Interdisciplinary Module			4	7/180		
	IPL3601	Intellectual Property Law		2	3/90	1+1+0	6
	Bioph3602	Biophysics		2	3/90	1+1+0	6
	IETC3603	Innovative Entrepreneurship in Telecommunications		2	3/90	1+1+0	6
	MMT3604	Management and Marketing in Telecommunications		2	3/90	1+1+0	6
4. Internship	**4.1 Professional internship(by types of internship)**			20/540			
	Ed101	Educational		2	3/90		2
	Ed202	Educational		2	3/90		4
	PT203	Internship Training		2	3/90		4
	PT304	Internship Training		2	3/90		6
	PT405	Internship Training		4	7/180		8
5. Final Attesta-tion	WPB401	Writing and Presentation of Bachelor's thesis (Diploma Project)		2	3/90		8
6. Additional Forms of Training	PT201	Sport and Recreation		8	13/585		1,2,3,4
TOTAL				252/6795			

For the degree programme Ma Radioengineering, Electronics and Telecommunications, the self-assessment report states the following **intended learning outcomes**:

Knowledge

1. Knowledge on mathematics, material science, and basic engineering and be able to use that knowledge in the applications of radio and electronics engineering;
2. knowledge of advanced mathematics through multivariate calculus and differential equations; be familiar with statistics and linear algebra;
3. knowledge necessary for construction of mathematical models of different objects and processes;
4. knowledge about principles of application of mathematics and applied science to perform technical calculations and solve technical problems of the types commonly encountered in radio and telecommunication engineering technology careers;
5. knowledge of professional practice issues, with an understanding of social responsibilities and a respect for diversity;
6. knowledge about the applications in business life such as risk analysis, assessment and management with project management, change management, be aware of entrepreneurship, modernism and sustainable development;
7. knowledge of contemporary issues while continuing to engage in lifelong learning;
8. know basic principles of programming in Matlab, LabView, Workbench and other computer programmes; know basic methods for modeling of digital devices used in telecommunications by use of methods of computer simulation;
9. know main aspects of theory of electrical communications, technology of wireless communications, and know principles of operation of antenna-feeder devices and electromagnetic waves transmission.

Understanding

1. Understand the role and impact of telecommunications in a broader societal and global context;
2. develop an understanding of contemporary technical and professional issues in the internship of Radioengineering, electronics and telecommunications;
3. understand the professional and ethical responsibilities incumbent upon the practicing radio engineer;
4. understand why he/she learns what he/she learns and have multiple opportunities to provide that during his/her university education;
5. understand methods for identification, formulation, and solving of engineering problems in the following major electrical engineering technology disciplines: analog and digital electronics,communication systems, power, aerospace and computer systems;
6. participation in testing pre-production models of Radioengineering devices and systems and to process the results;
7. understanding of methods for developing of structural and functional schemes of Radioengineering devices;

8. understand main principles of realization of methods of digital signal processing and realization of these methods on practice by use methods of computer simulation;
9. understand algorithms of methods of programming in Labview and programmable logic devices, and understand methods of visualization and explanation of obtained results;
10. understand methods of description of telecommunication systems by use of theory of Electrical Communication and basic statements of Technology of Wireless Communications.

Application

1. Demonstrate the ability to identify, formulate, and present creative solutions to technical problems in a variety of specialty areas within the broad fields of engineering technology;
2. be able to use modern computational tools for technical problem solving, including scientific calculators, computers, and appropriate software;
3. apply practical skills to design and conduct experiments in Radioengineering and electronics, and to analyze and interpret the data generated by those experiments;
4. apply skills for working effectively on multi-disciplinary teams involving people from diverse backgrounds;
5. demonstrate ability to design and integrate systems, components or processes to meet desired needs within realistic constraints;
6. demonstrate a broad education and knowledge of contemporary issues in a global and societal context, as necessary to develop professional and ethical responsibility, including responsibility to employers and to society at large;
7. apply the modern information technology for solving of problems in radioengineering, electronics and telecommunications by use of modern computer methods for information collection, storage and treatment;
8. choose methods of research activity and for developing of algorithms for their implementation;
9. illustrate and explain own results of research activity;
10. design components, devices, and systems to meet specific needs in Radioengineering and electronics;
11. use the techniques, skills, and tools of modern engineering, including the use of computer-based technologies such as programming, use of engineering and business applications, and the use of electronic media, effectively in the internship of Radioengineering, electronics and telecommunications;
12. apply practical skills to design and conduct experiments in Radioengineering and electronics, and to analyze and interpret the data generated by those experiments;
13. apply skills for working effectively on multi-disciplinary teams involving people from diverse backgrounds;
14. demonstrate ability to design and integrate systems, components or processes to meet desired needs within realistic constraints.

Analysis

1. Analyze the scientific and technical information on the subject of experiments for the preparation of surveys, reports and scientific publications, participation in the reporting of the assignment;
2. identify and define problems in radio and computer engineering, and to generate and evaluate solutions to those problems;
3. analyze, plane, organize and conduct scientific studies; use the knowledge of higher education psychology and pedagogy in practical activities;
4. analyze the information problems in various branches of radioengineering, electronics and telecommunications;
5. be able to function competently in a laboratory setting, making measurements, operating technical equipment, critically examining experimental results, and properly reporting on experimental results, including their potential for improvement;
6. be able to use modern computational tools for technical problem solving, including scientific calculators, computers, and appropriate software;
7. simulate electronic objects and processes in electrical circuites, radio engeneering devices, materials for their implementation, etc;
8. conduct information analysis and information-bibliographic work using modern information technologies.

Synthesis

1. Recognize needs for life-long learning and possess the skills to maintain and improve technical and non-technical abilities;
2. examine the professional literature and other scientific and technical information, the achievements of domestic and foreign science and technology in the field;
3. demonstrate an ability to communicate and function effectively with members of multi-disciplinary teams from a variety of backgrounds;
4. develop and implement programs of experimental researches;
5. make a plan on finding the bibliographic research;
6. composes reports (sections of the report) on the topic or section (step, task);
7. prepare the results of conducted researches for presentation at conferences and in for publication in scientific press;
8. synthesize skills acquired in the course of research practice;
9. offer training plan;
10. the statement of probation;
11. make a plan of the dissertation research;
12. compile reviews and reports of the results of conducted researches;
13. make a plan of the scientific research devoted to investigation of processes in telecommunication systems.

Evaluation

1. Demonstrate a broad education and knowledge of contemporary issues in a global and societal context, as necessary to develop professional and ethical responsibility, including responsibility to employers and to society at large;

2. discuss the modern system of organizing and financing scientific research;
3. demonstrate knowledge and understanding of the developmental obtained at the level of higher education, which are the basis for the original or the possibility of development or application of ideas, often in the context of scientific research;
4. ability to express problems, methods for their solving, and findings in written and oral forms;
5. ability to design systems, processes or products by applying modern methods of work study, ergonomics, production systems and simulation while fulfilling requirements under realistic conditions;
6. integrate knowledge to cope with the complexities and make judgments based on incomplete or limited information, based on ethical and social responsibility for the use of these judgments and knowledge;
7. integrate the knowledge to cope with the complexities and make judgments based on incomplete or limited information, based on ethical and social responsibility for the use of these judgments and knowledge;
8. communicate effectively, as orally as in writing, in the field of Radioengineering and Electronics;
9. ability to use techniques, skills and modern engineering tools necessary for engineering practice;
10. ability to express problems, methods for their solving, and findings in written and oral forms.

