ASIIN Accreditation Report

Bachelor's and Master's Degree Programmes

Materials science and technology of new materials

Metallurgy

offered by

Karaganda State Technical University

Last update: 28.03.2014

Basic information about the accreditation procedure

Degree programmes	**Bachelor's Degree Programme** • Materials science and technology of new materials • Metallurgy **Master's Degree Programme** • Materials science and technology of new materials (1,5 yrs) • Materials science and technology of new materials (2 yrs) • Metallurgy (1,5 yrs) • Metallurgy (2 yrs)
Higher Education Institution	**Karaganda State Technical University**
Seals applied for	The Higher Education Institution has applied for the following seals and labels: • ASIIN Seal for the degree programmes • EUR-ACE® Label for the degree programmes
Peer panel	Asem Arislanova, Bang&Bonsomer Kazakhstan (did not participate in site-visit) Prof. Dr.-Ing. Wolf-Berend Busch, Fachhochschule Bielefeld University of Applied Sciences Andrea Dreiseidler, Headmistress, Emil-Fischer-Gymnasium Prof. Dr.-Ing. Heinz Palkowski, Clausthal University of Technology Prof. Dr.-Ing. Siegfried Steinhäuser, Chemnitz University of Technology Prof. Dr.-Ing. Jörg Wauer, Karlsruhe Institute of Technology Marat Sagutdinov, Kazakh-German University Almaty (Stu-

	dent Representative)
ASIIN Procedure Manager	Johanna Höderath
On-site visit	The on-site visit took place on 23-24 October 2013.

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A Preliminary Remark

The on-site visit for the above mentioned degree programmes took place on 23-24 October 2013.

Prior to the talks with the representatives of the university, the peers met to prepare their questions and to discuss the self-assessment report. Prof. Wauer was asked to act as speaker of the audit team for the aforementioned degree programmes.

The peers had discussions with the following groups:

University management, responsible managers of degree programmes, teaching staff, students.

Additionally, the auditors inspected the infrastructure and the technical equipment at Karaganda State Technical University in Karaganda.

The following chapters relate to the Self Assessment Report (hereinafter SAR) provided in May 2013 as well as to the discussions and information provided during the on-site visit including samples of exams and final theses

The assessment and the award of the ASIIN-seal are always based on the European Standards and Guidelines (ESG) and the Subject-Specific Criteria of Technical Committees 01 – Mechanical Engineering/Process Engineering and 05 - Physical Technologies, Materials and Processes, valid at the time of conclusion of the contract. In case of the award of other seals or labels, the criteria of the respective seal or label-owner (here: ENAEE) are considered additionally.

As owner of the label ENAEE has authorized ASIIN to award the EUR-ACE® Label based on the „EUR-ACE Framework Standards for the Accreditation of Engineering Programmes". The assessment for the award of the EUR-ACE® Label is based on the General Criteria of ASIIN as well as on the Subject-Specific Criteria (SSC) of the Technical Committees 01 - Mechanical Engineering/Process Engineering and 05 - Physical Technologies, Materials and Processes.

The report has the following structure: Chapter B presents the facts which are necessary for the assessment of the requested seals. The information principally stems for the self-assessment report and related appendices provided by the Higher Education Institution (HEI). An analysis and separate assessments of the peers about the compliance with the criteria for the requested seals follow. The assessment of the peers is preliminary and

subject to changes based on the subsequent information. The statement of the HEI is included in a summarized manner. The final recommendation of the peers is drafted after and based on the statement of the HEI (and additional documents, if applicable). The Technical Committee makes a proposal for the accreditation decision (chapter F). The final decision is taken by the Accreditation Commission for Degree Programmes (chapter G).

Any gender-specific terms used in this document apply to both women and men.

B Report of the Peers (Accreditation Report)

B-1 Formal specifications

a) Name and awarded degree	d) Study mode	e) Programme Duration & Credit points	f) First & annual enrolment	g) Expected intake	h) Fees
Materials science and technology of new materials / Bachelor of Engineering and Technology	Full time/ part time	8 semesters 278 ECTS	Fall semester	50 per year	2430 US$ full time/ 1240 US$ part time
Metallurgy/ Bachelor of Engineering and Technology	Full time/ part time	8 semesters 270 ECTS	Fall semester	50 per year	2300 US$ full time/ 1275 US$ part time
Materials science and technology of new materials / Master of Engineering and Technology	Full time	4 semesters 161 ECTS	Fall Semester	20 per year	2248 US$
Materials science and technology of new materials / Master of Engineering and Technology	Full time	3 semesters 100 ECTS	Fall Semester	20 per year	2248 US$
Metallurgy/ Master of Engineering and Technology	Full time	4 semesters 161 ECTS	Fall semester	15 per year	2800 US$
Metallurgy/ Master of Engineering and Technology	Full time	3 semesters 100 ECTS	Fall semester	15 per year	2800 US$

Analysis of the peers:

The peers found the notation, degrees awarded and programme duration to be satisfying. Taking into account that the secondary school has a duration of only 11 years, they considered it reasonable that the Bachelor's degree programmes are composed of 8 semesters. Awarded degree, expected intakes per study year and tuition fees are within regular ranges.

The peers discussed with the university the part time option in the Bachelor´s programmes. Firstly, the identical duration of the part-time and full-time version of the Bachelor's programme seems to be at odds with what would have been normally expected (longer duration of the part time study programme). Secondly the peers could not yet consider that the feasibility of the part time study is ensured. An appropriate curriculum design of the part time option is at that time not available (cf. Curriculum). As to the Master's programme Metallurgy and Materials science and technology of new materials, representatives of the HEI in detail described the national graduate education strategy foreseeing an either research and pedagogical oriented (2 years) or a profession oriented approach (1,5 years). Whether choosing the 1,5 year or the 2 year curriculum of the Master's programme depends on the applicant demands in deepening their professional knowledge and competences or, otherwise, on their preceding knowledge and competences. The peers learned that the graduates of the 2 year education aspire to begin afterwards with a PhD and operate to the same time as scientific assistant.

Concerning the credit point system that the HEI took as a basis the peers appeared the conversion to ECTS and the relating workload not yet completely comprehensible. This aspect is discussed in detail at 3.2 workload and credit points.

Assessment of the peers:

Criterion 1 Formal specifications

The peers considered the formal specifications of the degree programme under review transparently documented. Regarding the formal aspects they assessed the criteria fulfilled.

B-2 Degree programme: content concept & implementation

B-2-1 Objectives of the degree programme

B-2-2 Learning outcomes of the programme

As **objectives of the degree programmes** the institution states the following in the self-assessment report:

- Students become specialists in organizing and carrying out the process of production of iron, steel, non-ferrous metals and metal of various sizes. Their compe-

tences also include functions for development and operation of metallurgical equipment - sintering machines, blast furnaces, basic oxygen furnace, electric arc furnaces and equipment for metal forming.

They acquire general competencies:

- Apply theoretical and practical professional knowledge and skills to solve problems in their professional activities;
- Choose the most effective methods and techniques for professional tasks;
- Analyze, evaluate, and adjust their own activities, be responsible for the results of their work;
- Solve problems, assess risks, make decisions in emergency situations;
- Determine the problem of professional and personal development, to educate ourselves, consciously plan for professional development;
- Be able to logical, analytical and conceptual thinking;
- Have communication skills, be able to organize the work of executives, find and make management decisions;
- Be able to work in a team / team and understand the collective processes in the industrial sector;
- Conscious of itself as a self-developing personality to be the bearer of rights and responsibilities for the implementation of professional development.

As **intended learning outcomes of the degree programmes** the institution states:

- Provide students a basic knowledge in the natural sciences and physical and mathematical subjects, which are based on the theory and technology of metallurgical processes of ferrous and non-ferrous metals and alloys;
- Interconnection of atomic and electronic structure of crystalline materials with physical properties and processes that occur in different types of thermal and thermo-mechanical processing;
- Students are able to understand physical methods to address the research and production problems in materials science.
- Students will have the ability of professional knowledge in the field of metallurgy of ferrous and non-ferrous metals and alloys, metal forming, metallurgical equipment and automation of metallurgical production;
- The programmes comprise scientific knowledge, practical experience and professional skills in the field of energy-efficient and resource-saving technologies for producing, processing, man-made materials and the use of secondary resources;

- Support the students by developing of research skills and methodologies for the development of modern methods of casting, assessing the quality of the castings.
- Developing of ideas about the basic objects, methods, and principles of thermal processing of ferrous and non-ferrous metals in the production stages of production and metallurgical engineering, quality control of steel products;
- Students grasp basics of thermal technology, thermo-mechanical processing of metallurgical and machine-building enterprises, innovative ways of ion-plasma surface treatment products;
- Developing of research skills in the field of thermal, chemical and thermal processing and combination of materials;
- Students have knowledge of nanotechnologies and nanomaterials, advanced methods of structural analysis, methods of mechanical testing of metals and alloys.

