Federal State Autonomous Educational Institution Higher Education "Peoples' Friendship University of Russia named after Patrice Lumumba"

Academy of Engineering

(name of the main educational unit (MEU) – developer of the educational program of higher education)

INTERNSHIP PROGRAM

Research work (acquiring basic research skills)

(name of practice)

Educational practice

(type of practice: educational, industrial)

Recommended by the ICSC for the field of study/specialty:

27.03.04 "Control in Technical Systems"

(code and name of the training area/specialty)

Practical training of students is carried out within the framework of the implementation of the main professional educational program of higher education (EP HE):

Data Science and Space Systems / Data Science and Space Systems

(name (profile/specialization) of the educational institution of higher education)

2025

1. PURPOSE OF THE INTERNSHIP

The purpose of the educational practice "Research work (obtaining primary skills of research work)" is the deepening, systematization and consolidation of theoretical knowledge, as well as the acquisition of primary professional skills and abilities in the field of conducting scientific research in solving practical problems related to the field of information technology in the management and cybersecurity of information systems, modern programming technologies, as well as in the field of application of this toolkit forperformance of certain types of work related to future professional activities.

The main objectives of the practice “Research work (obtaining primary skills of research work)” are:

- development of general and professional competencies in students;
- search and study of literature on the courses “Computer Science and Programming” and “Theory of Automatic Control”;
- familiarization with the main stages of software development and testing;
- independent development of computer programs
- mastering the work of searching for various sources of information;
- development of practical skills of independent work, skills of independent formulation of conclusions obtained based on the results of one’s own calculations;
- development of presentation skills and protection of the results of the work performed.

2. REQUIREMENTS TO LEARNING RESULTS AFTER COMPLETING THE INTERNSHIP

Conducting educational practice "Research work (obtaining primary skills of research work)" is aimed at developing the following competencies (parts of competencies) in students:

Table 2.1. List of competencies developed in students during internship (learning outcomes based on internship results)

Cipher	Competence	Indicators of Competence Achievement (within the framework of this discipline)
UC-1	Able to search, critically analyze and synthesize information, and apply a systematic approach to solving assigned tasks.	UC-1.1. Analyzes the task, identifying its basic components; UC-1.2. Defines and ranks the information required to solve the assigned task; UC-1.3. Conducts a search for information to solve the assigned task using various types of requests; UC-1.4. Works with scientific texts, distinguishes facts from opinions, interpretations, assessments and substantiates his conclusions using the philosophical conceptual apparatus; UC-1.5. Analyzes and contextually processes information to solve assigned tasks while forming their own opinions and judgments; UC-1.6. Suggests options for solving the problem, analyzes the possible consequences of their use; UC-1.7. Analyzes ways of solving problems of worldview, moral and personal character based on the use of basic philosophical ideas and categories in their historical development and socio-cultural context.
UC-2	Able to define a range of tasks within the framework of a set	UC-2.1. Formulates a problem, the solution of which is directly related to achieving the project goal;

Cipher	Competence	Indicators of Competence Achievement (within the framework of this discipline)
	goal and select optimal ways to solve them, based on current legal regulations, available resources and limitations	UC-2.2. Defines the connections between the tasks set and the expected results of their solution; UC-2.3. Within the framework of the set tasks, determines the available resources and limitations, current legal norms; UC-2.4. Analyzes the project implementation schedule as a whole and selects the optimal way to solve the tasks set, based on current legal regulations and available resources and limitations; UC-2.5 Monitors the progress of the project, adjusts the schedule in accordance with the monitoring results.
UC-3	Able to interact socially and fulfill his/her role in a team	UC-3.1. Determines his/her role in the team based on the strategy of cooperation to achieve the set goal; UC-3.2. Formulates and takes into account in its activities the behavioral characteristics of groups of people, identified depending on the set goal; UC-3.3. Analyzes the possible consequences of personal actions and plans his actions to achieve a given result; UC-3.4. Carries out the exchange of information, knowledge and experience with team members; UC-3.5. Argues his point of view regarding the use of ideas of other team members to achieve the set goal; UC-3.6. Participates in teamwork to carry out assignments.
UC-4	Capable of interpersonal and intercultural communication interaction in Russian (as a foreign language) and foreign language(s) based on proficiency in interconnected and interdependent types of reproductive and productive foreign language speech activity, such as listening, speaking, reading, writing and translation in everyday, socio-cultural, educational and professional, official business and scientific areas of communication.	UC-4.1. Selects a style of business communication, depending on the language of communication, the purpose and conditions of the partnership; UC-4.2. Adapts speech, communication style and sign language to interaction situations; UC-4.3. Searches for the necessary information to solve standard communication tasks in Russian and foreign languages; UC-4.4. Performs translation of professional texts from a foreign language into Russian and vice versa; UC-4.5. Conducts business correspondence in Russian and foreign languages, taking into account the stylistic features of official and unofficial letters and socio-cultural differences in the format of correspondence; UC-4.6. Uses dialogue to collaborate in academic work. communication taking into account the personality of the interlocutors, their communicative-speech strategy and tactics, and the degree of formality of the situation; UC-4.7. Forms and argues his/her own assessment of the main ideas of the participants in the dialogue (discussion) in accordance with the needs of the joint activity.
UC-5	Able to perceive the intercultural diversity of society in socio-historical, ethical and philosophical contexts.	UC-5.1. Interprets the history of Russia in the context of world historical development; UC-5.2. Finds and uses information about the cultural characteristics and traditions of various social groups in social and professional communication; UC-5.3. Takes into account, in social and professional communication on a given topic, the historical heritage and socio-cultural traditions of various social groups, ethnic groups and faiths, including world religions, philosophical and ethical teachings