The following **curriculum** is presented:

Title of modules	Title of courses			Credit	ECTS/ hours	Lec/prac /Lab.	Sem
Compulsory State Modules – 8 credits	1.1.	History and Philosophy of Science		2	3/90	1+1+0	1
	1.2.	Foreign language (Professional)		2	3/90	1+1+0	1
	1.3	Pedagogics		2	3/90	1+1+0	2
	1.4	Psychology		2	3/90	1+1+0	2
Compulsory Professional Modules – 14 credits	2.1.	Organization and Planning of Scientific Research		3	5/135	2+1+0	1
	2.2.	Computer Simulation of Telecommunication Systems		3	5/135	1+1+1	1
	2.3.	Chaos in Electronic Systems		3	5/135	2+1+0	1
	2.4.	Physical Processes of Nanoelectronics (In English)		3	5/135	2+1+0	2
	2.5.	Technological problems of Radioengineering, Electronics and Telecommunications		2	3/90	1+1+0	1
Modules of Individual Educa-tional Paths – 20 credits	**3.1.**	**IET 1 Electronics**	**IET 2 Radioengineering and Telecommunications**				
	3.2.	Synchronization of Electronic Systems	Simulation of Wireless Devices	3	5/135	1+1+1	2
	3.3.	Thin-film Microelectronics	Programming of Digital Devices	3	5/135	2+1+0	2
	3.4.	Fractal Radiophysic	Modern Telecommunication Technologies	2	3/90	1+1+0	3
	3.5.	Fractal Nanoelectronics	Theory and Technique of Scientific Experiment	2	3/90	1+1+0	3
	3.6.	Digital Systems for Information Transfer	Modern Methods of Information Security	3	5/135	1+2+0	3
	3.7.	Modern Fiber-Optic Communication Systems	Technologies of Digital Processing of Signals	2	3/90	1+0+1	3
	3.8.	Nonlinear Processes of Radio Physics	Radar Systems	3	5/135	2+1+0	3
Professional Internship – 6 credits	4.1.	Pedagogical Internship		3	5/135	-	3
	4.2.	Research Internship		3	5/135	-	1, 4
Master's Reseach Work and Fullfilment of Dissertation – 7 credits	5.1.	Preparation and Implementation of the Master's Thesis		7	12/315		
Final Attestation – 4 credits	6.1.	Complex Examination		1	2/45		
	6.2.	Dissertation Fullfilment and Defence		3	5/135		
TOTAL:				**99/2655**			

C Peer Report for the ASIIN Seal[3]

1. Formal Specifications

Criterion 1 Formal Specifications

Evidence:

- Self-Evaluation-Report
- Auxiliary document: “University-wide Academic Policies and Procedures of al-Farabi Kazakh National University”

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. The audit team confirms that the names chosen reflect the respective programme-contents. The master´s programmes are consecutive programmes with a preceding bachelor´s degree. The duration of studies derives from the Kazakh state requirements. This means the bachelor´s programmes lasting four years, in which 151 Kazakh credits (reported to correspond with around 252 ECTS) are achieved and the master´s programmes lasting two years with overall 59 Kazakh credits (reported to correspond with around 98 ECTS). Concerning the comparison between both credit systems, there is an uncertainty explained in chapter 3.2.

The expected intake of the programmes depends on the state grants the Kazakh Ministry for Education and Science allocates annually. It is therefore difficult to anticipate the expected intake of the programmes. Additionally, students can enroll on a self-paid basis with the fees measured at a comparable level like the state grants. Discounts for supporting special social situations are available as well.

Concerning the remaining formal attributes of the programmes (degree awarded, intake rhythm), the audit team considers the formal specifications of the programmes to be adequately defined. This information is published on the websites of al-Farabi Kazakh National University and in its “Academic Policy” (which is also available on the websites of the university).

[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.

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

Meaningful formal information according to the ASIIN criteria has been provided. Insofar as these data lead to further conclusions of the peers, they are addressed in the relevant chapters of this report.

2. Degree programme: Concept & Implementation

Criterion 2.1 Objectives of the degree programme

Evidence:

- Discussions with the responsible members of university management
- Discussions with staff responsible for managing the study programmes
- Defined programme objectives and learning outcomes in the Self-Evaluation-Report

Preliminary assessment and analysis of the peers:

The discussion between the audit team and the responsible staff for university- and programme-management shows that the programmes covered by this report are carried out as “specialities” according to the Kazakh governmental education plan. Autonomy in programme development therefore is limited to elective courses, which can be chosen by students as individual trajectories. The compulsory courses in these specialities are fixed for whole Kazakhstan by the Ministry of Education and Science, benchmarking them with programmes from other renowned international universities and taking into account specific Kazakh labour-market-needs.

With regards to the equivalence of the bachelor´s programmes to level 6 and of the master´s programme to level 7 of the European Qualifications Framework, the audit team considers them as comparable.

Criterion 2.2 Learning Outcomes of the Programmes

Evidence:

- Discussions with the responsible members of university management
- Discussions with staff responsible for managing the study programmes
- Defined programme objectives and learning outcomes in the Self-Evaluation-Report

Preliminary assessment and analysis of the peers:

In general, the bachelor´s programmes are more professionally oriented whereas the master´s programmes introduce students to scientific research. In general, the master´s programmes define publication-requirements for students. The learning outcomes of all programmes as well emphasize the importance of socially developed and patriotic graduates, speaking three to four languages. In the curricula of the programmes this is covered by “State Compulsory Modules” and in the bachelor´s programmes by “Social and Communicative Modules”. The subject-specific learning outcomes of every programme distinguish between *knowledge*, *understanding*, *application*, *analysis*, *synthesis* and *evaluation*.

There are two sets of subject specific criteria relevant for the accreditation of the respective three bachelor´s programmes: First, the *ASIIN Subject Specific Criteria for Electrical Engineering and Information Technology (SSC)* are applied for the ASIIN Seal. Secondly, the faculty has applied for the *EUR-ACE label (EUR-ACE)*, requiring the application of the respective criteria. The two sets of criteria and the learning outcomes of the programmes correspond as follows:

At bachelor´s level, EUR-ACE defines knowledge and understanding of the scientific and mathematical principles underlying the engineering subject. The SSC define knowledge in mathematics, natural sciences and engineering enabling graduates to understand the complex phenomena peculiar to electrical engineering/information technology and an understanding for the broader multidisciplinary context of engineering sciences. At master´s level this is elevated by a critical awareness of the forefront of their branch.

For the learning outcomes of the bachelor´s programme Electric Power Engineering these core-competences in mathematics and natural sciences are addressed in the defined learning outcomes under the topic of *knowledge to achieve* (e.g. “knowledge of the physical foundations of materials science, physical processes: dielectric materials, electrical insulating fluids and solid organic and inorganic materials, semiconducting and superconducting materials”) and the competences in *evaluation*. Mathematical competences could be defined clearer in view of the peers, but they are addressed implicitly and visible in the module outcomes. The bachelor´s programme in Thermal Power Engineering addresses these core competences under the subtitles of *application*, *analysis* and *synthesis,* although the definition could be spelled more explicitly. For the master´s programme, advanced subject-specific fundamentals in electrical engineering (SSC) are addressed e.g. by competences in developing mathematical models for industrial heat and power systems and using mathematical models as research tools. The description of core competences in knowledge and understanding for the bachelor´s programme in Radioengineering, Electronics and Communications explicitly addresses competences in maths and natural sciences under the subtitle of knowledge. For the master´s programme, an elevated level (e.g. “advanced mathematics through multivariate calculus and differential equations; be familiar with statistics and linear algebra, construction of mathematical models of different objects and processes”) is defined.

EUR-ACE defines for the competences for *engineering analysis* the ability to apply knowledge and understanding to identify, formulate and solve engineering problems using established methods. At the master´s level this is elevated in form of the ability to solve problems that are unfamiliar, incompletely defined, and have competing specifications. The relevant SSCs cite the ability to select and apply actual methods of modeling, calculating, and testing concerning their field of specialisation as well as designing and running experiments and computer simulations and explaining the results. At masters level this is elevated in terms of evaluating new complex modeling, measuring, design and test methods concerning their relevance, effectiveness and efficiency as well as developing independently new methods.

For the learning outcomes of the bachelor´s programme Electric Power Engineering these analytic competences are addressed in the definition of competences in *analysis* (e.g. “calculate the required parameters and values of installation, operation and maintenance of power technological equipment”, “experimental research in the field of electric power and the creation of theoretical models”) and *application* (e.g. “formulate the main technical and economic requirements to the projected devices and systems”). The bachelor´s programme in Thermal Power Engineering addresses these competences under the subtitle of *synthesis* (e.g. “Identify and address current and future heat power engineering problems related to energy sources, generation, conversion, transmission, utilization, efficiency, protection, and control”). For the master´s programme, advanced subject-specific fundamentals in thermal power engineering (SSC) are addressed e.g. in the subject of *application* by competences in applying decisions in complex engineering tasks involving high degree of uncertainty and lack of information basing on the acquired knowledge and criteria. The description of the respective competences for the bachelor´s programme in Radioengineering, Electronics and Communications addresses the equivalent competences e.g. under the subject of *application* (e.g. “apply the modern information technology for solving of problems in radioengineering, electronics and telecommunications by use of modern computer methods for information collection, storage and treatment”, “critically examining experimental results, and properly reporting on experimental results”). For the master´s programme, an elevated level (e.g. “simulate electronic objects and processes in electrical circuits, radio engineering devices, materials for their implementation”) is defined.