Students are familiar with:

- Principles of automation of the design of machinery parts and components;
- current state of structural crystallography and the use of crystals and crystalline materials in engineering;
- Scientific principles of synthesis of alloys for the development of materials in mechanical engineering;
- Defects of the crystal structure, processes, deformation and fracture;
- principles of the design of the pointed workshops and offices for production engineering;
- Representation on the principles of computer-aided design of machines and processes in mechanical engineering;
- Microscopic nature developed by macroscopic properties;
- Basics of physics and the nature of the physical properties evolution of material

As intended **learning outcomes of the pedagogical degree programmes** the institution states: Students

- Should possess overall educational attainment of humanitarian culture, ethical and legal norms of relations in human society, to be competent in matters of organizational and management activities, technical and environmental safety enterprises and the protection of human life, rule of law and economic problems;
- Have the professional competence of physico-chemical fundamentals of technologies for production and processing of materials, enrichment and extractive metal-

lurgy, technical and economic indicators of processes and equipment, preparation of flow charts materials processing and quality control of products;

- Will be able to practice the methods of theoretical calculations and technological processes and equipment in the industrial enterprises of ferrous and non-ferrous metallurgy, machinery and instrument, perform laboratory tests and mathematical treatment of the results.
- Know the basic directions of development of science and technology in their professional activities
- Will be able to formulate and solve problems arising in the course of research and teaching activities, and requiring in-depth professional knowledge;
- Choose the appropriate methods on the basis of the specific purpose of research; handle the experimental results, analyze, and interpret them in the light of available data in the literature;
- Carry out bibliographical work using modern information technologies;
- Present the results of the work done in the form of reports, essays, articles, designed in accordance with your requirements, using modern means of editing and printing;
- Make educational-methodical complexes disciplines rationally arrange for all types of training sessions;
- Have the skills of teaching activities, planning and research, use of foreign languages to the extent necessary to carry out research and teaching activities;
- Will be competent in matters of organization, planning, carrying out all kinds of scientific and educational activities.

The intended learning outcomes are published on the university's website in their original language.

Analysis of the peers:

The objectives and intended learning outcomes of the modules have not been sufficiently and transparently described yet. The peers discussed with the university representatives the need to differentiate the intended objectives and learning outcomes for the Bachelor's and for the Master's degree programmes. The peers considered it necessary to work out a more distinctive qualification profile for the programme, thereby clarifying the acquired competences of graduates. They found out that the main intention of the university with regards to the Bachelor's degree programme is to prepare the students for operational and experimental tasks, whereas the Master's degree programmes aims at scientific and pedagogic activities.

The HEI convincingly pointed out that the relevant stakeholders (for example companies, students, teachers, alumni and other universities) have been integrated in the process of defining the study objectives and learning outcomes of the programme under consideration and, thus, on equal part contribute to the further development of those programme. The auditors considered this involvement to be positive. As programme coordinators distinctively described the study aims and learning outcomes to be achieved in the study programme, the peers believed the aforementioned aspect to be rather a problem of structure than of qualification level of the programmes.

The peers also appreciated the endeavor of the HEI to adopt the degree programme to an international level and the need of employers in Kazakhstan. The audit team discussed with the programme coordinators the intensity and extent of the scientific competences in mathematics, chemistry and physics. The core subjects like mathematics, physics and chemistry are defined by the ministry. However, the peers found that the graduates in the Bachelor´s degree programmes gain knowledge in mathematics and natural science rather at a lower level. According to the peers the HEI could focus more on stressing the scientific fundamentals (cf. Curriculum). Apart from that the peers recognized that the learning outcomes in the fields engineering analysis, engineering design, engineering practice and transferable skills are achieved exemplary through following intended competences: the students are able to understand physical methods to address research and production problems of material sciences. Students are qualified to develop ideas of basic objects, methods and principles of thermal processing of ferrous and non-ferrous metals in production. They are able to practice the methods of theoretical calculations and technological processes and equipment in the industrial enterprises of ferrous and non-ferrous metallurgy. Students have an understanding of principles of automation of the design of machinery parts and components. Furthermore, they have the ability to choose the appropriate methods on the basis of the specific purpose of research to handle the experimental results, analyze, and interpret them in the light of available data in the literature. The peers took note of the fact that transferable skills like methods of communication, management and business practice and environmental and social backgrounds are intended during the programmes.

The objectives and learning outcomes of the degree programmes are accessible to students, lecturers and other stakeholders.

Assessment of the peers

Criterion 2.1 Objectives of the degree programme
Criterion 2.2 Learning outcomes of the programme

The peers gained a good overall impression of the aims and learning outcomes of the programmes as described by the university during the discussions. However, the intended learning outcomes must be specified for each programme as a whole in a written version.

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

The peers deemed that the intended learning outcomes of the degree programmes under review as they have been described during the onsite visit principally comply with the engineering specific part of subject-Specific Criteria of the Technical Committees 01 – Mechanical Engineering/Process Engineering and 05 - Physical Technologies, Materials and Processes. They considered the learning outcomes in the categories „Knowledge and Understanding“, „Engineering Analysis“, „Engineering Design“, „Investigations“, „Engineering Practice“ und „Transferable Skills“ to be fulfilled.

B-2-3 Learning outcomes of the modules/module objectives

The **objectives of individual modules** are published in the module descriptions (syllabus).

The module descriptions are available to the students and other interested persons digitally on the internet and in printed form.

Analysis of the peers:

In the discussion with the students the auditors learned that the course catalogue is available on the homepage.

The peers also noticed positively that the descriptions of the learning outcomes are formulated in an outcome-oriented way. The intended learning outcomes of the individual modules reflect the knowledge, abilities and competences of the students very well. Nevertheless, the peers found out that the module descriptions show some room for improvement. Thus they noticed that the information in the module descriptions is not always in line with the information in the syllabus particular for the Bachelor´s degree programme. Apart from some missing module descriptions for several general subjects of the Bachelor´s degree and the reference of duration and type of examination the provided module descriptions of the Master´s degree programme did not include several formulary aspects: person responsible for the module, relation to curriculum, type of teaching, contact hours, workload and credit points, duration and type of examination and recom-

mended prerequisites. Moreover, the audit team noticed inconsistencies regarding the prerequisites. In the module Physics that is offered in the first and second semester (bachelor programme "Metallurgy") the HEI required the module Mathematics as prerequisites. However, the module Mathematics is only provided in the third and fourth semester. The peers considered it necessary to review with regard to causality of prerequisites.

Assessment of the peers:

Criterion 2.3 Learning outcomes of the modules/module objectives

The peers considered the requirements of the above cited criterion not fully met. With respect to the deficits referred to above, they deemed it indispensable to update the course descriptions accordingly.

B-2-4 Job market perspectives and practical relevance

The HEI mentions the following job perspectives for the graduates:

The Republic of Kazakhstan is a rapidly developing country with rich mineral resources. This requires the preparation of their high-level expertise in metallurgical/materials science and technology of new materials. Therefore graduates of these areas are demanded by the industry.

Graduates of the degree programme "Metallurgy" can work as

- Technologists in organization, which produce metal products with a given structure and properties,
- Managers on the implementation of new technologies and the hardening of ferrous and non-ferrous metals and alloys in the metallurgical and mechanical engineering,
- Experts who determine the quality of steel in firms engaged in the supply of expertise and metal products,
- Employee of commerce,
- Customs offices and laboratories in the expert industry.

Graduates of the degree programme "Materials Science and Technology of new materials" can work as

- Experts in customs and non-destructive testing of oil and gas pipelines,
- Technologies for the organization and production of metallic and non-metallic products,

- Specialists in metrology and certification of materials for machine-building enterprises,
- Designers and technologists in companies engaged in the production and introduction of new materials and technologies.

Practical relevance of the programmes shall be achieved by:

Several types of practical elements are foreseen in the degree programmes: short term excursions, teaching practice, laboratories within the university. Practical trainings are realized through assignments in the laboratories of the department and at the branches of the department. External practical placements are organised by the department through contracts with companies or external institutions. Teaching staff is appointed as supervisor for each student.

Analysis of the peers:

Based on the self-assessment report and the discussions onsite, the peers estimated the job market perspectives of the graduates to be very good. They learned that 90 % of the graduates find employment immediately after graduation. Furthermore, the peers commended the good contacts of the involved lecturers to the local industry. With regard to the internships in place, the peers found it reasonable that they take place both in schools and in companies as employment both in education and the industry are expected from graduates. The laboratories in the university were considered to be well developed.

Assessment of the peers:

Criterion 2.4 Job market perspectives and practical relevance

The peers found the immersion into practical activities through laboratories with the university as well as the several internships to be adequate and thus this criterion to be fulfilled.

B-2-5 Admissions and entry requirements

Admission rules for the Bachelor's and for the Master's degree programmes are stipulated by orders of the national Ministry of Education and Science.

For the Bachelor's degree programmes the completion of secondary education as well as the participation in a unified national test is required. The university accepts only students which achieve a score of at least 50% in this test.