Cipher	Competence	Indicators of Competence Achievement (within the framework of this discipline)
		UC-5.4. Collects information on a given topic, taking into account the ethnic groups and religions most widely represented at the research sites. UC-5.5 Substantiates the specifics of project and team activities with representatives of other ethnic groups and (or) faiths UC-5.6 Adheres to the principles of non-discriminatory interaction in personal and mass communication in order to fulfill professional tasks and strengthen social integration
UC-6	Able to manage their time, build and implement a trajectory of self-development based on the principles of lifelong education	UC-6.1. Controls the amount of time spent on specific activities UC-6.2. Develops tools and methods for time management when performing specific tasks, projects, and goals UC-6.3. Analyzes his resources and their limits (personal, situational, temporary, etc.) for the successful completion of the assigned task. UC-6.4. Finds and uses sources of additional information to improve the level of general and professional knowledge UC-6.5. Analyzes the main opportunities and tools of continuous education in relation to their own interests and needs, taking into account the conditions, resources, personal capabilities, stages of career growth, time perspective of development of activities and requirements of the labor market UC-6.6. Defines the tasks of self-development, goals and priorities of professional growth UC-6.7. Distributes tasks into long-, medium- and short-term ones with justification of relevance and analysis of resources for their implementation
UC-7	Able to maintain an adequate level of physical fitness to ensure full social and professional activity	UC-7.1. Selects health-saving technologies to maintain a healthy lifestyle, taking into account the physiological characteristics of the body UC-7.2. Plans his/her working and free time for the optimal combination of physical and mental load and ensuring efficiency UC-7.3. Observes and promotes healthy lifestyle standards in various life situations and in professional activities"
UC-8	Capable of creating and maintaining safe living conditions in everyday life and professional activities to preserve the natural environment, ensure sustainable development of society, including in the event of a threat or occurrence of emergency situations and military conflicts	UC-8.1. Analyzes factors of harmful influence on the life activity of elements of the living environment (technical means, technological processes, materials, buildings and structures, natural and social phenomena) UC-8.2. Identifies hazardous and harmful factors within the framework of the task being performed UC-8.3. Identifies and eliminates problems related to safety violations in the workplace UC-8.4. Explains measures to prevent emergency situations UC-8.5. Explains the rules of conduct in the event of emergencies of natural and man-made origin, as well as in the event of military conflicts UC-8.6. Provides first aid, participates in recovery activities