EUR-ACE defines for competences in *engineering design* the ability to apply knowledge and understanding to develop and realize designs to meet defined and specified requirements. The SSC mention developing analogue and digital electric and electronic circuits, devices and products. At master´s level for EUR-ACE this is elevated in terms of designing solutions to unfamiliar problems, possibly involving other disciplines. The SCC specifically define skills for the design, development and operation of complex technical systems and services.

For the learning outcomes of the bachelor´s programme Electric Power Engineering the engineering-design-competences are related to electric power systems ("design and development using modern components of electric power systems and individual devices", "develop projects of power plants and substations, electrical systems and networks, relay protection and automation of power systems, power companies of various industries, the electric drive and automation systems"). The bachelor´s programme in Thermal Power Engineering addresses application-oriented competences concerning "methods of design, construction, installation and operation of technical equipment of heat power and thermal processing systems". For the master´s programme, this is elevated to the application of multi-disciplinary approaches ("multi-disciplinary approach to conceive, plan, design, and implement solutions to thermal engineering problems in the field of energy and sustainability", "technical and economic calculation of alternative options for production, introduction of new techniques and technologies, and modernization of facilities"). The description of the respective competences for the bachelor´s programme in Radioengineering, Electronics and Communications addresses the equivalent competences e.g. under the subject of *application* (e.g. "Demonstrate ability to design and integrate systems, components or processes to meet desired needs within realistic constraints"). The master´s programme defines an elevated level (e.g. "Design components, devices, and systems to meet specific needs in radio-engineering and electronics.").

The EUR-ACE criteria for *investigations* address the ability to design and conduct appropriate experiments, interpret the data and draw conclusions. The SSCs provide no equivalent at bachelor´s level. At master´s level, EUR-ACE requires the ability to design and conduct analytic, modelling and experimental investigations. The SSC define suitable methods to make concepts, do and evaluate detailed research concerning technical topics. Overall, this topic refers to the research competences of the graduates.

The learning outcomes related to *research* in the bachelor´s programme Electric Power Engineering define basic competences to conduct "theoretical and experimental research in the field of electric power and the creation of theoretical models". The bachelor´s programme in Thermal Power Engineering addresses research competences concerning "theoretical and experimental research methods in order to design new perspective heat power plants and systems". Overall, the peers consider these objectives to be sufficient for the more professionally oriented bachelor´s programmes. For the master´s programmes, an elevated standard is described. The master´s programme in Thermal Power Engineering describes research competences e.g. with regards to the "using an advanced approach to design and conduct experiments, and to analyze and interpret data", developing and using "automated experiment conduction", analyzing "economic and financial benefits from applying results of theoretical and experimental researches to real industrial and power engineering sectors". The description of the respective competences for the bachelor´s programme in Radioengineering, Electronics and Communications addresses the equivalent research competences e.g. under the subject of *application* (e.g. "apply practical skills to design and conduct experiments in radio-engineering and electronics, and to analyze and interpret the data generated by those experiments", "function competently in a laboratory setting, making measurements, operating technical equipment, critically examining experimental results, and properly reporting on experimental results, including their potential for improvement"). The master´s programme relates these competences stronger to the process of scientific publishing (e.g. "analyze the scientific and technical information on the subject of experiments for the preparation of surveys, reports and scientific publications, participation in the reporting of the assignment"). The preparation of a research plan in transition to the respective PhD-programme is also included in the programme objectives.

EUR-ACE defines requirements for *engineering practice* which are fulfilled in all bachelor´s programmes through the relevant experience to achieve ("possibilities and limits of the application of materials, computer-based model designs, systems, processes and tools for the solution of problems"). These competences are achieved in "permanent internships", meaning that students receive practical training in laboratories as well as in companies. At master´s level, this practical training is related to the achievement of research and educational competences. The competences concerning product development mentioned under this topic in the SCC were already addressed in the topic of *engineering design*.

EUR-ACE requires *transferable skills*, which are related more closely to technical fields in the SCC. In addition to the objectives stated at the beginning of this chapter, the bachelor´s programmes aim at the development of team competence. This is elevated at master´s level with the ability to function as a team leader.

Overall, the audit team appreciates the challenging programmes, the clarity of their descriptions and the rich learning experience they perceive to be provided by them.

Criterion 2.3 Learning outcomes of the modules/module objectives

Evidence:

- Module Handbook

- Objectives Matrix

Preliminary assessment and analysis of the peers:

The module descriptions clearly distinguish between knowledge, skills and competences to achieve, and provide adequate descriptions in these terms. For every programme, a meaningful objectives matrix is presented – showing the correspondence between the defined objectives and learning outcomes of the programmes and the modules leading towards them. Some minor aspects are missing in the perception of the peers. Although practical training is integrated into the subject specific modules and the respective student workload credited, the audit team would appreciate to enhance the module descriptions with information (learning outcomes and practical tasks to perform) on the internships attended in companies. Furthermore a module description for the final thesis is missing.

For a significant number of modules, the language is defined either as Russian, Kazakh and English. Upon request, the responsible staff for the programmes explains that the language of provision can be chosen by students previous to the beginning of the module. In the discussion with students, the audit team came to the impression that command of English as an academic language – though noticeable – could be actively improved. In perception of the peers, students seemed rather to tend to Kazakh and Russian. The audit team would therefore appreciate more compulsory English-language-based subject specific module parts to strengthen the respective competences.

Criterion 2.4 Job market perspectives and practical relevance

Evidence:

- Overview of companies in the Self-Evaluation-Report
- Discussion with responsible staff for the study programmes

Preliminary assessment and analysis of the peers:

Because of the programmes aligned to labour market needs by state regulation, there is no doubt for the peers concerning their practical relevance and the job market perspectives of their graduates. Over the whole course of studies in the bachelor´s programmes, the faculty is following the concept of a permanent internship, taking place every semester either as practical training in laboratories or as a professional internship in companies.

The member from university management explains that every faculty of al-Farabi University has its own council of employers interested in those specialities. A list of Kazakh and international employers is presented in the Self-Evaluation-Report. Furthermore, the faculty has established a model of collecting feedback from employers by utilizing internships (in companies) students have to attend in the 6th and 8th semesters of the bachelors` programmes. The objective of those internships refers to students comprehending the whole industrial process in their specific subjects. This is proven by a marked internship report, which includes the possibility of students´ failure. The types of companies suitable for internships in the specific programmes are defined by contracts between companies and the university.

Despite of the perceived alignment with job market perspectives, the peers feel the need to enrich practical "hands-on-experience" of advanced students in the late semesters of the bachelor´s programmes and the master´s students. This results mainly from a perceived lack of specific laboratory equipment (5.3), which is presently substituted by computer modeling. This is not satisfactory in a mid-term consideration. A schedule to enhance the laboratory equipment representing engineering applications and components has to be developed. In the meantime, the work and experience of the internships should be reflected in the respective module descriptions.

Criterion 2.5 Admissions and entry requirements

Evidence:

- Discussion with responsible staff for the study programmes
- Auxiliary document: "University-wide Academic Policies and Procedures of al-Farabi Kazakh National University"

Preliminary assessment and analysis of the peers:

The admission to the bachelor´s degree programmes depends to a vast extent on state grants provided by the Kazakh government. They are distributed to students on a competitive basis. Students have to pass the Unified National Test (covering competences in maths, natural sciences, languages, history) and – in case of successful competition – are awarded with a state grant for a specific programme, covering study fees and to some extend the costs for accommodation and subsistence. The ratio of self paying students in the faculty is reported to be rather low. For this case, the faculty management reports the acceptance of students from the lowest level in the test to be forbidden. International students can apply for the Higher Education Institutes in Kazakhstan as well by taking a standardized test (for bachelor´s programmes) and university entrance exams. Parts of these university entrance exams required command of Kazakh language.

