

Navoi State University – Physics

Program Duration: 2 years

Mode of Study: Full-time

Program Code: 70530501

Total Workload: 120 ECTS credits

ECTS credits per semester: 30

Overview

The Master's degree program in **Physics** (Program Code: 70530501) at Navoi State University is a two-year, full-time academic program comprising a total workload of 120 ECTS credits (30 ECTS per semester). The program is designed to prepare highly qualified physicists, scientific researchers, theoretical analysts, and laboratory specialists equipped with advanced knowledge in theoretical physics, experimental physics, condensed matter physics, quantum mechanics, and modern physical technologies.

The curriculum integrates advanced theoretical instruction, rigorous mathematical modeling, and hands-on laboratory experimentation. Students gain expertise in solid-state physics, semiconductor physics, optics and spectroscopy, nuclear physics, and computational physical modeling. The program places strong emphasis on basic research as well as practical applications relevant to industrial development, energy sectors, microelectronics, and advanced materials engineering in Uzbekistan.

Graduates of this program are fully equipped to pursue careers as research scientists, laboratory technicians, physics lecturers, technical consultants, and R&D specialists in academic institutions, research institutes, and high-tech industries, as well as to continue their research at the doctoral (PhD) level.

Assessment

A comprehensive and multi-component assessment system is applied in the Master's program in Physics to ensure continuous learning, mathematical precision, experimental competence, and scientific rigor.

1. Course-based assessment

- **Presentations and seminars** – assess students' ability to analyze, present, and defend complex physical theories, research findings, and scientific paper reviews in academic settings.
- **Mini-tests, quizzes, and oral exams** – monitor understanding of core theoretical concepts, mathematical physics methods, quantum laws, and experimental physics setups.
- **Midterm and final examinations** – evaluate theoretical depth, mathematical problem-solving skills, and experimental analysis through written exams and practical lab tasks.

- **Portfolio assignments** – compile laboratory measurement logs, computational simulation reports, experimental data analyses, and research drafts demonstrating technical progression.
 - **Independent assignments** – encourage independent scientific literature reviews, theoretical physics derivations, numerical simulations, and problem-solving assignments.
2. **Research-based assessment**
- **Scientific Research Work (ITI)** – evaluated through research proposals, regular laboratory/theoretical progress reports, and defense of research outcomes before the department.
 - **Scientific and Pedagogical Work (IPI)** – evaluated via teaching practice, preparation of physics problem sets, laboratory manuals, and scientific reporting.
 - **Master’s Thesis (MD/M)** – evaluated based on scientific originality, mathematical/experimental rigor, thesis writing quality, and public defense before the State Attestation Commission.
3. **Practice-based assessment**
- **Industrial and Laboratory Practice** – evaluated through performance in physical research institutes, industrial measurement laboratories, and specialized technical centers, accompanied by comprehensive practice reports.
 - **Pre-graduation practice** – assessed on the integration of theoretical/experimental results, scientific writing, and final thesis preparation.
4. **Work-integrated learning**
- **Computational and Experimental Modeling Projects** – assessed on mathematical modeling precision, algorithm development, experimental accuracy, and alignment with scientific standards.

Academic Requirements

Admission Requirements-Applicants applying for the Master’s degree program in Physics (Code: 70530501) must satisfy the following criteria:

- **Educational background** – A Bachelor’s degree (or equivalent qualification) in physics, applied physics, astronomy, engineering physics, materials science, or related exact sciences from a recognized higher education institution.
- **Academic excellence** – Applicants holding an honors diploma (*imtiyozli diplom*) are eligible for preferential admission according to current regulations of the Ministry of Higher Education, Science and Innovation of the Republic of Uzbekistan.
- **Language proficiency** – A valid national or international certificate demonstrating at least B2-level foreign language proficiency (CEFR, IELTS, TOEFL, etc.) in English, Russian, or another recognized foreign language.

Graduation Requirements

To be granted the Master of Science degree in Physics, students are required to:

- Complete all compulsory and elective modules specified in the curriculum, accumulating a total of **120 ECTS credits** (30 ECTS per semester).
- Maintain standard academic standing according to Navoi State University regulations (passing marks in all subjects).
- Successfully complete all practical trainings (laboratory research practice, educational teaching practice, and pre-graduation practice) with positive performance evaluations.

- Fulfill all research requirements (Scientific Research Work and Scientific-Pedagogical Work).
- Prepare, submit, and successfully defend a **Master's Thesis** demonstrating independent theoretical or experimental physics research before the State Attestation Commission.
- Pass all required state attestation processes.