Cipher	Competence	Indicators of Competence Achievement (within the framework of this discipline)
UC-9	Able to use basic defectological knowledge in social and professional spheres	UC-9.1. Has an understanding of the principles of non-discriminatory interaction in communication in various spheres of life, taking into account the socio-psychological characteristics of persons with disabilities UC-9.2. Plans and carries out professional activities with persons with disabilities or limited health capabilities UC-9.3. Interacts with persons with limited health capabilities or disabilities in the social and professional spheres
UC-10	Able to make informed economic decisions in various areas of life	UC-10.1. Understands the basic principles of the functioning of the economy and economic development, the goals of the form of state participation in the economy UC-10.2. Applies methods of personal economic and financial planning to achieve current and long-term financial goals UC-10.3. Uses financial instruments to manage personal finances (personal budget), controls own economic and financial risks
UC-11	Capable of forming an intolerant attitude towards manifestations of extremism, terrorism, corrupt behavior and counteracting them in professional activities	UC-11.1. Analyzes the current legal norms that ensure the fight against corruption in various areas of life, as well as methods of preventing corruption and forming an intolerant attitude towards it UC-11.2. Plans, organizes and conducts events that ensure the formation of a civic position and the prevention of corruption in society UC-11.3. Complies with the rules of public interaction based on compliance with current legislation and an intolerant attitude towards corruption
UC-12	Capable of: searching for the necessary sources of information and data, perceiving, analyzing, memorizing and transmitting information using digital means, as well as using algorithms when working with data obtained from various sources in order to effectively use the information obtained to solve problems; evaluating information, its reliability, building logical conclusions based on incoming information and data	UC-12.1. Searches for the necessary sources of information and data, perceives, analyzes, remembers and transmits information using digital means, as well as using algorithms when working with data obtained from various sources in order to effectively use the information obtained to solve problems UC-12.2. Conducts an assessment of information, its reliability, builds logical conclusions based on incoming information and data
GPC-1	Able to analyze the tasks of professional activity based on provisions, laws and methods in the field of natural sciences and mathematics	GPC-1.1 Possesses basic knowledge obtained in the field of mathematical and (or) natural sciences GPC-1.2 Knows how to use them in professional activities GPC-1.3 Has the skills to select methods for solving problems of professional activity based on theoretical knowledge

Cipher	Competence	Indicators of Competence Achievement (within the framework of this discipline)
GPC-2	Able to formulate tasks of professional activity based on knowledge, specialized sections of mathematical and natural science disciplines (modules)	GPC-2.1 Has mastered mathematical methods, programming fundamentals and specialized programming systems for implementing algorithms for solving applied problems GPC-2.2 Able to select and adapt mathematical methods and software to solve practical problems GPC-2.3 Possesses skills in developing and implementing algorithms for solving applied problems in the field of professional activity
GPC-3	Able to use fundamental knowledge to solve basic management problems in technical systems in order to improve in professional activities	GPC-3.1 Knows the theoretical foundations and principles of mathematical modeling GPC-3.2 Able to develop and use methods of mathematical modeling, information technologies to solve problems of applied mathematics GPC-3.3 Possesses practical skills in solving problems of applied mathematics, methods of mathematical modeling, information technologies and the basics of their use in professional activities, skills of professional thinking and an arsenal of methods and approaches necessary for the adequate use of methods of modern mathematics in theoretical and applied problems
GPC-4	Capable of assessing the effectiveness of management systems developed on the basis of mathematical methods	ORK-4.1 Knows the basic requirements of information security, existing information and communication technologies GPC-4.2 Able to solve professional tasks using information and communication technologies and taking into account the basic requirements of information security GPC-4.3 Possesses skills in using existing information technologies to solve problems of professional activity
GPC-5	Capable of solving problems of development of science, engineering and technology in the field of management in technical systems, taking into account legal regulation in the field of intellectual property	GPC-5.1 Defines goals for solving problems of development of science, engineering and technology in the field of management in technical systems GPC-5.2 Knows and uses methods to solve problems of development of science, engineering and technology in the field of management in technical systems, taking into account legal regulation in the field of intellectual property GPC-5.3 Provides solutions to problems of development of science, engineering and technology in the field of management in technical systems, taking into account legal regulation in the field of intellectual property
GPC-6	Capable of developing and using algorithms and programs, modern information technologies, methods and means of control, diagnostics and management, suitable for practical application in the field of his professional activity	GPC-6.1 Knows the basic algorithms and programs, modern information technologies, methods and means of control, diagnostics and management, suitable for practical application in the field of his professional activity GPC-6.2 Able to apply algorithms and programs, modern information technologies, methods and means of control, diagnostics and management, suitable for practical application in the field of his professional activity

