Approved by the decision
of the MIPT Academic Council
dated May 26, 2022
(protocol No. 02/05/2022)

Federal State Autonomous Educational Institution of Higher Education "Moscow Institute of Physics and Technology (National Research University)"

THE MAIN EDUCATIONAL PROGRAM OF HIGHER EDUCATION

Level of higher education
MASTER

Domain of study
12.04.03 PHOTONICS AND OPTICAL INFORMATICS

Orientation (specialty)
PHOTONICS, QUANTUM TECHNOLOGIES & 2D MATERIALS/ФОТОНИКА, КВАНТОВЫЕ ТЕХНОЛОГИИ И ДВУМЕРНЫЕ МАТЕРИАЛЫ

Starting year of the educational program
2022 y.

Update of the educational program:
решение Ученого совета МФТИ dated June 29, 2023 (protocol No. 01/06/2023)

The main educational program of higher education in the field domain of study 12.04.03 Photonics and Optical Informatics, orientation (specialty) Photonics, Quantum Technologies & 2D Materials/Фотоника, квантовые технологии и двумерные материалы, implemented at MIPT, is a set of basic characteristics of education (volume, content, planned results), organizational and pedagogical conditions, forms of certification, which is presented as a general characteristic of the educational program, curriculum, academic calendar schedule, work programs of disciplines (modules), training programs, evaluation and methodological materials. The main educational program of higher education has been created on the basis of the educational standard domain of study 12.04.03 Photonics and Optical Informatics, independently developed and approved by MIPT.

1. General characteristics of the educational program

Qualifications awarded to graduate: master.

Form of education: full-time

Education period: 2 years.

The educational program consists of: 120 credits and includes all types of student's classroom and independent work, training, time, allotted for quality control of the mastering of the educational program by the student.

The contact work of students with teachers consists of, at least, 817 hours.

Program implementation language: english.

Using a network form of educational program implementation: yes.

Program goal:

The program is aimed at training high professionals capable of making scientific discoveries at the most advanced frontiers of physics and High-Tech. Students and graduates are aimed at studying problems of the global scientific agenda in conditions of fierce competition and international integration on the horizon of knowledge of physical laws in the field of active plasmonics, optoelectronics of two-dimensional materials and quantum optoelectronics. Graduates continue their HhD and research careers either at MIPT or at other world-leading universities.

The educational program is implemented in a network form together with the Faculty of Science and Technology of the University of Twente.

2. Characteristics of the professional activity of graduates:

Fields of professional activity and areas of professional activity,

in which graduates, who have mastered the master's program, can carry out professional activities:

06 Communications, information and communication technologies (in the field of development of fundamental mathematical and physical foundations of communication and information and communication technologies, innovative and experimental design developments);

29 Production of electrical equipment, electronic and optical equipment (in the field of fundamental and applied research and innovative developments in the field of optics, physical and quantum electronics, modern laser, opto- and nanotechnology, including ultra-high resolution optical microscopy);

40 Cross-cutting types of professional activity in manufacturing (in the field of fundamental and applied research, innovation and development design, as well as in the development and implementation of new technological processes for the production of promising materials (including composites, nano- and metamaterials), opto -, micro- and nanoelectronics, development and application of electronic devices and complexes, as well as in the field of monitoring the parameters of materials, the state of complex technical and living systems and the state of the environment, including development and application to solve tasks).

Graduates can carry out professional activities in other fields of professional activity and (or) areas of professional activity, provided that their level of education and acquired competencies meet the requirements of the employee's qualification.

Types of tasks of professional activity of graduates:

research.