For the Master's degree programme the entrance requirements foresees the completion of a first higher education programme. Additionally, the results of the participation in entrance examinations in a foreign language and a special disciplinary exam must be provided. Students who do not fulfil all necessary entrance requirements have the possibility to attend additional courses in order to fill the gaps. Participation in these courses has to be paid for.

The students who study at other institutions (external and internal academic mobility) on the basis of students' exchange programs or KSTU partners' programs, the credits gained by them within the period of studying abroad are taken into account on disciplines corresponding to the working plans of a specialty in the adopted order.

The faculty has concluded co-operation agreements with two universities in USA and Italy which aim at student exchange, pursuit of PhD programmes in Europe and the commitment of international professors who give guest lectures.

Analysis of the peers:

The peers discussed the admission rules and procedures with the university representatives. The programme coordinators explained that the selection of the applicants in the end is made by the Ministry of Education and Science. In the national system school graduates with the highest grades are awarded government grants and can choose their preferred university. Grades in mathematics and physics are included in the threshold score. Altogether the peers found that the admission requirements are reasonable for maintaining the quality of the Bachelor´s degree programmes.

Regarding the Master's degree programme the auditors understood that there is no threshold score for the admission but the available places are offered to the best graduates of the Bachelor' degree programme. Distinctions between internal and external applicants are not made. The HEI stated that the gap between the competences of the graduates of the Bachelor's degree programme in similar study programme could be closed by elective courses within the Master's degree programme or discipline specific requirements.

As to the recognition of qualifications gained from other institutions of higher education, in particular abroad, the provision in place is, by and large, directed to grades, credits and content. There is no specific reference made by the regulations presented to the qualifications or competences to be recognized. Along the Lisbon Convention each university is asked to recognize activities completed externally unless the HEI can prove that the competences gained at the other HEI are completely different.

Assessment of the peers:

Criterion 2.5 Admission and entry requirements

While the university only had limited influence on the national admission rules to higher education, in the opinion of the peers this criterion is in principal fulfilled.

With regard to the recognition of activities completed at foreign HEIs or at institutions/learning environments other than HEIs they stated that rules for the recognition of activities have to be adopted especially with a view to internationalization and, in particular, the mobility of students.

B-2-6 Curriculum/content

The overview of single curricula is provided below. The different specifications of the programmes are not presented in detail. For the Bachelor´s degree programmes are following specifications possible:

Metallurgy: "Materials Science and heat treatment of metals, Metallurgy of ferrous metals and alloys, Metal Science and thermal treatment of metals, Foundry production, "Non-metallic materials.

Materials Science and technology of new materials: Non-metallic materials, Construction materials.

For the Master´s degree programmes are following specifications eligible:

Metallurgy: Materials Science and heat treatment of metals, Metallurgy of ferrous metals and alloys.

Materials science and Technology of new materials: Metallic materials, Non-metallic materials.

Bachelor‘ s degree programme Metallurgy, specification metal science and heat treatment of metals (4 years)

1 semester	**2 semester**	**3 semester**	**4 semester**	**5 semester**	**6 semester**	**7 semester**	**8 semester**
Kazakhstan History ECTS 5	Ecology and sustainable development ECTS 3	Social Science ECTS 3	Theory of metallurgical processes ECTS 5	Metals Physics and physical properties ECTS 5	HT technology ECTS 5	Labour protection ECTS 5	Nanotechnologies and nanomaterials ECTS 5
Kazakh (Russian) language ECTS 4,5	Kazakh (Russian) language ECTS 4,5	Elementary Economics ECTS 3	Mechanical properties ECTS 5	HT Theory ECTS 5	Materials processing technology ECTS 5	Equipment and design of heat treatment shops ECTS 9	Corrosion and metals protection ECTS 5
Foreign Language ECTS 4,5	Foreign Language ECTS 4,5	Philosophy ECTS 5	X-Ray diffraction and structural analysis ECTS 5	Applied mechanics ECTS 5	Metal science of non ferrous metals and special steels ECTS 5	Heat treatment shops technology and automatization ECTS 9	Pregraduation practice ECTS 6
Physics ECTS 3	Political Science ECTS 3	Law basics ECTS 3	General metallurgy ECTS 5	Standardization, certification and technical measurements ECTS 5	New technological processes of metallurgy ECTS 4,5	Economics and production management ECTS 5	Writing and defence of diploma work (project) ECTS 8
Informatics ECTS 5	Chemistry ECTS 5	Mathematics ECTS 4,5	Electrical Engineering ECTS 3	Metallurgical processes technology ECTS 3	Production practice ECTS 9	Elective 7,5	State examination on major 4
Descriptive geometry and engineering graphics ECTS 5	Physics ECTS 3		Mathematics ECTS 4,5	Heat powder engineering of metallurgical processes ECTS			Elective 7,5

				5			
Special course on informatics ECTS 5	Physical Training ECTS 4	Mineralogy, crystallography and metallographic ECTS 5	Physical Training ECTS 4	New technological processes of metallurgy ECTS 4,5			
Physical Training ECTS 4	Education Practice ECTS 2	Kazakh (Russian) language ECTS 3		Metal science of non ferrous metals and special steels ECTS 5			
	Basic of vital functions safety ECTS 3	Profession oriented foreign language ECTS 3					
		Physical Training ECTS 4					
ECTS 36	**ECTS 32**	**ECTS 34,5**	**ECTS 31,5**	**ECTS 37,5**	**ECTS 28,5**	**ECTS 34,5**	**ECTS 35,5**

Bachelor‘ s degree programme Materials science and technology of new materials, specification Non-metallic materials

1 semester	**2 semester**	**3 semester**	**4 semester**	**5 semester**	**6 semester**	**7 semester**	**8 semester**
Kazakhstan History ECTS 5	Kazakh (Russian) language ECTS 4,5	Sociology ECTS ECTS 3	Ecology and stainable development	Professional-oriented foreign language	Materials physical properties ECTS 5	Labour protection ECTS 5	Chemical thermal treatment theory and

			ECTS 3	ECTS 3			technology ECTS 5
Kazakh (Russian) language ECTS 4,5	Foreign language ECTS 4,5	Elementary Economics ECTS 3	Philosophy ECTS 3	Machine Elements ECTS 5	Modern methods of materials investigation ECTS 5	Economics and production management ECTS 5	Decorative and preotective coatings ECTS 5
Foreign Language ECTS 4,5	Mathematics II ECTS 5	Basic of law ECTS 3	Political Science ECTS 3	X-ray diffraction ECTS 5	Production of products of non metallic materials ECTS 5	Equipment of shops for making products of plastic, rubber and composite materials ECTS 5	Pregraduation practice ECTS 9
Mathematics I ECTS 5	Chemistry ECTS 5	Chemistry of high-molecular compounds ECTS 3	Physical materials science ECTS 5	Theory of structure of non-metallic materials ECTS 5	Materials selection methodology ECTS 5	Product design ECTS 5	Writing and defence of diploma work (project) ECTS 8
Chemistry ECTS 3	Physics I+ II ECTS 6	Standardization metrology and certification ECTS 5	Electrical Engineering ECTS 3	Thermal treatment of materials ECTS 5	Technology of production of powder and composite materials ECTS 5	Electives ECTS 7,5	State examination on major 4
Descriptive geometry and engineering graphics ECTS 5	Physical training ECTS 4	Heating and heating devices ECTS 5	Elasticity and plasticity theory ECTS 5	Special course of informatics ECTS 5	Technologies of equipment of materials production ECTS 5		Electives ECTS 7,5

Informatics ECTS 5	Educational practice ECTS 3	Crystallography and defects of crystal construction ETCS 5	Materials mechanical properties ECTS 5	Technological measurements and devices ECTS 5	Practical Training ECTS 9		
Physical training ECTS 4	Principal of personal and social safety ECTS 3	Physical training ECTS 4	Physical training ECTS 4				
			Practical Training ECTS 9				
ECTS 37	**ECTS 35**	**ECTS 31**	**ECTS 40**	**ECTS 32**	**ECTS 39**	**ECTS 27,5**	**ECTS 38,5**

Master's degree programme Materials science and technology of new materials specification metallic materials (1,5 year)

1 semester	**2 semester**	**3 semester**	
History and philosophy of science ECTS 4	Foreign language ECTS 2	Modern physico chemical methods of analysis of metallic materials ECTS 6	
Foreign language ECTS 2	Psychology ECTS 2	Perspective metallic materials ECTS 6	
Management ECTS 2	Business Kazakh language ECTS 4	Protection of metals and methods of corrosion ECTS 6	
New approaches to materials strength evaluation ECTS 4	Metallic materials marketing ECTS 6	Experimental research work ECTS 8	
Quality management and materials reliability ECTS 4	Information technologies of developing materials ECTS 4	Execution and defence of master´s dissertation ECTS 12	
Planning and processing of experimental results ECTS 6	Production practice ECTS 12	Complex Examination ECTS 4	
	Experimental research work ECTS 8		
ECTS 16	**ECTS 42**	**ECTS 42**	

