NJSC SHAKARIM UNIVERSITY OF SEMEY

EDUCATIONAL PROGRAM

7M07 - Engineering, Manufacturing and Civil engineering
(Code and classification of the field of education)

7M071 - Engineering and engineering trades
(Code and classification of the direction of training)

0710
(Code in the International Standard Classification of Education)

M103 - Mechanics and metalworking
(Code and classification of the educational program group)

7M07104 -Mechanical engineering
(Code and name of the educational program)

Master
(Level of preparation)

Semey

Educational program

7M07 - Engineering, Manufacturing and Civil engineering
(Code and classification of the field of education)

7M071 - Engineering and engineering trades
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(Code in the International Standard Classification of Education)

M103 - Mechanics and metalworking
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7M07104 - Mechanical engineering
(Code and name of the educational program)

Master
(Level of preparation)

Semey 2023

PREFACE

Developed

The educational program 7M07104 - Mechanical engineering in the direction of preparation 7M071 - Engineering and engineering trades on the basis of the State Compulsory Standards of Higher and Postgraduate Education approved by the Order of the Ministry of Science and Higher Education of the Republic of Kazakhstan dated July 20, 2022 No 2 (as amended by the order) was developed by the Academic Committee dated 20.02.2023 No 66).

Members of the Academic Committee	Full name	Academic degree, academic title, position	Signature
Head of the Academic Committee	Nurymkhan Gulnur	Dean of the Faculty of Engineering and Technology	
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Full name of the reviewer	Position, place of work	Signature
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Reviewed

at the meeting of the Quality Assurance Commission of the Faculty of Engineering and Technology
Recommended for approval by the Academic Council of the University
Protocol № 4.6 "10" April 2023
Chairman of the Commission on Quality Assurance Abdilova G.

Approved at the meeting of the Academic Council of the University Protocol No. 8 "25" April 2023.

Approved

at the meeting of the Academic Council of the University
Protocol № 1 "01" of September 2023
Chairman of the Academic Council of the University Orynbekov D.R.

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1. Introduction

1.1. General data

7M07104 "Mechanical engineering" is a mandatory part of the main educational program. The program of each discipline (course) is aimed at implementing a single target setting for training a specific specialist and is a basic educational and methodological document.

1.2. Completion criteria

The main criterion for the completion of the educational process for the preparation of masters of the scientific and pedagogical direction is the development of at least 88 credits of theoretical training, including 6 credits of pedagogical practice, 13 credits of research practice, as well as at least 24 credits of research work of a master s student, including internships and the completion of a master s thesis, at least 8 credits of the final attestations . A total of 120 credits.

1.3. Typical study duration: 2 years.

2. PASSPORT OF THE EDUCATIONAL PROGRAM

2.1.EP purpose	Training of specialists for the formation of skills of practical implementation and implementation of engineering solutions in the development of projects of product life cycle management, including the formation of technical documentation and protection of intellectual property.
2.2.Map of the training profile within the educational program	
Code and classification of the field of education	7M07 - Engineering, Manufacturing and Civil engineering
Code and classification of the direction of training	7M071 - Engineering and engineering trades
Code in the International Standard Classification of Education	0710
Code and classification of the educational program group	M103 - Mechanics and metalworking
Code and name of the educational program	7M07104 - Mechanical engineering
2.3.Qualification characteristics of the graduate	
Degree awarded / qualification	Master of Technical Sciences under the educational programme 7M07104- Mechanical Engineering
Name of the profession / list of positions of a specialist	lecturer at University, head of laboratory, technologist, master of food enterprises of different ownership forms, production technician production lab specialist (assistant) in research institutes and Universities, specialist centres of standardization and certification without presentation of requirements to the work experience in accordance with the qualification requirements Qualification Handbook for managers, professionals and other employees.
OQF qualification level (industry qualification framework)	7
Area of professional activity	all industries, including the military-industrial complex, machine-building production, all industries, including military-industrial, industry, transport and communications, agriculture and utilities, education and consumption .
Object of professional activity	government bodies, enterprises, organizations of state and non-state ownership, including industry, agriculture and utilities, the military-industrial complex, production and consumption. government bodies, enterprises, organizations of state and non-state ownership, including industry, agriculture and utilities,the military-industrial complex, production and consumption.
Types of professional activity	graduates of the master s degree program in mechanical engineering can perform the following types of professional activities production and technological; organizational and management; research and teaching; design and development; expert; design.
Graduate Model	The graduate model of the EP

	7M07104 – Mechanical Engineering 1 Description of the EP The educational program 7M07104 – Mechanical Engineering is a qualification characteristic of a graduate. It reflects the specifics of the goals of educational training of undergraduates with innovative thinking, advanced technologies in the field of engineering, with formed scientific thinking, Soft skills, which are necessary for flexible response to market needs, further self-improvement and competitiveness. The graduate model of the educational program 7M07104 – Mechanical Engineering was developed on the basis of: 1. The Law of the Republic of Kazakhstan "On Education" No. 319-III dated July 27, 2007. 2. State Standard of Higher and Postgraduate Education dated July 20, 2022 No. 2. 3. Rules for the organization of the educational process on credit technology of education Order of the Ministry of Education and Science of the Republic of Kazakhstan dated April 20, 2011 No. 152 4. Standard rules for the activities of educational organizations implementing educational programs of higher education, Resolution No. 595 of the Government of the Republic of Kazakhstan dated October 30, 2018 5. The strategic plan of the NJSC "Shakarim SemeyUniversity" for 2021-2025. 2 The purpose of the educational program Training of specialists for the formation of skills for the practical implementation and implementation of engineering solutions in the development of product lifecycle management projects, including issues of technical documentation and intellectual property protection. 3 Objectives of the educational program - To prepare a Master of technical sciences with responsibility for their decisions, determination, the ability to lead, the ability to work in a team, carry out scientific research, apply modern methods of scientific and pedagogical direction, the ability to self-improvement and self-development. - To prepare specialists for the implementation of design and technological security of production and the formation of design and technological documentation of machine-building production, capable of quickly adapting to rapidly changing socio-economic conditions, as well as meeting the needs of the individual in comprehensive professional and intellectual development. - To provide an opportunity to acquire knowledge in engineering and various research methods. 4 Results of the Master s degree in Technical Sciences EP 7M07104 – Mechanical Engineering : - ready to solve the tasks of professional activity of the following types: research, scientific and pedagogical, organizational and managerial, technological;

