Head of the Soviet Atomic project, one of the founders of MEPHi, I.V. Kurchatov

Outstanding Scientists — Nobel Prize winners who worked in MEPHi

N.G. Basov
A.D. Sakharov
N.N. Semenov
I.E. Tamm
I.M. Frank
P.A. Cherenkov

The University traces its history back to Moscow Mechanics Institute of Ammunitions established in November, 1942. Its original purpose was to train specialists for the nuclear industry.

The most outstanding scientists took part in establishment and development of MEPHi including the Head of the Soviet Atomic project academician Igor Vasilyevich Kurchatov.

Six Nobel prize winners worked in MEPHi — academicians N.G. Basov (MEPhI graduate), A.D. Sakharov, N.N. Semenov, I.E. Tamm, I.M. Frank, P.A. Cherenkov.
MEPhI IS THE PARTICIPANT OF THE FEDERAL PROGRAMS (2007-2020)

In July 2013 MEPhI was shortlisted in governmental Competitiveness Enhancement Program as one of the winners among the Russian Universities. There were only 15 universities chosen.

**MAIN RESULTS**
- Competitiveness enhancement program 2013-2020: Achieving global leadership in education and science
- Entering the TOP-100 list of the universities world rankings
- Internationalisation of the educational process
- Attracting leading scientists
- Attracting foreign students
- Increase in publication activity
- Radical renewing administrative and management personnel

- Research University Program 2009-2017: Regionally distributed network of branches formation
- Large-scale purchase of equipment for research and educational activities
- Large-scale capital construction and repair

- Education Innovations Program 2007: New educational programs
- New research and educational equipment
- Renovation of lecture halls and laboratories

**Volume of Funding**

**Competitiveness Program**

**Research University Program**

**Education Innovations Program**

**EIP**
MEPhI IN THE WORLD UNIVERSITY RANKINGS
INTERNATIONAL UNIVERSITY RANKINGS 2014

THE PHYSICAL SCIENCES
13th

AMONG RUSSIAN PARTICIPANTS
2nd

THE BRII S & EMERGING ECONOMIES RANKINGS
95th

QS GENERAL LIST
481st

3rd

QS PHYSICS & ASTRONOMY
251st

9th

QS EMERGING EUROPE AND CENTRAL ASIA
34th

4th

QS UNIVERSITY RANKINGS BRICS
57th

8th

The Times Higher Education BRII S and Emerging Economies Rankings 2014, Awarding Ceremony

NATIONAL UNIVERSITY RANKINGS

National university ranking of Interfax and Echo of Moscow

3

National university ranking of Expert RA

4
GLOBAL PHYSICS RESEARCH

CREATION OF WORLD-CLASS LABORATORIES

- Laboratory of Electromagnetic Methods of New Materials Production (in cooperation with the University of San Diego, USA)
- Laboratory of Experimental Nuclear Physics (in cooperation with the University of Tennessee, USA)
- Laboratory of Nano Bioengineering (together with Reims University, France)
- Laboratory of Plasma-surface Interaction and Plasma Technology (in cooperation with the University of San Diego, USA)
- Laboratory of Specialized Integrated Circuits Development
- Laboratory of Silicon Photomultipliers (in cooperation with the University of Kansas, USA)

GLOBAL PHYSICS RESEARCH

PARTICIPATION IN INTERNATIONAL COLLABORATIONS

MEPhI is the participant of major international collaborations on installations of mega-science: ATLAS, ALICE, CMS at CERN; FAIR, XFEL at DESY (Germany); ITER (France); ICECUBE, PAMELA (Italy), STAR and PHENIX (USA); T2K (Japan), and others. MEPhI has started the procedure of joining the following collaborations: SHIP, NSW (CERN), LZ (USA), BELLE (Japan).

- ATLAS, CERN
- ALICE, CERN
- CMS, CERN
- STAR, BROOKHAVEN NATIONAL LABORATORY
- PHENIX, BROOKHAVEN NATIONAL LABORATORY
- ICECUBE, ANTARCTICA
- Laboratory of Plasma-surface Interaction and Plasma Technology (in cooperation with the University of San Diego, USA)
- Laboratory of Electromagnetic Methods of New Materials Production (in cooperation with the University of San Diego, USA)
10 Centers of Excellence were established as a part of the University research innovative and educational infrastructure to train elite specialists for leading scientific organisations and high-tech industries.