Master's degree programme Metallurgy specification metallurgy of ferrous metals and alloys (1,5 year)

1 semester	**2 semester**	**3 semester**	
Psychology ECTS 4	Business Kazakh language ECTS 4	Modern physico chemical methods of analysis of metallic materials ECTS 6	
Foreign language ECTS 4	Theory of mass and heat exchange in metallurgical processes ECTS 6	Metals protection and methods of corrosion tests ECTS 6	
Management ECTS 2	Modern processes and aggregate of ferrous and non ferrous metallurgy ECTS 6	Perspective metallic materials ECTS 6	
Planning and processing of experimental results ECTS 6	Metallic materials marketing ECTS 6	Experimental research work ECTS 8	
	Production practice ECTS 12	Execution and defence of master´s dissertation ECTS 12	
	Experimental research work ECTS 8	Complex Examination ECTS 4	
ECTS 16	**ECTS 42**	**ECTS 42**	

Master's degree programme Materials science and technology of new materials specification metallic materials (2 year)

1 semester	2 semester	3 semester	4 semester
History and philosophy of science ECTS 6	Psychology ECTS 6	Methodic of teaching of technical courses ECTS 6	Computer simulation in material science ECTS 6
Foreign Language ECTS 3	Foreign Language ECTS 3	Modern physico chemical methods of analysis of metallic materials ECTS 9	Pedagogical practice ECTS 3
Planning and processing of experimental results ECTS 12	Pedagogy ECTS 6	Perspective metallic materials ECTS 9	Scientific research work of graduate including implementation of master's thesis ECTS 14
General problems of nanosystem ECTS 3	Business Kazakh language ECTS 6	Protection of metals and methods of corrosion tests ECTS 9	Execution and defence of master´s dissertation ECTS 12
Fundamental Problems of material Science ECTS 6	General problems of nanosystem ECTS 3	Scientific research work of graduate including implementation of master's thesis ECTS 14	Complex Examination ECTS 4
	Methods of calculation of phase transformations ECTS 3		
	Metallic materials marketing ECTS 9		

	Research practice ECTS 12		
ECTS 30	**ECTS 45**	**ECTS 47**	**ECTS 39**

Master's degree programme Metallurgy specification metallurgy of ferrous metals and alloys (2 year)

1 semester	**2 semester**	**3 semester**	**4 semester**
History and philosophy of science ECTS 6	Modern and perspective technologies of processing of raw materials of ferrous and non-ferrous metallurgy ECTS 9	Methodic of teaching of technical courses ECTS 6	Scientific research work of graduate including implementation of master's thesis ECTS 14
Foreign Language ECTS 6	Special chapters of theory of metallurgical processes ECTS 9	Modern physico chemical methods of analysis of metallic materials ECTS 9	Execution and defence of master´s dissertation ECTS 12
Psychology ECTS 6	Metallic materials marketing ECTS 9	Perspective metallic materials ECTS 9	Complex Examination ECTS 4
Pedagogy ECTS 6	Business Kazakh language ECTS 6	Protection of metals and methods of corrosion tests ECTS 9	Pedagogical practice ECTS 3
Planning and processing of experimental results ECTS 12	Research practice ECTS 12	Scientific research work of graduate including implementation of master's thesis ECTS 14	

ECTS 36	**ECTS 45**	**ECTS 47**	**ECTS 33**

Analysis of the peers:

While analysing the curriculum of the degree programmes under review, the peers took into account the fact that it is mainly prescribed by the Ministry of Science and Education and that the individual higher education institutions in Kazakhstan have only limited possibilities to change modules and courses. Nevertheless, the peers discussed with the university how the curriculum suited the achievement of the intended aims, specifically with view to the engineering profession in the bachelor programmes and the possibility of elective modules. The peers got the impression that the content of mathematics and scientific modules, seemed to be barely sufficient with particularly regard to the engineering competences. The concerns of the peers regarding the general structure of the curricula (General education requirements, basic courses, core subjects, major's electives and additional types of training) are eliminated by provided revised module descriptions and working curricula including the speciality of the programmes during the onsite visit.

The peers found that specific modules like metallurgical production automation, mechanics, engineering graphics and information technologies, computer simulation in material science and planning and processing of experimental results supported the learning activities leading to the qualifications in the first and second cycle. Thereby the students gained knowledge of the fundamentals of engineering design methodology and were able to develop systems, processes and methods on the basis of learned findings, processes and methods. Apart from this the students are involved during the studies in practical trainings in order to apply their knowledge to developing practical skills. In this context the ability to combine theory and practice and to integrate knowledge from different branches are in the main focus of the programmes. For this reason the peers found the curriculum to be adequate oriented towards application. The university made use of practical trainings in the Bachelor´s as well in the Master´s programmes.

In the Bachelor programmes as well in the Master programmes the students have the possibility to choose at the beginning of the study different specialties (Bachelor´s degree programme Metallurgy: "Materials Science and heat treatment of metals, "Metallurgy of ferrous metals and alloys", "Metal Science and thermal treatment of metals", "Foundry production", "Non-metallic materials"/ Bachelor´s degree programme Materials Science and technology of new materials: "Non-metallic materials", "Construction materials" / Master´s degree programme Metallurgy: "Materials Science and heat treatment of metals", "Metallurgy of ferrous metals and alloys"/ Master´s degree programme Materials science and Technology of new materials: "Metallic materials", "Non-metallic materials").

As already mentioned above, the university is requested to provide the curricula for the part time option.

Assessment of the peers:

Criterion 2.6 Curriculum/content

Basically the peers assessed the curricula of the programmes as suitable to achieve the intended learning outcomes. Nevertheless, while the peers found the curricular contents to be overall adequate, they recommended expanding the compulsory curriculum by further fields of scientific (mathematics, chemistry and physics) in order to ensure that all bachelor graduates achieve the intended fundamental competences.

Before being able to make a final assessment with regard to the part time curricula, they will need the documents for verification.

For the award of the EUR-ACE® Label:

The peers deemed that the curricular content is appropriate to achieve the intended learning outcomes. Therefore, they recommend the award of the EUR-ACE® label. In view of the criterion "Knowledge and Understanding" strengthening of mathematics and scientific competences are recommended (above-mentioned recommendation) but did not interfere the peer's suggestion to award the EUR-ACE® label. They considered the further programme outcomes in the categories be fully met by the Bachelor´s and Master's curricula/syllabi presented.

B-3 Degree programme: structures, methods and implementation

B-3-1 Structure and modularity

The modules have the following size: In the Bachelor's degree programme modules have between 3 and 9 ECTS, with 8 ECTS foreseen for the final thesis and 18 ECTS for the practical training. In the Master's degree programme modules have between 3 and 12 ECTS, with 59 foreseen for the final master's work composed of research and a report.

The university intends to facilitate international exchange of students by having concluded cooperation agreements with University Nancy in France, national University of Science in Russia, Louisiana Technical University in USA, South Kazakhstan State University (Shymkent), Pavlodar State University, and Politecnico di Torino in Italy.

Analysis of the peers:

According to the peers modularisation and structure of the curriculum were found to allow for the completion of the degree programme in time. In order to confirm this fact for the part time option the peers requested to provide the work schedule (curricula) for the part time option.

The peers discussed with the students and the programme coordinators the possibility for an international exchange in form of a semester or a practical placement abroad. As the peers noticed from the dialogue with the students, they are interested to make use of the mobility window, recognized at the same also that the engagements of the programme coordinators are limited concerning their language knowledge. The peers detected that the motivation of the involved staff in the programmes to learn and to improve their English language skills are distinctive. However, in the view of the peers the knowledge of foreign languages, especially English, is not yet sufficient to further develop the international co-operations.

Assessment of the peers:

Criterion 3.1 Structure and modularity

In general the peers considered the criterion to be fulfilled. In this context they recommended with view to internationalization, to expand the mobility of students. In that respect cooperation with other HEIs, in particular HEIs abroad, should be further developed.

B-3-2 Workload and credit points

According to the institution, 1 ECTS credit equates to 25 – 30 hours of student workload. ECTS are calculated by converting the locally used Kazakh credits. One Kazakh credit is awarded for 45 hours of student workload in the Bachelor's and for 60 hours of student workload in the Master's degree programme. This calculation is based on the assumption that one Kazakh credit equals 15 academic hours. According to the self-assessment report, one academic hour in the Bachelor is composed of 1 hour of classroom and 3 hours of independent work. A master student studies on the basis of an individual plan that is made under a supervisor's guide who has an academic degree of a doctor or a candidate and carries out active studies in the given field of science.

Different conversion factors are used to convert Kazakh credits into ECTS, also depending on the form of teaching (lecture, practice, final thesis). Credits for practical placements are awarded after the defence of a report.