Admission to the master´s degree programmes is also defined by the Ministry of Education and Science of Kazakhstan. The testing system for the distribution of state grants works similar to the bachelor´s level. Educational grants for master's degree programmes are awarded to students on a competitive basis. Candidates for the master´s programmes have to take entrance exams which comprise a standardized test of foreign language command and written exams conducted by the al-Farabi University´s Admission Commission.

In general, there are specific contingents e.g. for students from rural regions.

Although the audit team does not appreciate the standardized approach towards the admission of bachelor´s students, the peers understand it´s function in the overall context of financing studies. But this is not seen as a problem for the ASIIN-criteria. They appreciate the approach at master´s level, because they perceive it to belong to the autonomy of al-Farabi-University to a larger extend. A strong relation to quality assurance in alignment of admission criteria and programme objectives is visible in both cycles.

Criterion 2.6 Curriculum/Content

Evidence:

- Curriculum overview in the Self-Evaluation-Report
- Objectives matrix in the Self-Evaluation-Report

Preliminary assessment and analysis of the peers:

The equivalence between the relevant criteria and the objectives of the programmes in terms of defined learning outcomes is described in chapter 2.2. The faculty has presented objectives matrixes for every programme, showing the correspondence between learning outcomes and the modules where they are achieved. A specific strength in view of the peers is the sound theoretical basis of the programmes. The competences in product development and the respective application in an industrial environment were considered as options for enhancement in a mid-term perspective. But overall, the audit team confirms that the modules lead to the defined outcomes of the programmes.

But, as mentioned in 5.3, the peers had a problem with the achievement of learning outcomes with regards to *engineering practice* and *investigations* as required by the EUR-ACE and the ASIIN Subject Specific Criteria for Electrical Engineering and Information Technology. In the first line this is not a problem of the objectives of the programmes or the module descriptions. The peers detected a lack of application- and subject-specific laboratory equipment, leading to an underrepresentation of experimental topics in the final theses especially at master´s level. In view of the audit team, an enhancement of the laboratory equipment (as mentioned in 5.3) is required to assure that the respective learning outcomes can be achieved at master´s level.

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

The requirements of the sub-criteria referred to in this section have not yet been fully met. The comments of the HEI indicate a broadly constructive handling of the relevant critical comments of the peers and, on occasion, do allow for a better understanding of the reasons for some of the detected shortcomings. Yet, these comments do not alter the proposed decision as drafted by the peers during the on-site visit.

With respect to the module descriptions it has been argued that these should be revised thereby taking into account the remarks given in the report. In conjunction with this, it has been specifically pointed out that missing module descriptions need to be supplemented in order to provide students with complete information about all components of the curriculum. This is particularly necessary with respect to the final thesis and (within the concept of the "permanent internship") the professional internships in companies students are expected to pass successfully. Although it is to be taken into account – as the HEI states – that the number of modules is not at the disposition of the University, the said study units (final thesis and professional internship respectively) are apparently treated by the HEI itself as curricular components with their own well-defined learning outcomes, workload demand, credit point allocation, etc. It is appreciated that the University announces to communicate on this to the University top management. This announcement notwithstanding, students should be informed about these parts of the curriculum as they are about the role and specifics of, say, subject-specific modules. As to this, the peers confirm a correspondent requirement, only highlighting that missing module descriptions need to be supplemented (see below requirement 1). If, in fact, the formal question of the number of modules should turn out to be a serious obstacle to a reasonable solution, one may also think of alternative forms to effectively communicate the relevant information in the said cases to students and other stakeholders.

It is also appreciated that the HEI, in general, supports the assessment of the peers concerning the further development of the laboratory equipment, and that it has taken already (or, in the midterm, is planning to take) appropriate measures to upgrade its laboratory apparatus. Since it goes without further explanation that the application- and subject-specific laboratory equipment in its actual state is regarded as a major weakness of the programmes under review (see for instance its importance for achieving practical engineering competences or treating ambitious experimental topics in the framework of graduation works), a requirement formulated for this purpose during the onsite visit is explicitly confirmed (see below requirement 2). As the peers have received the impression that the HEI will be able to take meaningful steps to amend this situation even in the short term, it is expected that the said requirement can be fulfilled within a reasonable period of time.

3. Degree Programme: Structures, Methods & Implementation

Criterion 3.1 Structure and modularity

Evidence:

- Curriculum overview in the Self-Evaluation-Report
- Module Handbook

Preliminary assessment and analysis of the peers:

The faculty delivered module descriptions in the Self-Evaluation-Report. These module descriptions are reported to be published annually to enable students to choose an individual trajectory of studies (in the area of electives). Modules at bachelor´s level are clearly distinguished from modules at master´s level. One module usually contains several types of courses (lectures, seminars, practical training) and the description also takes into account times for unguided and guided self-studies. For the latter, teaching staff is available on request. The peers in general perceive the module descriptions to be very well thought of with a clear distinction between learning outcomes and content. The modules are considered to be coherent and consistent packages of teaching and learning organized in a meaningful sequence. As far as the audit team can see, every component of the programme is covered by a module description - with the following exceptions:

The description of the final thesis for every programme is missing. The stated credits in the study plan (2 Kazakh credits) obviously do not reflect the whole student workload, which spreads over several parts of the programmes. The audit team thus requests a module description, explaining these issues. Furthermore, the interships and laboratory practice, although mentioned in the module descriptions, should be described more explicitly in terms of tasks to perform and competences to achieve. The purpose of this description is to clarify the extent of competences closely related to engineering design and engineering practice.

Concerning international mobility the al-Farabi University participates in academic exchange programmes like ERASMUS and has several partnerships with universities abroad, with information on mobility options available in databases. This means that students usually don´t have to pay fees for their time abroad. Recognition procedures are in place, but the discussion with students reveals that recognition is based on the credit point as a quantified benchmark for the judgment. The peers cannot see that the decision is based on qualitative learning outcomes, which would be required for a country ratifying the Lissabon Declaration. The audit team therefore requests a clarification on how external achievements are recognized.

In the discussion with students, the peers got the impression that academic mobility in general could be enhanced and that students aiming at studying abroad prefer Russian speaking countries. The latter may result from a noticeable but yet improvable language policy for English as an academic language. Although this impression may not be representative, the peers encourage the faculty to strengthen English language competences in education (e.g. by implementing a more compulsory English-speaking policy) and to strengthen students´ motivation towards studying abroad.

In view of the peers, a module description for the final thesis has to be delivered and the recognition procedures have to be aligned with the content of the Lisbon Declaration Kazakhstan has ratified.

Criterion 3.2 Workload and credit points

Evidence:

- Auxiliary document: "University-wide Academic Policies and Procedures of al-Farabi Kazakh National University"
- Module Handbook
- Discussions with students

Preliminary assessment and analysis of the peers:

As far as the peers can see, 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.

The average workload per semester in the <u>bachelor´s programmes</u> usually exceeds thirty ECTS-credits and ranges up to forty. In the <u>master´s programmes</u> this is similar. The peers consider this to be quite a lot. It is explained by the faculty management with a former soviet policy. Nevertheless, the audit team relies on the students´ feedback, considering this amount of workload to be challenging but acceptable. Furthermore the teaching staff is reported to be cooperative concerning unbalanced workload in certain courses and willing to do adjustments.

Concerning the comparison between both credit systems the peers do not understand the calculation at master´s level. The "University-wide Academic Policies and Procedures of al-Farabi Kazakh National University" state that one credit in the master´s programmes is equal to 60 hours of student workload. In this calculation the master´s programmes should sum up to 131 ECTS although 98 ECTS are stated in the Self-Evaluation-Report. The peers ask the faculty to clarify this because it is not understandable in an easy manner.

Overall, awarding of credits points seems realistic. In order to assess whether the credit point system in place meets the criteria it would be required to clarify the equation between the Kazakh credits system and ECTS.

Criterion 3.3 Educational methods

Evidence:

- Discussion with teaching staff
- Module handbook

Preliminary assessment and analysis of the peers:

The discussion with teaching staff confirms the impression the peers got from the module handbooks that a rich variety of teaching methods is applied. This especially includes non-traditional methods activating students like problem-focused lectures, case studies, brainstorming methods and discussion classes. As a rule, the vast majority of the modules contain to some extent seminary educational methods and students are regularly expected to do presentation. Furthermore new media like audio books and video lectures are applied. The peers appreciate this rich variety of educational methods.