Cipher	Competence	Indicators of Competence Achievement (within the framework of this discipline)
		GPC-6.3 Confidently uses algorithms andand programs, modern information technologies, methods and means of control, diagnostics and management, suitable for practical application in the field of their professional activity
PC-1	Capable of conducting computational experiments using standard software tools in order to obtain mathematical models of processes and objects of automation and control	PC-1.1 Knows standard software tools and can use them to conduct computational experiments PC-1.2 Can create mathematical models of processes and objects of automation and control using modern software PC-1.3 Proficient in the methodology of creating mathematical models of processes and objects of automation and control, as well as conducting computational experiments using standard software tools
PC-3	Capable of carrying out work on processing and analyzing information in the field of application of mathematical methods and information technologies in the field of application of remote sensing data of the Earth from space	PC-3.1 Knows the basic concepts in the field of application of mathematical methods and information technologies and application of remote sensing space systems PC-3.2 Able to solve analytical problems that offer a choice from a variety of relevant methods for solving problems, has skills in working with geographic information systems software packages PC-3.3 Possesses practical skills in solving problems related to obtaining, processing and applying remote sensing data of the Earth from space
PC-4	Able to formulate, analyze and solve engineering problems in the field of ballistics, motion mechanics and spacecraft motion control based on professional knowledge	PC-4.1 Knows the basic concepts and basic algorithms for solving problems in the field of ballistics, motion mechanics and motion control based on automated and automatic systems PC-4.2 Able to solve engineering problems of an analytical nature in the field of ballistics, motion mechanics and control of spacecraft motion based on professional knowledge PC-4.3 Has the skills to use mathematical methods for processing information obtained as a result of experimental studies, the main methods of analyzing the mechanics of motion and controlling the motion of spacecraft based on standard methods and software packages
PC-5	Capable of collecting and analyzing initial data for the calculation and design of automation and control systems and equipment	technical support for the processes of creation, improvement and maintenance of information systems for automation of organizational and production management tasks PC-5.2 Able to organize technical support for the processes of creation, improvement and maintenance of information systems that automate the tasks of organizational and production management and business processes PC-5.3 Possesses skills in organizing technical support for the processes of creation, improvement and maintenance of information systems that automate the tasks of organizational and production management and business processes

3. PLACE OF PRACTICE IN THE STRUCTURE OF THE EDUCATIONAL INSTITUTION

Educational practice "Research work (obtaining primary skills of research work)" refers to the optional component of the compulsory part of block 2 of the curriculum.

As part of the educational program of higher education, students also master disciplines and/or other practices that contribute to the achievement of planned learning outcomes following the completion of the educational practice “Research work (acquiring primary skills in research work)”.

Table 3.1. List of components of the educational program of higher education that contribute to the achievement of planned learning outcomes following the completion of the internship

Cipher	Name of competence	Previous courses/modules, practices*	Subsequent disciplines/modules, practices*
UC-1	Able to search, critically analyze and synthesize information, and apply a systematic approach to solving assigned tasks.	History of Russia / History of Russia Jurisprudence / Legal Science Philosophy / Philosophy Introduction to the Specialty / Introduction to the Specialty Business Ethics / Business Ethics Sociology / Sociology Cultural Studies	Technological Training / Technological Practice Undergraduate Training / Pre-graduation Internship State final certification
UC-2	Able to define a range of tasks within the framework of a set goal and select optimal ways to solve them, based on current legal regulations, available resources and limitations	Jurisprudence / Legal Science Fundamentals of Project Activities	Technological Training / Technological Practice Undergraduate Training / Pre-graduation Internship State final certification
UC-3	Able to interact socially and fulfill his/her role in a team	Psychology and Pedagogy / Psychology and Pedagogy Fundamentals of Project Activities	Technological Training / Technological Practice Undergraduate Training / Pre-graduation Internship State final certification
UC-4	Capable of interpersonal and intercultural communication interaction in Russian (as a foreign language) and foreign language(s) based on proficiency in interconnected and interdependent types of reproductive and productive foreign language speech activity, such as listening, speaking, reading, writing	Russian Language and Speech Culture / Russian language and speech culture Russian as a Foreign Language / Russian language (as a foreign language) Foreign Language / Foreign Language Professional Russian (as a foreign language) in professional activities	Undergraduate Training / Pre-graduation Internship State final certification