Tasks of professional activity of graduates:

planning and conducting scientific work and analytical research in accordance with the approved direction of research in the subject area of specialization;

planning and independent conduct of observations and measurements, planning, setting up and optimizing experiments in the subject area of research, selection of effective data processing methods and their implementation;

definition of promising directions of scientific research and information sources for analytical search in the subject area chosen for specialization, effective collection and processing of scientific and analytical information using modern programs, tools and methods of computer and information technologies and computational mathematics;

planning and conducting theoretical research, development of new physical and mathematical, including computer, models of the processes and phenomena under study, analysis and synthesis of analytical research data in the subject area;

consolidation of the obtained data, independent formation of conclusions and preparation of scientific and analytical reports, publications and presentations of the results of scientific and analytical research, qualified transfer of the results of scientific and analytical research to related subject areas;

planning and development of new methods and technical means for fundamental research and innovative developments;

planning and development of new algorithms and computer programs for research and applied purposes.

Objects of professional activity of graduates, mastered the program Master's:

optical and quantum computing systems and optical computers;

устройства и системы компьютерной фотоники;

devices and systems based on coherent optics and holography;

fundamental, applied research and development designs in the field of photonics;

element base, systems and technologies of integrated, fiber and gradient optics, as well as micro-optics;

element base, systems, materials, methods and technologies providing optical transmission, reception, processing, recording and storage of information.

3. List of professional standard, corresponding to the professional activities of graduates:

40.011 Research and Development Specialist;

40.008 Specialist in the organization and management of research and development work;

29.004 Specialist in the field of design and maintenance of the production of optotechnics, optical and optoelectronic devices and sestems;

06.054 Research and development specialist in the field of electronic communications.

Code and name of the professional standard	Generalized labor functions			Labor functions		
	code	name	level of qualification	name	code	level of qualification
40.011 Professional standard "Research and Development Specialist"	B	Conducting research and development in the study of independent topics	6	Leading a group of workers in the study of independent topics	B/03.6	6
				Conducting work on the processing and analysis of scientific and technical information and research results	B/02.6	6
	C	Conducting R&D work on the subject of the organization	6	Implementation of scientific management of research on individual tasks	C/01.6	6
				Management of the results of R&D work	C/02.6	6
	D	Implementation of scientific leadership in the relevant field of knowledge	7	Formation of new areas of R&D work	D/01.7	7
				Coordination of the activities of co-executors involved in the performance of work with other organizations	D/03.7	7
				Defining the scope of application of the results of R&D work	D/04.7	7
40.008 Professional standard "Specialist in the organization and management of research and development work"	B	Organization of work on the implementation of R&D work	6	Organization of the implementation of research work on the problems provided for by the thematic plan of the sector (laboratory)	B/01.6	6
				Resource management of the relevant structural unit of the organization	B/02.6	6
				Organization of analysis and optimization of life cycle management processes for R&D work	B/03.6	6

29.004 Professional standard "Specialist in the field of design and maintenance of the production of optotechnics, optical and optoelectronic devices and sestems"	C	Scientific research in the field of optical instrumentation, optical materials and technologies	7	Analysis of scientific and technical information on the development of optotechnics, optical and optoelectronic devices and complexes	C/01.7	7
				Simulation of optoelectronic devices operation based on physical processes and phenomena	C/02.7	7
				Experimental research for the creation of new optotechnics, optical and optoelectronic devices and complexes	C/03.7	7
				Development of competitive technologies for obtaining, storing and processing information using optical and optoelectronic devices and systems	C/04.7	7
				Development of new technologies for the production of optotechnics, optical and optoelectronic devices and complexes	C/05.7	7
06.054 Professional standard "Research and development specialist in the field of electronic communications"						

4. Requirements for the results of mastering the educational program

As a result of mastering the main educational program, the graduate should form universal, general professional and professional competencies.