Each programme enables students to a certain extent to choose between elective modules in individual trajectories. The <u>bachelor´s programmes in Electric Power Engineering, Thermal Power Engineering</u> and in <u>Radioengineering, Electronics and Telecommunications</u> contain individual trajectories of studies. The <u>master´s programmes Thermal Power Engineering</u> and <u>Radioengineering, Electronics and Telecommunications</u> permit more freedom of choice for individual specialization by electives.

Criterion 3.4 Support and advice

Evidence:

- Auxiliary document: “University-wide Academic Policies and Procedures of al-Farabi Kazakh National University”
- Discussions with students
- Discussions with teaching staff

Preliminary assessment and analysis of the peers:

Students report to be devided into groups of around twenty persons with each group having an advisor. This advisor functions as a communicative knot between students and the programme management. He is the first person to address when it comes to subject specific problems and questions. A tutorial system is reported to be in place either. Non-subject specific counseling needs are addressed by a special counseling-infrastructure at university level (including a bologna office supporting mobility).

Overall, students made a satisfied impression on the peers.

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

The demands of the related sub-criteria are not deemed to be completely fulfilled. In particular, the additional information given with respect to the conversion of Kazakh credit points into ECTS credit points as well as about the practice of the recognition of competences gained at other universities (especially universities abroad) is considered unsatisfactory. Therefore, the preliminary proposed resolution remains mostly unchanged, but is explicitly supplemented with regard to the credit point system and the recognition of learning achievements.

In its statement the HEI only reiterates the main difference between the student-workload-based ECTS system on the one hand and the teaching-load-focussed Kazakh credit point system on the other. Although it is recognized that the University's autonomy in allocating the credit points is in fact highly limited, the peers' request for a binding statement on how the HEI is conceiving the underlying conversion of Kazakh credit points into ECTS credit points has not yet been answered. Because of the paradigm change to a learner-oriented perspective that does also refer to the workload calculation (resulting in the ECTS system in the European Higher Education Area), a clear idea of the ratio between ECTS credit points and Kazakh credit points is a prerequisite for a proper understanding of the amount of work students are expected to spend on each module, in a semester and/or during the course of study. This seems all the more necessary – as has been argued above –, since the general problem of confusing workload calculations and credit allocations that are essentially incomparable is complicated through a second line of differentiation apparently applied in the workload calculation at the master's level. A clarification of this matter has not been provided either in the statement of the University.

Therefore, it is deemed indispensible that the University shall produce a comprehensible explanation, which at the same time can be received as a binding statement, of its "conversion policy" regarding the different credit point systems. This binding statement needs also to be implemented in official documents with relevance to external stakeholders (the Diploma Supplement, for instance). Otherwise – as has also been stated very clear in the preliminary assessment of the peers –, the workload of students, overall and per semester as well, is considered to be acceptable, at least. Thus, the said deficiency is assumed to have no structural but rather documentary impact. In consequence, it seems to be adequately approached through a requirement (see below requirement 5) that should be added to the originally proposed resolution. In this context and irrespective of the general conclusion of an acceptable student workload, the apparently uneven distribution of the workload per semester is clearly not considered an optimal solution. In this respect, the University is encouraged to establish a more even workload distribution in the long run.

In case of the final thesis, it has been observed that the scheduled credit point allocation does not reflect the actual workload students will have to expend on it. This is another reason why a module description or equivalent source which, inter alia, provides reliable information about the expected student workload, is essential (see above final assessment to requirement 2, and below requirement 1 with regard to the module descriptions).

The University's remarks concerning the recognition procedure of external achievements are recognised. Generally, this procedure seems to be in accordance with the requirements of the Lisbon convention, though nothing has been said about the practise in case of a negative decision on the recognition. But whether and, if so, to what extend the procedure is formally regulated, cannot be derived from the University's statement. As to this, it should be recalled that Kazakhstan is member of the Bologna Process and, accordingly, also bears the related duties of the member states. Rights and duties of students and universities deriving from the Lisbon Convention are then to be reliably implemented in the national law. Since it cannot be decided from the information available whether this has been carried through in Kazakhstan or the University respectively, the issue should be addressed in a requirement to be supplemented to the primarily proposed resolution (see below requirement 3).

The efforts and intended measures of the University concerning the student mobility and – as its precondition – the improvement of English language skills are highly appreciated. This strategy is explicitly supported by the recommendations which have been preliminary formulated to that effect (see below recommendations 1 and 2). Peers should have a look on the outcomes of the strategy in the course of the re-accreditation procedure.

4. Examination: System, Concept & Implementation

Criterion 4 Exams: System, concept & implementation

Evidence:

- Auxiliary document: "University-wide Academic Policies and Procedures of al-Farabi Kazakh National University"
- Module Handbook

Preliminary assessment and analysis of the peers:

The types of exams are defined in the module handbooks of the study programmes. The main types of exams in the first year of the bachelor´s programmes consist of multiple choice and written exams. After this, as a rule students are free to choose between oral or written exams with some courses requiring only oral exams. In general, examinations are organized similar to the Anglo-American system with midterms and final exams. The examination schedule is drafted to assure that there are no overlaps in exams on compulsory courses and that there are one to two days between the single exams. As far as this is concerned, nothing is indicating an interference with individual students´ progress. With regards to the achievement of module objectives, students confirm exams to be reasonably linked to the course contents and the competences they are expected to achieve. An appeal against examinations is possible within 24 hours after publication of the marks. It is challenged by a specific commission.

Each study programme has a final thesis and the peers could inspect the topics of the mostly in Russian or Kazakh written theses. The perceived lack of experimental based theses in the master´s programmes of the respective subjects is mentioned in 5.3. With regards to subjects, either the choice of students is accepted or they accept the proposed subjects of their supervisors. Final theses in industry are also possible and supervised from teaching staff from the faculty. Usually, students choose their supervisors from the academic staff of the faculty when finishing the third year of the bachelor´s programmes.

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

The requirements of the sub-criteria of section 4 are deemed to be fulfilled.

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 member of the university management resumes the yet 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 to 50%, the educational performance to 35% and to 15% the social work of teaching staff in creating a generation with a deep respect to society.

In general, the academic career stages lead from the position of a young researcher to an assistant professor to an associate professor and then to a full professorship with the latter being the only permanent position in the academic career. The appointment to titles is based on requirements set by the Ministry of Education and Science, mostly taking into account the number of publications and their impact factor. The requirements are elevated towards the next position. Staff recruitment in general is conducted by open calls (e.g. announcements in newspapers) and for new specialities, staff is partly recruited directly from companies. There is also a governmental budget available for the integration of foreign researchers.

There are fixed ratios of students to teaching staff required by the ministry of education. Generally, the approximate ratio follows 8:1 at bachelor´s level, 4:1 at master´s level and 4:1 at the PhD-level. For the level of courses this means that a lecture group should contain about 50 students, a seminar group around 25 and 15 for a lab group.

The member from the university management confirms that the present resources for the programmes in terms of staff, equipment and budget are assured for the period of accreditation. There is no reason for the peers to doubt this declaration. Concerning the present teaching staff, they had a good overview through the staff handbooks provided in the Self Evaluation Report. The peers approve sufficient scientific quality and quantity of teaching staff to conduct the programmes – although they would appreciate more research work directly connected to the specialities combined with an enhancement of specific laboratory equipment (5.3.).

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:

Staff development is reported to be closely related to the fulfillment of the faculty´s own staff recruitment needs. The path of the academic career has been already described in the preceding chapter. Already at master´s level some pedagogical practice is integrated into the course of studies. At PhD-level it is quite usual that PhD-students hold lectures from their supervising professors to supplement their salaries. Young professors are supported by a mentoring programme and there are seminars on educational methods available where staff can obtain certificates on their pedagogical competences. Furthermore there are sabbaticals available over a special government programme called “Bolashak”. Funds from research projects can be used to a certain extent for personal development, too.

Overall the audit team considers the opportunities for staff development to be supportive with respect to the quality of the degree programmes under consideration.

