

**Ministry of Higher Education and Science of the Republic of Kazakhstan
Kazakh National Research Technical University named after K.I. Satbayev
Mining and Metallurgical Institute named after O.A. Baikonurov**

APPROVED



Educational Program Development Plan
EP 8D07103 – «Materials science and engineering»
(PhD)

Almaty 2026

The Department of Materials Science, Nanotechnology, and Engineering Physics plans to train specialists in the educational program 8D07103 - "Materials science and engineering". These specialists will be highly qualified researchers and teachers capable of solving fundamental and applied problems in materials science, nanomaterials, and high-tech manufacturing, in accordance with the principles of sustainable development, internationalization, and scientific ethics.

The professional activities of graduates include:

- research institutes and centers, technology parks.
- metallurgical and mechanical engineering plants, energy and electronics, chemical and petrochemical industries, biomedicine and pharmaceuticals, aerospace and defense industries;
- design, engineering, and technology organizations;
- innovation and startup environments: technology parks, business incubators, venture capital firms;
- in expert and analytical structures: certification and standardization centers, technical regulatory bodies, and consulting companies.

Graduates of the educational program are currently working at leading research institutes, in industries, in government agencies, and teaching at universities, holding PhD degrees.

Main planned activities for the program:

1. Annual updating of academic disciplines considering global trends in materials science, nanotechnology, and the digitalization of science. Introducing courses on AI and machine learning in materials science, sustainable development and green materials technologies, academic writing, and research ethics. Updating the individual educational and research trajectories of doctoral students.
2. Developing doctoral students' research activities, engaging doctoral students in international and national research projects, requiring mandatory publication activity in Scopus/Web of Science journals (Q1-Q2), organizing scientific seminars, schools, and colloquiums, supporting participation in international conferences, and organizing international internships.
3. Internationalization and academic mobility. Concluding double degree and co-supervision agreements. Involving visiting professors, developing English-language modules.
4. Strengthening ties with industry and innovation. Launching joint PhD projects with industrial partners, engaging doctoral students in enterprise R&D, supporting start-ups and commercialization of developments, and involving industrial experts in dissertation evaluation. Concluding cooperation agreements and opening a department branch with leading research institutes to conduct certain types of practical and laboratory classes at the research institute, which uses modern technology in the production of nanomaterials and is equipped with advanced research equipment, conducting joint research projects, and preparing and implementing research projects.
5. Continuing education for faculty and supervisors. Faculty internships at international research centers. Concluding agreements with partner universities to conduct advanced training courses for faculty. Sending faculty to professional

development courses at partner universities abroad. Concluding agreements with companies to provide internships for the university's faculty. Strengthening the practical qualifications of the faculty. Developing an internship program in collaboration with research institutes and companies, considering the requirements of the faculty and the specifics of the research institutes and companies. Involving employees of specialized research institutes in teaching. Continuing the qualifications of the faculty in English for teaching specialized disciplines in doctoral programs. Developing academic supervision and mentoring skills.

6. Quality assurance and monitoring of learning outcomes. Regular review of learning outcomes. Surveys of doctoral students and graduates, analysis of learning outcomes' compliance with labor market requirements. Work with the employers' council and international experts.

7. Expansion and updating of the department's educational and laboratory facilities through:

- modernization of laboratories (XRD, SEM, AFM, DSC, TEM, etc.).

- concluding cooperation agreements between KazNITU named after K.I. Satpayev and leading research institutes with the aim of eventually opening training and production centers for the introduction of innovative advances in new materials and technologies into the educational process, practical familiarization with new technologies and types of research equipment, lectures, practical and laboratory classes, etc.

- creation of an "Electrochemical Engineering and Corrosion" laboratory, which will be organized within the department. The laboratory will enable research on the corrosion properties of materials and the characteristics of materials for solar panel and battery elements.

8. Integration of sustainable development, inclusion, and AI. Implementation of SDGs in dissertation topics, development of an inclusive research environment, and the use of AI in data analysis and materials modeling.

9. Further development of international cooperation with Top 100 universities, including the conclusion of agreements in the areas of research, student academic mobility, experience exchange, and advanced training for the department's faculty (2026-2027).

10. Involvement of doctoral students in scientific conferences organized by the Department of Scientific and Informatics and the Institute's leading departments, and publication of their articles in collections of papers. Expanded access to electronic databases (Scopus, WoS, Springer), increasing the number of Q1-Q2 publications, increasing the share of international PhD projects, and increasing graduate employment in R&D and universities.

11. Strengthening efforts to monitor the department's research and innovation activities and analyzing the performance of the department's faculty. 12. Further strengthen the preparation of projects for participation in various grant, program-targeted funding, and other competitions held within the framework of scientific research.

13. Create a program to attract and recruit strong master's students for doctoral studies. Develop a program to attract strong graduates in relevant fields and industry

employees to the university for doctoral studies in the department's specialties.

14. Develop an educational program based on leading global practices. Develop curricula for doctoral studies based on best global practices. Implement enhanced research practice. Develop an internship program in collaboration with employers. Implement an annual process for approving the topic and writing a master's thesis jointly with research institutes and enterprises on topics related to specific problems of new materials for their subsequent solution.

15. Develop a program for high-quality employment. Develop a system for informing graduates and employers about vacancies and candidates. Develop a system for informing employers about potential candidates, their achievements, and skills.