Universal competencies of graduates and indicators of their achievement:

Code and name of competence	Code and name of the indicator of competence achievement

UC-1 Use a systematic approach to critically analyze a problem and develop an action plan	UC-1.1 Systematically analyze the problem situation, identify its components and the relations between them UC-1.2 Search for solutions by using available sources UC-1.3 Develop a step-by-step strategy for achieving a goal, foresee the result of each step, evaluate the overall impact on the planned activity and its participants
UC-2 Manage all stages of a research project	UC-2.1 Set an objective within a defined scientific problem; formulate the agenda, relevance, significance (scientific, practical, methodological, or other depending on the project type), forecast the expected results and possible areas of their application UC-2.2 Forecast the project outcomes, plan necessary steps to achieve the outcomes, chart the project schedule and monitoring plan UC-2.3 Organize and coordinate the work of project stakeholders, provide the team with necessary resources UC-2.4 Publicly present the project results (or results of its stages) via reports, articles, presentations at scientific conferences, seminars, and similar events
UC-3 Organize and manage a team and develop the team strategy to achieve the objectives	UC-3.1 Organize and coordinate the work of the project stakeholders and help resolve disputes and conflicts UC-3.2 Consider the interests, specific behavior, and diversity of opinions of team members/colleagues/counterparties UC-3.3 Foresee the results (consequences) of both individual and collective actions UC-3.4 Plan teamwork, distribute tasks to team members, hold discussions of different ideas and opinions
UC-4 Use modern communication tools in the academic and professional fields, including those in a foreign language	UC-4.1 Exchange business information in oral and written forms in Russian and at least one foreign language UC-4.2 Use the acquired skills to write, translate, and edit various academic texts (abstracts, essays, reviews, articles, etc.) UC-4.3 Present the results of academic and professional activities in various academic events, including international conferences UC-4.4 Use modern ICT tools for academic and professional collaboration
UC-5 Analyze and consider cultural diversity in intercultural interactions	UC-5.1 Identify specific philosophical and scientific traditions in major world cultures UC-5.2 Define the theoretical and practical significance of cultural and linguistic factors within various interrelated philosophical and scientific traditions
UC-6 Determine priorities and ways to improve performance through self-assessment	UC-6.1 Achieve personal growth and professional development, determine priorities and ways to improve performance UC-6.2 Evaluate performance results in correlation with the set objectives and applied methods

General professional competencies of graduates and indicators of their achievement:

Code and name of competence	Code and name of the indicator of competence achievement
Gen.Pro.C-1 Gain fundamental scientific knowledge in the field of physical and mathematical sciences	Gen.Pro.C-1.1 Apply fundamental scientific knowledge in the field of physical and mathematical sciences Gen.Pro.C-1.2 Able to summarise and critically evaluate experiences and research results in the field of photonics and opto-informatics Gen.Pro.C-1.3 Understands the interdisciplinary links in mathematics and physics and is able to apply them to problems in photonics and opto-informatics
Gen.Pro.C-2 Acquire an understanding of current scientific and technological challenges in professional settings, and scientifically formulate professional objectives	Gen.Pro.C-2.1 Has an understanding of the current state of research in photonics and opto-informatics Gen.Pro.C-2.2 Assess the relevance and practical importance of research in professional settings Gen.Pro.C-2.3 Understand professional terminology used in modern scientific and technical literature and present scientific results in oral and written form within professional communication

Gen.Pro.C-3 Select and/or develop approaches to professional problem-solving with consideration to the limitations and specifics of different solution methods	Gen.Pro.C-3.1 Analyze problems, plan research strategy to achieve solution(s), propose, and combine solution approaches Gen.Pro.C-3.2 Employ research methods to solve new problems, and apply knowledge from various fields of science (technology) Gen.Pro.C-3.3 Gain knowledge of analytical and computational methods of problem-solving, understand the limitations for applying the obtained solutions in practice
Gen.Pro.C-4 Successfully perform a task, analyze the results and present conclusions, apply knowledge and skills in the field of physical and mathematical sciences and ICTs	Gen.Pro.C-4.1 Apply ICT knowledge and skills to find and study scientific literature and use software products Gen.Pro.C-4.2 Apply knowledge in the field of physical and mathematical sciences to solve problems, make conclusions, and evaluate the obtained results Gen.Pro.C-4.3 Justify the chosen method of scientific research
Gen.Pro.C-5 Undertake professional training, achieve professional growth, and become a team leader in a professional sphere, tolerant of social, ethnic, religious and cultural differences	Gen.Pro.C-5.1 Tolerate social, ethnic, religious, and cultural differences in teamwork Gen.Pro.C-5.2 Manage a small professional team Gen.Pro.C-5.3 Apply new knowledge and achieve personal and professional growth