	- demonstrate the developing knowledge and understanding gained at the level of higher professional education, the ability to self-study; - apply knowledge, understanding and the ability to solve problems in new or unfamiliar situations in contexts and within broader (or interdisciplinary) fields related to the field being studied, often in the context of scientific research; - integrate knowledge, cope with difficulties and make judgments based on incomplete or limited information, taking into account the ethical and social responsibility for the application of these judgments and knowledge; - clearly, clearly and reasonably communicate their conclusions and knowledge and their justification to specialists and non-specialists. 4.1 Acquired competencies expressed in the achieved learning outcomes As a result of mastering this Master s degree program, the graduate must have the following competencies: 1) general cultural competencies (OK): - the ability to improve and develop their intellectual and cultural level; - willingness to use knowledge of modern problems of science and education in solving educational and professional tasks; - the ability to independently master new research methods, to change the scientific profile of their professional activities; 2) professional competencies: general professional: - the ability to manage the project at all stages of the life cycle; - the ability to solve production and (or) research tasks based on fundamental knowledge in the field of mechanical engineering; - the ability to evaluate the results of research and development, scientific research and justify their own choice, systematizing and summarizing achievements in the field of engineering; - the ability to develop scientific and technical, design and service documentation, prepare scientific and technical reports, reviews, publications, reviews; - the ability to independently carry out research on modern equipment and devices (in accordance with the goals of the master s program) and set new research tasks. 4.2 Personal qualities of the graduate The personal qualities of a graduate that must be possessed in order to be a competitively capable specialist in the field of engineering: - Analytical skills: the ability to carry out a critical analysis of problematic situations based on a systematic approach, to develop a strategy of action; - Diagnostic skills: the ability to determine and implement the priorities of one s own activities and ways to improve them based on self-assessment, to design a further educational route and professional

	career; - Verbal and non-verbal skills: the ability to organizeand lead the work of a team, analyze and take into account the diversity of cultures in the process of intercultural interaction, develop a team strategy toachieve a goal. - Predictive skills: the ability to put forward goals and objectives; selection of ways to achieve goals; foreseeing the result, possible deviations and undesirable phenomena; determining the stages (or stages) of the process; time allocation; manifestationsof perseverance, activity, ability to withstand the load,perseverance in performing complex tasks. - Correctional skills: the ability to determine and implement the priorities of one s own activities andways to improve it based on self-assessment.

3. Modules and content of the educational program

Sociolinguistic and scientific-pedagogical activity

Apply fundamental scientific, pedagogical, philosophical, managerial, and communicative knowledge and skills in professional activities.

Foreign language (professional)

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	34590 (3026255)
Course	2
Term	1
Credits count	3
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline

Mastery of general cultural, professional and special competencies for the implementation of professional activities, involving teaching free reading of original literature of the relevant branch of knowledge in a foreign language; development of oral communication skills in monological and dialogical form in the specialty; development of written scientific communication skills on topics related to the scientific work of a graduate student, as well as familiarization with the forms and types of international cooperation in the scientific field.

Purpose of studying of the discipline

The purpose of studying the discipline "Foreign language (professional)" in the master`s degree program is the systematic deepening of communicative competence within the framework of international standards of foreign language education on the basis of further development of skills and abilities of active language proficiency in the professional activity of the future master.

Learning Outcomes

ON1 Apply fundamental scientific, pedagogical, managerial, communicative knowledge and skills in professional activities.

Prerequisites

Bachelor

Postrequisites

Final examination Research work of a master student, including internship and master s project II

History and philosophy of science

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	34593 (3026258)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline is aimed at studying the culture of scientific thinking, forms analytical capabilities and research skills, provides theoretical and practical knowledge necessary for a future scientist. Explores the historical evolution of the sciences and the philosophical perspectives they form. The origins of modern science, its social and institutional connections are described. General philosophical issues related to thought experiments, confirmation and refutation of theories, the origin and application of quantitative and high-quality research methods are considered.

Purpose of studying of the discipline

the formation of an interdisciplinary worldview among undergraduates, based on a deep understanding of the history and philosophy (theory) of scientific thinking, as part of a universal culture.

Learning Outcomes

ON1 Apply fundamental scientific, pedagogical, managerial, communicative knowledge and skills in professional activities.

Prerequisites

Bachelor

Postrequisites

Final examination

Tertiary education

Discipline cycle	Basic disciplines

Discipline component	University component
SubjectID	34591 (3026256)
Course	2
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline

The course is aimed at studying the main directions, principles and patterns of higher education. During the course of the course, the basic concepts of modern pedagogy, concepts and theories of teaching and upbringing, didactics of higher education will be considered. The master`s student will master the skills of designing the organization of the educational process, techniques of individual and group reflection, will be able to correctly formulate pedagogical goals, apply educational technologies in the educational process. in the process, to design work programs of disciplines.

Purpose of studying of the discipline

The purpose of mastering the discipline is to master the system of knowledge about higher education, its content, structure, principles of educational process management and mastering modern technologies in the field of management and organization of the educational process

Learning Outcomes

ON1 Apply fundamental scientific, pedagogical, managerial, communicative knowledge and skills in professional activities.

Prerequisites

Bachelor

Postrequisites

Pedagogical practice

Psychology of management

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	34592 (3026257)
Course	2
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline

The content of the course is aimed at mastering the approaches and directions of management psychology, psychological laws of management, features of planning and solving management problems. Students will get acquainted with the psychological methods of resolving conflict situations, master the ways of motivating work, the methods of using effective management styles. Skills will be formed to analyze the psychological causes underlying the decline in the effectiveness of the management process.

Purpose of studying of the discipline

The purpose of the discipline "Psychology of Management" is the formation of scientifically based ideas about the system of mental phenomena, psychological variables of behavior and conscious human activity in modern conditions and allows undergraduates to form skills of applying the acquired psychological knowledge in educational activities

Learning Outcomes

ON1 Apply fundamental scientific, pedagogical, managerial, communicative knowledge and skills in professional activities.

Prerequisites

Bachelor

Postrequisites

Final examination Pedagogical practice

Pedagogical practice

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	34598 (3026254)
Course	2
Term	2
Credits count	6
Pedagogical practics	180hours

Total	180hours
Knowledge control form	Total mark on practice

Short description of discipline

Allows you to formulate an array of pedagogical knowledge and skills acquired during the master`s course. Pedagogical practice organizes knowledge and reveals the possibilities of their application. Performs an analysis of pedagogical activity in working with a diary, methodological material, classes, in communication with students. Assesses readiness for actual pedagogical activity.

Purpose of studying of the discipline

Pedagogical practician maқsaty undergraduate bilim alushylarmen pedagogical zhұmys boyinsha ғylym negizdelgen blimi men құzyrettiligin kalyptastyru bolyp tabylady

Learning Outcomes

ON1 Apply fundamental scientific, pedagogical, managerial, communicative knowledge and skills in professional activities.

Prerequisites

Tertiary education Psychology of management

Postrequisites

Final examination

Scientific research and automation in mechanical engineering

To show the learning skills necessary for independent continuation of further education in the field of study. To demonstrate the ability to conduct experiments according to specified methods with processing and analysis of results,to apply standard test methods to determine the physical and mechanical properties and technological parameters of the materials used and finished products. Analyze, think creatively and creatively approach new problems and situations.The ability to independently apply methods and means of cognition, learning and self-control. Be able to critically assesstheir strengths and weaknesses. Apply the skills of scientific research on the formulated topic, obtaining new scientific and applied results, their analysis, systematization, generalization and presentation.

Research work of a master student, including internship and master s thesis I

Discipline cycle	Profiling discipline
Discipline component	University component
SubjectID	34574 (3026250)
Course	1
Term	2
Credits count	11
The research work	330hours
Total	330hours
Knowledge control form	Total mark on practice

Short description of discipline

Formation of the presentation of scientific research (formulation of topics, goals, objectives); methodology of theoretical, experimental research. The course presents an analysis of theoretical and innovative research, conducting experiments and developing conclusions and recommendations. The course provides knowledge on innovations in scientific activity, their promotion and implementation, the main criteria for registration and protection of copyright and other rights.