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:

The self-evaluation report provides a detailed list of the laboratory and IT-equipment available. In addition to this, the audit team had the opportunity to visit the laboratories of the Physical and Technical Faculty of al-Farabi University. In general the peers had a positive impression of the equipment – especially the labs for basic education in *physics*, *electricity* and *electronics* were very well proportioned.

Considering the expected learning outcomes of the bachelor´s and master´s programmes, the peers notice a lack of application- and subject-specific laboratory equipment for Thermal Power Engineering, especially for Electrical Power Engineering as well as for Radioengineering, Electronics and Telecommunication (antennas, wave propagation, high frequency signals). In view of the peers, this deficiency uncloses room for improvement towards the hands-on-experiences of master´s students indicated by an underrepresentation of application-relevant-topics in master´s theses. Furthermore, although students have access to essential scientific programming software, the peers feel the need to include modern design software: For Thermal Power Engineering, open source solutions would be available. In case of Radioengineering, Electronics and Telecommunications as well as Electrical Power Engineering, pertinent software comparable to e.g. HP-ADS or CST would be required.

The financial stability of the programmes was confirmed by a member of the university management (5.1). All in all, despite of the mentioned deficiencies, the physical equipment is considered to be sufficient to achieve the learning outcomes of the programmes at bachelor´s level. But for master´s level, an enhancement of the respective equipment would be required.

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

The requirements regarding the resources for the study programmes under review have not yet been fulfilled completely.

As has been discussed already (see above section 2), it is deemed necessary that the University enhances the application- and subject-specific laboratory equipment for the said degree programmes in order to ensure the achievement of the intended learning outcomes (see below requirement 2). The constructive response of the University concerning this matter is laudable.

As to the issue of updating the essential design software, the University has apparently undertaken immediate measures (acquisition of CST and initiative for the acquisition of HP-ADS), which are highly valued. Taking into account these efforts and concrete improvements, it would seem to be inappropriate addressing the issue in a formal requirement, as previously conceived. However, peers of the re-accreditation procedure should have a look at the further development of the pertinent programming equipment. Consequently, a preliminary formulated requirement concerning the design software for the study programmes should be converted into an additional recommendation (see below recommendation 5).

It would also significantly contribute to the engineering-specific education, if (more) lecturers with relevant industrial engineering experience are engaged in the study programmes. A recommendation aiming at this purpose that has been part of the peers' conclusions during the onsite visit is still considered to be adequate (see below recommendation 3).

6. Quality Management: Further Development of Degree Programmes

Criterion 6.1 Quality assurance & further development

Evidence:

- Auxiliary document: "University-wide Academic Policies and Procedures of al-Farabi Kazakh National University"
- Sample of the evaluation questionnaire
- Discussion with students

Preliminary assessment and analysis of the peers:
Concerning quality assurance and its further development, the member of the university management explains to have implemented an ISO 9001 approach for management- and administration-oriented issues.

There are several methods to collect feedback from students. One option is the scientific-clubs the faculty is conducting. Another option of collecting students´ feedback is focused on the quality of the teaching staff. The faculty has implemented an evaluation questionnaire which focuses on teaching performance. Additionally, exams are checked by a commission within the faculty to rate the teachers´ performance (this also counts for advisors). As a support for further didactical development, there are didactical trainings available provided by the university´s institute for quality management. In view of the students attending the discussions, an enhancement is visible. Because of non-permanent contracts for a significant share of teaching staff, a bad feedback over three consecutive years can lead to not prolonging the contract.

As mentioned before, the autonomy of the faculty in changing the programmes is limited to the electives. They are reported to be reviewed on an annual basis with regards to labour market needs. Students report to have a say when it comes to the question who conducts which electives.

Overall, the audit team concludes that sufficient quality management procedures are implemented. Concerning the teachers-based evaluation, they are not fully convinced and recommend a more course based approach to the faculty. This would enable a specific feedback e.g. on the achievement of the defined learning outcomes of the modules (in students´ view) and on the actual approximative workload spent on the module.

Criterion 6.2 Instruments, methods and data

Evidence:

- Discussion with staff from the university and faculty management

Preliminary assessment and analysis of the peers:

Concerning information on student counts and students´ progress, data was presented by the faculty on the on-site-audit, but it did not seem to depict the whole picture. Drop-out-rates are reported to be rather low (around 10%). Nevertheless, the peers request some additional data on total student counts in the programmes and student progression based on students´ cohorts.

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

In principle, the requirements with respect to the quality assurance of the degree programmes are considered to be met adequately. This does not fully apply with regard to the student statistics and the use the University makes of it.

Peers' request for additional information on students' progress on the basis of student cohorts in the respective programmes has not been answered in a meaningful manner. It would have been helpful to see whether the University refers to data collected (for example student history data (such as duration of study and dropout rate), examination statistics, (teaching) evaluations, survey results, average actual workload for the individual modules, etc.) when deciding about steps to further develop the study programmes and/or improve the quality of the programmes. The impression notwithstanding that, overall, the instruments of quality assurance are working well, the University is strongly encouraged to plausibly use its statistical record in the framework of the established QM system. This matter is proposed to be dealt with in a recommendation that complements the peers' preliminary proposed resolution (see below recommendation 4).

7. Documentation & Transparency

Criterion 7.1 Relevant Regulations

Evidence:

- Revision of supplementary documents on the on-site-audit
- Auxiliary document: "University-wide Academic Policies and Procedures of al-Farabi Kazakh National University"

Preliminary assessment and analysis of the peers:

On the on-site-visit the peers had the possibility to take an insight into the study related regulations. They were not available in an English translation. Therefore the opinion is based on the *uno actu* translation of the excellent interpreter. The peers did not find any noteworthy issues. Additionally, most of the regulations-relevant topics are explained in the "University-wide Academic Policies and Procedures of al-Farabi Kazakh National University". The audit team expects the characteristics of the programmes to be adequately defined in the respective regulations.

Criterion 7.2 Diploma Supplement and Certificate

Evidence:

- Sample of the Transcript of records

Preliminary assessment and analysis of the peers:

At present, the al-Farabi-University has just started to provide a diploma supplement as an auxiliary document to the degree certificate and the already delivered transcript of records (which was made available to the audit team). This draft could not be reviewed by the audit team. With regards either to the objective of al-Farabi University to establish a conversion towards the European Higher Education Area as well as the requirements of the ASIIN seal, the peers strongly support the idea 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. Additionally, it should explain the calculation of the final grade and present statistical data on the distribution of marks.

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

The requirements of the criteria with respect to the documentation and transparency are not considered to be fully met.

In particular, a Diploma Supplement according to the above stated specifications has not yet been provided. It is noticed that the University will be able to issue programme-specific Diploma Supplements only after a successful completion of the international accreditation procedure. Until then, it is necessary to address this matter in an additional requirement (see below requirement 4).

D Additional Documents

Before preparing their final assessment, the panel ask that the following missing or unclear information be provided together with the comment of the Higher Education Institution on the previous chapters of this report:

D 1. Student counts and information on students´ progress on basis of student cohorts in the respective programmes.

D 2. Clarification on the conversion of Kazakh credits to ECTS points.

D 3. Explanation of how the recognition of external achievements is handled. (How does the process work? What is the basis for recognition?)

D 4. Diploma supplement (supplementary document, describing the qualification achieved and the educational system of Kazakhstan)

D 5. Module description for final theses (explaining the total student workload considered for the final thesis)

E Comment of the Higher Education Institution (22.08.2014)

The institution provided a detailed statement, in particular with respect to the additional information it has been requested to provide.

Besides, no additional documents have been submitted.

F Summary: Peer recommendations (08.09.2014)

Taking into account the additional information and the comments given by programme coordinator of the 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
B.Sc. Electric Power Engineering	With requirements	EUR-ACE® with requirements	30.09.2020
B.Sc. Radioengineering, Electronics and Telecommunications	With requirements	EUR-ACE® with requirements	30.09.2020
M.Sc. Radioengineering, Electronics and Telecommunications	With requirements	EUR-ACE® with requirements	30.09.2020
B.Sc. Thermal Power Engineering	With requirements	EUR-ACE® with requirements	30.09.2020
M.Sc. Thermal Power Engineering	With requirements	EUR-ACE® with requirements	30.09.2020

Requirements

For all degree programmes

A 1. (ASIIN 2.3) The module descriptions have to be improved as indicated in the report. Missing descriptions have to be added.