INTEGRATION OF EDUCATIONAL, SCIENTIFIC AND INNOVATIVE ACTIVITIES

UNIVERSITY INNOVATION ECOSYSTEM

- Centers of Excellence
- Small Innovative Enterprises
- Engineering Centers
- Prototyping Centers and Design Centers
- Industrial Enterprises

INTEGRATION OF EDUCATIONAL, SCIENTIFIC AND INNOVATIVE ACTIVITIES

Russian-American seminar on nuclear non-proliferation and countering nuclear terrorism issues

MEPhI Rector at Moscow-London teleseminar on the results of QS Rankings

Dr. Siegfried S. Hecker (Stanford University), ex-director of the Los Alamos National Laboratory (LANL), educational conference on Nuclear Cooperation: Achievements and Perspectives, MEPhI, Moscow

IAEA mission on establishment of Nuclear Management Academy, MEPhI, Moscow

Representatives of Tokyo Institute of Technology at round-table conference, MEPhI, Moscow

Discussing issues of training specialists for South African NPPs

Technical universities representatives discussing engineer training issues, RIA News Agency, Moscow
INTEGRATION OF EDUCATIONAL, SCIENTIFIC AND INNOVATIVE ACTIVITIES

CENTERS OF EXCELLENCE

Basic Research & Particle Physics
Plasma & Laser Research & Technologies
Nuclear Engineering
Nuclear Systems & Materials
Nanostructured Electronics
Non-equilibrium Atomic Systems

CENTERS OF EXCELLENCE

Applied Mathematics & Theoretical Physics
Cybersecurity & IT
Life Science & Technologies
Computing, Humanities & Cognitive Research
MAIN SCIENTIFIC ACHIEVEMENTS

- In the framework of ATLAS collaboration at LHC a Transition Radiation Tracker was created and a new particle, Higgs boson, was discovered.
- In the framework of STAR collaboration the existence of quark-gluon plasma was demonstrated, antihelium-4 nuclei were extracted.
- Installation with PAMELA detector was created on board of Russian satellite Resurs-DK 1 and data on the existence of new additional cosmic rays source probably connected with annihilation or decay of hypothetical “dark matter” particles were obtained.
- A catalogue of solar bursts within 2-20 keV range detected on board “Coronas-Photon” satellite during low solar activity was made.
- Theory of quantum electrodynamic cascades in extremely strong laser field was developed.
- Full-scale simulator Russian Nuclear Power Plant was developed and implemented.
- The technology of terahertz radiation source creation was developed based on Smith-Purcell and Vavilov-Cherenkov radiation.
- Experimental installation Pico-4 was created for modelling microelectronics products radiation stability.
- Technology of neutron-capture therapy of cancerous tumour was developed at MEPNI nuclear reactor.
- Endoscopic capsular complex “Landysh” was developed.

R&D

Research and development

MEPhI holds the leading positions among the Russian universities both in the total volume of R&D funding (2 785 million rubles) and total R&D per 1 faculty member (3,481 million rubles).

70+

foreign scientists take part in joint scientific and educational projects of the university

5

projects for high-tech production development (235 million rubles)

5

fundamental and pilot studies under the Russian Science Foundation programs (135 million rubles)

62

INSTITUTIONS AND RESEARCH CENTRES OF RAS (THE RUSSIAN ACADEMY OF SCIENCES) PARTICIPATE IN JOINT RESEARCH PROJECTS

Main partner organisations: Physical Institute, Space Research Institute, Institute of General Physics, Institute of Crystallography, Institute of Applied Mathematics, Institute of Chemical Physics, Institute of Atmospheric Physics, etc.
INTEGRATION OF EDUCATIONAL, SCIENTIFIC AND INNOVATIVE ACTIVITIES

DEVELOPMENT, PROTOTYPING AND COMMERCIALISATION OF INNOVATIVE PRODUCTS

- 43.1% the share of income from non-budgetary sources in the income structure more than 43.1%
- 113 patents for invention
- 99 certificates of the government registration of the computer program and data bases
- 341 copyright items
- 26 know-how
- 20 university small innovative enterprises

INTEGRATION OF EDUCATIONAL, SCIENTIFIC AND INNOVATIVE ACTIVITIES

- A solder zirconia spacer grid of VVER and RBMK
- Gamma-locator for preoperative diagnostics of sentinel lymph nodes and noninvasive diagnostics of superficial cancers
- A unique leukemia diagnostics complex on peripheral blood samples
- Samples ion mobility spectrometer for noninvasive diagnostics of socially important human diseases
- A three stage amplifier within 8-12 GHz frequency range
- High efficiency ultra-bright LEDs
- Neutron flux monitoring equipment for NPP, research reactors and critical experimental facilities
- Endoscopic complex “Landysh” for automated recognition of pathologies and morphological changes of digestive tract
MEPhI was officially recognised as a member of the Worldwide CDIO Initiative on modernisation of engineering education in higher school (http://www.cdio.org/)

Modernisation and development of engineering curricula have been implemented meeting the CDIO standard requirements.

