**Federal State Autonomous Educational Institution
of Higher Education « Peoples' Friendship University of Russia »**

**SUMMARY OF DISCIPLINES (MODULES)
The study of disciplines is carried out as part of Master Professional
Educational program of Higher Education (EP HE)
"INNOVATION MANAGEMENT",
in the field of study: 27.04.05 INNOVATIONS STUDY**

2022

Disciplines (modules) are studied as part of Master EP HE "Innovation Management" in field of study 27.04.05 "Innovations study"

Name of the discipline	Contemporary problems of control theory Современные проблемы теории управления
The volume of the discipline	3 Credit Units (108 hours)

Content of the discipline	
Topic	**Sections**
Basic concepts of simulation modeling. Methodology of mathematical modeling	General characteristics of the problem of modeling systems. Principles of the systematic approach in modeling. Classification of system models. Basic concepts of systems modeling theory. Features of system development and use of models: the principle of a systematic approach; general characteristics of the problem; classification of types of system modeling; ensuring and efficiency of machine modeling.
Queuing Simulation Models	
Simulation of stochastic processes	The role of modeling in the analysis of economic objects. The concept of an object model. Classification of models. Static and economic models. Mathematical and simulation models. Simulation modeling on a computer. The concept of a service device and service requests in the system. The object of the economy as a queuing system. Assign queuing simulation models.
Model management and simulation results	
Mathematical schemes of systems modeling	Random characteristics of queuing systems. Choice of the law of distribution of a random characteristic. Uniform, normal, exponential and beta laws. The impact of random processes on queue latency. Pollacek-Hinchin formula
Mathematical schemes of simulation modeling	
Mathematical approaches in simulation modeling	Host management commands. Transactional parameters. Node state settings. Sensors of pseudo-random quantities. The results of the model. Transition from a meaningful description of systems to a mathematical scheme. Mathematical schemes of a general kind. Typical mathematical schemes. Continuously deterministic models (D-circuits). Discrete-deterministic models (F-schemes). Discrete-stochastic models (P-schemes). Continuous stochastic models (Q-schemes). Network models (N-diagrams). Combined models (A-schemes).
Formalize the modeling process	
	Construction of conceptual models and their implementation.
Formalization and algorithmization of the processes of functioning of systems	Algorithmization of models and their machine implementation. Obtaining and analyzing the results of modeling. New approaches to building models; continuously deterministic models; discrete-deterministic models; discrete-stochastic models; continuous stochastic models; network models; combined models.
Modeling the business process of a manufacturing firm	Methods of development and machine implementation of models; construction of conceptual models and their formalization; algorithmization of models and their machine generation; obtaining and interpreting the results of modeling.

Synthesis of mathematical models of optimal control systems	Structure diagram of the business process. The relationship between order flows and financial resource flows. It is displayed on the simulation model diagram. Payment modeling. Simulate transactions from the same source account to different destination accounts. Modeling of a bank loan. Forecast of the company's performance indicators. Simulation of parallel and generated processes
Statistical modeling of computer systems	The problem of choosing the page of the mathematical model. Linear models. Analytical design of optimal regulators (ACOR). Numerical methods of synthesis of control systems.
Modeling Tools	Selection of parameters of the mathematical model. Regression analysis. The method of least squares.
Simulation Software.	Recurrent methods. General characteristics of the method; machine generation of pseudorandom sequences; checking and improving the quality of random sequences; modeling of stochastic influences.
Evolutionary modeling	Systematization and comparative analysis of simulation modeling languages; systems modeling application packages; systems modeling databases; hybrid modeling complexes. Features of the choice of simulation modeling software. Classification of simulation software Capabilities when using simulation programs. Random number generators. Generation of random variables. The main attributes of evolutionary modeling. Genetic algorithms. Evolutionary algorithms. Population algorithms. Genetic programming. The method of grammatical evolution. Analytical programming. Network operator.

Name of the discipline	Foreign language in the professional activity of the master
The volume of the discipline	6 Credit Units (216 hours)
Content of the discipline	
Topic	Sections
1. Institute of Science and Technology. Specialized culture. Reports. Article. Patents. Business letter.	1. Specifics of the functioning of the institute on THEUC and technology in foreign-speaking countries and in Russia. Rules and norms of communication in professional scientific and technical sphere. Formation of the ability to understand oral reports / long speeches in a foreign language on engineering topics. Written foreign language general scientific / highly specialized articles in the field of engineering. Foreign patents in the field of engineering. Structure and types of business letters.

| 2.Prepared/unprepared conversation. Reputable scientists in the field of engineering. Discussion. Argumentation. Message. Scientific and technical concepts in professionally oriented discourse.

3. The Logic of Scientific Exposition. Text abstracting. The main idea and the author's attitude. Abstract. Review. Business conversation. | 2. An unprepared conversation on a general scientific/highly specialized topic in the field of engineering. Well-known scientists in the field of science and technology. The main directions of development on THE AND
techniques in the field of engineering. Discussions on general scientific/ highly specialized issues. Expressing one's own position
and logical argumentation in a foreign language. General Science Report in a Foreign Language: Scientific and Technical Concepts in a Foreign Language and Russian Text in the Field of Engineering.