Analysis of the peers:

The peers discussed with the university representatives the students' workload, use of credit points and conversion of Kazakh credit points into ECTS. The peers got the impression that the workload is basically in line with the given ECTS credits and the students are able to finish their studies within the standard period of time. Moreover, the peers understood that so-called self study periods (SRSP) during which students independently solve problems but a lecturer is present and provides help upon request were widely in use and appreciated by the students. However, regarding the fact that the introduction of the ECTS system is comparatively new and the planning could not yet be checked against the students' actual workload, it might be reasonable to implement appropriate mechanisms in the quality management system in order to verify whether the estimated workload matches the actual workload of the students.

While talking with students, the peers got the impression that the students didn't have a precise understanding of the ECTS. Since students were used to the Kazakh credit point system with working hours of the teaching staff as its basis, the peers suggested intensifying the information on the ECTS, in particular, with regard to its relationship with the students' workload. This seems important, since a realistic calculation of students' workload in the meaning of ECTS is a precondition for an adequate allocation of credit points.

Assessment of the peers:

Criterion 3.2 Workload and credit points

The peers found that the ASIIN-criteria for the award of credits following the European Credit Transfer System (ECTS) are largely met. They, nevertheless, recommended including mechanisms in the quality management system in order to verify whether the estimated workload matches the actual workload of the students. If major differences occur, ECTS credits allocation must be adjusted.

B-3-3 Educational methods

According to the self-assessment report, the following educational methods are in use: Lectures, practice sessions, seminars and laboratories.

The university states using an approach of problem-oriented training which is designed to enable students to actively apply the theoretical knowledge gained and to solve problems by using analysis. Furthermore, an interdisciplinary approach is used in the Master's degree programme by grouping students from different areas and asking them to jointly solve problems.

Options for elective modules are available.

Analysis of the peers:

The peers learned that the division of teaching methods within the modules is prescribed by the so-called State Standards but that theoretical teaching also occurred in the practical classes and laboratories. A great importance was also given to the self-study of students. The peers noted positively student projects and initiatives supported by the university. They also acknowledged that some lecturers employ modern didactic methods such as project-oriented teaching with which the university claimed to enhance the social skills of the students.

The audit team noticed that besides compulsory components a sufficient range of elective and compulsory elective subjects is offered to allow students to develop an individual focus. Depending on the chosen specialisation the students are provided a wide range of electives.

Assessment of the peers:

Criterion 3.3 educational methods

The peers assessed that the educational methods, also with regard to the hours of theoretical training, were adequate to support the achievement of the programme objectives. The selections of elective course are in good balance to the mandatory modules.

B-3-4 Support and advice

Offers for support and counselling of students are provided as described below:

Student support is available through nominated teachers who inform the students about curricular issues, liaise with teaching staff but are also responsible for familiarizing students with the rules and regulations of the university as well as its non-curricular offer (e.g. sports, events). Additionally to that, the university offers tutorials and trainings for the students.

Analysis of the peers:

During the discussions with teaching staff and students, the peer group noticed a high degree of commitment. They found that the teachers actively support student projects by providing resources and advice and integrating the projects into the teaching modules. Teachers were also interested in fostering international exchange as well as immersion

into the labour world for the students. Overall, the motivation and openness to discussion of both students and lecturers was very positively recognized by the peers.

Furthermore, the peers rewarded positively the support of the students concerning scholarships. As they learned during the site visit over 60 % of the students receive a scholarship. In cases of financial difficulties the students have the possibility to ask for assistance from the university. The students confirmed that the academic feasibility is ensured through the proficient support of the university.

Assessment of the peers:

Criterion 3.4 Support and advice

In the opinion of the peers, the support and advice available to students is suitable so that they considered this criterion to be fulfilled.

B-4 Examinations: system, concept and organisation

According to the self-assessment report and the information gathered during the discussions, the **exam methods** described subsequently are foreseen: written exams, computer testing, oral exams. Usually, each module is examined by so-called current controls (e.g. homework, quizzes, assignment, term papers), and intermediate and a final exam. The results of all types of controls are considered for the calculation of the module grades. In the Bachelor's and Master´s degree programmes, 6 exams and 1 course project are foreseen each semester. The types of exams used are mentioned in the module descriptions.

The final grade for each module is calculated from the results of all controls and exams within the semester.

A final thesis is foreseen in both projects and has to be defended in an oral exam.

The **organisation of exams** is managed as follows:

The examination timetable is made in such a way that students have enough time for preparation for it (not less than 3 days). After completing all the training modules there is conducted a final state attestation of master students in the form of a complex examination and defending a dissertation. For conducting a final state attestation there are formed State attestation commissions (SAC) which conduct their work in accordance with the "Typical regulations of conducting current control of the progress, interim and final students' attestation at higher school institutions realizing educational professional programs of higher and post-graduate education". The results of experimental-research or

scientific-research work at the end of each academic period are documented in the form of a report. The main results of masters' dissertations are presented by at least one publication and one report at a scientific-practical conference or a report at the academic-methodological seminar of the graduating chair. The final mark is defined as a sum of maximal indicators of progress by the interim controls (up to 60%) and final attestation (examination) (up to 40%) and makes up to 100%.

Analysis of the peers:

In general, the assessment methods are aimed at measuring the extent to which the learning objectives of the courses are achieved by the individual student. The diversity of assessment forms, including current controls, intermediates and final exams, appears of an assessment approach that intensively and continuously monitors student's achievements. Nonetheless the peers noticed that apart from the defending the final thesis at the end of the study there is no possibility for students to exercise an oral discussion of problem from their specialist area. The peers deemed that especially in the Master´s degree programme the focus on orally conducted examinations should be enhanced.

They also learned that students are informed at the beginning of the teaching term about the examination requirements. Regarding the final thesis the peers got the impression that students can carry out an assigned task independently and at the level of the qualification sought.

Compensating disadvantages of handicapped students with regard to time-related and formal guidelines in the studies as well as in the final performance tests and those during the studies is ensured.

Assessment of the peers:

Criterion 4 Examinations: system, concept and organisation

Basically, the peers found the exam methods and system compliant with the criterion. However, they recommended further strengthening the student's capability of orally discussing a problem from their specialist area and placing it in the context of a subject.

B-5 Resources

B-5-1 Staff involved

The programmes under review are offered by the Mechanical Engineering Institute and the Department of Metallurgy, Materials Science and Nanotechnologies.

According to the HEI, the teaching staff involved in the programmes under review is composed of 5 full-time professors, 21 full time associate professors as well as 15 lecturers. They are members of different departments of the university.

The teaching staff is involved in research & development activities relevant to the degree programmes.

- Kazakhstan Institute of Welding
- Kazakhstan Multi Profile Institute of reconstruction and development
- Institute of New Materials

Analysis of the peers:

The peers considered the overall number of professor, associated-professor and teaching staff to be sufficient to properly implement the degree programmes under review. Nonetheless, they learned that the workload of most teachers is almost fully used with teaching whereas the research activities are comparatively small. Especially for the master programmes the peers confirmed that they have sufficient co-operations with research institutes to support the students in their research activities.

Assessment of the peers:

Criterion 5.1 Staff involved

In the view of the peers the adequate implementation of the study programme is ensured with regard to the qualitative and quantitative facilities. The research and development activities of teaching staff are limited, sufficient enough in order to guarantee the education level.

B-5-2 Staff development

The institution reported on the following measures to subject-related and didactical further training for staff:

Staff members are encouraged to participate in national and international trainings and conferences. The university also offered different so-called “refresher courses” for the teaching staff.

Analysis of the peers:

The auditor noted that all of the teaching staff members have sufficient possibilities to develop and train their didactical and professional skills. The discussion with teachers confirmed the peer’s impression that the university invested a lot in the basic trainings of the staff. Especially the young generation (PhD and graduates, who are entitled to teach) benefit from the advanced trainings in the international context.

Assessment of the peers:

Criterion 5.2 Staff development

The peers considered the staff development opportunities available sufficient to demonstrate compliance with this criterion.

B-5-3 Institutional environment, financial and physical resources

According to the self-assessment report, the students have free access to library stocks and databases, methodological instructions, as well as visual aids, video-materials. The IT system, including the 57 computers available and the accessibility of the WIFI system have been continuously expanded in the past years. In the period 2008-2013 the Department restructured and upgraded the educational and research laboratories and laboratory equipment in order to meet scientific and technical level. Classrooms are equipped with visual aids and required equipment in the fields of educational programs. At the department, there is a experimental base containing various and test facilities for research, there are modern hardware and software systems and simulation tools shaping processes of materials and products. For the implementation of the experimental work at the department the following teaching and research laboratory facilities are offered:

- The physical properties of metals;
- Thermal conductivity and convective heat transfer;
- Optical methods for studying the structure;
- Electro-optical methods of investigation;
- Modelling of metallurgical processes;
- Instrumentation and process instrumentation.

The development of the incomes and expenses of the university is described in the self-assessment report. The university stresses that the salaries are above average.

