

Navoi State University – Chemistry

Program Duration: 2 years

Mode of Study: Full-time

Program Code: 70530101

Total Workload: 120 ECTS credits

ECTS credits per semester: 30

Overview

The Master's degree program in **Chemistry** (Program Code: 70530101) 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 chemists, chemical researchers, and industry specialists equipped with advanced knowledge in physical, organic, inorganic, analytical, and macromolecular chemistry, as well as modern chemical synthesis and analysis techniques.

The curriculum integrates theoretical instruction, advanced laboratory experiments, and independent research training. Students gain hands-on experience in qualitative and quantitative analysis, molecular structure determination, spectroscopic techniques, chemical kinetics, and industrial chemical technologies. The program places strong emphasis on practical research applications, environmentally friendly green chemistry, chemical technology optimization, and regional industrial priorities, including the mining, chemical, and metallurgical sectors of Uzbekistan.

Graduates of this program are fully equipped to pursue careers as chemical analysts, research scientists, quality control managers, laboratory directors, and academic staff in higher education, as well as to continue their studies at the doctoral (PhD) level.

Assessment

A comprehensive and multi-component assessment system is applied in the Master's program in Chemistry to ensure continuous learning, practical laboratory competence, and scientific rigor.

1. Course-based assessment

- **Presentations and seminars** – assess students' ability to present, analyze, and defend research proposals, chemical reaction mechanisms, and literature reviews in academic settings.
- **Mini-tests, quizzes, and oral exams** – monitor understanding of core theoretical concepts, safety protocols, synthesis pathways, and analytical instrument operations.
- **Midterm and final examinations** – evaluate in-depth theoretical and practical subject knowledge through written exams, problem-solving tasks, and laboratory examinations.
- **Portfolio assignments** – compile laboratory logs, experiment protocols, spectral data analyses, and research paper drafts demonstrating progressive skill development.

- **Independent assignments** – encourage independent literature review, experimental design, theoretical modeling, and computational chemistry tasks.
- 2. **Research-based assessment**
 - **Scientific Research Work (ITI)** – evaluated through research proposals, regular laboratory research reports, and periodic progress defenses before the department.
 - **Scientific and Pedagogical Work (IPI)** – evaluated via teaching practice, preparation of laboratory training manuals, and scientific reporting.
 - **Master's Thesis (MD/M)** – evaluated based on scientific originality, practical relevance, laboratory work quality, thesis writing, and public defense before the State Attestation Commission.
- 3. **Practice-based assessment**
 - **Industrial and Laboratory Practice** – evaluated through performance in industrial plant laboratories, research institutes, and certified testing centers, accompanied by comprehensive practice reports.
 - **Pre-graduation practice** – assessed on the synthesis of research findings, practical trial results, and final thesis preparation.
- 4. **Work-integrated learning**
 - **Analytical and Synthesis Projects** – assessed on experimental accuracy, reproducibility, usage of modern analytical software, and alignment with safety and environmental standards.

Academic Requirements

Admission Requirements: Applicants applying for the Master's degree program in Chemistry (Code: 70530101) must satisfy the following criteria:

- **Educational background** – A Bachelor's degree (or equivalent qualification) in chemistry, chemical technology, materials science, biochemistry, or related natural science fields 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 Chemistry, 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, industrial internship, 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 experimental research and analytical skill before the State Attestation Commission.
- Pass all required state attestation processes.

Courses Offered

Year 1

Compulsory:

- Research Methodology in Chemistry
- Reforms in the Education System under the Development Strategy of New Uzbekistan
- Modern Instrumental Methods of Chemical Analysis (NMR, IR, UV-Vis, Mass Spectrometry)
- Advanced Inorganic and Coordination Chemistry
- Physical Chemistry of Heterogeneous Systems and Catalysis

Elective:

- Green Chemistry and Sustainable Technologies
- Chemistry of High-Molecular Weight Compounds (Polymers)
- Organic Synthesis and Reaction Mechanisms
- Environmental Chemistry and Chemical Safety
- Regulatory Documents and Quality Standards in Chemical Laboratories

Year 2

Compulsory:

- Chemistry of Natural Compounds and Bioorganic Chemistry
- Physical-Chemical Methods in Material Science
- Industrial Chemistry and Chemical Technology Optimization