3. Composition, motifs, pragmatic attitude of a foreign language
scientific text. Key segments of text. Receiving information
It's a good thing. Abstract. Review. The main idea of the text. Author's relation
To the topic of the text. Abstracting of foreign text in the area
Engineering. Ability to determine your attitude to the content
Read. Presentation of development achievements in the field of Inge
Of course (review). Professional/Scientific Conversation/
of a production nature. |
|---|---|

Name of the discipline	Проектирование автоматизированных систем управления
The volume of the discipline	5 Credit Units (180 hours)
Content of the discipline	
Topic	Sections
Tools and technologies of integrated automation of the design stage of control systems (LMS)	Topic 1. Problems of design, automated control systems.
The subject and objectives of the discipline. Statement of the task of designing automation SU. A systematic approach to the design of SU. Structural, block-hierarchical, characteristic equations, object-oriented approaches in the formulation of the problem of computer-aided design of SU. Structuring of the SU design process. Problems of computer-aided design and control systems.
Topic 2. Functions of CAE/CAD/CAM systems. The composition of integrated CAD systems.
Integrated CAE/CAD/CAM systems. Functions of automated control systems (ERP systems). Functions of SCADA systems. The fundamental principle of management: feedback. Tools and systems of complex automation.
Models and methods of SU analysis in the automation of the design stage	Topic 3. Model representation of management tools and systems (SD). Model representation of control systems and SU elements as design objects. Setting the task of analyzing the SU as an object with distributed parameters. Formal methods of obtaining models of control systems. Mathematical representation of SU.
Topic 4. Methods of computer-aided design: methods of analysis of RMS. Performance evaluation. Methods of SR analysis in the time domain. Methods of analysis of technical systems in CAD. Features of the mathematical description of the SU in computer-aided design. Methods of analysis in the frequency domain, their main characteristics. Main statistical characteristics of the output parameters of the LM. Evaluation of the accuracy of the statistical test method.

	Topic 5. Methods of computer-aided design: methods of synthesis of SU. A quadratic assignment model. Methods and algorithms of technical optimization of management tools and systems, their main characteristics. Methods of artificial intelligence as a means of automating the tasks of structural synthesis of SU. Adaptive genetic algorithms as algorithms for solving problems of synthesis of SU devices.
Methods of RMS synthesis and verification of design solutions in the automation of the design stage	Topic 6. Automation of design design of SU. Automation of design design within the framework of complex automation of the design stage of the SU. Levels and tasks of design and technological design of SU. Mathematical models of SU elements in design automation. Topic 7. Automation of SU tests. SU test methods: based on semi-natural modeling; physically real SU equipment. Testing algorithms. Methods and algorithms for processing test results.

Name of the discipline	**Big data mining** Оработка больших данных
The volume of the discipline	**4 Credit Units (144 hours)**
Content of the discipline	
Topic	Sections
Introduction to the Mathematical foundations of blockchain distributed database technology. The concept of a distributed information processing system. The main mechanisms of distributed object technologies. Basic models of distributed object technologies Internet Technologies Component model technology. Types of distributed applications. Application integration problems.	Types and properties of distributed systems. Software architecture of information systems. Managing the interaction of heterogeneous applications (middleware). The concept of a remote procedure (RPC model). Transactional monitors. Transaction confirmation algorithms. Remote access to object methods (RMI model). Object brokers (CORBA specification). Interaction based on messaging (MOM model). Message queues and transactional queues. A point-to-point interaction model. The concept of a network service (Web Service). Service services and application integration. Basic components of network services. Protocols and standardization. Problems of publishing data and searching for network services. Coordination of interaction of network services. Composite network services. Fundamentals of component software systems. COM and COM+, EJB for high-level programming languages. Cloud technologies. Definition of cloud computing. Multi-layer architecture of cloud applications. Components of cloud applications. Advantages and disadvantages of cloud computing. Classification of clouds. The most common cloud platforms. GRID technologies. GRID architecture. GRID standards. Parametric models of GRID performance. Comparison of GRID and Cloud computing. Agent systems. The concept of a software agent. Multi-agent systems. Security in mobile agent systems. Integrated Application Integration (EAI). Message brokers. The "publish/subscribe" interaction model. Workflow management systems. Application servers.