Analysis of the peers:

The peers considered the financial resources for the programmes to be sufficient. During the onsite visit, the peers visited the facilities used for teaching and learning of the degree programmes under review as well as a few research laboratories from different fields.

Assessment of the peers:

Criterion 5.3 Institutional environment, financial and physical resources

The peers found the resources available to be adequate in order to fulfil the requirements of the criterion.

B-6 Quality Management: further development of degree programmes

B-6-1 Quality assurance and further development

According to the self-assessment report, the university has implemented a quality assurance system which is certified according to requirements of RK ST ISO 9001-2009 and requirements to quality management system. In order to increase the quality of education taking into account the needs and possibilities of a personality, the University has introduced a certified quality management system since 2004.

Every year in the scheduled intervals, there are carried out internal audits with the aim of establishing the quality management system: The auditors' group gives recommendations of supporting QMS in the working state and of permanent supporting its results in accordance with the requirements of the international standard.

Analysis of the peers:

The means of the quality assurance system introduced, established and put into practice seemed to be suitable to ensure the achievement of the HEIs quality aims, to identify deficits and deficiencies and to promote strategies for removing them.

While the quality assurance system appeared to be generally conclusive, the peers had difficulties to assess whether certain quality processes are sufficiently responsive in building a reliable benchmark for substantially checking the feasibility of the self-imposed

quality objectives. In particular, the discussion with students led to the impression that the results of evaluations of single modules, which are conducted on a regular basis, were not effectively communicated to students and discussed with the lecturers so far. Consequently, students felt almost unable to assess whether there were any improvements derived from the evaluation results. Because of their good direct contact to the teachers and the opportunity of solving any arising problems that way, students seemed not really worried about the somewhat dysfunctional feedback loop.

Assessment of the peers:

Criterion 6.1 Quality assurance and further development

The peers considered the requirements of the criterion adequately fulfilled already. Strongly supporting the HEI's ongoing efforts regarding the quality assurance of its study programmes, the peers recommended the further implementation and development of the quality management system and the utilisation of its results for continuing improvements of the degree programmes. In particular, students should be informed about the results of the evaluations.

B-6-2 Instruments, methods and data

The feedback for improving the educational programme quality and expertise, as well as for the revealing of the consumers' satisfaction with educational services is assured by:

- Periodic polling, students oral questionnaire and analysis of their results (conducted by academic groups curators and chair head);
- Systematic contacts with representatives of external consumers – enterprises and organizations;
- Systematic contacts with different years graduates, correspondence with them at yearly scheduled meetings.

Analysis of the peers:

The peers took note of the set of tools and instruments in the framework of quality assurance that were already in use. The peers analyse the degree to which modifications in the programmes have been derived from evaluation results.

The peers pointed out with regard to the allocation of credit points, the further development of the quality management system should systematically focus on student workload. It should be checked whether the respective allocation to modules is consistent with

the actual workload or needs to be adapted, thus pressing for adjustment in the allocation of credits.

Assessment of the peers:

Criterion 6.2 Instruments, methods & data

Overall, the peers found the requirements of the criterion under review are basically met. However, in conjunction with their remarks to the further implementation of the quality assurance system, they recommended using the collected data for continuous improvement. In particular, the collection of data should include information about students' actual workload in order to allow for adjustments of the correspondent credit allocation, if necessary.

B-7 Documentation and transparency

B-7-1 Relevant regulations

The regulations mentioned below have been provided for assessment (all put into force):

- Rules of graduation thesis (project) implementation in higher education institutions
- Rules of conducting the current control of progress, interim and final certification of students (put into force)
- RK 5.03.010-2006 Department of Education regulations
- QMS MI 110.08-2012 General requirements to organizing and conducting laboratory classes
- QMS SO 1.1.08 - 2012 General requirements to the formation, exposition and execution of working curricula in the European system ECTS
- QMS SO 4.4.01 - 2012 Managing the process of entrants selection, educational and organizational process management, organization of educational process for credit training technology

Analysis of the peers:

The peers found that all aspects of admission, assessment, progress and graduation of the students were regulated. All necessary information was available to teachers, students and applicants.

Assessment of the peers:

Criterion 7.1 Relevant regulations

The peers considered the criterion to be fulfilled.

B-7-2 Diploma Supplement and qualification certificate

No samples of the Diploma Supplement were provided.

Analysis of the peers:

The peers were provided with samples of diploma certificates and transcripts during the site visit. While they found these documents to be suitable, they explained that additionally, Diploma Supplements should be provided. The Diploma Supplement accompanies a higher education diploma, providing a standardized description of the nature, level, context, content and status of the studies completed by its holder. A model for these should be available from the Ministry as the template would be the same for all universities in Kazakhstan.

Assessment of the peers:

Criterion 7.2 Diploma Supplement and qualification certificate

In order to be able to assess the compliance with this criterion, the peers asked as additional document for the English language version of the diploma supplement (not transcript) for both programmes.

C Additional Information

Before preparing their final recommendation, the auditors 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:

1. English language version of the diploma supplement (not transcript) for all programmes
2. Educational plan for the part time option

D Comment of the HEI (02.01.2014)

Higher Education Institution comments on estimates of the peers (remarks)

B-2-1 Objectives of the degree programme

According to an assessment of experts (Report, p. 12-15) we provide the processed differentiated version of **Bachelor/Master Criterion 2.1 Objectives of the degree programme. Criterion 2.2 Learning outcomes of the programme**

Objectives of the degree programme for bachelors:
- specialities **"Metallurgy"** («Metallurgy of ferrous metals», «Foundry production», «Metals science and thermal processing of metals»);
- specialities **«Materials science and technology of new materials»** («Constructional materials», «Non-metallic materials») correspond to the general strategic directions of industrial and innovative development of the Central region of Kazakhstan, where the Karaganda State Technical University is located (KSTU), to requirements of SES and purposes of the department in charge, stated in table 5 and modular directory. General strategic objectives of degree programme are as follows:
- providing industries with the qualified personnel meeting modern requirements of society, science and equipment, in the field of technology of production of new materials and products;
- integration to the international educational space by harmonization of constantly updated accredited degree programme of the higher and postgraduate technical education, with degree programme of leading foreign technical universities that is confirmed by the corresponding international rating;
- development of effectively operating mechanisms of interaction with professional associations and communities on formation and updating degree programme, on independent quality control of education and corresponding qualifications in the areas of activities of the department;
- formation of free, physically healthy, spiritually rich, moral personality promoting consolidation of the Kazakhstan society, professionally demanded on the domestic and international labor markets, focused on training and continuous education during all life. Purposes of degree programme of Master programs are presented in table 5, b.

Table 5, a - Purposes of the degree programme (DP) bachelor degree

Contents	DP «Metallurgy» / «Materials science and technology of new materials»
- providing basic knowledge on natural-science and physical and mathematical courses which the	**DP «Metallurgy of ferrous metals»**

metallurgical processes of ferrous and non-ferrous metals and alloys production theory and technology is based on; - development of professional knowledge in the field of metallurgy of ferrous and non-ferrous metals and alloys, metalforming, metallurgical equipment and automation of metallurgical production; - development of scientific knowledge, practical experience and professional skills in the field of creation of the power effective and source saving technologies of production, processing of technogenic raw materials and use of secondary resources; - integration into the international educational space by harmonization of degree programme of the higher and postgraduate technical education with degree programme of leading foreign technical universities.	
- formation of concepts about a current state and prospects of development of foundry production: manufacturing techniques of casting molds, forming materials, automation of ways of a molding, melting of foundry alloys and the modern melting equipment for producing foundry structural alloys of iron, steel and non-ferrous metals; - development of research skills and methodology for the development of modern ways of molding, an assessment of quality of castings.	**DP «Foundry production»**
- development of ideas of the main objects, methods and principles of the organization of thermal processing of ferrous and non-ferrous metals in technological operations of metallurgical production and mechanical engineering, steel products quality management; - to master the bases of technologies of thermal, thermomechanical processing at metallurgical and machine-building enterprises, innovative ways of ion-plasma superficial processing of products; - development of research skills in the field of the thermal, chemical and thermal and combined processing of materials; - knowledge in nanotechnologies and nanomaterials, modern methods of the structural analysis, ways of mechanical tests of metals and alloys.	**DP «Metals science and thermal processing of metals»**
- to know: about principles of the automated design of machines and technological processes in mechanical en-gineering; - about main types of corrosion of metals and alloys and the main methods of their protection;	**DP «Constructional materials»**

- to know about: a current state of a structural crystallography and application of crystals and crystal substances in equipment; - scientific principles of synthesis of alloys for development of materials in mechanical engineering	
- microscopic essence of shown macroscopical properties; - bases of physics of materials and nature of change of physical properties. - interrelation of a nuclear and crystal and electronic structure of materials with physical properties and the processes proceeding at different types of thermal and thermomechanical processing; - possibilities of use of physical methods for the solution of research and production tasks in materials science; – principles of work of the equipment used by production of materials; – to structure of machine building plants; – about interrelation of the equipment in uniform technological process	**DP «Nonmetallic materials»**