A 2. (ASIIN 2.4, 5.3) A schedule/time table describing the enhancement of the required laboratory equipment has to be developed and executed.

A 3. (ASIIN 2.5) Regulations must be put in place covering the recognition of competences acquired externally.

A 4. (ASIIN 7.2) Programme-specific diploma supplements according to the indications in the report have to be provided and issued to graduates on a routine basis.

For the Master's degree programmes

A 5. (ASIIN 3.2) The Kazakh system of credit points and its conversion into any other credit point system must be consistent and comprehensible. Moreover, the national credit point system has to be made transparent and comprehensible to relevant external stakeholders (in the Diploma Supplement, for instance).

Recommendations

For all degree programmes

E 1. (ASIIN 3.1) International mobility in the programmes should be enhanced to achieve a higher level of international academic experience.

E 2. (ASIIN 3.1, 3.3) The English-language policy should be actively pursued. This includes more subject specific modules taught in English.

E 3. (ASIIN 5.1) Lecturers with relevant industrial engineering experience should be engaged in the study programmes to strengthen engineering topics.

E 4. (ASIIN 6.2) Collection and interpretation of student data should plausibly be focused on the quality assurance and further development of the study programmes.

For the Master's degree programmes

E 5. (ASIIN 5.3) The design software should be continually updated as stated in the report. This will contribute to ensure the achievement of the subject specific learning outcomes at master´s level.

G Comment of the Technical Committees

Technical Committee 02 – Electrical Engineering and Information Technology (10.09.2014)

The Technical Committee discusses the procedure.

Assessment and analysis for the award of the ASIIN seal:

The Technical Committee fully approves of the assessment of the peers. It proposes a minor modification of the wording of requirement 3 (recognition of competences), but explicitly confirms its substantial purpose.

Assessment and analysis for the award of the EUR-ACE® Label:

The Technical Committee deems that the intended learning outcomes of the degree programmes do comply with the engineering specific part of Subject-Specific Criteria of the Technical Committee Electrical Engineering and Information Technology.

The Technical Committee 02 – Electrical Engineering and Information Technology recommends the award of the seals as follows:

Degree Programme	ASIIN seal	Subject-specific Label	Maximum duration of accreditation
Ba Electric Power Engineering	With requirements	EUR-ACE® with requirements	30.09.2020
Ba Radioengineering, Electronics and Telecommunications	With requirements	EUR-ACE® with requirements	30.09.2020
Ma Radioengineering, Electronics and Telecommunications	With requirements	EUR-ACE® with requirements	30.09.2020
Ba Thermal Power Engineering	With requirements	EUR-ACE® with requirements	30.09.2020

Degree Programme	ASIIN seal	Subject-specific Label	Maximum duration of accreditation
Ma Thermal Power Engineering	With requirements	EUR-ACE® with requirements	30.09.2020

Modification of requirement 3 (recognition of competences):

A 3. (ASIIN 2.3) Regulations must be put in place covering the recognition of competences acquired externally.

Technical Committee 05 – Physical Technologies, Materials and Processes (10.09.2014)

For reasons of professional competence the Technical Committee decides that it would not deliver an opinion on the said accreditation procedure.

H Decision of the Accreditation Commission (26.09.2014)

The Accreditation Commission discusses the procedure.

With regard to contents, it fully agrees to the assessment of the peers. Nevertheless, the Accreditation Commission insists on harmonizing the wording of the requirements and recommendations with the other clusters at the al-Farabi University, where applicable. Concerning the degree programmes under review this affects the requirements 1 and 4 and the recommendation 2 as well.

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

Apart from the said modifications, the Accreditation Commission for Degree Programmes fully agrees to the proposed requirements and recommendations.

Assessment and analysis for the award of the EUR-ACE® Label:

The Accreditation Commission deems that the intended learning outcomes of the degree programmes do comply with the engineering specific part of Subject-Specific Criteria of the Technical Committee 02 – Electrical Engineering and Information Technology.

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

Degree Programme	**ASIIN seal**	**Subject-specific Label**	**Maximum duration of accreditation**
Ba Electric Power Engineering	With requirements for one year	EUR-ACE®	30.09.2020
Ba Radioengineering, Electronics and Telecommunications	With requirements for one year	EUR-ACE® s	30.09.2020
Ma Radioengineering, Electronics and Telecommunications	With requirements for one year	EUR-ACE®	30.09.2020

Degree Programme	ASIIN seal	Subject-specific Label	Maximum duration of accreditation
Ba Thermal Power Engineering	With requirements for one year	EUR-ACE®	30.09.2020
Ma Thermal Power Engineering	With requirements for one year	EUR-ACE®	30.09.2020

Requirements

For all degree programmes

A 1. (ASIIN 2.3) The module descriptions must be updated according to the comments made in the accreditation report. Missing descriptions have to be added.

A 2. (ASIIN 2.4, 5.3) A schedule/time table describing the enhancement of the required laboratory equipment has to be developed and executed.

A 3. (ASIIN 2.5) Regulations must be put in place covering the recognition of competences acquired externally.

A 4. (ASIIN 7.2) A programme-specific Diploma Supplement has to be prepared and handed out to students on a routine basis providing information about the objectives, intended learning outcomes, structure and level of the degree, as well as about an individual's performance.

For the Master's degree programmes

A 5. (ASIIN 3.2) The Kazakh system of credit points and its conversion into the ECTS credit point system must be consistent and comprehensible. Moreover, it has to be made transparent to relevant external stakeholders (in the Diploma Supplement, for instance).

Recommendations

For all degree programmes

E 1. (ASIIN 3.1) International mobility in the programmes should be enhanced to achieve a higher level of international academic experience.

E 2. (ASIIN 3.1, 3.3) It is recommended to offer more courses taught in English and to further enrich international scientific literature resources.

E 3. (ASIIN 5.1) Lecturers with relevant industrial engineering experience should be engaged in the study programmes to strengthen engineering topics.

E 4. (ASIIN 6.2) Collection and interpretation of student data should plausibly be focused on the quality assurance and further development of the study programmes.

For the Master’s degree programmes

E 5. (ASIIN 5.3) The design software should be continually updated as stated in the report. This will contribute to ensure the achievement of the subject specific learning outcomes at master´s level.

I Fulfilment of Requirements (11.12.2015)

Analysis by the Peer Panel

The peer panel found that – with the exception of requirement A4 – none of the requirements has been fulfilled satisfactorily so far. It came to its conclusion through carefully monitoring the documentation the HEI provided for this purpose.

<u>Concerning requirement A1/all programmes:</u>

Indeed, the revised module handbooks seem to roughly correspond to the respective requirement. However, regarding the missing descriptions (internal/external internship and thesis, in particular) there is only the statement that critical suggestions have been included. Evidence for that could not be found in the documentation. Additionally, 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.

<u>Concerning requirement A2/all programmes:</u>

The reported schedule for the improvement of the laboratory equipment seems reasonable. Apparently, in 2014-2015 a new aerodynamic stand for "Thermal power operation" has been put into operation. In addition, the HEI lists its plans for the next few years, which sounds good. However, there is no reliable statement as to whether those plans are realizable with regard to the financial situation of the faculty or to the general policy of the university. As the requirement explicitly refers not only to the *description* but also to the *execution* of a time table, there should be at least an authoritative statement of the university confirming the plans to modernize the laboratory equipment.

<u>Concerning requirement A3/all programmes:</u>

The required regulations are described and it is stated that they have been imposed. But there is no clear evidence of this statement.

<u>Concerning requirement A5/Master's programmes:</u>

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.

Analysis by the Technical Committee 02 - Electrical Engineering and Information Technology (27.11.2015)

The Technical Committee fully agreed with the findings and conclusions of the peers.

Decision of the Accreditation Commission (11.12.2015)

The Accreditation Commission discussed the procedure. It agreed with the findings and conclusions of the peers and the Technical Committee 02, thus considering requirements A1 to A3 in case of the Bachelor's degree programmes, and A1 to A3 and A5 in case of the Master's degree programmes *not* fulfilled.

