

Physics of high-speed processes

National Research Nuclear University MEPhI (Moscow Engineering Physics Institute)

Degree or qualification is awarded: **Master degree**

Language of study: **Russian**

Mode of study: **full-time**

Duration: **2 years**

Availability of free education: **yes**

Price: **207 610 rubles per semester**

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The goal of the program: to prepare graduates for work in the field of design, analysis and evaluation of safety, economy of current and future power plants (including nuclear power plants). Participation in the research of the thermodynamic processes at ultra-high speed of interaction, explosion and combustion. Graduates will have a sufficient set of system analytical skills, project management skills, as well as leadership and communication qualities to work in a creative team.

The area of professional activity of graduates of the Master's Degree Program "Physics of high-speed processes" includes: creating models and facilities for theoretical and experimental studies of fast processes, including the processes of combustion and explosion of energy-intensive systems; ensuring explosion and fire safety of industrial objects and evaluation of consequences of anthropogenic accidents.

The features of the curriculum: Physics and Mathematics training, as long as information technology training, in the field of critical high technology. Students receive knowledge in the field of chemical physics, physics of high-speed processes, industrial safety. Graduates researchers are capable of solving a wide range of problems in the physics of condensed state of the environment monitoring, searching particularly dangerous substances, development of new technologies (including nanotechnology). Education system focuses on training in the field of computer simulation of fast processes of combustion and explosion in three-dimensional space. Graduates of Chemical Physics Department receive preparation for the solution of a wide range of problems, first of all, such, as:

- mathematical and physical simulation of thermogasdynamic processes, in particular, at creation of gas-turbine installations;
- synthesis of new materials on the basis of the self-extending power-intensive processes, including with use of nanomaterials;
- a pilot study of combustion of the condensed combustible, rocket fuels and gunpowder, with participation of nanomaterials;
- experimental methods of definition of ballistic characteristics: speeds of combustion, temperature coefficient of speed of combustion and others.
- the forecast of consequences of accidents on industrial facilities. The analysis of risk, mathematical forecasting of technogenic emergencies in chemical, oil, gas and nuclear branches of industrial production.

Module 1 «Natural-sciences»

This module is directed on mastering by the theory (a conceptual framework, the principles, basic concepts and so forth) and the organization of management by innovative activity managing the subject and high technologies.

This module allows students to receive skills of theoretical modeling of high-speed currents of the squeezed continuous environment with an exit to interesting tasks of physics of fast-proceeding processes which will help them to be guided correctly in a difficult technique of research of fast-proceeding physical and chemical processes. The module helps students to apply the computing principles studied in discipline to the solution of practical physical tasks. The module gives the chance for students to examine special literature in English, to gain experience of transfer of technical literature in the specialty, taking into account a distribution of students to Educational and Research Work.

Module 2 «Professional -Special»

The module includes areas of professional activity such as: exploitation of modern physical hardware and automatic control systems with the use of computer technologies; research and technological solutions for industrial and scientific problems, mathematical models for the theoretical and experimental study of fast kinetic processes, including combustion and explosion of energy-intensive systems; creating, editing, debugging and application of the experimental assemblies for experimental studies of fast processes; providing explosive and fire safety of industrial facilities (including nuclear facilities), modeling the effects of industrial accidents; use and development of new innovative technologies and solutions for the study of the properties and applications of nanomaterials with desired properties.

The module prepare graduates for work in the field of industrial, scientific and research activities related to the design, analysis and evaluation of safety, efficiency of current and future power plants. Provide basic humanitarian graduate, mathematical and professional knowledge; provides graduates with skills in the professional field and prepares them for the Master's degree.

Module 3 «Research and development»

The module allows students to examine real technological and scientific processes, to fix and to expand the theoretical knowledge received during the training. The module is aimed at the development of practical skills and competences during the research work in laboratories, acquisition by the student of practical skills and experience of independent professional activity. And also allows to prepare the student for presentation of final thesis.

Successful graduation is based on the natural-science subjects and subjects of a professional cycle. Knowledge of fundamental bases of the higher mathematics, mathematical physics, statistical physics, organic chemistry is necessary for knowledge of physics of burning bases, gidro-gas dynamics, chemical thermodynamics and computer modeling.

The venue of disciplines of this module: branch and academic scientific research institutes, laboratories, scientific and production associations, and also MEPhI research part where studying of the materials is connected with a subject of final thesis.

Part of the curriculum is also implemented in English.

Organizations for practice: the Institute of Chemical Physics of the Russian Academy of Sciences (RAS); Federal State Establishment All-Russian Research Institute for Fire Protection of Ministry of Russian Federation for Civil Defense, Emergencies and Elimination of Consequences of Natural Disasters (FGU VNIPO of EMERCOM of Russia); Russian Federal Nuclear Center; The Kurchatov Institute; All-Russia Research Institute of Automatics named after N.L. Dukhov; Gidropress Experimental and Design Organization; Rosenergoatom; the Institute of Problems of Chemical Physics of the Russian Academy of Sciences; and other scientific and technical centers of ROSATOM.

The Lifelong Learning Programme: Bachelor 's Degree - Master of Science - Post Graduate.

Specializations within this programme

Nuclear Physics and Technologies

The objects of professional activity of graduates: research and technology in the field of high-speed kinetic processes, industrial safety and environmental monitoring, the development of new technologies, including nanotechnology.