

**С. СЕЙФУЛЛИН атындағы  
ҚАЗАҚ  
АГРОТЕХНИКАЛЫҚ  
УНИВЕРСИТЕТІ**



**S.SEIFULLIN  
KAZAKH AGROTECHNICAL  
UNIVERSITY**

**CATALOG OF ELECTIVE DISCIPLINES**

**by speciality**

**6M072400 – Technological machines and equipment**

**for post-graduate students  
(polingual study)**

**Astana 2014**

**UDK 378:631 (085.2)**  
**BBK 74.58:41.4Я26**  
**317**

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**317 Catalog of elective disciplines** / Seksenbayeva R.B., Tursunbayeva A.K. - Astana: KazATU named after S. Seifullin. 2014, 10 p.

Considered at a meeting of the department of TME protocol №12 07.06.2014

Considered at a meeting of the Academic Council of the Technical faculty protocol №11 16.06.2014.

Considered and approved at a meeting of the Academic Council KATU (protocol № 12 18.06.2014.) and is recommended for use in the educational process.

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## **DEAR MASTERS!**

At credit system of education compulsory element of educational and methodical complex of specialty is a catalog of elective disciplines (CED), which is a systematic annotated list of disciplines included in the component of choice.

This catalog of elective disciplines is composed in order to create for you the possibility of independent, efficient, flexible and comprehensive definition of learning paths. CED is your assistant in designing a study plan of a student.

Proposed CED contains a list of disciplines, which will fully master the professional knowledge, certain state standards of education (SOSE).

The catalog of elective disciplines you used in the preparation of the individual curriculum of a master, developed personally under the direction of the supervisor, your prospects for growth, labor market needs and production.

Catalog of disciplines combined in two cycles: the cycle of basic disciplines (BD) and the cycle of major disciplines (MD). Cycle of basic disciplines aimed at developing a student fundamental knowledge in the relevant specialty. Cycle of major disciplines defines the list of special knowledge, skills and competences in relation to a particular area of professional activity.

In the annual message of the President N.A. Nazarbayev to the people of Kazakhstan «Social and economic modernization - main direction of development of Kazakhstan» relevance of multilingual education, as «one of the most important values, and the main advantage of our country is to be a multicultural and multilingual». In accordance with the objectives set by the President of the Republic of Kazakhstan to 2020, all Kazakhstan people must learn Kazakh, Russian and English.

The implementation of competence polylinguism at undergraduates through elective subjects in the Kazakh, Russian and English languages will competitive, high-quality graduates to continue their studies in foreign universities and doctoral work in joint ventures. The intensive pace and level of development of science and technology in the world require fluency in foreign languages for better and proper achievement of the necessary theoretical and practical knowledge and skills. Teaching disciplines in three languages, provides the following relation of disciplines: in Kazakh language - 33%, in Russian-33%, in English - 34%.

To form own educational program, graduate student should master all disciplines of base component (established SOSE) in accordance with the model curricula, as well as choose to study in the proposed catalog of discipline selection component. The choice of undergraduate of elective disciplines must be carried out in accordance with the logic of the relationship of academic disciplines and consistency.

You must remember that how well thought-out and coherent educational trajectory of a master depends on the level of his training as a future professional.

**Wish you all the best on study  
and proper choice of elective disciplines!**

## LIST OF BASE AND MAJOR DISCIPLINES



**S. Seifullin Kazakh  
Agrotechnical University**

**for post-graduate students  
of polingual study  
by speciality of  
6M072400 – Technological machines and equipment  
(scientific and pedagogical direction)**

№	Code of the discipline	Name of the discipline	Number of credits	Page
1	2	3	4	5
<b>BASE DISCIPLINES (BD) – 20 credits:</b>				
Selective component (SC) - 12credits				
<b>Module 3 – Theory of mobile aggregates and mobile equipment -6 credits</b>				
1	ESMA 5205	Performance properties of mobile aggregates	3	
	TPEMTA 5205	The theory of operation of the production of tractor aggregates		
2	DTESO 5206	Diagnosis and technical maintenance of self-propelled equipment	3	
	ESMMA 5206	Operation of self-propelled machines and mobile aggregates		
<b>Module 4 -Design and construction of technological machines-6 credits</b>				
3	TPTO 6304	Theory of technical objects designing	3	
	OTKSSM 6304	Fundamentals of the theory and design of modern agricultural machinery		
4	PNTPKTM 5207	Application of new technologies in the design and construction of technological machines	3	6
	IM 5207	Engineering simulation		3
<b>MAJOR DISCIPLINES (MD) - 22 credits:</b>				
Selective components (SC) - 20credits				
<b>Module 6 - Modeling and organization of scientific research -6 credits</b>				
5	MOPRTI 5302	Methods for assessing the results of technical errorsin measurement	3	7
	OTUKST 5302	Evaluation of the technical level and quality of agricultural machinery		7
6	SPPMSxMO	Modern applications of modeling	3	