Elective:

- Electrochemistry and Corrosion Protection
- Chemistry of Rare and Scattered Elements
- Computational Chemistry and Molecular Modeling
- Professional Morality and Ethics in Science
- Chemistry of Nanomaterials and Surface Phenomena
- Analytical Chemistry of Industrial Products
- Chemical Thermodynamics and Kinetics

Career Opportunities

Graduates of the Master's degree program in Chemistry possess strong analytical, experimental, and theoretical expertise, allowing them to work in a wide range of academic, research, and industrial environments:

- **Research Scientist / Specialist** at the Academy of Sciences of the Republic of Uzbekistan (e.g., Institute of General and Inorganic Chemistry, Institute of Bioorganic Chemistry, Institute of Polymer Chemistry and Physics).
- **Chemist / Chemical Analyst** in industrial plants, mining and metallurgical combines (e.g., NGMK, AGMK), chemical fertilizer production plants, and oil refineries.
- **Quality Control (QC) & Quality Assurance (QA) Manager** in pharmaceutical companies, food processing industries, cosmetics manufacturing, and building materials enterprises.

- **Chemistry Lecturer / Instructor** in higher education institutions, specialized academic lyceums, professional colleges, and secondary schools.
- **Laboratory Director or Analyst** in state certification, standardization, forensic science, environmental testing, and sanitary-epidemiological laboratories.
- **R&D (Research and Development) Specialist** in private and public manufacturing companies developing new materials, polymers, and chemical products.
- **Environmental & Chemical Safety Officer** in industrial facilities and government monitoring agencies.
- **Technical Sales / Consultant** for international chemical equipment suppliers, laboratory reagents distributors, and analytical instrument companies.

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 Chemistry

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

1. Knowledge

- **1.1.** Demonstrate advanced knowledge of theoretical, inorganic, organic, physical, and analytical chemistry principles and reaction dynamics.
- **1.2.** Understand state-of-the-art instrumental analysis techniques (spectroscopy, chromatography, electrochemistry, thermal analysis) and their theoretical foundations.
- **1.3.** Explain principles of green chemistry, chemical catalysis, materials synthesis, and polymer chemistry in modern industrial applications.
- **1.4.** Understand international quality control standards (ISO/IEC 17025), chemical hazard classifications, and laboratory safety protocols.
- **1.5.** Recognize the role of chemical sciences in solving regional economic, industrial, environmental, and technological challenges.

2. Skills

- **2.1.** Design, execute, and optimize multi-step chemical syntheses, isolation procedures, and purification processes for inorganic and organic substances.
- **2.2.** Operate complex analytical laboratory instruments (such as HPLC, GC, FTIR, UV-Vis spectrophotometers) and interpret technical spectral and quantitative data.
- **2.3.** Apply statistical, computational, and software tools to process experimental data, calibrate measurement devices, and model chemical structures.
- **2.4.** Develop and validate new analytical measurement procedures and testing methods for quality control in manufacturing.
- **2.5.** Prepare scientific reports, laboratory SOPs (Standard Operating Procedures), patents, project proposals, and peer-reviewed research papers.
- **2.6.** Effectively present scientific findings and chemical safety information to scientific audiences, industry stakeholders, and students in national and foreign languages.

3. Competences

- **3.1. Chemical & Research Competence** – Conduct independent, safe, and original scientific experiments in chemistry to solve fundamental and applied scientific problems.
- **3.2. Laboratory Management Competence** – Manage chemical laboratory operations, oversee inventory and chemical waste management, and ensure compliance with safety and environmental regulations.
- **3.3. Methodological & Educational Competence** – Teach chemical subjects at universities and secondary specialized institutions using innovative pedagogical methods and modern laboratory practices.
- **3.4. Technical Leadership Competence** – Lead multidisciplinary team projects in chemical production, material testing, and R&D departments.
- **3.5. Ethical & Environmental Competence** – Uphold rigorous academic integrity, professional ethics, and sustainable practices in handling hazardous chemical substances.
- **3.6. Lifelong Learning Competence** – Continually expand scientific knowledge, adapt to new analytical technologies, and participate in international chemistry conferences and professional training.