Professional competencies of graduates and indicators of their achievement:

Code and name of competence	Code and name of the indicator of competence achievement	Basis (professional standarts, analysis of other requirements for graduates)
type of professional activity tasks: research		
Pro.C-1 Assign, formalize, and solve tasks, develop and research mathematical models of the studied phenomena and processes, systematically analyze scientific problems and obtain new scientific results	Pro.C-1.1 Locate, analyze, and summarize information on current research findings within a selected subject field Pro.C-1.2 Make hypotheses, build mathematical models of the studied phenomena and processes, evaluate the quality of the developed model Pro.C-1.3 Able to apply theoretical and/or experimental research methods in photonics and opto-informatics to a specific scientific problem and interpret the results obtained	Specialist in research and development, Specialist in organization and management of research and development, Specialist in design and production support of optotechnics, optical and optoelectronic devices and complexes, Specialist in research and development in the field of quantum communications.
Pro.C-2 Organize and conduct scientific research and testing independently or as a member (leader) of a small research team	Pro.C-2.1 Able to plan and carry out research in photonics and opto-informatics independently or as part of a research team Pro.C-2.2 Conduct tests of research results through scientific publications and participation in conferences	Specialist in research and development, Specialist in organization and management of research and development, Specialist in design and production support of optotechnics, optical and optoelectronic devices and complexes, Specialist in research and development in the field of quantum communications.

Pro.C-3 Professionally use research and testing equipment (devices and installations, specialized software) in a selected subject field	Pro.C-3.1 Understand the operating principles of the equipment and specialized software Pro.C-3.2 Conduct an experiment (simulation), using research equipment (software) Pro.C-3.3 Evaluate the accuracy of the experimental (numerical) results	Specialist in research and development, Specialist in organization and management of research and development, Specialist in design and production support of optotechnics, optical and optoelectronic devices and complexes, Specialist in research and development in the field of quantum communications.

5. Curriculum

The curriculum (Appendix 1) determines the list, labor input, sequence and distribution by periods of study of academic disciplines (modules), trainings, other types of educational activities, forms of intermediate and final certification of students. The labor input of the educational program is set in credit units.

The volume of compulsory part, excluding the volume of the state final attestation, is 71,67 persents percent of the total volume of the program.

The matrix of compliance of competencies with the disciplines of the curriculum is given in Appendix 2.

6. Academic calendar schedule

Academic calendar schedule (Appendix 3) shows the distribution of types of educational activities, periods of attestation of students and vacations by year of study (courses) and within each academic year. The academic calendar schedule of the educational program of higher education includes 97 weeks, of which there are 58 4/6 weeks of theoretical and practical training, 18 3/6 weeks of the credit-examination period, 3 1/6weeks of the state final certification and 16 4/6 weeks of holidays.

7. Work programs of disciplines (modules)

Work programs of disciplines (modules), including evaluation materials for ongoing monitoring of progress and intermediate certification, are presented in Appendix 4.

8. Practice programs

The educational program provides for the following trainings:

Personal Research Project/Научно-исследовательская работа: practical training.

Work programs of trainings, including assessment materials for ongoing monitoring of progress and intermediate certification are presented in Appendix 5.

9. Program of the state final certification

As part of the state final certification, the following are provided:

Performance of and Defence of Graduation Thesis/Выполнение и защита выпускной квалификационной работы.

