Ministry of Higher Education and Science of the Republic of Kazakhstan Kazakh National Research Technical University after K.I. Satpayev

Mining and Metallurgical Institute named after O. A. Baikonurov

APPROVED
Director of M&MI
_____ K.B. Rysbekov
«___» _____ 2025.

Educational program development plan

7M05301 – Applied and Engineering Physics (Master's Degree)

Almaty, 2025

Educational Program 7M05301 – Applied and Engineering Physics

The Department of Materials Science, Nanotechnology, and Engineering Physics plans to train specialists in the educational program 7M05301 – Applied and Engineering Physics. Due to their interdisciplinary training and versatility, these specialists can find employment in research organizations and high-tech industries.

Master's degree training is aimed at developing students' competencies in applied physics, engineering physics, modern materials and technologies, as well as methods of physical analysis, modeling, and the development of innovative technological solutions.

The development plan outlines strategic directions, implementation mechanisms, quality assurance processes, and expected outcomes for the program's sustainable development.

Strategic objectives of the program

The key strategic objectives include:

- Enhancing academic quality through continuous modernization of the curriculum.
- Strengthening research orientation of the master's program.
- Developing international cooperation with universities and research centers.
- Integrating education with industry and innovation sectors.
- Improving graduate employability and professional competencies.
- Ensuring compliance with international accreditation standards.

The program development includes ***modernization*** of educational and research infrastructure: physics laboratories, materials science laboratories, computational physics laboratories, access to scientific databases, and modern experimental equipment. Digital learning technologies and simulation software are actively integrated into the educational process.

Internationalization is an important component of program development. Key directions include academic mobility of students and faculty, joint research projects, joint supervision of master's theses, participation in international conferences, development of double-degree programs.

Strong ***collaboration with industry*** ensures practical relevance of the program, which includes internships in industrial laboratories, joint research projects, participation of industry experts in curriculum design, guest lectures by industry specialists, employment opportunities for graduates.

The ***quality assurance*** system includes regular curriculum review, student and graduate feedback, employer surveys, monitoring of graduate employment, internal and external program evaluation. Quality management processes are aligned with international accreditation requirements.

Implementation of this development plan will lead to improved quality of education, increased international recognition of the program, higher research

productivity, stronger links with industry, increased employability of graduates. Graduates of the program will possess advanced competencies in applied physics, engineering technologies, and scientific research, enabling them to contribute to technological innovation and scientific progress.

The professional activities of graduates include:

- research institutes, scientific centers, and laboratories engaged in fundamental and applied research in physics, materials science, and nanotechnology;
- technology parks, innovation centers, and science and technology clusters;
- Design, engineering, and technology organizations engaged in the development of new devices, instruments, materials, and technologies;
- Metallurgical and beneficiation plants using modern physical methods of analysis, diagnostics, and materials processing;
- Chemical and materials science enterprises;
- High-tech industrial enterprises using physical methods of research and quality control of materials and products;
- Higher education institutions and educational organizations engaged in scientific and pedagogical activities.

Graduates of the educational program are currently employed at leading research institutes, industrial enterprises, and government organizations, and are also engaged in teaching at higher education institutions, holding a master's degree.

Main planned activities for the educational program:

1. As part of the department's research activities, the development of scientific areas in the fields of applied and engineering physics, new materials, and nanotechnology, as well as expanded participation in scientific programs and projects.
2. Further development of international cooperation with leading universities and research centers in neighboring and distant countries, concluding cooperation agreements in the fields of scientific research, academic mobility of students, exchange of experience, and advanced training of faculty (2025-2030).
3. Improvement of the educational process through the introduction of modern educational technologies, interactive teaching methods, digital platforms, and elements of research-based learning in lectures, practical classes, and laboratory classes.
4. Expansion and modernization of the department's educational and laboratory facilities by:

- equipping laboratories with modern research equipment and measuring systems;
- establishing joint laboratories and department branches at research institutes and industrial enterprises;
- implementing modern software for modeling physical processes and materials analysis.

5. Creation and development of research laboratories in the field of nanomaterials, functional materials, and the physics of modern technologies.

6. Actively involve master's students in scientific conferences, research projects, and publication of research results in international and domestic scientific journals.

7. Strengthen monitoring of the department's research and innovation activities, analyze the effectiveness of research projects by faculty and students (2025-2030).

8. Prepare and submit research projects for grant and program-targeted funding competitions (2025-2030).

9. Develop and improve the educational program, considering international best practices in training specialists in applied and engineering physics.

10. Develop cooperation with industrial enterprises and research institutes to organize internships, internships, and the completion of master's theses on relevant scientific and technical problems.

11. Continuing professional development for faculty, including internships at leading foreign universities, research centers, and industrial enterprises (annually).

12. Developing the department's material and technical resources and acquiring modern scientific equipment for training highly qualified specialists.

13. Improving the graduate employment system, developing interactions with employers, and creating a database of vacancies and potential employers.