Purpose of studying of the discipline

The goal is to study the latest theoretical, methodological and technological achievements of domestic and foreign science, as well as to consolidate practical skills in applying modern methods of scientific research

Learning Outcomes

ON2 Show the learning skills necessary to independently continue further education in the field of study.
ON5 Be able to critically assess their strengths and weaknesses. Apply the skills of scientific research on the formulated topic, obtaining new scientific and applied results, their analysis, systematization, generalization and presentation.
ON6 Demonstrate the ability to conduct a preliminary feasibility study of design solutions.

Prerequisites

Basic and profile disciplines of the EP

Postrequisites

Methods of experimental design Research work of a master student, including internship and master s project II

Automation of tool production

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	34589 (3026228)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
Generalization of knowledge about tool production, its automation, including at the design stage and using special software; at the stageof manufacturing and developing high-precision and economical technological processes for manufacturing tools. Show how, based on a thorough analysis of experience and design and technological practice, to develop a perfect technological process using modern productive equipment, fixtures and tools.

Purpose of studying of the discipline
The purpose of studying the discipline "Automation of tool production" is to generalize knowledge on the automation of production and apply it in the automation of tool production, taking into account its features.

Learning Outcomes
ON3 Show the ability to conduct experiments according to specified methods with processing and analysis of the results, apply standard test methods to determine the physical and mechanical properties and technological indicators of the materials used and finished products. ON4 Analyze, think creatively and creatively approach new problems and situations. The ability to independently apply methods and means of cognition, learning and self-control.

Prerequisites
Preparation of machine-building production

Postrequisites
The control system in mechanical Improvement of automated production

Automation of technological processes in mechanical engineering

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	34587 (3026227)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The course shows the automation of technological processes in mechanical engineering. Methods for calculating economic efficiency, mechanization and automation itself, the difficulties of these processes are considered. Formation of knowledge on the operation of mechanization and automation devices during the machining of parts on metal- cutting machines, both for general purposes and with numerical control; their optimal setting, design features.

Purpose of studying of the discipline
The purpose of studying the discipline "Automation of technological processes in mechanical engineering" is the formation of scientifically based knowledge and methods of calculation for the automation of technological processes of mechanical engineering production

Learning Outcomes
ON3 Show the ability to conduct experiments according to specified methods with processing and analysis of the results, apply standard test methods to determine the physical and mechanical properties and technological indicators of the materials used and finished products. ON4 Analyze, think creatively and creatively approach new problems and situations. The ability to independently apply methods and means of cognition, learning and self-control.

Prerequisites
Improvement and optimization of technological processes in mechanical engineering Preparation of machine-building production

Postrequisites
The control system in mechanical Improvement of automated production

Flexible manufacturing cells and automated production lines in mechanical engineering

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	34584 (3026226)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Formation of the concept of modern mechanical engineering as a production with a frequent change of manufactured parts and their wide range. The course builds knowledge about production using automated production modules for mass, large-scale, serial and even small- scale production. The course deals with the automation of production. Knowledge is being formed on the intensification and automation of technologies, digitalization.

Purpose of studying of the discipline

The purpose of studying the discipline "Flexible production modules and automated lines in mechanical engineering" is to gain knowledge and competencies on innovative ways to automate various types of production

Learning Outcomes

ON3 Show the ability to conduct experiments according to specified methods with processing and analysis of the results, apply standard test methods to determine the physical and mechanical properties and technological indicators of the materials used and finished products. ON4 Analyze, think creatively and creatively approach new problems and situations. The ability to independently apply methods and means of cognition, learning and self-control.

Prerequisites

Innovative technologies in mechanical engineering Preparation of machine-building production

Postrequisites

Modernizathion of technological processes in mechanical engineering Improvement of automated production Innovative solutions of machine-building production

Methods of experimental design

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	34581 (3026223)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Formation of the necessary knowledge about the methods of planning and processing the experiment. The course gives a theory about the main methods of planning an experiment, conducting the necessary experiments and measurements, processing the data obtained by methods of mathematical statistics. The ways of processing the results, knowledge of the theory and practice of the experiment are considered.

Purpose of studying of the discipline

The purpose of studying the discipline "Methods of Experiment Planning" is to provide students with knowledge of the basics of mechanical engineering technology, about modern progressive methods of planning experiments, methods of processing and conducting experiments.

Learning Outcomes

ON3 Show the ability to conduct experiments according to specified methods with processing and analysis of the results, apply standard test methods to determine the physical and mechanical properties and technological indicators of the materials used and finished products. ON4 Analyze, think creatively and creatively approach new problems and situations. The ability to independently apply methods and means of cognition, learning and self-control.
ON7 Explain how to perform organizational and planning calculations for the creation or reorganization of production sites, apply progressive methods of operating technological equipment.

Prerequisites

Tenzo and Vibrometry in mechanical engineering Research work of a master student, including internship and master s thesis I

Postrequisites

Final examination Organization and planning of research and innovation

Increasing the efficiency of the cutting tool

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	34594 (3026259)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
Formation of knowledge about effective modern metal- cutting tools. Methods for designing a metal- cutting tool, modern material and hard alloys used for its manufacture, innovative methods for manufacturing a cutting tool and methods for hardening its cutting part are described. Examples of calculation and graphical representation of the cutting tool are given. Methods for calculating and manufacturing stamps are considered.

Purpose of studying of the discipline
The purpose of studying the discipline "Improving the efficiency of the cutting tool" is scientifically based knowledge to improve the effective use of the tool using modern tools, this is hardening, hard alloy deposition, deposition.

Learning Outcomes
ON4 Analyze, think creatively and creatively approach new problems and situations. The ability to independently apply methods and means of cognition, learning and self-control.
ON5 Be able to critically assess their strengths and weaknesses. Apply the skills of scientific research on the formulated topic, obtaining new scientific and applied results, their analysis, systematization, generalization and presentation.
ON9 Apply knowledge of legal, social, environmental and cultural aspects of integrated engineering activities.

Prerequisites
Preparation of machine-building production

Postrequisites
Modern problems of technologies of production machines

Statistical methods for planning an experiment

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	34582 (3026225)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The course describes the acceleration of research work and the provision of optimal solutions. Describes statistical methods for designing an experiment, while varying by several factors. Shows the use of a multifactorial experiment so that during mathem atical processing it is possible to choose the conditions for the following experiments until the optimum region is reached.

Purpose of studying of the discipline
The purpose of studying the discipline "Static Methods of Experiment Planning" is the formation of scientifically based ideas about the methods of planning an experiment and their use in practice

Learning Outcomes
ON3 Show the ability to conduct experiments according to specified methods with processing and analysis of the results, apply standard test methods to determine the physical and mechanical properties and technological indicators of the materials used and finished products.
ON4 Analyze, think creatively and creatively approach new problems and situations. The ability to independently apply methods and means of cognition, learning and self-control.
ON7 Explain how to perform organizational and planning calculations for the creation or reorganization of production sites, apply progressive methods of operating technological equipment.