Having joined the CDIO standards MEPhI has come into line with world leaders such as Stanford University, Massachusetts Institute of Technology, California State University, United States Naval Academy, Tsinghua University (Asia Region), Chalmers University of Technology (Europe Region), etc.

11 MEPhI engineering curricula are in Index programs, their quality corresponding to “European level” (FEANI Index).

14 curricula were accredited by FEANI in 2014 for entering FEANI Index in 2015.

The University curricula entering FEANI Index gives MEPhI graduates, who have been taught in accordance with these curricula, a chance to get the qualification of EUR ING (European Engineer) — a specialist whose qualification is recognized by all EU countries and corresponds to international requirements.
COOPERATION WITH WORLD LEADING SCIENTIFIC AND EDUCATIONAL CENTERS

JOINT EDUCATIONAL PROGRAMS STARTED IN 2014

<table>
<thead>
<tr>
<th>Program</th>
<th>University Partner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials in extreme conditions</td>
<td>MIT (USA)</td>
</tr>
<tr>
<td>Nanotechnology</td>
<td>UNIKO (Germany)</td>
</tr>
<tr>
<td>Graphene electronics</td>
<td>RNYH (Germany)</td>
</tr>
<tr>
<td>Design of microelectronic component base</td>
<td>TÜB Dresden (Germany)</td>
</tr>
<tr>
<td>Computer simulation of materials for energy technologies</td>
<td>Aalto University (Finland)</td>
</tr>
<tr>
<td></td>
<td>MIT (USA)</td>
</tr>
<tr>
<td></td>
<td>Institute for Energy Technology (Norway)</td>
</tr>
<tr>
<td></td>
<td>University College of Telemark (Norway)</td>
</tr>
<tr>
<td></td>
<td>University of Exeter (UK)</td>
</tr>
<tr>
<td>Femtosecond laser physics and technology</td>
<td>Beijing Institute of Technology (China)</td>
</tr>
</tbody>
</table>

In 2014, in order to develop international research and educational programs, a number of partnership agreements on academic mobility, including agreements on “double diploma” were made.

MEPhI new educational partners

- Argonne National Laboratory (USA)
- Enrico Fermi National Accelerator Laboratory (USA)
- University of Illinois (USA)
- University of Surrey (UK)
- Politecnico di Torino (Italy)
- Federal University of Rio Grande do Sul (Brazil)
- University of Nebraska, Lincoln (USA)
- 8th Research Institute (China)
- International Organization of the ITER on fusion Energy
- Baku State University (Azerbaijan)
- National Laboratory of Legnaro (Italy) and etc.

EDUCATIONAL PROGRAMS IN COOPERATION WITH THE LEADING UNIVERSITIES AND SCIENTIFIC CENTERS

2014 FIGURES AND FACTS

- 8 times more educational programs have been introduced in cooperation with the leading foreign and Russian universities and scientific organisations
- 39 joint basic educational programs
- 4 times more foreign faculty members
- 7 new curricula of “double diploma” have been developed
- 389 students enrolled in joint curricula (foreign - 50.9%, Russian - 49.1)
- 284 people started their training in joint programs (18% of the intake per year)

- 25 joint curricula providing mutual credit recognition
MEPhI in close cooperation with the State atomic energy corporation “Rosatom” is actively involved in training foreign students for subsequent maintenance of industrial facilities constructed by the State atomic energy corporation “Rosatom”.

Rosatom NPP construction perspective backlog – 90 units

Special customer service for foreign students support has been established.

MEPhI organises international academic competitions, the winners have benefits when entering the university:

- Nuclear physics and technology (participants from 6 countries)
- Economic security (participants from 10 countries)
- System analysis (teams from 3 countries)
- Academic competition Rosatom (participants from 10 countries)

510 foreign students are trained in MEPhI today, which is 6.6% of the total number of students.
PARTICIPATION IN THE WORLD NUCLEAR EDUCATION NETWORKS

In 2014 MEPhI as a leading university of the Association “Consortium of the universities supporting the State atomic energy corporation “Rosatom” continued its work on strengthening the cooperation between Russian Nuclear Education Network and international networks of nuclear and engineering education, including ENEN, INSEN, ANENT and others.