The program of the state final certification (Appendix 6) includes requirements for final qualifying works (volume, structure, design, presentation), the procedure for their implementation, the procedure for defending the final qualifying work, criteria for evaluating the results.

10. Material and technical, educational and methodological support of the educational program

Work programs of disciplines (modules), trainings determine the material and technical, educational and methodological support of the educational program, including a list of licensed and freely distributed software, a list of electronic educational publications and (or) printed publications, electronic educational

resources, a list and composition of modern professional databases and information reference systems.
Classrooms for conducting learning sessions provided for by the educational program feature equipment and technical teaching aids, the composition of which is determined in the work programs of disciplines (modules) and trainings.

Premises for independent work of students are equipped with computers with Internet connection and are provided with access to the electronic information and educational environment of MIPT.

The MIPT electronic information and educational environment provides access to:

- Electronic library system (hereinafter – ELS):

Golden Fund of Scientific Classics ELS
University Online Library;
Book on Lime of University's Book House publishing house;
Doe publishing house ELS;
Urait publishing house ELS;
IBooks.ru publishing house ELS;
Information system "National Electronic Library" (NEL);
LLC Publishing House Fizmatkniga;
Znanium ELS;
books.mipt.ru ELS;
Litsenziat ELS;
Knowledge Lab ELS;

- international scientific journals and electronic databases:

ELS Doe Database
SPIE journals;
The Cambridge Crystallographic Data Centre Database;
Elsevier database;
Web of Science database;
abstract and scientometric database (citation index) Scopus;
American Chemical Society journals;
American Institute of Physics journals;
Optical Society of America database;
The Royal Society of Chemistry journals;
Sage Publications journals;
Taylor & Francis Group journals;
WILEY journals;
American Physical Society journals;
Cambridge University Press publishing house journals;
Institute of Electrical and Electronics Engineers database;
Institute of Physics journals;
MathSciNet abstract database;
Oxford University Press journals;
American Association for the Advancement of Science — AAAS journal;
Springer Nature E-Books database;
Questel patents database;
Annual Reviews journals.

The logistical and technical, educational and methodological support of disciplines (modules) and practices is determined by the specific features of the corresponding disciplines (modules) and includes publicly available and specialized software, access to professional databases, electronic and printed literature sources and other educational resources listed in the work programs of the disciplines. These resources are publicly available or provided by the institute and the base organizations.

11.Features of the educational program implementation for the disabled and persons with special needs

If there are persons with disabilities or persons with special needs among students, the educational program is adapted taking into account the special educational needs of such students.

When teaching according to an individual curriculum for people with disabilities, the period for mastering the educational program can be extended at their request by no more than one year compared to the period for obtaining education for the corresponding form of education.

12. Staff conditions for the implementation of the educational program

Leading Russian and foreign scientists are involved in the lectures including experts in the field of physics and technology of two-dimensional materials, photonics and applied quantum technologies from the Center for Photonics and Two-dimensional Materials of MIPT, as well as employees of the Russian Quantum Center. Some of the classes are held online.

The share of scientific and pedagogical staff (in teaching loads reduced to integer values) with an education corresponding to the profile of the discipline (module) being taught, in the total number of scientific and pedagogical staff implementing the Master's program is more than 70 persents.

The share of scientific and pedagogical staff (in teaching loads reduced to integer values) who have an academic degree (including an academic degree awarded abroad and recognized in the Russian Federation) and (or) an academic title (including an academic title obtained abroad and recognized in the Russian Federation), in the total number of scientific and pedagogical staff implementing the Master's program, is more than 60 persents.

The share of scientific and pedagogical staff (in teaching loads reduced to integer values) from the number of managers and employees whose activities are related to the orientation (specialty) of the ongoing Master's program (having work experience in this professional field for more than 3 years) in the total number of employees implementing the master's program is more than 5 persents.