Name of the discipline	Прикладные задачи математического моделирования
The volume of the discipline	3 Credit Units (108 hours)
Content of the discipline	
Topic	**Sections**
Basic concepts of simulation modeling. Methodology of mathematical modeling	General characteristics of the system modeling problem. Principles of a systematic approach in modeling. Classification of system models. Basic concepts of the theory of systems modeling. Features of systems for the development and use of models: the principle of a systematic approach; general characteristics of the problem; classification of types of modeling systems; provision and effectiveness of machine modeling.
Simulation models of queuing systems	"Credit units". The concept of an object model. Classification of models. Static and economic models. Mathematical and simulation models. Simulation modeling on a computer. The concept of a service device and a service request in the system. The object of economy as a queuing system. Purpose of simulation models of queuing systems.
Modeling of random processes Model management and simulation results Mathematical schemes of systems modeling	Random characteristics of queuing systems. Choice of the distribution law of a random characteristic. Uniform, normal, exponential and beta laws. The effect of random processes on queue latency. Pollacek-Khinchin Formula
Mathematical schemes of simulation modeling	Node management commands. Transaction parameters. Node status parameters. Pseudorandom value sensors. The results of the model.
Mathematical approaches in simulation modeling	Transition from a meaningful description of systems to a mathematical scheme. Mathematical schemes of a general kind. Typical mathematical schemes. Continuously deterministic models (D-schemes). Discrete-deterministic models (F-schemes). Discrete stochastic models (P-schemes). Continuous stochastic models (Q-schemes). Network models (N-schemes). Combined models (A-schemes).
Formalization of the modeling process	Construction of conceptual models and their implementation. Algorithmization of models and their machine implementation. Obtaining and analyzing simulation results.
Formalization and algorithmization of system functioning processes	Basic approaches to model construction; continuously deterministic models; discrete-deterministic models; discrete-stochastic models; continuous stochastic models; network models; combined models.
Modeling the business process of a manufacturing company	Methods of development and machine implementation of models; construction of conceptual models and their formalization; algorithmization of models and their machine generation; obtaining and interpreting the results of modeling. Structure diagram of the business process. The relationship between order flows and financial resource flows. It is displayed on the simulation model diagram. Payment modeling. Simulate transactions from the same source account to different destination accounts. Modeling of a bank loan.
Synthesis of mathematical models of optimal control systems	Forecast of the company's performance indicators. Simulation of parallel and generated processes The problem of choosing the structure of a mathematical model. Linear models. Analytical Design of Optimal Controllers (ACOR). Numerical methods for the synthesis of control systems. Choice of parameters of the mathematical model. Regression analysis. Least square method. recurrent

Statistical modeling of computer systems	methods. General characteristics of the method; machine generation of pseudorandom sequences; checking and improving the quality of random sequences; modeling of stochastic influences.
Modeling tools Simulation software.	Systematization and comparative analysis of simulation modeling languages; systems modeling application packages; systems modeling databases; hybrid modeling complexes.
Evolutionary modeling	Features of the choice of simulation modeling software. Classification of simulation software Capabilities when using simulation programs. Random number generators. Generation of random variables. The main attributes of evolutionary modeling. Genetic algorithms. Evolutionary algorithms. Population algorithms. Genetic programming. The method of grammatical evolution. Analytical programming. Network Operator.

Name of the discipline	**Numerical methods for solving mathematical modeling problems** Численные методы решения задач математического моделирования
The volume of the discipline	**3 Credit Units (108 час)**

<div align="center">Content of the discipline</div>

Topic	Sections
Methods of minimizing the functions of one variable	Problem setting. The classical method. BiSection method. The golden ratio method. The broken method. Coating method. Prominent functions of one variable. Tangent method
Classical extremum theory of functions of many variables.	Problem statement. Weierstrass theorem. The classical method of solving problems on an unconditional extremum. Conditional extremum tasks. Prerequisites of the first order. Second-order prerequisites. Sufficient extremum conditions.
Methods for minimizing functions of many variables.	Gradient method. The gradient projection method. Conditional gradient method. The method of possible directions. Proximal method. Linearization method. Quadratic programming. The method of conjugate directions. Newton's method. Continuous methods with variable metrics. The method of coordinate descent. Coverage method in multidimensional problems. Modified Lagrange functions method. The method of penalty functions. Proof of the necessary conditions of the first and second order extremum with the help of penalty functions. The method of barrier functions. The method of loaded functions. Random search method.
Dynamic programming.	Bellman's diagram. Synthesis problem for discrete systems. Moiseev's scheme. Synthesis problem for systems with continuous time. Sufficient optimality conditions.
The principle of Pontryagin's maximum.	Formulation of the problem of optimal control. Formulation of the principle of maximum. Proof of the principle of maximum. Maximum principle for optimal control tasks with phase limits. The relationship between the principle of maximum and the classical calculus of variations.
Application of the principle of maximum to the tasks of optimizing the trajectories of spacecraft flights.	Reduction of the optimization problem to the boundary value problem of the maximum principle. A shooting method for the numerical solution of the boundary value problem of the maximum principle. Modifications of the Newton method: Isaev-Sonin modification, Fedorenko normalization. The Runge-Kutta method of solving the Cauchy problem. Investigation of the problems of minimizing the flight time and the mass of spent fuel.

Methods for minimizing functions of a single variable.	Problem statement. The classic method. Bisection method. The golden ratio method. The broken method. Coating method. Prominent functions of one variable. Tangent method
Classical theory of the extremum of functions of many variables.	Problem statement. Weierstrass theorem. The classical method of solving problems on an unconditional extremum. Conditional extremum tasks. Prerequisites of the first order. Second-order prerequisites. Sufficient extremum conditions.