Network control centers of nuclear knowledge management in the University sector is being developed on the basis of the Association “Consortium of the universities supporting the State atomic energy corporation “Rosatom”.

A number of education modules on nuclear knowledge management have been elaborated in cooperation with the IAEA.

A SYSTEM FOR SEARCH AND SELECTION OF TALENTED YOUTH

Contests:

- Grants to young MEPhI lecturers
- Grants to MEPhI postgraduate students
- Grants to MEPhI students

International competition for the university PostDoc positions

The system of internal rankings of undergraduate and graduate students

Training programs for the most active and promising MEPhI students, post-graduate students, trainees, young faculty members in the leading Russian and foreign educational and research centers

In 2014 284 students got an opportunity to take training courses in such leading Russian and foreign research centers as:

- Royal Institute of Technology in Stockholm (Sweden)
- the European Synchrotron Radiation Facility (Grenoble, France)
- University of Southern California (USA)
- Munich University of Ludwig Maximilian (Germany)
- CERN (Geneva, Switzerland)
- Monterey Institute for International Studies (USA) and others

Experts from 30 countries took part in the School of Nuclear Knowledge Management, organized by the IAEA in cooperation with MEPhI. The IAEA Director General Mr. Yukiya Amano praised the initiative of MEPhI on certification of “Nuclear Knowledge Management Course”.

The Workshop on Nuclear Knowledge Management “Formation of competence in the field of nuclear knowledge management within the university curricula” (MEPhI, 2014)

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The International Centre for Theoretical Physics (ICTP) Trieste (Italy), 2014

MEPhI has joined the organizers of the International Vienna Centre for Nuclear Competence (ViNC). The main task of the Center is provision of professional training and expertise for the safe and effective use of nuclear technology and nuclear applications.

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INCREASING QUALITY OF FACULTY STAFF AND ADMINISTRATIVE AND MANAGERIAL PERSONNEL

• ATTRACTING YOUNG RESEARCHERS AND SCIENTISTS WITH WORK EXPERIENCE IN LEADING RUSSIAN AND FOREIGN UNIVERSITIES AND SCIENTIFIC CENTERS
• STIMULATION OF THE PUBLICATION ACTIVITY, CREATION AND DEVELOPMENT OF THE UNIVERSITY SYSTEM OF COOPERATION WITH SCOPUS AND WEB OF SCIENCE DATABASES
• IMPROVEMENT OF THE QUALIFICATION REQUIREMENTS FOR FACULTY MEMBERS AND RESEARCHERS RELATED TO THEIR PUBLICATION ACTIVITY
• IMPROVEMENT OF HR SERVICES AND UNIVERSITY RECRUITMENT SYSTEM

IMPROVEMENT OF MANAGEMENT SYSTEM

• COMMITMENT TO GLOBAL PRESENCE IN EDUCATION, SCIENCE AND INTERACTION WITH INDUSTRIAL PARTNERS
• DECENTRALISED TACTICAL AND OPERATIONAL DECISION MAKING

In 2014 the second stage of the University management system establishment was completed. The system allows to respond quickly to changing conditions on the basis of monitoring and predictive analysis of the development of science & technology and education market in specialised university segment.

A system of motivation and the key efficiency indicators for faculty members, senior management and administrative personnel have been elaborated and introduced. In 2014 100% transition of faculty members and management and administrative personnel to the effective contract was completed.

In 2014 the development of inner services took place, supporting effective education, research and innovation activities of the University, including HR service and service of international recruiting, marketing, service and support of publication activity.

The quality management system for the University international activities has been introduced. A system of internal management audit has been created.

The University management system is changing for a number of support functions (procurement, finance and economics, IT, human resources management, international cooperation). The transition to the service model has been made. The quality and speed of support functions have been significantly improved as compared to the previous years.

The University structure is undergoing transformation in order to change the existing infrastructure and to shift from faculties to Centers of Excellence and Institutes that combine educational process and scientific research.
## Areas of Training

