

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

**APPROVED BY**

**Director of MMI**

**К.В. Rysbekov**

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**Educational program development plan**

**7M07153 – Materials science and engineering  
(Master's degree)**

Almaty 2026

The department of “Materials science, nanotechnology and engineering physics” plans to prepare specialists in educational programme 7M07153 - Materials science and engineering, which, due to their versatility, can find application in the advanced sectors of the national economy.

The objects of professional activity of graduates are:

- research institutes and centers, technology parks.
- machine-building plants producing various equipment, machine parts, machine-building products;
- design, design and technological organizations;
- metallurgical and enrichment enterprises;
- chemical enterprises.

Graduates of the specialties are currently working in leading research institutes, industries, government agencies, teaching at universities, having a master's degree.

The main planned activities for the EP:

***Strategic Objectives (2025–2030)***

***Objective 1. Academic excellence and curriculum modernization***

1. Update curriculum in line with:
  - Industry 4.0 / Industry 5.0 trends;
  - Digital materials design (ICME, computational materials science);
  - Additive manufacturing;
  - Smart and functional materials;
  - Green and sustainable materials engineering.
2. Introduce elective tracks:
  - Advanced Structural Materials
  - Functional & Electronic Materials
  - Nanomaterials and Surface Engineering
  - Sustainable Materials Technologies
3. Increase research-based learning components.
4. Align learning outcomes with ASIIN and international accreditation standards.

***Objective 2. Strengthening research integration***

1. Integrate master’s students into active research laboratories from Semester
2. Establish thematic research clusters:
  - Energy Materials
  - Advanced Metallurgy
  - Composite & Polymer Materials
  - Digital Modeling and Simulation
3. Require at least one indexed publication or conference paper before thesis defense.
4. Promote participation in national and international research grants.

***Objective 3. Laboratory infrastructure modernization***

1. Upgrade equipment:
  - XRD, SEM/TEM, mechanical testing systems

- Thermal analysis equipment
  - Additive manufacturing units
2. Develop computational materials lab (simulation software, HPC access).
  3. Implement digital laboratory management system.
  4. Strengthen safety and quality standards (ISO-based lab procedures).

*Objective 4. Industry Collaboration and Employability*

1. Establish industrial advisory board (metallurgy, energy, manufacturing sectors).
2. Implement dual supervision (academic + industrial supervisor).
3. Increase industrial internships (minimum 6–8 weeks).
4. Launch joint R&D projects with companies.
5. Develop industrial problem-based master's theses.

*Objective 5. Internationalization*

1. Encourage academic mobility (Erasmus+, bilateral agreements).
2. Invite visiting professors and researchers.
3. Promote joint publications with international partners.

*Objective 6. Digitalization and Innovation*

1. Integrate:
  - AI in materials science
  - Machine learning for materials prediction
  - Digital twins in materials processing
2. Introduce course: "Data-Driven Materials Engineering".
3. Develop student innovation/start-up support.
4. Encourage patent applications and technology transfer.

*Objective 7. Quality Assurance and Accreditation*

1. Align programme with:
  - National Qualification Framework
  - ESG standards
  - ASIIN accreditation requirements
2. Annual stakeholder feedback analysis.
3. Graduate tracking system.
4. Continuous learning outcome assessment

**Resource Plan**

*Human Resources*

- Recruit 2–3 international-level researchers
- Train faculty in digital tools and AI applications
- Increase number of PhD-qualified staff

*Financial Resources*

- National research grants
- Industry co-financing

- International funding programs
- University development funds

*Infrastructure*

- Laboratory upgrades
- Software licenses
- HPC access

*Expected Outcomes by 2030*

- Recognized research-oriented Master's programme in Asia
- Strong industry integration with CityU Hong Kong partners
- Increased publication output
- Improved graduate employability
- Preparation pipeline for PhD studies