Courses Offered

Year 1

Compulsory:

- Research Methodology and History of Physics
- Reforms in the Education System under the Development Strategy of New Uzbekistan
- Advanced Quantum Mechanics and Field Theory
- Mathematical Methods in Physics and Computer Simulation
- Physical Properties of Solids and Condensed Matter Physics

Elective:

- Physics of Semiconductors and Microelectronics
- Optics, Photonics, and Laser Physics
- Nuclear Physics and Elementary Particles
- Computational Physics and Data Processing
- Regulatory Documents and Safety Standards in Physical Laboratories

Year 2

Compulsory:

- Modern Methods of Physical Spectroscopy and Diagnostics
- Nanophysics and Materials Science
- Statistical Physics and Thermodynamics of Non-Equilibrium Systems

Elective:

- Renewable Energy Sources and Solar Physics
- Plasma Physics and Controlled Fusion
- Biophysics and Medical Physics Fundamentals
- Professional Morality and Ethics in Science
- Crystallography and X-ray Structural Analysis
- Physics of Thin Films and Surface Phenomena
- Radio Physics and Electronics

Career Opportunities

Graduates of the Master's degree program in Physics acquire comprehensive theoretical, mathematical, and laboratory skills, enabling them to work in diverse scientific, industrial, and educational fields:

- **Research Scientist / Specialist** at the Academy of Sciences of the Republic of Uzbekistan (e.g., Institute of Nuclear Physics, Physical-Technical Institute, Institute of Material Sciences).

- **Physics Lecturer / Instructor** in higher education institutions, specialized academic lyceums, professional colleges, and secondary schools.
- **R&D (Research and Development) Specialist / Engineer** in high-tech manufacturing, microelectronics plants, solar panel production facilities, and metallurgical industries.
- **Laboratory Analyst / Engineer** in metrology, standardization, radiation safety, and non-destructive testing laboratories.
- **Medical Physicist / Equipment Specialist** in diagnostic medical centers, radiological departments, and healthcare technology organizations.
- **Data Analyst / Computational Modeler** in technological startups, IT enterprises, and research organizations requiring complex mathematical modeling and problem-solving skills.
- **Technical Officer / Inspector** in energy management agencies, atomic energy regulation bodies (e.g., Uzatom), and environmental monitoring centers.
- **Consultant or Service Provider** offering expertise in physical measurements, scientific instrumentation, and technical safety auditing.

Tuition Fees

- **For local students:** Approximate annual tuition – 9,700,000 UZS.
- **For international students:** Approximate annual tuition – 774.28 USD.

(Note: Tuition fees are subject to adjustment in accordance with university policy and foreign currency exchange rates.)

Learning Outcomes

Master's Degree in Physics

Upon successful completion of the program, graduates will be able to:

1. Knowledge

- **1.1.** Demonstrate advanced knowledge of theoretical physics, quantum mechanics, thermodynamics, statistical physics, and electrodynamics.
- **1.2.** Understand the fundamental principles of solid-state physics, semiconductor physics, photonics, and condensed matter phenomena.
- **1.3.** Explain theoretical and practical aspects of modern physical experimental methods, spectroscopy, structural analysis, and physical diagnostics.
- **1.4.** Demonstrate knowledge of mathematical modeling, numerical methods, and software algorithms used to simulate physical processes.
- **1.5.** Recognize the applications of physics in high-tech industries, renewable energy, microelectronics, and material synthesis.

2. Skills

- **2.1.** Design, assemble, calibrate, and operate complex experimental physics equipment and measuring instruments.
- **2.2.** Apply mathematical techniques and computational algorithms to solve advanced physical problems and simulate natural phenomena.
- **2.3.** Process, analyze, and interpret experimental physical data using statistical tools, numerical methods, and specialized software.

- **2.4.** Develop new physical measurement protocols, theoretical models, and experimental research methodologies.
- **2.5.** Prepare scientific reports, technical specifications, patent documentation, and publishable research papers in physical sciences.
- **2.6.** Effectively communicate physical concepts, research findings, and technical data to academic audiences, engineers, and students in national and foreign languages.

3. Competences

- **3.1. Physical & Research Competence** – Conduct independent, precise, and safe theoretical or experimental research in physics to address fundamental and applied scientific problems.
- **3.2. Laboratory & Technical Competence** – Manage physics laboratories, oversee precision measuring equipment, and ensure compliance with radiation and electrical safety standards.
- **3.3. Methodological & Educational Competence** – Teach physics at academic institutions, designing modern lecture courses, problem-solving workshops, and laboratory experiments.
- **3.4. Analytical & Leadership Competence** – Lead multidisciplinary scientific and technical project teams in university departments, research institutes, or high-tech enterprises.
- **3.5. Ethical & Scientific Integrity** – Promote academic integrity, objective scientific analysis, and responsible innovation in physical research and technological applications.
- **3.6. Lifelong Learning Competence** – Continuously update knowledge in rapidly evolving areas of physics, adopt emerging experimental techniques, and participate in international physics conferences and scientific collaborations.