Name of the discipline	**Management of business operations of hi-tech industries** Управление операционной деятельностью наукоемких производств
The volume of the discipline	**3 Credit Units (108 hours)**
Content of the discipline	
Topic	Sections
Business Operations in Different Industries Functions of Business Operations (BO) Elements of BO Basic concepts of process management in enterprise restructuring Knowledge management system Business process reengineering technology.	The concept of reengineering. The definition of "business reengineering", proposed by M. Hammer and D. Champi, four key words of this definition. Process – Location – Technology - Business Machinery and Equipment – Staffing How to Enhance Business Operations? Benefits and limitations. Definition of "business process", its characteristics. Key indicators for evaluating the effectiveness of business processes. What is not business reengineering. Value chain concept. Results of identification of business processes. Business process interface with requirement. Business process interface with schedule. Goals of business process reengineering. Features of enterprises where business process reengineering is most effective. Conditions for successful business process reengineering. The concept of sysSections of knowledge management. Typical mistakes in reengineering. Systems design technology. Stages of the life cycle of systems development. Basic requirements of design technology. Methodologies for modeling business processes. Technological network of business process reengineering.

Name of the discipline	**Technologies of programming for innovation production** Технологии программирования для инновационных производств
The volume of the discipline	**10 Credit Units (360 hours)**
Content of the discipline	
Topic	**Sections**
Basic concepts of simulation modeling. Methodology of mathematical modeling Simulation models of	General characteristics of the system modeling problem. Principles of a systematic approach in modeling. Classification of system models. Basic concepts of the theory of systems modeling. Features of systems development and use of models: the principle of the system approach; general characteristics of the problem; classification of types of systems modeling; provision and effectiveness of machine modeling.

queuing systems Simulation of random processes Model control and simulation results	The role of modeling in the Credit Units analyzer of economic objects. The concept of an object model. Classification of models. Static and economic models. Mathematical and simulation models. Simulation modeling on a computer. The concept of a service device and a service request in the system. The object of economy as a queuing system. Purpose of simulation models of queuing systems.
Mathematical schemes for system modeling Mathematical schemes of simulation modeling	Random characteristics of queuing systems. Choice of the distribution law of a random characteristic. Uniform, normal, exponential and beta laws. The effect of random processes on queue latency. Pollacek-Khinchin Formula
Mathematical approaches in simulation modeling	Node management commands. Transaction parameters. Node status parameters. Pseudorandom value sensors. The results of the model. Transition from a meaningful description of Intersections to a mathematical scheme. Mathematical schemes of a general kind. Typical mathematical schemes. Continuously deterministic models (D-schemes). Discrete-deterministic models (F-schemes). Discrete stochastic models (P-schemes). Continuous stochastic models (Q-schemes). Network models (N-schemes). Combined models (A-schemes).
Formalization of the modeling process	Construction of conceptual models and their implementation. Algorithmization of models and their machine implementation. Obtaining and analyzing simulation results.
Formalization and algorithmization of systems functioning processes	Basic approaches to model construction; continuously deterministic models; discrete deterministic models; discrete stochastic models; continuously stochastic models; network models; combined models. Methods of development and machine implementation of models; construction of conceptual models and their formalization; algorithmization of models and their machine generation; obtaining and interpretation of modeling results.
Modeling the business process of a manufacturing company	Block diagram of the business process. The relationship between order flows and financial resource flows. Its display on the simulation model diagram.
Synthesis of mathematical models of optimal control systems	Modeling of payments. Modeling transactions from the same source account to different receiver accounts. Modeling of a bank loan. Forecast of the company's performance indicators. Modeling of parallel and generated processes
Statistical modeling of systems on a computer	The problem of choosing the structure of a mathematical model. Linear models. Analytical design of optimal regulators (ACOR). Numerical methods for the synthesis of control systems. Selection of parameters of the mathematical model. Regression analysis. The least squares method. Recurrent methods.
Modeling tools	General characteristics of the method; machine generation of pseudorandom sequences; verification and improvement of the quality of random sequences; modeling of stochastic effects.
Simulation software.	Systematization and comparative analysis of simulation modeling languages; system modeling application software packages; system modeling databases; hybrid modeling complexes.
Evolutionary modeling	Features of the choice of simulation software. Classification of simulation modeling software Features when using simulation modeling programs. Random number generators. Generating random variables.
	The main attributes of evolutionary modeling. Genetic algorithms. Evolutionary algorithms. Population algorithms. Genetic programming. The method of grammatical evolution. Analytical programming. Network

	operator

Name of the discipline	**Innovation technologies of personnel management** Инновационные технологии управления персоналом
The volume of the discipline*	**3 Credit Units (108 hours)**

Content of the discipline

Topic	Sections
Personnel in the organization management system	Human resource management - scientific discipline. The place human resource management in the management system. Personnel as an object and subject of management. Human resource policy in management. Scientific bases and principles of HRM. Scientific approach and methods of HRM. Styles of leadership and personnel management.
Methodological foundations of personnel management	
	HRM system: concepts, purpose, structure, principles of construction. Organizational chart and implementation of the project in personnel management. Improving the systems of HRM.
Organization, functioning and improvement of HRMS	
	Planning and forecasting the need for personnel. Organization of personnel marketing. Registration of labor relations, selection, placement, career guidance and labor adaptation of personnel.
Recruitment	
Organisational culture. Human capital formation	Recruitment of the organization's staff. Motivation and stimulation of labor activity of the personnel of the organization. Business assessment and staff appraisal