	5303	agricultural machinery and equipment		
1	2	3	4	5
	MTNS 5303	Modeling of technological processes accuracy		
<b>Module7 - Adjustable hydraulic actuators and repair of technological machines - 6 credits</b>				
7	RGpTM 6304	Adjustable hydraulic drives of technological machines	3	
	MEDTORGP 6304	Installation, operation, diagnostics, maintenance and repair of hydraulic and pneumatic drives		
8	PMRTMO 6305	Progressive methods of repair of technological machines and equipment	3	8
	STTSTORM 6305	Modern technologies and technical means in the maintenance and repair of machines		8
<b>Module 8 -High Tech and management of technological machines - 8 credits</b>				
9	NTMP 6306	High tech in mechanical production	3	9
	NtM 6307	Nanotechnology in Engineering		10
10	MDVMY 6307	Mechanization of differentiated application of mineral fertilizers	3	
	PKTSX 6307	The use of space technology in agriculture		
11	IM 6308	Innovation management	2	
	MVT 6308	High tech Management		

## BASE DISCIPLINES

### Module 4 -Design and construction of technological machines - 6 credits

#### 4.1 PNTPKTM 5208 Application of new technologies in the design and construction of technological machines

**Number of credits - 3.**

**Prerequisites:** Engineering Graphics; Computing, Mechanical Engineering Technology; CAD ME; Installation and operation of technological machines; Modelling of agroengineering systems; Repair of technological machines.

**Postrequisites:** Methods for assessing the results of technical errors dimension; Application of new technologies in the design and construction of technological machines; High Tech in mechanical production. Work on the master's thesis.

**Aim of the discipline:** Study of new technologies used in the design and construction of technological machines.

**Content of the course:** Levels, aspects and stages of the design of technological machines. Typical project procedures. Modern computer systems of designing cars. Mathcad. Universal calculation system APM WinMachine. Design system AutoCAD. Create and edit drawings in AutoCAD 2012. Three-dimensional design in KOMPAS-3D LT. Rapid prototyping technology of parts and units of machines and mechanisms.

**Expected results:** Ability to work with databases, subsystems and application packages forming CAD machines and processes, designed to find the parameters of machines and mechanisms using modern computer technology; identify cost-effective and reliable dimensions of parts.

#### 4.2 IM 5208 Engineering modeling

**Number of credits - 3.**

**Prerequisites:** Engineering Graphics; Computing, Mechanical Engineering Technology; CAD ME; Installation and operation of technological machines; Modeling of agroengineering systems; Repair of technological machines.

**Postrequisites:** Methods for assessing the results of technical errors measurement; High Tech in mechanical production. Work on the master's dissertation.

**Aim of the discipline:** Introduction principles and approaches to the construction of mathematical models. Formation of knowledge of the objective function as a result of passive and active experiment.

**Content:** Place of modeling among methods of knowledge. Classification of models. The advantages of mathematical modeling. Principles and approaches to the construction of mathematical models. Verifying the resulting system of mathematical relations. Methods of unconditional optimization of functions of one and several variables. Methods of conditional optimization of functions of several

variables. Formation of the objective function as a result of passive and active experimentation. Dynamic modeling.

**Expected results:** Acquire practical skills of mathematical models and dynamic modeling.

## **MAJOR DISCIPLINES**

### **Module 6 - Modeling and organization of scientific research -6 credits**

#### **6.1 MOPRTI6 303 Methods for assessing the results of the technical errors in measurements**

**Number of credits - 3.**

**Prerequisites:** Standardization, certification and technical measurements; Design principles and machine parts; Mechanical Engineering Technology; CAD ME Reliability of technological machines; Installation and operation of technological machines; Repair of technological machines.

**Postrequisites:** Application of new technologies in the design and construction of technological machines; High Tech in mechanical production. Work on the master's dissertation.

**Aim of the discipline:** A study of methods for assessing the results of the technical errors in measurement.

**Course content:** Metrological characteristics of measuring instruments. Technical analysis of errors of measurement. Standard deviation of the results of individual measurements in a series of measurements. The error of a single measurement result. The total standard deviation of the arithmetic mean of the measurements.

**Expected results:** The ability to make judgments, evaluation of ideas and formulate conclusions on the accuracy and quality of the treated surface.

#### **6.2 OTUKST 6303 Evaluation of the technical level and quality of agricultural machinery**

**Number of credits - 3**

**Prerequisites:** Standardization, certification and technical measurements; Design principles and machine parts; Mechanical Engineering Technology; CAD ME Reliability of technological machines; Installation and operation of technological machines; Repair of technological machines.

**Postrequisites:** Application of new technologies in the design and construction of technological machines; High Tech in mechanical production. Work on the master's thesis.

**Aim of the discipline:** A study of methods for assessing the technical level and quality of agricultural machinery.

**Course content:** The general procedure for the development, coordination and approval of technical specifications. Getting the characteristics that define a

suitable machine to the destination. Indicators that determine the performance of the test machine. To verify compliance with the requirements of the machine standards, technical specifications and drawings.

**Expected results:** The ability to evaluate the technical level and quality of agricultural machinery

## **Module7 - Adjustable hydraulic actuators and repair of technological machines - 6 credits**

### **7.1 PMRTMO 6306 Progressive methods of repair of technological machines and equipment**

**Number of credits - 3.**

**Prerequisites:** Design principles and machine parts; Mechanical engineering, installation and maintenance of technological machines; Reliability of technological machines; Repair of technological machines.