Since statistical data in addition to the final mark according to the ECTS user's guide have not been explicitly required, the Accreditation Commission decided adding an indication for this purpose in the letter to the HEI. Thus, external stakeholders would be enabled to comparatively classify the final mark.

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

Degree Programme	**ASIIN seal**	**Subject-specific Label**	**Maximum duration of accreditation**
Ba Electric Power Engineering	Requirements A1, A2 and A3 not fulfilled satisfactorily*	EUR-ACE®	23.06.2016
Ba Radioengineering, Electronics and Telecommunications	Requirements A1, A2 and A3 not fulfilled satisfactorily*	EUR-ACE®	23.06.2016
Ma Radioengineering, Electronics and Telecommunications	Requirements A1, A2, A3 and A5 not fulfilled satisfactorily*	EUR-ACE®	23.06.2016

Degree Programme	ASIIN seal	Subject-specific Label	Maximum duration of accreditation
Ba Thermal Power Engineering	Requirements A1, A2 and A3 not fulfilled satisfactorily*	EUR-ACE®	23.06.2016
Ma Thermal Power Engineering	Requirements A1, A2, A3 and A5not fulfilled satisfactorily*	EUR-ACE®	23.06.2016

* The Accreditation Commission decides to add an indication in the official letter to the university: “Statistical data concerning the distribution of grades should be added to the final mark in order to facilitate a reliable assessment of the grade.”

J Fulfilment of remaining Requirements (01.07.2016)

Analysis of the peers and the Technical Committee

Requirements

For all degree programmes

A 1. (ASIIN 2.3) The module descriptions must be updated according to the comments made in the accreditation report. Missing descriptions have to be added.

Second assessment	
Peers	(satisfactorily) fulfilled Statement: All in all, the revision of the module descriptions could be considered to sufficiently meet the peers' objections. However, there is still room left for improvement regarding the description of the intended learning outcomes. Module descriptions for the internal/external internships as well as for the final theses still need to be included, particularly in the case of the BaMa Radioengineering, Electronics and Telecommunications. The latter should be clearly indicated in a letter to the HEI (*see indication below*).
FA 02	fulfilled Statement: The Technical Committee agrees with the peers' assessment.
FA 05	fulfilled Statement: The Technical Committee agrees with the peers' assessment.

A 2. (ASIIN 2.4, 5.3) A schedule/time table describing the enhancement of the required laboratory equipment has to be developed and executed.

Second assessment	
Peers	satisfactorily fulfilled (Ba Electrical Power Engineering; BaMa Thermal Power Engineering) *not fulfilled* (BaMa Radioengineering, Electronics and Telecommunications) Statement for Ba Electrical Power Engineering; BaMa Thermal

	Power Engineering: Peers accept the arguments of the university and deem the list of equipment bought recently as a major step in enhancing the laboratory equipment. This notwithstanding, the impression of one expert is that none of the standard power electrical components or related test beds seem to be under way. This auditor therefore sees the requirement only partly fulfilled. However, since his concern has not been voiced in the first round of discussion about the fulfilment of requirement, and could not be perceived as a shortcoming deriving directly from the concrete form of fulfilment either, it cannot be resumed as a major shortcoming now. Having stated this, an indication in the letter to the HEI that the Electric Power Engineering equipment will be under close scrutiny in the course of the reaccreditation procedure might adequately serve the concern of the peers (see indication below). Statement for BaMa Radioengineering, Electronics and Telecommunications: Concerning the Radioengineering programmes, a clear roadmap for improving the laboratory facilities in the area of radio engineering and telecommunications was not found in the documentation. In the appendices 1 and 2, the information provided, clearly shows that the envisaged upgrade of the laboratory equipment does not specifically include essential equipment in the area of radio engineering and telecommunications. Also equipment, generally considered being essential to radio engineering and telecommunications engineering, such as antenna measuring facilities and S-parameter measuring facilities, were not featured in the upgrades indicated in appendices 1 and 2. Such deficiencies deprive the subject area of parity at the international level.
FA 02	*not fulfilled* Statement: It seems that the expert panel, when discussing the fulfilment of that requirement in the first round, has been primarily concerned with the HEI's commitment to the schedule, but neither in the case of the Electric Power programmes nor in that of the Radioengineering programmes voiced substantial criticism. However, it turns out, that major shortcomings addressed in the report regarding the laboratory equipment, particularly in the Radioengineering programmes, have been and still remain untackled by the HEI. Proven access to micro-wave laboratory, for instance, would have been sufficient to substantiate a major improvement of the Radioengineeering programmes in that respect. However, there is no evidence at all for basic equipment one would expect in a study programme with this designation. Since the HEI might have (erroneously) referred solely to the peers' quest for an authoritative

	statement concerning the schedule for an improvement of the laboratory, the Technical Committee recommends an extraordinary prolongation of the accreditation so as to give an opportunity to take appropriate steps with regard to the set-up of basic Radioengineering equipment (high frequency equipment).
FA 05	*not fulfilled* Statement: The technical committee discusses the procedure. It finds the assessment of the peers, especially in case of the Bachelor/Master Radio-engineering, Electronics and Telecommunication, well founded. Therefore it follows the auditors´ proposal for a resolution in all aspects.

A 3. (ASIIN 2.5) Regulations must be put in place covering the recognition of competences acquired externally.

Second assessment	
Peers	fulfilled Statement: Peers accept the statement of the university and the form shown in Appendix 3.
FA 02	fulfilled Statement: The Technical Committee agrees with the peers' assessment.
FA 05	fulfilled Statement: The Technical Committee agrees with the peers' assessment.

A 4. *Already fulfilled.*

For the Master's degree programmes

A 5. (ASIIN 3.2) The Kazakh system of credit points and its conversion into the ECTS credit point system must be consistent and comprehensible. Moreover, it has to be made transparent to relevant external stakeholders (in the Diploma Supplement, for instance).

Second assessment	
Peers	fulfilled Statement: The HEI has approached the ECTS User's Guide as a means for explaining the way of converting teaching hours into ECTS workload. All in all, these guidelines are consistently applied in the module descriptions (despite some calculation errors). Though the conversion appears to be less clear in the diploma supplement, the strategy on the whole appears to be acceptable.
FA 02	fulfilled

	Statement: The Technical Committee agrees with the peers' assessment.
FA 05	fulfilled Statement: The Technical Committee agrees with the peers' assessment.

Decision of the Accreditation Committee (01.07.2016)

The Accreditation Commission discusses the procedure.

Regarding requirement 2 for the Radioengineering degree programmes, it shares the deep concern of the peers that major basic equipment for teaching and research in these programmes is not available nor is its upgrade envisaged in the short and medium term. Since another extension of the accreditation for the purpose of properly fulfilling this requirement is no option, the Accreditation Commission decides to not extend the accreditation for the Radioengineering programmes.

As to the other programmes, the Commission follows the peers' and Technical Committees' recommendation considering all requirements to be fulfilled satisfactorily. However, it also states that the HEI should be advised that the further upgrade of the equipment of the Bachelor's degree programme Electric Power Engineering will be thoroughly checked in the course of the reaccreditation procedure. Moreover the HEI should be pointed to still missing module descriptions for the internships and theses modules which should be supplemented.

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

Degree Programme	**ASIIN seal**	**Subject-specific Label**	**Duration of accreditation**
Ba Electric Power Engineering	all requirements fulfilled	EUR-ACE®	30.09.2020
Ba Radioengineering, Electronics and Telecommunications	requirement 2 not fulfilled	EUR-ACE® s	accreditation expiring by 30.09.2016
Ma Radioengineering, Electronics and Telecommunications	requirement 2 not fulfilled	EUR-ACE®	accreditation expiring by 30.09.2016

Degree Programme	ASIIN seal	Subject-specific Label	Duration of accreditation
Ba Thermal Power Engineering	all requirements fulfilled	EUR-ACE®	30.09.2020
Ma Thermal Power Engineering	all requirements fulfilled	EUR-ACE®	30.09.2020

* The Accreditation Commission decides to add an indication in the official letter to the university:

“It is indicated that the equipment of the Electric Power Engineering programme will be thoroughly scrutinized in the framework of the reaccreditation procedure. Also, it is suggested that the HEI should complement module descriptions for the internships and theses modules where these are still missing.