Name of the discipline	**Digital technologies of innovative production** Цифровые технологии инновационного производства
The volume of the discipline*	**3 Credit Units (108 hours)**

Content of the discipline

Topic	**Sections**
Digital economy: concept, goals and objectives, structure Trends and prospects for the development of the digital economy Features of management and interaction in the digital economy Industrial Internet. Big data. Components of robotics and sensors. Virtual and augmented reality technologies. Wireless communication technologies. Nanotechnology and artificial intelligence. The life cycle of the	Basic concepts of the digital economy. Goals and objectives of the digital economy. Global trends in the digital economy. Legal regulation of the digital economy. Digitalization as a factor in the formation of new economic technologies Architecture of control and regulation systems in the digital economy. Industrial Internet: definition and evolution of technology. Data mining. Machine learning. Wireless communication technologies. Product life cycle management. Simulation and supercomputer modeling of products. Additive technologies and rapid prototyping. Methods for evaluating digital transformation. Digital transformation assessment indices.

introduction of digital technologies Assessment of the economic efficiency of the introduction of digital technologies. The experience of foreign countries in the development of the digital economy	

Name of the discipline	Applications of GIS/ Практикум применения геоинформационных систем
The volume of the discipline*	3 Credit Units (108 hours)
Content of the discipline	
Topic	Sections
Basic concepts of simulation modeling. Methodology of mathematical modeling Simulation models of queuing systems	General characteristics of the problem of system modeling. Principles of a systematic approach in modeling. Classification of system models. Basic concepts of the theory of system modeling. Features of the development of systems and the use of models: the principle of a systematic approach; general description of the problem; classification of types of system modeling; provision and efficiency of machine simulation.
Simulation of random processes Model control and simulation results Mathematical schemes for modeling systems	The role of modeling in the analysis of economic objects. The concept of an object model. Classification of models. Static and economic models. Mathematical and simulation models. Simulation modeling on a computer. The concept of a service device and requests for service in the system. The object of the economy as a queuing system. Purpose of simulation models of queuing systems.
Mathematical schemes of simulation modeling Mathematical approaches in simulation modeling	Random characteristics of queuing systems. The choice of the law of distribution of a random characteristic. Uniform, normal, exponential and beta laws. Influence of random processes on delay in queues. Pollacek-Khinchin formula Node management commands. Transaction parameters. Node state parameters. Sensors of pseudo-random variables. The results of the model.
Formalization of the modeling process Formalization and algorithmization of systems functioning processes	The transition from a meaningful description of sysSections to a mathematical scheme. Mathematical schemes of a general form. Typical mathematical schemes. Continuously deterministic models (D-schemes). Discrete-deterministic models (F-schemes). Discrete stochastic models (P-schemes). Continuous stochastic models (Q-schemes). Network models (N-schemes). Combined models (A-schemes). Construction of conceptual models and their implementation. Algorithmization of models and their machine implementation. Obtaining and analysis of simulation results.
Modeling the business process of a manufacturing company Synthesis of mathematical models of optimal control systems Statistical modeling of	Basic approaches to building models; continuously deterministic models; discrete deterministic models; discrete stochastic models; continuous-stochastic models; network models; combined models. Methodology for the development and machine implementation of models; construction of conceptual models and their formalization; algorithmization of models and their machine generation; obtaining and interpreting simulation results.

systems on a computer	Structural diagram of a business process. Relationship between order flows and financial resource flows. Its display on the diagram of the simulation model. Payment modeling. Simulation of transactions from the same source account to different destination accounts. Modeling a bank loan. Forecast of performance indicators of the company. Simulation of parallel and child processes.
Modeling tools	
Simulation software.	
Evolutionary modeling	The problem of choosing the structure of a mathematical model. Linear models. Analytical Design of Optimal Controllers (ACOR). Numerical methods for the synthesis of control systems. Choice of parameters of the mathematical model. Regression analysis. Least square method. recurrent methods.
	General characteristics of the method; machine generation of pseudo-random sequences; checking and improving the quality of random sequences; modeling of stochastic influences.
	Systematization and comparative analysis of simulation languages; application software packages for system modeling; system modeling databases; hybrid modeling complexes.
	Features of the choice of simulation software. Classification of simulation software tools Opportunities when using simulation software. Random number generators. Generation of random variables.
	Basic attributes of evolutionary modeling. Genetic algorithms. evolutionary algorithms. population algorithms. genetic programming. Method of grammatical evolution. Analytical programming. network operator.

