Bachelor program: «Problems of theoretical physics and mathematical modeling»

**Educational profile:** 03.03.01 Applied mathematics and physics

**Level/Duration:** Bachelor/4 years

**Host department:** The program is realized at the Department of Theoretical Nuclear Physics, a part of the Institute for Laser and Plasma Technologies MEPhI. The department represents a leading and internationally recognized scientific and educational school in theoretical physics. The first department chair was Academician Igor E. Tamm, a Nobel Prize winner. Several eminent Russian theorists including M.A. Leontovich, I. Ya. Pomeranchuk, A.B. Migdal, V.M. Galitsky and I.S. Shapiro worked at the Department in different time periods. Among the department graduates, one finds the Nobel Prize winner N.G. Basov and over 20 members of the Soviet (later the Russian) Academy of Scientists. Presently, five RAS members and several professors of leading foreign universities and research centers work and teach at the Department.

**Program description:** The program aims the training of highly qualified theoretical physicists capable of conducting fundamental and applied research including the search for new laws of nature; modeling of complex physical, technical and engineering systems; suggesting and boosting new research directions in applied physics and technologies. Those graduates, who have successfully passed through the program including regular and final examinations, are expected to possess skills and research capabilities sufficient for productive and creative work in any area of modern physics. This includes physics of atoms, molecules and nanostructures, physics of classical and quantum fields, of atomic nuclei and elementary particles, astrophysics and cosmology, physics of plasmas and of condensed matter, laser physics, physics of extreme states of matter and high energy density physics.

The key element of the education process consists of an intense training in fundamental physics and mathematics as well as in numerical simulations and computer sciences in general. The program relies on the cooperation between basic (general) and special courses in theoretical physics as well as on those on theoretical methods in physics and on mathematical modeling.

The program includes several fundamental disciplines, which continue and develop further the bachelor course in theoretical physics; special disciplines; research, tutorial and pre-diploma projects and the preparation of the master thesis. The core part of the program includes the theory of elementary particles, methods of modern statistical physics, selected chapters of quantum field theory, general relativity as well as modern methods of mathematical modeling in theoretical physics. The specialized part of the program is built on distinguished courses developed by leading, well recognized researchers in the respective fields, and includes plasma theory, nuclear physics, astro- and cosmo-physics, physics of condensed matter. These specialized courses are being delivered by leading researchers from RAS institutes and research centers of the State Corporation “Rosatom”.

Our students perform their research projects in the groups working at the Department or in various research centers of “Rosatom” and RAS. Department graduates work in leading Russian and foreign research centers including the Russian Federal Nuclear Centers, National Research Center “Kurchatov Institute”, Dukhov Research Institute for Automaties, Joint Institute for Nuclear Research in Dubna and more.