The general management of the scientific content of the master's program is carried out by the Doctor of Physics and Mathematical Sciences, Kolachevskiy Nikolay Nikolaevich, who carries out independent research projects and participates in the implementation of such projects in the field of study, who has annual publications based on the results of this research activity in leading Russian and international peer-reviewed scientific journals and publications, as well as carrying out annual approbation of the results of this research activity at national and international conferences.

Nikolay Nikolaevich Kolachevsky, Corresponding Member of the Russian Academy of Sciences, Doctor of Physics and Mathematics.

Place of work and position: The Lebedev Physical Institute of the Russian Academy of Sciences (LPI), Director (since 2015).

Education – MIPT (Department of General and Applied Physics, 1994), diploma qualification "Engineer-physicist", specialty "Automation and electronics", training area "Applied Mathematics and Physics"

Academic degree – Doctor of Sciences in Physical and Mathematical Sciences ("Coherent laser spectroscopy of hydrogen and rubidium atoms")

Academic title – Professor (according to the Department No. 78 of the NRNU MEPhI – "Physical and technical problems of metrology")

Honorary title – Corresponding Member of the Russian Academy of Sciences (Specialist in the field of precision laser spectroscopy, X-ray, nonlinear and quantum optics, laser cooling.)

The type of activity of the institution is a wide range of research topics covering almost all areas of modern physics.

Area of scientific interests:

Precise frequency measurements, ultra-high resolution spectroscopy, ultra-stable lasers, optical clocks, laser cooling, research of exotic atoms (antihydrogen), measurements of fundamental constants, experimental testing of fundamental theories.

Publications:
author of 192 publications indexed in WOS (Researcher ID: D-2448-2013), including collective monographs. Scientific editor and translator of the monograph “Frequency Standards. Principles and Applications” (Fizmatlit, 2006). More than 20 invited talks at conferences. Awards, grants, projects: three times winner of the competition for outstanding young scientists – candidates and doctors of sciences of the President of the Russian Federation. Fellow of the Alexander von Humboldt Foundation, Max Planck Society. Head of grants of the RFBR, the German Physical Society, projects of the Russian Academy of Sciences. Since 2012 Head and responsible executor of contracts (R&D, ROC) within the framework of the Federal Target Program “GLONASS 2012-2020”, member of the GBAR collaboration (CERN), head of the joint laboratory of LPI and Russian Quantum Center (Skolkovo).
Teaching activities:
Scientific supervisor of students and postgraduates (Lebedev Physical Institute), teaching of courses of lectures on modern fields of quantum physics at MEPhI and MIPT.
h-index: 20 (WOS), 25 (Google scholar).
Participation in scientific and public organizations:
Member of the Scientific Coordinating Council of the FANO, member of the Scientific Council of the LPI, Scientific and Technical Council of the Main Metrological Center of the State Service of Time and Frequency of VNIIFTRI. Member of the editorial board of the journal "Physics-Uspekhi (Advances in Physical Sciences)". Member of the organizational international conferences ICONO/LAT, CLEO, ICOLS. Expert of funds: RFBR (Russian Federation), GACR (Czech Republic).
Participation in joint research projects:
JINR (Dubna), VNIIFTRI (Mendeleevo), Russian Quantum Center (Skolkovo), Max-Planck Institute for Quantum Optics (Garching, Germany), Max-Planck Institute for Nuclear Physics (Heidelberg, Germany), ETH (Zuerich, Switzerland), CERN (Switzerland).
Interaction with the industry:
Joint projects with "Lens-Optics" (Russian-German manufacturer of optical components), "Avesta" (Russian manufacturer of laser systems), "Menlo Systems" (German manufacturer of optical frequency synthesizers).
Main scientific achievements:
- performed advanced experimental studies of optical micro- and nanostructures in the soft X-ray range, developed new methods for studying components of X-ray optics. The results of work were used in the creation of spectrometers and spectrogeliographs (the CORONAS-F space project) and in laser plasma studies.
- developed a new laser method for creating a thermal neutron polarizer. He implemented a polarizing helium cell, which was used in preparations of an experiment on search of violations of T-invariance in the neutron beam of the IBR-30 reactor (JINR, Dubna).
- developed a new optical method for determining energy of hyperfine splitting in hydrogen-like atoms, which enabled frequency measurements of the hyperfine splitting of level 2S in hydrogen and deuterium with record accuracy. Based on the obtained results, a detailed study of the corrections of quantum electrodynamics of bound states was carried out.
- proposed and developed a method of model-independent estimation of the upper limit of the drift of a fine structure constant. Measured the absolute frequency of the 1S-2S transition in a hydrogen atom, which allowed scientists to impose a limit on the drift of the fine structure constant at the level of 10-15 per year.
- implemented deep laser cooling of a rare-earth thulium atom to temperatures of 10 microns for the first time to solve the problem of creating a high-precision optical clock. For the first time, he implemented secondary cooling, as well as the capture of thulium in magnetic and optical traps.
- implemented new principles of laser frequency stabilization, which make it possible to obtain compact tunable laser radiation sources with a spectral line width of less than 1 Hz.
Applied research:
Creation of optical clocks on laser-cooled atoms and ions, creation of unique laser systems for optical clocks on strontium atoms within the framework of the Federal Target Program “GLONASS” for FSUE VNIIFTRI, Rosstandart.