<table>
<thead>
<tr>
<th>Areas of Training</th>
<th>Duration</th>
<th>Level of Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science and Engineering</td>
<td>4 years</td>
<td>Undergraduate</td>
</tr>
<tr>
<td>Information Security</td>
<td>4 years</td>
<td>Undergraduate</td>
</tr>
<tr>
<td>Information Systems and Technology</td>
<td>4 years</td>
<td>Undergraduate</td>
</tr>
<tr>
<td>Applied Informatics</td>
<td>4 years</td>
<td>Undergraduate</td>
</tr>
<tr>
<td>Applied Mathematics and Informatics</td>
<td>4 years</td>
<td>Undergraduate</td>
</tr>
<tr>
<td>Materials Science and Technology of Materials</td>
<td>4 years</td>
<td>Undergraduate</td>
</tr>
<tr>
<td>Management</td>
<td>4 years</td>
<td>Undergraduate</td>
</tr>
<tr>
<td>Applied Mathematics and Physics</td>
<td>4 years</td>
<td>Undergraduate</td>
</tr>
<tr>
<td>Software Engineering</td>
<td>4 years</td>
<td>Undergraduate</td>
</tr>
<tr>
<td>Physics</td>
<td>4 years</td>
<td>Undergraduate</td>
</tr>
<tr>
<td>Economics</td>
<td>4 years</td>
<td>Undergraduate</td>
</tr>
<tr>
<td>Nuclear Physics and Technology</td>
<td>4 years</td>
<td>Undergraduate</td>
</tr>
<tr>
<td>Nuclear Power Plants: Design, Operation and Engineering</td>
<td>5 years 6 months</td>
<td>Specialist</td>
</tr>
</tbody>
</table>

## Areas of Training

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<tr>
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<th>Level of Education</th>
</tr>
</thead>
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<tr>
<td>Information Security of Automated Systems</td>
<td>5 years</td>
<td>Specialist</td>
</tr>
<tr>
<td>Information Analytical Systems Security</td>
<td>5 years 6 months</td>
<td>Specialist</td>
</tr>
<tr>
<td>Isotope Separation Technology and Nuclear Fuel</td>
<td>5 years 6 months</td>
<td>Specialist</td>
</tr>
<tr>
<td>Economic Security</td>
<td>5 years</td>
<td>Specialist</td>
</tr>
<tr>
<td>Electronics and Automation of Physical Installations</td>
<td>5 years 6 months</td>
<td>Specialist</td>
</tr>
<tr>
<td>Nuclear Reactors and Materials</td>
<td>5 years 6 months</td>
<td>Specialist</td>
</tr>
<tr>
<td>Information Security</td>
<td>2 years</td>
<td>Master</td>
</tr>
<tr>
<td>Materials Science and Technology of Materials</td>
<td>2 years</td>
<td>Master</td>
</tr>
<tr>
<td>Economics</td>
<td>2 years</td>
<td>Master</td>
</tr>
<tr>
<td>Nuclear Power and Thermal Physics</td>
<td>2 years</td>
<td>Master</td>
</tr>
<tr>
<td>Applied Mathematics and Informatics</td>
<td>2 years</td>
<td>Master</td>
</tr>
<tr>
<td>Nuclear Physics and Technology</td>
<td>2 years</td>
<td>Master</td>
</tr>
<tr>
<td>Information Measuring and Control Systems (by Industry)</td>
<td>4 years</td>
<td>Postgraduate</td>
</tr>
<tr>
<td>Mathematical and Software Support of Computers, Systems and Computer Networks</td>
<td>3 years</td>
<td>Postgraduate</td>
</tr>
<tr>
<td>Devices and Methods of Experimental Physics</td>
<td>4 years</td>
<td>Postgraduate</td>
</tr>
<tr>
<td>Solid-State Electronics, Radio-Electronic Components, Micro-and Nano-Electronics, Devices Based on Quantum Effects</td>
<td>4 years</td>
<td>Postgraduate</td>
</tr>
<tr>
<td>Plasma Physics</td>
<td>4 years</td>
<td>Postgraduate</td>
</tr>
<tr>
<td>Nuclear Power Plants: Design, Operation and Decommission</td>
<td>4 years</td>
<td>Postgraduate</td>
</tr>
<tr>
<td>Automation and Management of Technological Processes and Production (by Industry)</td>
<td>4 years</td>
<td>Postgraduate</td>
</tr>
<tr>
<td>Physics and Astronomy</td>
<td>4 years</td>
<td>Postgraduate</td>
</tr>
<tr>
<td>Condensed Matter Physics</td>
<td>4 years</td>
<td>Postgraduate</td>
</tr>
</tbody>
</table>
International relations development has been accelerated in order to overcome the consequences of the former “closeness” of the University. In 2010 MEPhI became an open university.

The University alumni database has been updated and expanded. The interaction and feedback flow from alumni who work in leading international laboratories, universities and corporations have been noticeably intensified.

Further development and promotion of the MEPhI Alumni Club is performed in order to expand the contact list and engage graduates’ career experience for strengthening the international appeal of the University.
National Research Nuclear University MEPhI
(Moscow Engineering Physics Institute)

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