Cipher	Name of competence	Previous courses/modules, practices*	Subsequent disciplines/modules, practices*
	and translation in everyday, socio-cultural, educational and professional, official business and scientific areas of communication.	/ Russian language (as a foreign language) in professional activities Foreign Language in Professional Activities / Foreign Language in Professional Activities	
UC-5	Able to perceive the intercultural diversity of society in socio-historical, ethical and philosophical contexts.	History of Russia / History of Russia History of religions in Russia / History of religions in Russia Fundamentals of Russian Statehood / Fundamentals of Russian Statehood Philosophy / Philosophy Business Ethics / Business Ethics Sociology / Sociology Cultural Studies Political science / Political science	Undergraduate Training / Pre-graduation Internship State final certification
UC-6	Able to manage their time, build and implement a trajectory of self-development based on the principles of lifelong education	History of Russia / History of Russia Fundamentals of Engineering Economics and Management / Fundamentals of Engineering Economics and Management Psychology and Pedagogy / Psychology and Pedagogy Physical Culture / Physical Culture Introduction to the Specialty / Introduction to the Specialty Fundamentals of Project Activities	Technological Training / Technological Practice Undergraduate Training / Pre-graduation Internship State final certification
UC-7	Able to maintain an adequate level of physical fitness to ensure full social and professional activity	Basic military training. Life safety / Basics of military training. Life safety Physical Culture / Physical Culture Applied Physical Education / Applied Physical Education	Undergraduate Training / Pre-graduation Internship State final certification

Cipher	Name of competence	Previous courses/modules, practices*	Subsequent disciplines/modules, practices*
UC-8	Capable of creating and maintaining safe living conditions in everyday life and professional activities to preserve the natural environment, ensure sustainable development of society, including in the event of a threat or occurrence of emergency situations and military conflicts	Basic military training. Life safety / Basics of military training. Life safety Jurisprudence / Legal Science	Undergraduate Training / Pre-graduation Internship State final certification
UC-9	Able to use basic defectological knowledge in social and professional spheres	Basic military training. Life safety / Basics of military training. Life safety Psychology and Pedagogy / Psychology and Pedagogy Jurisprudence / Legal Science	Research Work / Research work Undergraduate Training / Pre-graduation Internship State final certification
UC-10	Able to make informed economic decisions in various areas of life	History of Russia / History of Russia Fundamentals of Engineering Economics and Management / Fundamentals of Engineering Economics and Management Jurisprudence / Legal Science	Undergraduate Training / Pre-graduation Internship State final certification
UC-11	Capable of forming an intolerant attitude towards manifestations of extremism, terrorism, corrupt behavior and counteracting them in professional activities	Jurisprudence / Legal Science Fundamentals of Artificial Intelligence / Fundamentals of Artificial Intelligence	Undergraduate Training / Pre-graduation Internship State final certification
UC-12	Capable of: searching for the necessary sources of information and data, perceiving, analyzing, memorizing and transmitting information using digital means, as well as using algorithms when working with data obtained from various sources in order to effectively use the	Analysis of Geoinformation Data / Analysis of Geoinformation Data Automatic Control Theory Optimal Control Methods / Methods of optimal control Fundamentals of information security and	Research Work / Research work Technological Training / Technological Practice Undergraduate Training / Pre-graduation Internship State final certification

Cipher	Name of competence	Previous courses/modules, practices*	Subsequent disciplines/modules, practices*
	information obtained to solve problems; evaluating information, its reliability, building logical conclusions based on incoming information and data	cyber resilience / Fundamentals of information security and cyber resilience Fundamentals of Information Security and Cyber Resilience	
GPC-1	Able to analyze the tasks of professional activity based on provisions, laws and methods in the field of natural sciences and mathematics	Mathematical Analysis / Mathematical Analysis Algebra and Geometry / Algebra and Geometry Physics / Physics Complex Analysis Space Flight Mechanics / Space Flight Mechanics	Research Work / Research work Technological Training / Technological Practice Undergraduate Training / Pre-graduation Internship State final certification
GPC-2	Able to formulate tasks of professional activity based on knowledge, specialized sections of mathematical and natural science disciplines (modules)	Mathematical Analysis / Mathematical Analysis Algebra and Geometry / Algebra and Geometry Equations of Mathematical Physics / Equations of Mathematical Physics Space Flight Mechanics / Space Flight Mechanics Analysis of Geoinformation Data / Analysis of Geoinformation Data Numerical Methods / Numerical Methods Automatic Control Theory	Research Work / Research work Technological Training / Technological Practice Undergraduate Training / Pre-graduation Internship State final certification
GPC-3	Able to use fundamental knowledge to solve basic management problems in technical systems in order to improve in professional activities	Mathematical Analysis / Mathematical Analysis Algebra and Geometry / Algebra and Geometry Theory of Probability and Mathematical Statistics Differential Equations / Differential Equations Complex Analysis Equations of Mathematical Physics / Equations of Mathematical Physics Theoretical Mechanics / Theoretical Mechanics	Technological Training / Technological Practice Undergraduate Training / Pre-graduation Internship State final certification