Name of the discipline	**Strategic controlling at innovative enterprise** Стратегический контроллинг на инновационном предприятии
The volume of the discipline*	**7 Credit Units (252 hours)**
Content of the discipline	
Topic	Sections
The essence, tasks and functions of controlling. History of Controlling. Basic interpretations. Differences between operational and strategic controlling	The role of controlling in the enterprise management system. The history of the emergence and development of controlling in business administration. American and German controlling concepts.
	Tasks and controlling tools. Controlling tasks.
	Different meanings and definitions of the term "controlling". Interpretation of controlling as "system management systems"
	Role of controling in strategic management. Strategic and operational controlling in the management system.
	Essence of strategic efficiency. Strategic management tools. Controlling the external environment. Controlling objects in the enterprise Classification of controlling objects. Creation proper controlling function at enterprise.
The main tasks and functions of strategic controlling. Fundamental principles of substantiation of managerial decisions in innovative controlling Basic concepts of justification of	Tasks of strategic controlling. Identification of critical external and internal strategic positions. Control of the main indicators in accordance with the strategic goals. Participation in the setting of strategic goals. Participation in the development of strategies. Analysis of strategic effectiveness.
	Strategic reflection. Controlling functions. Processing of information on different "tiers" of management system. Srategic and operational planning; The rationality of the management process; Research of tendencies of development of the enterprise in the conditions of market economy.
	Lifecycle cost concept. Target costing and continuous cost improvement.
	Process control. Business process management: functions kept by controlling. The idea of controlling a business process through information

management decisions in strategic controlling.	system. Balanced scorecard BSC. The modern concept of strategic analysis Strategic Approach to Cost Behavior Analysis. Strategic positioning. Value chain concept.
Strategic controlling tools Goal setting and planning. Strategic planning at the enterprise. Fundamentals of Integrated Cross-Functional Enterprise Management	Portfolio analysis. BCG Matrix, Porter 5C. Potential analysis. growth curve. SWOT analysis. Strategic gaps (GAP analysis). Balanced scores. Balanced Scorecard (BSC) Development of scenarios, etc. Basics of planned activities at the enterprise Target picture and targets. Profit target indicators. Budgeting. Management process and structure of the enterprise, cost control.

Name of the discipline	Economy of hi-tech production branches Экономика высокотехнологичных отраслей промышленности
The volume of the discipline*	5 Credit Units (180 hours)
Content of the discipline	
Topic	Sections
Introduction to the discipline "Economics of high-tech industries"	Термин «высокотехнологический», современные подходы к его пониманию. Классификация наUCоемких отраслей. Инновационный процесс как объект управления. Инновационный процесс: понятие, стрUCтура, содержание работ в высокотехнологических отраслях
Innovations as the content of an Hitech industry and a factor of economic growth	Preliminary analysis of innovations and preparation of a pricing business plan. Macroeconomic prerequisites for innovation. Product selection and competitive strategy. Evaluation of sales markets. Assessment of competitors. Product life cycle. Analysis of trends in the development of industries. Place of the enterprise in the industry. Justification and analysis of a future marketing strategy: the main elements of a marketing plan, policy rationale
Structure of the high-tech sector of the Russian economy	Features of market relations of high-tech firms. Supply, demand and price models
Macroeconomic factors and trends affecting the development strategy of high-tech enterprises	Factors affecting the development strategy of high-tech enterprises. Opportunities for economic and successful management practices of high-tech enterprises.
The system of dynamic optimization of economic and technological development of a high-tech enterprise	The concept and patterns of development of the economic and technological complex of firms. The origin of firms and their development. Personnel of high-tech industries.

Name of the discipline	Marketing of innovative products/ Маркетинг инновационных продуктов
The volume of the discipline*	3 Credit Units (108 hours)
Content of the discipline	
Topic	Sections
Strategic management process and marketing of innovative products	Strategic management and marketing; Marketing management; The study of the product in the marketing activities of the organization;

Marketing strategies in the overall strategy of the company. Types of Marketing Strategies Marketing research in the field of innovative industries. Analysis of the general situation in the industry and competition in it Marketing research in the field of innovative industries. Analysis of the state of the company Fundamentals of foreign economic activity in innovative industries	Analysis of the effectiveness of marketing activities; Building a strategic pyramid; Marketing strategies of competition; Analysis of the general situation in the industry and competition in it; Methods for collecting marketing information; Evaluation of the effectiveness of the current strategy; Strengths and weaknesses of the organization. Market opportunities and threats; Competitiveness of prices and costs of the organization; Assessment of the company's competitive position; Assessment of strategic problems; General characteristics and basic concepts of foreign economic activity; Organization of international cooperation in innovative industries; General characteristics and features of the market for space products and services

Name of the discipline	**Management of supply chains at innovative enterprise/** Управление цепями поставок на инновационном предприятии
The volume of the discipline*	**6 Credit Units (216 часов)**
Content of the discipline	
Topic	Sections
Basic concepts in the field of material and information flow management (logistics) in the production business Material flows and logistics operations Inventories of material resources Warehousing at the enterprise, strategies of warehouse management Strategic Procurement Production Logistics Transport Logistics Production Distribution	Goals and objectives of logistics management, logistics systems. The concept of material flow and logistics operations, types, classification. The concept of inventories, inventory management main concepts. Strategic warehouse management. The task of choosing between own and rented warehouses, determining the optimal number of warehouses. Procurement, tasks and functions of procurement logistics, supplier selection, types of needs. Strategic production management, concepts, flexibility of production systems, types of material flow management systems, efficiency of the logistics approach to material flow management in production. Enterprise transport management. The essence of transport logistics, the choice of mode of transport, tariffs and transportation rules Infrastructure of commodity markets, types of intermediaries, the importance of intermediaries in the commodity market, efficient distribution of goods flows. Information logistics management, types of information systems in logistics.