Table 5, - Purposes of Degree programme (DP) of Master

Purposes	DP "Metallurgy" / «Materials science and technology of new materials»
- training of specialists with fundamental knowledge in the field of the theory of metallurgical processes; - training of specialists to research and settlement and analytical activity in area of production and processing of metals and alloys	**DP «Metallurgy of ferrous metals», «Metals science and thermal processing» (scientific and pedagogical direction) – 2 years**
- training of specialists for the enterprises of ferrous and nonferrous metallurgy for the following types of professional activity: professional and technological, organizational and administrative, assembly and adjustment activity	**DP «Metallurgy of ferrous metals», «Metals science and thermal processing of materials» (professional direction) – 1,5 year**
- training of specialists and scientists to research activity in the field of creation of modern constructional, functional metals and nonmetallic materials; - preparation of pedagogical staff for teaching activity at technical universities and	**DP «Metal materials», «Nonmetallic materials» (the scientific and pedagogical direction) – 2 years**

colleges	
- training of specialists in production activity in creation of materials with the set of technological and functional properties for various areas of equipment and technology; - training of specialists in organizational and administrative activities for development and realization of progressive technologies of production and processing of new materials, and finished articles	**DP «Metallic materials», «Nonmetallic materials» (professional direction) – 1,5 year**

B-2-2 Learning outcomes of the programme

As a result of training on degree programme **5B070900 "Metallurgy" / 5B071000 «Materials science and technology of new materials»** graduates should gain general erudition, humanitarian culture, ethical and legal rules of the relations in human society, to be competent in questions of organizational and administrative activity, technical and ecological safety of the plants and protection of activity of the person, legal rules and economic problems. Students should have professional competence on physical and chemical bases of technology of production and processing of materials, enrichment and extractive metallurgy, technical and economic indicators of processes and equipment, drawing up technological cards of processing of materials and production quality control. To be able to put into practice methods of theoretical and technological calculations of processes and the equipment at the industrial enterprises of ferrous and nonferrous metallurgy, mechanical engineering and instrumentation, to carry out laboratory researches and mathematical processing of results. They should know the main directions of development of a science and equipment in the professional activity Graduates can carry out the following types of professional activity: production - technological, organizational, settlement and design, experimental and research.

Master of **6M070900 "Metallurgy" / 6M071000 «Materials science and technology of new materials»** should be able:
- to formulate and solve the problems arising during research and pedagogical activity and demanding profound professional knowledge;
- to choose necessary methods, in term of problems of the defined research; to process the received experimental results, to analyze and comprehend them taking into account available literary data;
- to carry out bibliographic work with attraction of modern information technologies;
- to present results of the work done in the form of reports, papers, articles issued according to available requirements, with attraction of modern editing tools and the press;
- to make educational and methodical kit of courses; to rationally organize the carrying out of all types of studies;

- to have skills of pedagogical activity; planning and carrying out scientific researches; use of foreign languages in the volume necessary for implementation of research and pedagogical activity;
- to be competent in questions of the organization, planning, carrying out of all types of scientific and pedagogical activity (table 5, b).

Table 5, b - Results of Degree Programme (DP) of Master

Contents	DP "Metallurgy" / «Materials science and technology of new materials»
- knowledge of physical and chemical bases of the theory of metallurgical processes, principles of interaction in metallurgical liquid-alloy at various processes; - creation of the base for further studying of technological courses in metallurgy; - ways of planning of experiments, analytical and graphic methods of processing of results; - abilities to carry out calculations for thermodynamics and kinetics of pyrometallurgical, hydrometallurgical processes to formulate recommendations about an intensification of processes; - competence of the theory and practice of metallurgical processing of mineral raw materials with production of competitive products, - to development recommendations of reasonable choice of effective processes of metallurgical processes	**DP «Metallurgy of ferrous metals» (scientific and pedagogical direction) – 2 years**
- structure and properties of metal, oxide and sulphidic systems, thermodynamics and kinetics of pyrometallurgical processes, theory and practice processing of mineral and technogenic raw materials; - analysis of phase transformations in pure metals and multicomponent systems to carry out calculations for thermodynamics and kinetics of metallurgical processes; - knowledge of theoretical bases and practical methods of the physical and chemical analysis of metals and alloys of designs of modern devices and apparatuses; - to science-reasonably carry out selection	**DP «Metallurgy of ferrous metals» (professional direction) – 1,5 years**

of physical and chemical methods of the analysis and to interpret the obtained results at the solution of tasks in metallurgy; - ability to plan experiments and to carry out calculations for processing of results; - use of modern devices and devices for an assessment of structure and structure of metal alloys; - competences to development of new technological processes on an intensification of metallurgical production	
- to have knowledge in the field of physical and chemical bases of receiving metal alloys and ways of processing of technogenic raw materials; - skills of the analysis of phase transformations in metal systems; - to be able to solve practical problems in the field of processing of ore and technogenic raw materials; - to have competences on carrying out calculations and carrying out scientific experiments on thermodynamics and kinetics pyrometallurgical and hydrometallurgical processes; - to carry out market researches in the field of ferrous and nonferrous metallurgy;	**DP «Metals science and thermal processing» (the scientific and pedagogical direction) – 2 years**
- knowledge of the theory and practice of extraction, melting and refinement of metal liquid-alloys taking into account production of the competitive metallurgical products and observance of ecological requirements; - to be able to make recommendations about improvement of metallurgical processes and creation of energy saving technologies for production of quality steel products; - to have competences of area of scientific and practical justification, technologies and design of new processes	**DP «Metals science and thermal processing of materials» (professional direction) – 1,5 year**
- knowledge on scientific bases and principles of chemical interactions, phases and structure for the purpose of obtaining the set properties materials;	**DP «Metallic materials» (the scientific and pedagogical direction) – 2 years**

- schemes of designs, physical bases methods and to equipment of carrying out experiments in the field of materials science; - ability of development of elements of new technologies of production and processing of materials with use of modern methods of research of structure and properties of materials; - to master methods mathematical processing of results of scientific researches, drawing up of scientific and technological documentation; - to have competences of area of design and creation of new materials and processes	
- knowledge of bases of modern technological processes and the research equipment in the field of production and processing of new materials; - abilities to carry out calculations of technological processes of production and processing materials; - to be competent in questions of technological production of new materials in term of environment safety, legal rules and feasibility	**DP «Metallic materials» (professional direction) – 1,5 year**
- to know bases of technological processes of nanomaterials and creation of new technologies; - methods and means of research of structure and properties of nanomaterial; - to be able to put theoretical knowledge into practice for selection of technology of production and processing of nanomaterials; - to have competences of physical bases and practical possibilities of modern methods of research of the material, scanning analytical and atom microscopy, principles of work, structure of main modern research equipment; - to gain practical skills on creation of nanomaterials with the set properties; - to be able to carry out science-reasonable	**DP «Nonmetallic materials» (scientific and pedagogical direction) – 2 years**

selection of demanded methods of analyses of materials in solving technological tasks in materials science, to analyze information obtained by means of research devices; - be competent in use of modern equipment and tools for qualitative and quantitative structure and structure of alloys analysis;	
- knowledge of classification and scopes of the main nonmetallic materials; - ability to carry out market researches on the market of nonmetallic materials; - to have competences in effective system of advance of nonmetallic materials on sales markets	**DP «Nonmetallic materials» (professional direction) – 1,5 year**

Co-ordinators of the programme agree with an assessment of experts that in working plans of the Degree Programme of Bachelor there is insufficient quantity of the credits on mathematics, physics, chemistry. We understand that these courses are the basis for the subsequent development of technical subjects in the area of materials science and metallurgy. We will focus the curriculum on increase of the number of the credits on mathematics and natural sciences.

B-2-3 Results of training on the modules / purposes of modules

To insert the description of modules according to information in syllabus for bachelor degree programme. Study plan of a part-time study is presented in C-Additional information. We agree with an assessment of peers and believe that it is necessary to make calculation of student's labour input only in the system credits of ECTS.

B-4 Examinations: system, general idea and organisation

We agree with an assessment of peers and assure, as we go forward for the corresponding courses to carry out examination in an oral form (Report, p. 35).

B-6-2 Tools, methods and information

We agree with an assessment of peers **Criterion 6.2 «Tools, methods and information»**. Commit ourselves continue to improve the quality assurance system (Report, page 39).

B-7 Documentation and transparency
B-7-2 Annexes to the diploma and qualifying certificate

C Additional information.

We provide English version of the appendix to the diploma.