Cipher	Name of competence	Previous courses/modules, practices*	Subsequent disciplines/modules, practices*
		Space Flight Mechanics / Space Flight Mechanics Analysis of Geoinformation Data / Analysis of Geoinformation Data Numerical Methods / Numerical Methods Automatic Control Theory Optimal Control Methods / Methods of optimal control	
GPC-4	Capable of assessing the effectiveness of management systems developed on the basis of mathematical methods	Differential Equations / Differential Equations Analysis of Geoinformation Data / Analysis of Geoinformation Data	Technological Training / Technological Practice Undergraduate Training / Pre-graduation Internship State final certification
GPC-5	Capable of solving problems of development of science, engineering and technology in the field of management in technical systems, taking into account legal regulation in the field of intellectual property	Fundamentals of Artificial Intelligence / Fundamentals of Artificial Intelligence Theoretical Mechanics / Theoretical Mechanics Analysis of Geoinformation Data / Analysis of Geoinformation Data Automatic Control Theory	Technological Training / Technological Practice Undergraduate Training / Pre-graduation Internship State final certification
GPC-6	Capable of developing and using algorithms and programs, modern information technologies, methods and means of control, diagnostics and management, suitable for practical application in the field of his professional activity	Computer Science and Programming / Computer Science and Programming Space Flight Mechanics / Space Flight Mechanics Automatic Control Theory	Undergraduate Training / Pre-graduation Internship State final certification
PC-1	Capable of conducting computational experiments using standard software tools in order to obtain mathematical models of processes and objects of automation and control	Computer Science and Programming / Computer Science and Programming Space Flight Mechanics / Space Flight Mechanics Analysis of Geoinformation Data /	Technological Training / Technological Practice Undergraduate Training / Pre-graduation Internship State final certification

Cipher	Name of competence	Previous courses/modules, practices*	Subsequent disciplines/modules, practices*
		Analysis of Geoinformation Data Numerical Methods / Numerical Methods Automatic Control Theory Optimal Control Methods / Methods of optimal control Discrete Mathematics / Discrete Mathematics Discrete Mathematics Virtual and Augmented Reality Technology / Virtual and Augmented Reality Technologies Virtual and augmented reality technologies	
PC-3	Capable of carrying out work on processing and analyzing information in the field of application of mathematical methods and information technologies in the field of application of remote sensing data of the Earth from space	Analysis of Geoinformation Data / Analysis of Geoinformation Data	Technological Training / Technological Practice Undergraduate Training / Pre-graduation Internship State final certification
PC-4	Able to formulate, analyze and solve engineering problems in the field of ballistics, motion mechanics and spacecraft motion control based on professional knowledge	Theoretical Mechanics / Theoretical Mechanics Space Flight Mechanics / Space Flight Mechanics Optimal Control Methods / Methods of optimal control	Technological Training / Technological Practice Undergraduate Training / Pre-graduation Internship State final certification
PC-5	Capable of collecting and analyzing initial data for the calculation and design of automation and control systems and equipment	Analysis of Geoinformation Data / Analysis of Geoinformation Data Fundamentals of information security and cyber resilience / Fundamentals of information security and cyber resilience Fundamentals of Information Security and Cyber Resilience Virtual and Augmented Reality Technology /	Research Work / Research Work Technological Training / Technological Practice Undergraduate Training / Pre-graduation Internship State final certification

Cipher	Name of competence	Previous courses/modules, practices*	Subsequent disciplines/modules, practices*
		Virtual and Augmented Reality Technologies Virtual and augmented reality technologies	

* - filled in in accordance with the competency matrix and the SUP OP VO

4. SCOPE OF THE INTERNSHIP

Total labor intensity of the educational practice "Research work" is 3 credit units (108 academic hours).

5. CONTENT THE INTERNSHIP

*Table 5.1. Contents of practice**

Name of the practice section	Section content (topics, types of practical activities)	Labor intensity,ac.h.
Section 1. Organizational and preparatory.	Receiving an individual assignment for practice from the supervisor	2
	Safety training at the workplace (in the laboratory and/or in production)	2
Section 2. Research	Completing scientific assignments	34
	Carrying out the instructions of the internship supervisor, collecting and systematizing the material necessary to complete an individual assignment, preparing and filing a report on the internship.	34
	Ongoing monitoring of the internship by the supervisor	9
	Keeping a diary of your internship	9
Preparation of the internship report		9
Preparation for defense and defense of the internship report		9
	TOTAL:	**108**

* - the content of the practice by sections and types of practical training is FULLY reflected in the student's practice report.