Prerequisites
Tenzo and Vibrometry in mechanical engineering

Postrequisites
Organization and planning of research and innovation

Theoretical foundations of modeling cutting processes

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	34576 (3026222)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Formation of the student`s basic knowledge of modeling the basic processes of cutting metals (turning, milling, grinding and drilling). The course program considers mathematical modeling methods (stochastic, etc.) and also the possibility of using the finite element apparatus.
Development of a scientific understanding of modern modeling methods, cutting theory and cutting modeling, both theoretical and by the finite element method.

Purpose of studying of the discipline

The purpose of the discipline "Theoretical foundations of modeling cutting processes" is the formation of knowledge about various modern cutting processes, their features, the use of mathematical apparatus and various software for their modeling.

Learning Outcomes

ON4 Analyze, think creatively and creatively approach new problems and situations. The ability to independently apply methods and means of cognition, learning and self-control.
ON5 Be able to critically assess their strengths and weaknesses. Apply the skills of scientific research on the formulated topic, obtaining new scientific and applied results, their analysis, systematization, generalization and presentation.
ON9 Apply knowledge of legal, social, environmental and cultural aspects of integrated engineering activities.

Prerequisites

System analysis, optimization and mathematical modeling in mechanical engineering

Postrequisites

Final examination Engineering methods of calculation Innovative solutions of machine-building production Dynamic calculation of design studies

Theory of cutting and high precision machining

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	34595 (3026260)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Mastering in-depth knowledge in the field of cutting theory, the basics of tribology, various types of high-precision machining. Analysis of each type of processing, tool used, cutting conditions, workpiece material, cutting tool material and conclusions about the possibility ofhigh-precision processing in each case. Ranking of each case, economic and technical substantiation of high-precision processing.

Purpose of studying of the discipline

The purpose of studying the discipline "Theory of cutting and high-precision machining" is a systematic deepening of knowledge and practical competence for solving problems of cutting theory in relation to modern methods of high-precision machining

Learning Outcomes

ON4 Analyze, think creatively and creatively approach new problems and situations. The ability to independently apply methods and means of cognition, learning and self-control.
ON5 Be able to critically assess their strengths and weaknesses. Apply the skills of scientific research on the formulated topic, obtaining new scientific and applied results, their analysis, systematization, generalization and presentation.
ON9 Apply knowledge of legal, social, environmental and cultural aspects of integrated engineering activities.

Prerequisites

Innovative technologies in mechanical engineering Technical regulation in mechanical engineering

Postrequisites

Modernizathion of technological processes in mechanical engineering

Introduction to experiment

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	34596 (3026224)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Formation of the concept of the theory of experiment, multifactorial and factorial experiments, development of methods for conducting

an experiment, mathematical processing of results. The methods of the theory of experiment aimed at planning and conducting a research experiment are described; substantiation and verification of the adequacy of the results obtained. Comparison of the universality of experimental methods.

Purpose of studying of the discipline

The purpose of studying the discipline "Introduction to the theory of experiment" is the formation of theoretical knowledge on the conduct of the experiment, processing its results using the existing mathematical apparatus

Learning Outcomes

ON3 Show the ability to conduct experiments according to specified methods with processing and analysis of the results, apply standard test methods to determine the physical and mechanical properties and technological indicators of the materials used and finished products.
ON4 Analyze, think creatively and creatively approach new problems and situations. The ability to independently apply methods and means of cognition, learning and self-control.
ON7 Explain how to perform organizational and planning calculations for the creation or reorganization of production sites, apply progressive methods of operating technological equipment.

Prerequisites

Tenzo and Vibrometry in mechanical engineering

Postrequisites

Dynamic calculation of design studies Research practice Research work of a master student, including internship and master s project II

Research work of a master student, including internship and master s project II

Discipline cycle	Profiling discipline
Discipline component	University component
SubjectID	34610 (3026251)
Course	2
Term	2
Credits count	4
The research work	120hours
Total	120hours
Knowledge control form	Total mark on practice

Short description of discipline

Allows you to summarize the entire array of knowledge gained during the training period. The internship is an important part of the research work, it allows you to receive additional advice on the research topic. The result of all work is the implementation of a master`s thesis in which all research materials, conclusions and processing of experimental data are collected.

Purpose of studying of the discipline

The goal is to collect theoretical and experimental data, study the latest theoretical, methodological and technological achievements of domestic and foreign science.

Learning Outcomes

ON5 Be able to critically assess their strengths and weaknesses. Apply the skills of scientific research on the formulated topic, obtaining new scientific and applied results, their analysis, systematization, generalization and presentation.

Prerequisites

Introduction to experiment Organization and planning of research and innovation

Postrequisites

Final examination Research practice Research work of a master student, including internship and master s project III

Research work of a master student, including internship and master s project III

Discipline cycle	Profiling discipline
Discipline component	University component
SubjectID	34612 (3026252)
Course	3
Term	1
Credits count	9
The research work	270hours
Total	270hours
Knowledge control form	Total mark on practice

Short description of discipline

Allows you to summarize the entire array of knowledge gained during the training period. The internship is an important part of the research work, it allows you to receive additional advice on the research topic. The result of all work is the implementation of a master`s thesis in which all research materials, conclusions and processing of experimental data are collected.

Purpose of studying of the discipline

The goal is to consolidate practical skills in applying modern methods of scientific research, processing experimental data using mathematical apparatus;

Learning Outcomes

ON5 Be able to critically assess their strengths and weaknesses. Apply the skills of scientific research on the formulated topic, obtaining new scientific and applied results, their analysis, systematization, generalization and presentation.

Prerequisites

Basic and profile disciplines of the EP Organization and planning of research and innovation Engineering methods of calculation Research work of a master student, including internship and master s project II

Postrequisites

Final examination

Process modeling and innovation activities in Mechanical Engineering

To demonstrate the ability to conduct a preliminary feasibility study of design solutions. Explain how to perform organizational and planning calculations for the creation or reorganization of production sites, apply progressivemethods of operation of technological equipment To show the ability to work effectively individually and as a team member. Apply knowledge of the legal, social, environmental and cultural aspects of integrated engineering activities.

Measurement of vibration and shock

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	34572 (3026237)
Course	1
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The course shows modern production with systems for registration and analysis of process parameters (static, quasi-static, dynamic). Methods for measuring variable (in time) processes, such as vibrations of mechanical vibrations, are described. One of the parameters of vibration processes is the amplitude of vibrations (vibration displacement) and vibration frequency (vibration velocity). Two measurement methods are shown: contact and non-contact.

Purpose of studying of the discipline

The purpose of studying the discipline is the formation of students` theoretical knowledge on the application of modern methods and principles of measurement

Learning Outcomes

ON5 Be able to critically assess their strengths and weaknesses. Apply the skills of scientific research on the formulated topic, obtaining new scientific and applied results, their analysis, systematization, generalization and presentation.
ON6 Demonstrate the ability to conduct a preliminary feasibility study of design solutions.
ON7 Explain how to perform organizational and planning calculations for the creation or reorganization of production sites, apply progressive methods of operating technological equipment.