Since 2021, leader of a project of creation of an ion-based quantum processor, which is supervised by Rosatom as part of the Quantum Technologies roadmap.

13. Information about the departments involved in the implementation of the educational program

Chair of the Russian Quantum Centre: head of Chair, Doctor of Physics and Mathematical Sciences, Shlyapnikov Georgiy Vsevolodovich, scientific Director of the Russian Quantum Center. The RQC developments – ultra-sensitive sensors, solid–state photomultipliers, femtosecond lasers, an ultra-sensitive magnetic cardiograph and others - are designed for financial, telecommunications, medical and other industries. The key development is a quantum communication system for secure transmission of information in banking, military, government and other fields. At the RQC department, students can choose a promising topic of research work, solve up-to-date theoretical and experimental problems under the supervision of experienced mentors, work with advanced equipment that has no analogues in Russia and sometimes in the world, participate in conferences and interact with the international scientific community.

Chair of Physics and Technology of nanostructures: head of Chair, Doctor of Physics and Mathematical Sciences, Senior Research Professor, Lebedev Vladimir Valentinovich, principal Researcher of the Landau Institute for Theoretical Physics of the Russian Academy of Sciences. The department of Physics and Technology of Nanostructures trains specialists of a wide profile in the field of physics and technology of nanostructures and nanomaterials, including two-dimensional materials. The combination of theoretical courses and intensive specialized practical courses allows students to form a deep understanding of physics of the nanoscale objects. Leading Russian and foreign scientists representing MIPT, MIT, King's College London, etc. are involved in the lectures. Students are employed in the laboratory of the Center for Photonics and Two-dimensional Materials of MIPT, and do their internships in numerous partner leading research centers and organizations.

Basic organisations:

Московский физико-технический институт Центр «Коммуникационные системы и логистика», Center for Photonics and 2D Materials was established on 30.09.2016 by order of the Rector of MIPT No. 55-6. The Center aims to achieve global leadership in such areas as active plasmonics, optoelectronics of two-dimensional materials and quantum optoelectronics. The main objectives of Center are development and creation of fundamentally new class of nanoscale optoelectronic devices and components for a wide range of applications (electronic components, nanosensors, biosensors, nanolasers, quantum communication lines, energy-efficient lighting devices, etc.), including special-purpose applications. The transition to nanoscales and the use of new materials (including graphene and other 2D materials) will allow optoelectronic devices to replace existing electronic and optical analogues..