Name of the discipline	**Run-time controlling at innovative enterprise** Оперативный контроллинг на инновационном предприятии
The volume of the discipline*	**5 Credit Units (180 hours)**
Content of the discipline	
Topic	Sections
Essence, tasks and functions of operational controlling	Operational controlling. Features and economic content of controlling. Complex of organizational and methodological principles of controlling.

Organization of the controlling function. Controlling objects.	Organization and implementation of the concept of controlling in the enterprise. Basic requirements when creating a controlling service. Job duties. Qualification and role requirements. Structure of the controlling function: The main stages of the implementation of controlling systems in the enterprise
Financial controlling.	Tasks and main elements of financial controlling. Financial controlling tools. Identification of "bottlenecks" of the enterprise Optimal production program taking into account "bottlenecks" Diagnostics of the Financial condition and results of the enterprise. The method of extreme points.
Fundamentals of Finance in Controlling. Management Accounting System (LMS).	Differences from financial and tax accounting. Management accounting as the basis of controlling. Classification of various methods of management accounting and their application in controlling. Costs and their classification. Responsibility centers and their classification.Cash method and accrual method. Absorption and direct costing. Marginal analysis.
Marketing Controlling Controlling Innovative Projects	The content of marketing analysis. Marketing controlling Project - controlling Analysis of the effectiveness of innovative projects
Information support of controlling	Sources of information. Information systemSections for solving controlling problems. Information flows at the enterprise in the controlling system. Management decision-making in the system of operational controlling
Planning and budgeting in the controlling system	Five basic principles of budgeting. Hierarchy of planning elements. "Master" - the (general) budget and its relationship with the operational and financial budgets. Types of budgets by planning levels. Planning sequence. Analysis of deviations in the controlling system.
Internal control system. Internal control and audit	Organization of internal control system in the organization. Characteristics of the COSO model. The difference between internal audit and internal control. The difference between an external audit and an internal audit.

Name of the discipline	**Ecological management at innovative enterprise** Экологический менеджмент на инновационных предприятиях
The volume of the discipline*	**3 Credit Units (108 hours)**
Content of the discipline	
Topic	Sections
The main provisions of the environmental management of industries. Key tools of environmental management. Implementation of an environmental management system at an industrial enterprise.	Goals and objectives of environmental management in industry. Economic, financial, legal, organizational, managerial, reporting and statistical foundations of modern environmental management. International and environmental standards for environmental management. Environmental standardization, environmental labeling, environmental audit, environmental insurance. Development and implementation of an environmental management system at the enterprise, taking into account the characteristics of the industry. Ecological management tools in the resource-saving activity of the enterprise. The principles of sustainable development as the basis for building an environmental management system at the enterprise.

Name of the discipline	**Innovative technologies of ecological mamagement in industries/** Инновационные технологии природопользования в отраслях промышленности
The volume of the discipline*	**3 CREDIT UNITS (108 часа)**
Content of the discipline	

Topic	Sections
Economic development and environmental factors. Sustainable development. From technogenic to sustainable type of development. Use and protection of renewable natural resources. Use and protection of non-renewable natural resources. Environmental pollution Ecologization of sectors of the economy. International experience in solving environmental problems.	Stages of the work of the Club of Rome. Goals and objectives of the Stockholm Conference and the Rio de Janeiro Conference. Principles of sustainable development. National sustainable development programs. Innovative technologies for the use, protection and renewal of water, air resources, soil and biota. Innovative technologies for the use, non-renewal and protection of subsoil. Chemical, physical, biological and information pollution of the environment. Economic damage due to environmental pollution. Innovative methods of dealing with various types of pollution. The economic mechanism of ecologization of the economy. Innovative methods of environmental management in various industries. Ecologization of the economy and a way out of environmental crises. Efficiency of environmental measures. Key international environmental projects - advantages, disadvantages - efficiency.

Name of the discipline	**Assessment of innovative-investment projects effictiveness/** Оценка эффективности инновационно-инвестиционных проектов
The volume of the discipline	**3 Credit Units (108 hours)**
Content of the discipline	

Topic	Sections
Main categories of investment analysis: investments Main categories of investment analysis: project Evaluation of the effectiveness of innovation and investment projects in the rocket and space industry. Key principles and indicators The content of the economic part of the business plan of the innovation and investment project in the rocket and space industry Accounting for inflation in assessing the economic efficiency of the project. Discount rate Basic principles of building a model for evaluating economic efficiency Evaluation of the economic	Essence of investments and their economic significance. Classification of investments. Dependence of the level of risk on the innovative component of the project. Organizational and economic mechanism for the implementation of the project. Composition of design materials. Features of investment projects in the rocket and space industry. Normative documentation, its content and purpose. Efficiency. Cash flows. NPV. Net discounted income. Payback period. Profitability Index. Initial data. Capital and operating costs. income component. Nominal and real cash flows. Nominal and real discount rate. Features of determining the discount rate for innovative projects. Development of a model for evaluating economic efficiency. Leasing payments. Loan payments: differentiated and annuity.

efficiency of the project, taking into account financing	Univariate and multivariate sensitivity analysis. Qualitative risk anal Sensitivity and risk analysis in evaluating the economic efficiency of the project ysis.