Prerequisites

Basic and profile disciplines of the EP

Postrequisites

Applied theory of mechanical vibrations Simulation of oscillations in a mechanical system

Engineering methods to ensure the reliability of the machines

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	34567 (3026232)
Course	1
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The reliability criteria of machines and units are considered, the causes of failure are investigated. The course provides knowledge on the theory of equipment reliability. The technique for calculating the reliability of machine- building equipment is considered. Methods for providing numerical indicators of machine reliability. The course forms knowledge on machine reliability management, engineering and organizational and technical methods

Purpose of studying of the discipline

The purpose of teaching the discipline is to study methods of ensuring the reliability of machines arising in the design, manufacture and operation. Mastering and researching methods of calculating and predicting the reliability of technical devices.

Learning Outcomes

ON5 Be able to critically assess their strengths and weaknesses. Apply the skills of scientific research on the formulated topic, obtaining new scientific and applied results, their analysis, systematization, generalization and presentation.
ON7 Explain how to perform organizational and planning calculations for the creation or reorganization of production sites, apply progressive methods of operating technological equipment.

ON8 Be able to critically assess their strengths and weaknesses.
ON9 Apply knowledge of legal, social, environmental and cultural aspects of integrated engineering activities.

Prerequisites

Basic and profile disciplines of the EP

Postrequisites

Theoretical foundations of modeling cutting processes System analysis, optimization and mathematical modeling in mechanical engineering

Innovative technologies in mechanical engineering

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	34566 (3026231)
Course	1
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Formation of knowledge about innovative technologies in the field of mechanical engineering, which includes innovative methods for obtaining blanks by casting, pressure treatment, powder metallurgy and cutting methods, modern processing methods, modern metal- cutting machines, tools for processing complex- shaped parts, methodological foundations for creating and arranging innovative technological machining and assembly processes. New methods of processing and manufacturing parts are described.

Purpose of studying of the discipline

The purpose of the discipline: Familiarization of students with innovative technologies in mechanical engineering, these are modern processing methods, innovative methods for obtaining blanks, powder metallurgy, additive technologies.

Learning Outcomes

ON3 Show the ability to conduct experiments according to specified methods with processing and analysis of the results, apply standard test methods to determine the physical and mechanical properties and technological indicators of the materials used and finished products.
ON6 Demonstrate the ability to conduct a preliminary feasibility study of design solutions.
ON7 Explain how to perform organizational and planning calculations for the creation or reorganization of production sites, apply progressive methods of operating technological equipment.

Prerequisites

Basic and profile disciplines of the EP

Postrequisites

Flexible manufacturing cells and automated production lines in mechanical engineering Theory of cutting and high precision machining

Qulimetry of machine engineering

Discipline cycle	Profiling discipline
Discipline component	University component
SubjectID	34560 (3026221)
Course	1
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Formation of the concept of qualimetry as a discipline about the quantitative assessment of quality. Methods of qualimetry, means of qualimetry, quality indicators are described. Methods of qualimetric (quantitative) evaluation of products are described. Examples of calculation (qualimetric) details are shown; methods for calculating the overall quality assessment at individual stages and for the fulllife cycle of the product.

Purpose of studying of the discipline

The purpose of the discipline: about the history and current state of qualimetry at home and abroad; about the basic methods of qualimetry, the basics of qualimetry technology in mechanical engineering; about the collection and processing of raw data to determine the quantitative values of quality indicators in mechanical engineering.

Learning Outcomes

ON2 Show the learning skills necessary to independently continue further education in the field of study.
ON3 Show the ability to conduct experiments according to specified methods with processing and analysis of the results, apply standard

test methods to determine the physical and mechanical properties and technological indicators of the materials used and finished products.
ON4 Analyze, think creatively and creatively approach new problems and situations. The ability to independently apply methods and means of cognition, learning and self-control.
ON6 Demonstrate the ability to conduct a preliminary feasibility study of design solutions.

Prerequisites

Basic and profile disciplines of the EP

Postrequisites

Final examination Engineering methods to ensure the reliability of the machines Engineering methods of calculation

Preparation of machine-building production

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	34568 (3026233)
Course	1
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Formation of knowledge about the preparation of mechanical engineering production in three stages of integrated training: design training; technological and planning stages of processing parts on time, volumes and financial costs. Works, methods that create competitive products in mechanical engineering are described. Measures for the development, implementation and control of norms and conditions for engineering products are determined.

Purpose of studying of the discipline

The purpose of teaching the discipline is to study the stages of preparation of machine-building production, solving problems that arise at various stages with ensuring the reliability of machines at the stage of design preparation, problems with product manufacturing and financial planning.

Learning Outcomes

ON5 Be able to critically assess their strengths and weaknesses. Apply the skills of scientific research on the formulated topic, obtaining new scientific and applied results, their analysis, systematization, generalization and presentation.
ON7 Explain how to perform organizational and planning calculations for the creation or reorganization of production sites, apply progressive methods of operating technological equipment.
ON8 Be able to critically assess their strengths and weaknesses.
ON9 Apply knowledge of legal, social, environmental and cultural aspects of integrated engineering activities.

Prerequisites

Basic and profile disciplines of the EP

Postrequisites

Flexible manufacturing cells and automated production lines in mechanical engineering Automation of technological processes in mechanical engineering Automation of tool production System management of processes in mechanical engineering

System analysis, optimization and mathematical modeling in mechanical engineering

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	34561 (3026229)
Course	1
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Knowledge is formed on the methods of analysis, mathematical modeling, allowing to study the influence of the control action on the functioning of systems, optimization of their parameters within the criteria. The course applies a systematic approach to solving: scientific problems in the field of high-tech production; development of the technological process, taking into account the limitations of the process.

Purpose of studying of the discipline

Familiarization of students with the methods of system analysis, with methods of modeling cutting processes and various systems; methods of both mathematical and computer modeling; knowledge of the modern level of system analysis and modeling of complex systems.

Learning Outcomes
ON3 Show the ability to conduct experiments according to specified methods with processing and analysis of the results, apply standard test methods to determine the physical and mechanical properties and technological indicators of the materials used and finished products.
ON6 Demonstrate the ability to conduct a preliminary feasibility study of design solutions.
ON7 Explain how to perform organizational and planning calculations for the creation or reorganization of production sites, apply progressive methods of operating technological equipment.

Prerequisites
Basic and profile disciplines of the EP

Postrequisites
Final examination Theoretical foundations of modeling cutting processes

Improvement and optimization of technological processes in mechanical engineering

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	34565 (3026230)
Course	1
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
Knowledge about the tasks and methods for optimizing technological processes in mechanical engineering is being formed. Various methods for optimizing technological processes for processing parts are considered. Methods for analyzing technological processes and choosing the optimal path for optimization and improvement are described. The software for choosing the optimal processing conditions is determined, examples of technological processes are given.

Purpose of studying of the discipline
The purpose of the discipline: Acquaintance of students with the methods of improvement and optimization of technological processes, the use of system and dimensional analysis and computer modeling in the optimization of technological processes.

Learning Outcomes
ON3 Show the ability to conduct experiments according to specified methods with processing and analysis of the results, apply standard test methods to determine the physical and mechanical properties and technological indicators of the materials used and finished products.
ON6 Demonstrate the ability to conduct a preliminary feasibility study of design solutions.
ON7 Explain how to perform organizational and planning calculations for the creation or reorganization of production sites, apply progressive methods of operating technological equipment.