E Final Assessment of the peers (17.01.2014)

The peers found the **additional information** provided by the institution to be:

- The peers appreciate the attached Diploma supplement for the Bachelor's Programme Metallurgy. Generally, they state that a sample of the Diploma Supplement has to be provided *for each study programme*. The important information about objectives, intended outcomes, structure and level of the degree programme as well as about an individual's performance are not clearly worded. Still, there is no information allowing for a comparative assessment of the graduates final grade (according to the ECTS User's Guide; like, for instance, statistical data about the grading in his/her respective cohort). For this purpose the peers updated their assessment and recommended adding the requirement that deals with the sample diploma supplements for each programme.
- The peers took note of the additional information concerning the curricula of the part-time options of the different degree programs. They considered that the feasibility of the part time study is ensured.
- The peers generally welcome the revision of learning outcomes undertaken by the HEI in order to more accurately relate these outcomes to course content and teaching, especially with a view to competencies. Nonetheless they received the impression that these learning outcomes still not distinguished between the specific alignment of the two Bachelor´s programs and the Master´s programs. They are largely redundant and might be structured more consequently along the different categories (knowledge, skills and competences). In addition the learning outcomes for the pedagogical and the scientific direction should be considered separately.

Taking into account the additional information and the comments given by university the peers summarize their analysis and **final assessment** as follows:

For the award of the ASIIN seal:

Apart from the modification concerning the sample diploma supplements, the peers confirm their previous assessment.

For the award of the EUR-ACE® Label:

The peers deemed that the intended learning outcomes of the degree programs under review do comply with the engineering specific part of Subject-Specific Criteria of the Technical Committees 01 – Mechanical Engineering/Process Engineering and 05 - Physical

Technologies, Materials and Processes. Therefore, they do recommend the award of the EUR-ACE® label.

The peers recommend the award of the seals as follows:

Degree Programme	ASIIN seal	Subject-specific labels	Maximum duration of accreditation
Ba Materials science and technology of new materials	With requirements	EUR-ACE®	30.09.2019
Ba Metallurgy	With requirements	EUR-ACE®	30.09.2019
Ma Materials science and technology of new materials (1,5 years)	With requirements	EUR-ACE®	30.09.2019
Ma Materials science and technology of new materials (2 years)	With requirements	EUR-ACE®	30.09.2019
Ma Metallurgy (1,5 years)	With requirements	EUR-ACE®	30.09.2019
Ma Metallurgy (2 years)	With requirements	EUR-ACE®	30.09.2019

Requirements and recommendations for the different seals:

Requirements	**ASIIN**
1. The module descriptions must be updated according to the comments made in the accreditation report (module description for each module/coherence with the syllabus/ duration and type of examinations/formal aspects of the description for master`s degree programmes/to review the causality of prerequisites)	2.3
2. The objectives and revised intended learning outcomes for each pro-	2.2

gramme as a whole have to be specified.	
3. With view to internationalization and, in particular, the mobility of students rules for the recognition of activities completed at other (national and foreign) HEIs have to be adapted.	2.5
4. A programme-specific document (e.g. Diploma Supplement) has to be prepared and handed out to students on a regular basis providing information about the objectives, intended learning outcomes, structure and level of the degree, as well as about an individual's performance.	7.2
Recommendation	
1. It is recommended to further strengthen the student's capability of orally discussing a problem from their specialist area and placing it in the context of a subject.	4
2. It is recommended, with view to internationalization, to expand the mobility of students. In that respect cooperation with other HEIs, in particular HEIs abroad, should be further developed.	3.1
3. It is recommended to further develop the concept of quality assurance for the degree programmes and to use the results for continuous improvements. Feedback loops in the student evaluation should be organized in a more effective manner. Furthermore, the collection of data should also include information about students' actual workload in order to allow for adjustments of the corresponding credit allocation, if necessary.	2.9
For Bachelors ´degree programmes	
4. To ensure that all graduates achieve the intended fundamental competences it is recommended in regard to the scientific fields (mathematics, chemistry and physics) to strengthen the curriculum.	2.6

F Comment of the Technical Committees

F-1 Technical Committee 01- Mechanical Engineering/Process Engineering (06.03.2014)

Assessment and analysis for the award of the ASIIN seal:

The Technical Committee fully agrees with the views and recommendations of the peers.

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 01 - Mechanical Engineering/Process Engineering.

The Technical Committee 01- Mechanical Engineering/Process Engineering recommends the award of the seals as follows:

Degree Programme	ASIIN seal	Subject-specific labels	Maximum duration of accreditation
Ba Materials science and technology of new materials	With requirements	EUR-ACE®	30.09.2019
Ba Metallurgy	With requirements	EUR-ACE®	30.09.2019
Ma Materials science and technology of new materials (1,5 years)	With requirements	EUR-ACE®	30.09.2019
Ma Materials science and technology of new materials (2 years)	With requirements	EUR-ACE®	30.09.2019
Ma Metallurgy (1,5 years)	With requirements	EUR-ACE®	30.09.2019
Ma Metallurgy (2 years)	With requirements	EUR-ACE®	30.09.2019

F-2 Technical Committee 05- Physical Technologies, Materials and Processes (04.03.2014)

Assessment and analysis for the award of the ASIIN seal:

The Technical Committee fully agrees with the views and recommendations of the peers.

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 05 - Physical Technologies, Materials and Processes.

The Technical Committee 05- Physical Technologies, Materials and Processes recommends the award of the seals as follows:

Degree Programme	ASIIN seal	Subject-specific labels	Maximum duration of accreditation
Ba Materials science and technology of new materials	With requirements	EUR-ACE®	30.09.2019
Ba Metallurgy	With requirements	EUR-ACE®	30.09.2019
Ma Materials science and technology of new materials (1,5 years)	With requirements	EUR-ACE®	30.09.2019
Ma Materials science and technology of new materials (2 years)	With requirements	EUR-ACE®	30.09.2019
Ma Metallurgy (1,5 years)	With requirements	EUR-ACE®	30.09.2019
Ma Metallurgy (2 years)	With requirements	EUR-ACE®	30.09.2019

G Decision of the Accreditation Commission (28.03.2014)

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

The Accreditation Commission discussed the procedure. Although the statements of the students interviewed did not show any concern about the feasibility of the high workload, the Accreditation Commission detected that the workload is much higher than accepted by the ECTS system and exceeded the maximum of 900h per semester. On the basis of equal treatment (cf. Cluster A - Power Engineering) the Accreditation Commission added two further two requirements (A. 1 and A. 2). It seems that the HEI had no university-wide guidelines which regulate the repeating failed examinations.

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 parts of Subject-Specific Criteria of the Technical Committees 01 - Mechanical Engineering/Process Engineering and 05 - Technical Committee 05 - Physical Technologies, Materials and Processes.

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

Degree Programme	ASIIN seal	Subject-specific labels	Maximum duration of accreditation
Ba Materials science and technology of new materials	With requirements	EUR-ACE®	30.09.2019
Ba Metallurgy	With requirements	EUR-ACE®	30.09.2019
Ma Materials science and technology of new materials (1,5 years)	With requirements	EUR-ACE®	30.09.2019

Degree Programme	ASIIN seal	Subject-specific labels	Maximum duration of accreditation
Ma Materials science and technology of new materials (2 years)	With requirements	EUR-ACE®	30.09.2019
Ma Metallurgy (1,5 years)	With requirements	EUR-ACE®	30.09.2019
Ma Metallurgy (2 years)	With requirements	EUR-ACE®	30.09.2019

Requirements	ASIIN
1. The students' workload per semester must be set at a level that avoids structural pressure on training quality. In line with the ECTS Users' Guide, the workload per semester must not exceed that of a full-time employee (maximum of 900h). The ECTS credits awarded must be adapted accordingly.	3.2
2. Students must have sufficient opportunities for repeating failed exams, independent of individual permission by the department, so that the requirement to repeat whole modules does not cause extensions of the standard period of study.	4
3. The module descriptions must be updated according to the comments made in the accreditation report (module description for each module/coherence with the syllabus/ duration and type of examinations/formal aspects of the description for master`s degree programmes/to review the causality of prerequisites)	2.3
4. The objectives and revised intended learning outcomes for each programme as a whole have to be specified.	2.2
5. With view to internationalization and, in particular, the mobility of students rules for the recognition of activities completed at other (national and foreign) HEIs have to be adapted.	2.5

6. A programme-specific document (e.g. Diploma Supplement) has to be prepared and handed out to students on a regular basis providing information about the objectives, intended learning outcomes, structure and level of the degree, as well as about an individual's performance.	7.2
Recommendation	
1. It is recommended to further strengthen the student's capability of orally discussing a problem from their specialist area and placing it in the context of a subject.	4
2. It is recommended, with view to internationalization, to expand the mobility of students. In that respect cooperation with other HEIs, in particular HEIs abroad, should be further developed.	3.1
3. It is recommended to further develop the concept of quality assurance for the degree programmes and to use the results for continuous improvements. Feedback loops in the student evaluation should be organized in a more effective manner. Furthermore, the collection of data should also include information about students' actual workload in order to allow for adjustments of the corresponding credit allocation, if necessary.	2.9
For Bachelors ´degree programmes	
4. To ensure that all graduates achieve the intended fundamental competences it is recommended in regard to the scientific fields (mathematics, chemistry and physics) to strengthen the curriculum.	2.6