Name of the discipline	**International scientific and technical cooperation** Международное научно-техническое сотрудничество
The volume of the discipline*	3 Credit Units (108 hours)
Content of the discipline	
Topic	Sections
- The current state and development trends of the Russian science - The role and place of the ISTC in the system of the state scientific and technical policy of Russia - The main goals and objectives of the ISTC of the Russian Federation - Priority directions of participation of the Russian Federation in the ISTC - Promotion and distribution results of ISTC in Russia - The main risks and ensuring the scientific and technical security of Russia in the implementation of the ISTC - Measures to promote Russian interests within the framework of the ISTC	A brief review of the main indicators of the development of the Russian science; Cross-country comparisons. The main modern problems of the Russian science, the solution of which can be facilitated by the active development of the ISTC; Ensuring Russian interests in the implementation of the ISTC. The main goals and objectives of the ISTC of the Russian Federation. Cooperation in the field of fundamental research, including participation in multilateral scientific and technical projects and programs; Cooperation in the field of applied research and commercialization of the results of intellectual activity; International exchanges of scientific information, scientists, graduate students and doctoral students; Attracting foreign investment in science and technology; Participation in the work of international organizations; Cooperation in the field of solving global problems; The role of the Russian scientific diaspora in the development of the ISTC of Russia. Promotion and dissemination of ISTC results in Russia. The main risks and ensuring the scientific and technical security of Russia in the implementation of the ISTC. Measures to promote Russian interests within the framework of the ISTC.

Name of the discipline	**Game theory/ Теория игр**
The volume of the discipline*	3 Credit Units (108 часа)
Content of the discipline	
Topic	Sections
Introduction	The concept of the game. Examples of game situations and game productions. The concept of winning and the price function. Winning games and the result on an acyclic graph. Static games: players, strategies, payments. Examples of games: "prisoner's dilemma", "family dispute", "penalty shootout".
Elements of Mathematical Programming	Tasks of mathematical programming. Linear programming. Convex programming. The concept of duality. The Kuhn-Tucker theorem. Simplex method, the concept of a basis and properties of solving a linear programming problem. The fixed point theorem.

	Computational methods of mathematical programming and game theory
Positional games	The game tree. Winning and losing positions. The existence of a winning strategy for one of the players. The game "him" and winning strategies in it.
Static games	Dominant and dominated strategies. Solving dominance games. The concept of Nash equilibrium. Properties of optimal strategies and game values. Mixed strategies. Mixed Nash equilibrium. Models of Cournot and Bertrand oligopoly. Static games with incomplete information. Bayes-Nash equilibrium.
Dynamic games	Multi-step games. Dynamic games with complete information. Dynamic games with incomplete information. Game-theoretic interpretation of probability theory. Repetitive games. Infinitely repetitive two-player zero-sum games. Blackwell's reachability theorem. Games with optimal stopping. Games of the best choice. Differential games. Differential pursuit and speed games.
Co-op games	Arbitration schemes and cooperative games. C is the kernel and the Shapley vector. Prenucleolus. Games with limited cooperation. Coalition games. Mechanisms of group selection.
Implementing Game Theory in Python	An overview of the method of implementing the main tasks and algorithms of game theory.

Name of the discipline	**Analytical support of decision making** Аналитическое обеспечение поддержки принятия решения
The volume of the discipline*	3 Credit Units (108 часа)
Content of the discipline	
Topic	Sections
Theoretical foundations for the choice of alternatives	The concept of a binary relationship. Ways to define relationships. Operations on relationships.
Selection functions	Classes of selection functions. Operations on selection functions. Dynamic selection functions
Computer Information analytical decision support	Methods of decision support based on information technology. Characteristics of the DSS, classification of the DSS, architecture of the DSS.
Acceptance procedures and algorithms Solutions	Expert decision-making procedures. Methods of processing expert information. Formation of the initial set of alternatives.
Selection task	Mathematical problem of choice. An algorithm for solving the general selection problem. Utility functions in the selection problem.
Multicriteria optimal control problems	Formulation of the control problem under many criteria and its properties. A general algorithm for solving the optimal control problem for utility functions.
Discrete multicriteria problems	A discrete-time problem. The task of independent choice. The task of designing
Applied multicriteria	Optimal management of a three-industry economy. A multi-criteria

| problems | problem of optimal sequential selection. |

Руководитель программы, доцент департамента инновационного менеджмента в отраслях промышленности

Назарова Ю.А.

| Должность, БУП | Подпись | Фамилия И.О. |