Prerequisites
Basic and profile disciplines of the EP

Postrequisites
Flexible manufacturing cells and automated production lines in mechanical engineering Automation of technological processes in mechanical engineering

Tenzo and Vibrometry in mechanical engineering

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	34570 (3026235)
Course	1
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
Formation of ideas about tensovibrometry - methods and devices. Forms knowledge about strain measurements, assessment of the stress-strain state of the object under study. The course provides knowledge on the experimental determination of the stress-strain stateof moving nodes. On the methods of strain measurement: X-ray, optical, brittle coating, electroplating, with the help of strain gauges and strain gauges.

Purpose of studying of the discipline
The goal is to form students` theoretical knowledge on the application of modern measurement methods and principles

Learning Outcomes
ON5 Be able to critically assess their strengths and weaknesses. Apply the skills of scientific research on the formulated topic, obtaining new scientific and applied results, their analysis, systematization, generalization and presentation.
ON6 Demonstrate the ability to conduct a preliminary feasibility study of design solutions.
ON7 Explain how to perform organizational and planning calculations for the creation or reorganization of production sites, apply progressive methods of operating technological equipment.

Prerequisites
Basic and profile disciplines of the EP

Postrequisites
Final examination Methods of experimental design Introduction to experiment Statistical methods for planning an experiment

Oscillation theory

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	34571 (3026236)
Course	1
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The course shows possible types of motions in non-linear oscillatory systems, their features, development and formation, characteristicsof stationary and non- stationary processes. When analyzing ideal mathematical models of such systems, it is necessary to use approximate analytical and qualitative methods for solving equations. When studying the course, mathematical analysis and other examples from theoretical mechanics, strength of materials are used.

Purpose of studying of the discipline
The purpose of studying the discipline is the formation of students` theoretical knowledge on the analysis of possible types of movements in nonlinear oscillatory systems, the main characteristics of stationary and non-stationary processes

Learning Outcomes
ON5 Be able to critically assess their strengths and weaknesses. Apply the skills of scientific research on the formulated topic, obtaining new scientific and applied results, their analysis, systematization, generalization and presentation.
ON6 Demonstrate the ability to conduct a preliminary feasibility study of design solutions.
ON7 Explain how to perform organizational and planning calculations for the creation or reorganization of production sites, apply progressive methods of operating technological equipment.

Prerequisites
Basic and profile disciplines of the EP

Postrequisites
Applied theory of mechanical vibrations Simulation of oscillations in a mechanical system

Technical regulation in mechanical engineering

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	34569 (3026234)
Course	1
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
Formation of knowledge on technical regulation: scientific organization of labor, production process, time cost structure, its classification and study, the structure of a scientifically based time norm, components and methods of regulation, the methodology for the formation of technical standards for various processing methods and methods for organizing the work of processing regulation in machine- building organizations.

Purpose of studying of the discipline
The purpose of teaching the discipline is to study the methods of normalizing processes in mechanical engineering, the methods of forming technical standards for various processing methods, and their scientific justification.

Learning Outcomes
ON5 Be able to critically assess their strengths and weaknesses. Apply the skills of scientific research on the formulated topic, obtaining

new scientific and applied results, their analysis, systematization, generalization and presentation.
ON7 Explain how to perform organizational and planning calculations for the creation or reorganization of production sites, apply progressive methods of operating technological equipment.
ON8 Be able to critically assess their strengths and weaknesses.
ON9 Apply knowledge of legal, social, environmental and cultural aspects of integrated engineering activities.

Prerequisites
Basic and profile disciplines of the EP

Postrequisites
Computational modeling of the processing time norm Theory of cutting and high precision machining

System management of processes in mechanical engineering

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	34597 (3026253)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The course describes the ways of digitalization of technological and processes in mechanical engineering. Lists ways to organize innovative digitalized production; digitalization of production management processes; use of software in the development of technological processes; digitalization of scientific research in the field of their production, scientific activities and improvement of production, equipment and technologies in mechanical engineering.

Purpose of studying of the discipline
The purpose of the discipline: Familiarization of students with the ways and methods of digitalization of technological and production processes in mechanical engineering, with methods for modeling cutting processes and various systems; methods of both mathematical and computer modeling;

Learning Outcomes
ON6 Demonstrate the ability to conduct a preliminary feasibility study of design solutions.
ON7 Explain how to perform organizational and planning calculations for the creation or reorganization of production sites, apply progressive methods of operating technological equipment.
ON9 Apply knowledge of legal, social, environmental and cultural aspects of integrated engineering activities.

Prerequisites
Preparation of machine-building production

Postrequisites
The control system in mechanical Innovative solutions of machine-building production

Dynamic calculation of design studies

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	34608 (3026247)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
Formation of knowledge about materials, aluminum alloys and polymers, which are non- linear elastic, which raises questions of their calculation. The need for calculation methods in the dynamic analysis of structures made of a non-linear elastic material is described. Description of the problem in the dynamic calculation of nonlinear systems and in the calculation of structures made of linear elastic material.

Purpose of studying of the discipline
Formulate the rationale for design schemes of structures, determine the most dangerous combination of loads, select rational materials for machine elements

Learning Outcomes
ON3 Show the ability to conduct experiments according to specified methods with processing and analysis of the results, apply standard test methods to determine the physical and mechanical properties and technological indicators of the materials used and finished

products.
ON4 Analyze, think creatively and creatively approach new problems and situations. The ability to independently apply methods and means of cognition, learning and self-control.
ON5 Be able to critically assess their strengths and weaknesses. Apply the skills of scientific research on the formulated topic, obtaining new scientific and applied results, their analysis, systematization, generalization and presentation.

Prerequisites
Introduction to experiment

Postrequisites
Final examination Research work of a master student, including internship and master s project III

Engineering methods of calculation

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	34604 (3026243)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The course forms knowledge for the design and design of products, assemblies, objects. Describes automated systems for designing parts, programs used for calculation, drawing drawings, calculations and modeling using computer technology. Examples of calculation methods in engineering, strength and stiffness calculations with the possibility of automation are given; methods for calculating typical schemes in mechanics, their graphic description

Purpose of studying of the discipline
Learning how to design various geometric spatial objects, how to obtain their drawings at the level of graphic models and the ability to solve these problems using various methods of optimizing calculations during design.

Learning Outcomes
ON4 Analyze, think creatively and creatively approach new problems and situations. The ability to independently apply methods and means of cognition, learning and self-control.
ON5 Be able to critically assess their strengths and weaknesses. Apply the skills of scientific research on the formulated topic, obtaining new scientific and applied results, their analysis, systematization, generalization and presentation.
ON8 Be able to critically assess their strengths and weaknesses.

Prerequisites
Basic and profile disciplines of the EP Theoretical foundations of modeling cutting processes

Postrequisites
Final examination Research practice Research work of a master student, including internship and master s project III

Innovative solutions of machine-building production

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	34605 (3026244)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
Solutions are listed that give the engineering industry as a multiplier for the development of related industries, which increase the employment of the population and increase the competitiveness of the economy. Knowledge is being formed to increase production efficiency and innovation for development in related areas - mechanical engineering, machining of parts, automation and modern materials science, innovative technologies.