**Postrequisites:** High tech in the engineering industry; Mechanization of differentiated application of mineral fertilizers; Work on the master's dissertation.

**Aim of the discipline:** Study of advanced methods of repair of technological machines and equipment.

**Course content:** The challenges facing the technological machines and equipment. Framework for ensuring efficiency, the technical condition and operation of technological machinery and equipment. Factors causing the change in the technical condition of TME in service. Classification of regularities characterizes of the technical condition of TME. System of maintenance and repair of TME. Structures and resources of engineering services (ES).Forms and methods of management of ES. Information support of workability and diagnostics of TME. General characteristics of technological processes ensure the efficiency of TME. Progressive methods of repair and organization of TM and repair of technological equipment.ES staff and decision-making methods in the management of maintenance and repair of TME. Quality management of maintenance and repair of TME. Comprehensive performance evaluation of the effectiveness of the technical operation of TME.

**Expected results:** The ability to analyze the key issues of repair production, use modern progressive methods to repair machines.

### **7.2 STTSTORM 6306 Modern technologies and technical means in the maintenance and repair of machines**

**Number of credits - 3.**

**Prerequisites:** Technology of construction materials, Theoretical and Applied Mechanics.



**Postrequisites:** Planning of experiments, testing of agricultural machinery, working on a master's dissertation.

**Aim of the discipline:** Familiarization with advanced technologies and processes for maintenance and repair of machines.

**Content:** The main directions of development of the technology and equipment maintenance and repair of machines. Advanced technologies and processes for maintenance and repair of machines. The scientific basis for the development of technology and equipment maintenance and repair of machines. Challenges to improve the quality and efficiency of technologies and equipment maintenance and repair of machines. Methods for determining the technical standards of operation. Cost-effectiveness of technologies and equipment maintenance and repair of machines. Ways of improving productivity in the maintenance and repair of machines. Calculation of technical and economic performance of maintenance and repair of machinery.

**Expected results:** Ability to use, taking into account economic efficiency of technologies and facilities, maintenance and repair of machines.

## **Module 8 -High tech and management of technological machines - 8 credits**

### **8.1 NTMP 6306 High tech in mechanical production**

**Number of credits - 3.**

**Prerequisites:** Metal cutting machines; Mechanical Engineering Technology; Technology of Agricultural Engineering; Installation and operation of technological machines; Repair of technological machines.

**Postrequisites:** Work on master's dissertation.

**Aim of the discipline:** Acquisition of skills and abilities to solve research and applied problems arising in the design of processes and equipment for production and processing machinery products

**Course content:** Methodology of the design and technological solutions. Classification of design and technological solutions. Engineering solutions for manufacturing pre-production. The principle of decomposition. The principle of modular design. The principle of equivalence and equilibrium options. Private pre-production design principles. Technological solutions in technological preparation of production. Methodology of creation of complex technological systems. The principle of integrated product design. The principle of parallel development of products and production technology. The principle of cross-cutting technology. Inversion principle technology. The principle of reliability of technological systems. Composite design of complex technological systems.

Cybernetic design and management of complex technological systems. Structural analysis of complex technological systems aggregative model of the functioning of complex technological systems. Management components of complex technological systems. Risk management of complex technological systems. The effectiveness of the management of complex technological systems.

**Expected results:** Providing of efficiency of technological machines and equipment depending on the decision of problems of science in the field of mechanical engineering.

## 8.2 NtM 6307 Nanotechnology in Engineering

**Number of credits - 3.**

**Prerequisites:** Mechanical Engineering Technology; Technology of Agricultural Engineering; Installation and operation of technological machines; Repair of technological machines.

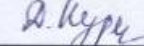
**Postrequisites:** Work on the Master's dissertation.

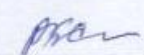
**Aim of the discipline:** Training on research methods used in experimental research activities related to the development of modern production engineering.

**Course content:** Fundamentals of nanotechnology. Effect of dispersion on properties of a substance. Physical and chemical bases of nanoeffect. Nanoparticles. Classification of nanoobjects. Technique of scanning probe microscopy (SPM). Elements of scanning probe microscopes. Shaping and processing of SPM images. Atomic force microscopy (AFM). Scanning tunneling microscopy. Morphology relief by scanning tunneling microscopy. SPM and characterization of materials. AFM studies for use of nanoscale mechanical properties. Physical effects in tunnel-probe nanotechnology. Lithography techniques and manipulation of atomic force microscopy. Modern applications for STM analysis and surface modification

**Expected results:** Obtaining the necessary knowledge of the promising areas of nanotechnology in mechanical engineering, skills techniques of scanning probe microscopy.

**Dean of the faculty** \_\_\_\_\_  **S.O. Nukeshev**

**Chairman of the methodical commission** \_\_\_\_\_  **D.B. Kurmangalieva**

**The head of Technological machines and equipment department** \_\_\_\_\_  **R.B. Seksenbaeva**