6. MATERIALLY-TECHNICAL SUPPORT FOR CONDUCTING PRACTICE

Scientific and educational laboratories of the Department of Mechanics and Control Processes, where students undergo practical training:

Audience with a list of logistical supplies	Location
"RUDN Flight Control Center": Set of specialized furniture; technical equipment: PC "Khoper" (4 pcs.), monitor 23.6 Viewsonic VG2433-LED (4 pcs.), projection screen Projecta Home Screen 316x416, LCD panel Philips 52 model BDL5231V/100, LCD panel for creating a video wall Orion OLM-4611 (1 pc.), LCD panel for creating a video wall Orion OLM-4611 (8 pcs.), acoustic system Bose Companion (1 pc.), interactive system 3D-Pointer, computer MEIJIN, personal computer (system unit Esprimo NYK3F0012776, monitor YEFQ614055), personal computer (system	Moscow, MiklUCho-Maklaya st., 6.

unit Esprimo NYK3F0012794, monitor YEFQ614089), personal computer (system unit Esprimo YK1M001806, mon. YESV030505), personal computer (Esprimo system unit YKQBO48715, mon. YE7J36089), personal computer (Esprimo system unit YL6K005094, mon. YV1PQ13636), personal computer (Esprimo system unit YL6K005288, mon. YV2L010546). There is Internet access.	

7. METHOD OF CONDUCTING PRACTICE

The educational practice “Research work (obtaining primary skills in research work)” can be carried out both in RUDN structural divisions or in Moscow organizations (stationary), and at bases located outside of Moscow (visiting).

Conducting an internship at an external organization (outside RUDN) is carried out on the basis of a relevant agreement, which specifies the terms, place and conditions for conducting the internship at the base organization.

The terms of the internship correspond to the period specified in the academic calendar of the EP VO. The terms of the internship may be adjusted upon agreement with the Educational Policy Department and the Department of Organization of Internships and Employment of Students at RUDN.

8. EDUCATIONAL, METHODOLOGICAL AND INFORMATIONAL SUPPORT FOR PRACTICE

Main literature:

1. Nefedov V.N., Osipova V.A. Course of discrete mathematics: Textbook. – M.: MAI Publishing House, 1992.

2. Kuznetsov O.P., Adelson-Velsky G.M. Discrete Mathematics for an Engineer. – M.: Energoatomizdat, 1988.

3. Gurov V.V., ChUCanov V.O. Fundamentals of the theory and organization of computers - Internet University of Information Technologies - INTUIT.ru ", 2006 - 280 p.

4. Cormen Thomas H., Leiserson Charles I., Rivest Ronald L., Stein Clifford Algorithms. Construction and Analysis, 2nd edition – Moscow: Williams Publishing House, 2007. - 1296 p.

5. Knuth Donald E. The Art of Computer Programming in 3 volumes – M.: Williams Publishing House, 2008. – T.1 – 720, T.2 – 832 p., T.3 - 824 p.

6. Aho Alfred V., HGPCroft John, Ullman Jeffrey D., Data structures and algorithms - – M.: Williams Publishing House, 2000. – 384 p.

7. MalyUC A.A., Pazizin S.V., Pogozhin N.S. Introduction to information security in automated systems – M.: Goryachaya Liniya-Telecom, 2001, 148 p.

8. Belov E.B., Los V.P., Meshcheryakov R.V., Shelupanov A.A. Fundamentals of information security. Textbook for universities, Moscow: Hotline – Telecom, 2006. - 544 p.

9. Tikhonov V.A., Reich V.V. Information security: conceptual, legal, organizational and technical aspects: textbook. - M .: Helios ARV, 2006.- 528 p.