Purpose of studying of the discipline
Studying ways to increase production efficiency in mechanical engineering and innovative solutions for the further development of the field.

Learning Outcomes
ON4 Analyze, think creatively and creatively approach new problems and situations. The ability to independently apply methods and means of cognition, learning and self-control.

ON5 Be able to critically assess their strengths and weaknesses. Apply the skills of scientific research on the formulated topic, obtaining new scientific and applied results, their analysis, systematization, generalization and presentation.
ON8 Be able to critically assess their strengths and weaknesses.

Prerequisites

Flexible manufacturing cells and automated production lines in mechanical engineering System management of processes in mechanical engineering

Postrequisites

Final examination

Simulation of oscillations in a mechanical system

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	34609 (3026248)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Formation of knowledge about the modeling of oscillatory processes (mechanical) by solving problems. The studies in modeling programs are described. The theory of vibrations in machining is a way of studying machining processes. The theory of oscillations is based on general and experimental physics. The main attention is paid to the generality of mathematical analysis for oscillations of various nature.

Purpose of studying of the discipline

The purpose of studying the discipline is the formation of students` theoretical knowledge about the modeling of oscillatory processes (mechanical) by solving specific physical problems.

Learning Outcomes

ON3 Show the ability to conduct experiments according to specified methods with processing and analysis of the results, apply standard test methods to determine the physical and mechanical properties and technological indicators of the materials used and finished products.
ON4 Analyze, think creatively and creatively approach new problems and situations. The ability to independently apply methods and means of cognition, learning and self-control.
ON5 Be able to critically assess their strengths and weaknesses. Apply the skills of scientific research on the formulated topic, obtaining new scientific and applied results, their analysis, systematization, generalization and presentation.

Prerequisites

Basic and profile disciplines of the EP

Postrequisites

Final examination

Modernizathion of technological processes in mechanical engineering

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	34601 (3026240)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The course describes the methods of modernization of technological processes of parts, examples of technological processes of processing, constructive and technological methods are given: this is the combination of design, manufacture, operation and repair of parts into one technological process; accounting for technological heredity during processing, from the receipt of the workpiece and ending with the operation of the product.

Purpose of studying of the discipline

To study methods and means of achieving the required quality of the product; to know the basics of the production of construction materials, the latest trends in the production of parts and blanks.

Learning Outcomes

ON2 Show the learning skills necessary to independently continue further education in the field of study.

ON3 Show the ability to conduct experiments according to specified methods with processing and analysis of the results, apply standard test methods to determine the physical and mechanical properties and technological indicators of the materials used and finished products.
ON5 Be able to critically assess their strengths and weaknesses. Apply the skills of scientific research on the formulated topic, obtaining new scientific and applied results, their analysis, systematization, generalization and presentation.

Prerequisites

Flexible manufacturing cells and automated production lines in mechanical engineering Theory of cutting and high precision machining

Postrequisites

Final examination Research practice

Organization and planning of research and innovation

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	34599 (3026238)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Formation of the presentation of scientific research (formulation of topics, goals, objectives); methodology of theoretical, experimental research. The course presents an analysis of theoretical and innovative research, conducting experiments and developing conclusions and recommendations. The course provides knowledge on innovations in scientific activity, their promotion and implementation, the main criteria for registration and protection of copyright and other rights.

Purpose of studying of the discipline

Planning of management of research and innovation " – to promote the formation of knowledge about the methodology and methods of implementation of science-based research

Learning Outcomes

ON2 Show the learning skills necessary to independently continue further education in the field of study.
ON3 Show the ability to conduct experiments according to specified methods with processing and analysis of the results, apply standard test methods to determine the physical and mechanical properties and technological indicators of the materials used and finished products.
ON5 Be able to critically assess their strengths and weaknesses. Apply the skills of scientific research on the formulated topic, obtaining new scientific and applied results, their analysis, systematization, generalization and presentation.

Prerequisites

Methods of experimental design Introduction to experiment Statistical methods for planning an experiment

Postrequisites

Final examination Research practice Research work of a master student, including internship and master s project III

Applied theory of mechanical vibrations

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	34607 (3026246)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The course formulated moments of the theory of oscillations of linear and nonlinear mechanical systems. Methods for calculating machine-building products (systems) are described. Methods for calculating plates and shells are shown, information is given on self-oscillations and aeroelastic oscillations. The oscillations resulting from shock, periodic loads are described. Digitization of calculationson special software is shown, their description is given.

Purpose of studying of the discipline

Formulate the rationale for design schemes of structures, determine the most dangerous combination of loads and vibrations, select rational materials for machine elements

Learning Outcomes

ON3 Show the ability to conduct experiments according to specified methods with processing and analysis of the results, apply standard

test methods to determine the physical and mechanical properties and technological indicators of the materials used and finished products.
ON4 Analyze, think creatively and creatively approach new problems and situations. The ability to independently apply methods and means of cognition, learning and self-control.
ON5 Be able to critically assess their strengths and weaknesses. Apply the skills of scientific research on the formulated topic, obtaining new scientific and applied results, their analysis, systematization, generalization and presentation.

Prerequisites
Oscillation theory Measurement of vibration and shock

Postrequisites
Final examination

Computational modeling of the processing time norm

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	34606 (3026245)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
Formation of skills for modeling time norms using formulas, in cases where the duration of machining operations can be regulated by technical conditions, processing conditions, and physical laws. The development and modeling of norms based on the norms of labor costs consists in the use of norms with the given norms of labor costs for typical movements.

Purpose of studying of the discipline
Studying methods for modeling and designing time norms using formulas, influencing factors and main costs using various methods for optimizing calculations.

Learning Outcomes
ON4 Analyze, think creatively and creatively approach new problems and situations. The ability to independently apply methods and means of cognition, learning and self-control.
ON5 Be able to critically assess their strengths and weaknesses. Apply the skills of scientific research on the formulated topic, obtaining new scientific and applied results, their analysis, systematization, generalization and presentation.
ON8 Be able to critically assess their strengths and weaknesses.

Prerequisites
Technical regulation in mechanical engineering

Postrequisites
Final examination

The control system in mechanical

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	34602 (3026241)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The course summarizes knowledge about the types of control systems in mechanical engineering. Describes the structure of enterprise management, the basis of which is the organization of production. The structure of management in mechanical engineering - complexity, levels of formalization and centralization, coordination mechanisms. Distinguish between engineering data management systems, quality management systems, cost management and product prices.

Purpose of studying of the discipline
To acquaint undergraduates with automated control and design systems in mechanical engineering.

Learning Outcomes
ON6 Demonstrate the ability to conduct a preliminary feasibility study of design solutions.
ON7 Explain how to perform organizational and planning calculations for the creation or reorganization of production sites, apply progressive methods of operating technological equipment.

ON8 Be able to critically assess their strengths and weaknesses.