Further reading:

1. Informatics. Basic course. Simonovich S.V., St. Petersburg: Peter, 2011 – 640 pp.;
2. Python for Kids. Self-study Guide to Programming. Briggs D., M.: "Mann, Ivanov and Ferber", 2017 - 321 p.;
3. Programming in examples and problems. T.Yu. Gratsianova, M.: Laboratory of Knowledge, 2016 – 368 pp.;
4. Programming in examples and problems. T.Yu. Gratsianova, M.: Laboratory of Knowledge,

2016 – 368 pp.;
5. Moore T., Pym D., Ioannidis C., Economics of Information Security and Privacy, Springer, 2010, - 320 pp.
6. Ensuring information security of business, Edited by Kurilo A.P., Alpina Publishers, 2011, - 392 p. Demidovich, E.M. Fundamentals of algorithmization and programming. Language SI: Tutorial. SPb: BHV-Petersburg, 2006. - 438 p.
7. Samarsky A.A. Introduction to numerical methods. – M.: NaUCa, 1997.
8. Voevodin V.V., Kuznetsov Yu.A. Matrices and calculations. – M.: NaUCa, 1984.
9. Ortega J., Poole W. Introduction to Numerical Methods for Solving Differential Equations. – Moscow: NaUCa, 1986.
10. Schildt, G. Complete reference book on C, 4th edition: - M.: Williams Publishing House, 2005. - 704 p.

Periodicals:

Domestic journals: Automation and Remote Control; Sensors and Systems; News of Higher Educational Institutions. Instrument Making; News of Higher Educational Institutions. Applied Nonlinear Dynamics; News of Higher Educational Institutions. Power Engineering Problems; News of the Russian Academy of Sciences. Control Theory and Systems; Information Measuring and Control Systems; Information Technology; Mathematical Modeling; Mechatronics. Automation. Control; Nonlinear World; Review of Applied and Industrial Mathematics; Devices and Systems: “Control, Monitoring, Diagnostics”; Applied Mathematics and Mechanics; Forecasting Problems; Problems of Control Theory and Practice; Control Problems; Control Systems and Information Technology; Digital Signal Processing; Open Systems; Neurocomputers: Development, Application.

Resources of the information and telecommunications network "Internet":

1) Electronic library system (ELS) of RUDN and third-party ELS, to which the university students have access on the basis of concluded agreements:

– EBS RUDNhttp://lib.rudn.ru/MegaPro/Web
– Electronic library system "University Library Online"http://www.biblioclub.ru
– EBS "Yurait"http://www.biblio-online.ru
– Electronic Library System "Student Consultant" www.studentlibrary.ru
– EBS "Lan"http://e.lanbook.com/
– EBS "Troitsky Bridge"

2) Databases and search engines:

– electronic fund of legal and normative-technical documentationhttp://docs.cntd.ru/
– Yandex search enginehttps://www.yandex.ru/
– Google search enginehttps://www.google.ru/
– SCOPUS abstract databasehttp://www.elsevierscience.ru/products/scopus/

Software:

*1.*Specialized software for conducting practical training and generating reporting documentation for students:

- MATLAB

- Geoinformation system QGIS 3.4 64 bit and a set of modules for it (freely distributed under the GNU General Public License version 2 (GNU GPL 2));

- Python programming language and development environment (freely distributed under the Python Software Foundation License);

- Borland Developer Studio 2006 (License Certificate Number: 33080, 33081, 33082)

Educational-methodological materials for completing the internship, filling out the diary and preparing the internship report:*

1) Rules for safe working conditions and fire safety during the training practice "Research work (obtaining primary skills in research work)" (primary briefing).

2) General structure and operating principle of technological production equipment used by students during their internship; process maps and regulations, etc. (if necessary).

3) Methodological instructions for students to fill out a diary and prepare a practice report.

* - all educational and methodological materials for completing the internship are posted in accordance with the current procedure on the internship page in TUIS

9. EVALUATIONMATERIALS AND SCORE-RATING SYSTEM FOR ASSESSING THE LEVEL OF COMPETENCE DEVELOPMENT BASED ON THE RESULTS OF PRACTICE

Assessment materials and a scoring and rating system* for assessing the level of development of competencies (part of competencies) based on the results of passingeducational practice “Research work (obtaining primary skills of research work)” are presented in the Appendix to this Practice Program (module).

* - OM and BRS are formed on the basis of the requirements of the relevant local regulatory act of RUDN (regulations/procedures).

DEVELOPERS:

Associate Professor of the Department of Mechanics and Control Processes		Saltykova O.A.
Position, Department	Signature	Surname I.O.
Associate Professor of the Department of Mechanics and Control Processes		Varfolomeev A.A.
Position, Department	Signature	Surname I.O.

HEAD OF THE DEPARTMENT:

Head of the Department of Mechanics and Control Processes		Razumny Yu.N.
Name of the Department	Signature	Surname I.O.

HEAD OF THE EP HE:

Professor of the Department of Mechanics and Control Processes		Razumny Yu.N.
Position, Department	Signature	Surname I.O.