Prerequisites

Automation of technological processes in mechanical engineering Automation of tool production

Postrequisites

Final examination Research practice

Improvement of automated production

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	34603 (3026242)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The course forms knowledge on improving the automation system, production efficiency, mobility. The methods of automation and the result of an increase in the level of competitiveness, an increase in the use of the resource base are described. Automation measures aimed at reducing the number of employees and increasing production efficiency, improving product quality and working conditions are shown.

Purpose of studying of the discipline

To acquaint with computer-aided design systems in mechanical engineering, ways of changing automation and, as a result, an increasein the level of production efficiency.

Learning Outcomes

ON3 Show the ability to conduct experiments according to specified methods with processing and analysis of the results, apply standard test methods to determine the physical and mechanical properties and technological indicators of the materials used and finished products.
ON6 Demonstrate the ability to conduct a preliminary feasibility study of design solutions.
ON7 Explain how to perform organizational and planning calculations for the creation or reorganization of production sites, apply progressive methods of operating technological equipment.

Prerequisites

Flexible manufacturing cells and automated production lines in mechanical engineering Automation of technological processes in mechanical engineering Automation of tool production

Postrequisites

Final examination

Modern problems of technologies of production machines

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	34600 (3026239)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The course provides knowledge on high technologies: combined processing; quality assurance by technological methods; cost reduction and productivity increase; development of innovative technologies that save energy and materials; formation of the surface layer by technological methods - alloying, welding, various coatings; regular provision of changes in the quality of the surface layer and operational properties of blanks by technological methods.

Purpose of studying of the discipline

Study of the regularities operating in the manufacturing process of modern machine parts.

Learning Outcomes

ON2 Show the learning skills necessary to independently continue further education in the field of study.
ON3 Show the ability to conduct experiments according to specified methods with processing and analysis of the results, apply standard test methods to determine the physical and mechanical properties and technological indicators of the materials used and finished products.
ON5 Be able to critically assess their strengths and weaknesses. Apply the skills of scientific research on the formulated topic, obtaining

new scientific and applied results, their analysis, systematization, generalization and presentation.

Prerequisites

Basic and profile disciplines of the EP Increasing the efficiency of the cutting tool

Postrequisites

Final examination

Research practice

Discipline cycle	Profiling discipline
Discipline component	University component
SubjectID	34611 (3026249)
Course	3
Term	1
Credits count	13
Working practice	390hours
Total	390hours
Knowledge control form	Total mark on practice

Short description of discipline

Allows you to generalize and apply knowledge in special disciplines, to assess the ability to use the acquired knowledge in research practice. Shows the ability of the undergraduate to produce real research, the ability to set goals and objectives and achieve their implementation. Analyze and propose a methodology for experiments and correctly interpret the results of a scientific experiment.

Purpose of studying of the discipline

Collection of the latest theoretical, methodological and technological achievements of domestic and foreign science

Learning Outcomes

ON2 Show the learning skills necessary to independently continue further education in the field of study.

Prerequisites

Organization and planning of research and innovation Engineering methods of calculation Dynamic calculation of design studies Research work of a master student, including internship and master s project II

Postrequisites

Final examination

Final assessment

Master`s dissertation

Credits count	8

4. Summary table on the scope of the educational program

«7M07104 - Mechanical engineering»

Name of discipline	Cycle/ Component	Term	Number of credits	Total hours	Lec	SPL	LC	IWST	IWS	Knowledge control form
Sociolinguistic and scientific-pedagogical activity										
Foreign language (professional)	BS/US	3	3	90		30		20	40	Examination
History and philosophy of science	BS/US	3	5	150	15	30		35	70	Examination
Tertiary education	BS/US	3	3	90	15	15		20	40	Examination
Psychology of management	BS/US	3	3	90	15	15		20	40	Examination
Pedagogical practice	BS/US	4	6	180						Total mark on practice
Scientific research and automation in mechanical engineering										
Research work of a master student, including internship and master s thesis I	AS/US	2	11	330						Total mark on practice
Automation of tool production	BS/CCh	3	5	150	15	30		35	70	Examination
Automation of technological processes in mechanical engineering	BS/CCh	3	5	150	15	30		35	70	Examination
Flexible manufacturing cells and automated production lines in mechanical engineering	BS/CCh	3	5	150	15	30		35	70	Examination
Methods of experimental design	BS/CCh	3	5	150	15	30		35	70	Examination
Increasing the efficiency of the cutting tool	BS/CCh	3	5	150	15	30		35	70	Examination
Statistical methods for planning an experiment	BS/CCh	3	5	150	15	30		35	70	Examination
Theoretical foundations of modeling cutting processes	BS/CCh	3	5	150	15	30		35	70	Examination
Theory of cutting and high precision machining	BS/CCh	3	5	150	15	30		35	70	Examination
Introduction to experiment	AS/CCh	3	5	150	15	30		35	70	Examination
Research work of a master student, including internship and master s project II	AS/US	4	4	120						Total mark on practice
Research work of a master student, including internship and master s project III	AS/US	5	9	270						Total mark on practice
Process modeling and innovation activities in Mechanical Engineering										
Measurement of vibration and shock	AS/CCh	2	5	150	15	30		35	70	Examination
Engineering methods to ensure the reliability of the machines	AS/CCh	2	5	150	15	30		35	70	Examination
Innovative technologies in mechanical engineering	AS/CCh	2	5	150	15	30		35	70	Examination
Qulimetry of machine engineering	AS/US	2	5	150	15	30		35	70	Examination
Preparation of machine-building production	AS/CCh	2	5	150	15	30		35	70	Examination
System analysis, optimization and mathematical modeling in mechanical	AS/CCh	2	5	150	15	30		35	70	Examination

engineering										
Improvement and optimization of technological processes in mechanical engineering	AS/CCh	2	5	150	15	30		35	70	Examination
Tenzo and Vibrometry in mechanical engineering	AS/CCh	2	5	150	15	30		35	70	Examination
Oscillation theory	AS/CCh	2	5	150	15	30		35	70	Examination
Technical regulation in mechanical engineering	AS/CCh	2	5	150	15	30		35	70	Examination
System management of processes in mechanical engineering	AS/CCh	3	5	150	15	30		35	70	Examination
Dynamic calculation of design studies	AS/CCh	4	5	150	15	30		35	70	Examination
Engineering methods of calculation	AS/CCh	4	5	150	15	30		35	70	Examination
Innovative solutions of machine-building production	AS/CCh	4	5	150	15	30		35	70	Examination
Simulation of oscillations in a mechanical system	AS/CCh	4	5	150	15	30		35	70	Examination
Modernizathion of technological processes in mechanical engineering	AS/CCh	4	5	150	15	30		35	70	Examination
Organization and planning of research and innovation	AS/CCh	4	5	150	15	30		35	70	Examination
Applied theory of mechanical vibrations	AS/CCh	4	5	150	15	30		35	70	Examination
Computational modeling of the processing time norm	AS/CCh	4	5	150	15	30		35	70	Examination
The control system in mechanical	AS/CCh	4	5	150	15	30		35	70	Examination
Improvement of automated production	AS/CCh	4	5	150	15	30		35	70	Examination
Modern problems of technologies of production machines	AS/CCh	4	5	150	15	30		35	70	Examination
Research practice	AS/US	5	13	390						Total mark on practice
Final assessment										
Master`s dissertation		5	8	240						