

# Navoi State University – Renewable Energy Sources

**Program Duration:** 2 years

**Mode of Study:** Full-time

**Program Code:** 70710413

**Total Workload:** 120 ECTS credits

**ECTS credits per semester:** 30

## Overview

The Master's degree program in **Renewable Energy Sources** (Program Code: 70710413) 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 renewable energy engineers, clean energy systems architects, green technology researchers, and energy sustainability specialists equipped with advanced knowledge in solar, wind, biomass, hydro, and geothermal energy technologies, energy storage systems, and smart grid integration.

The curriculum integrates advanced energy engineering principles, thermodynamics, electrical system design, environmental impact assessment, and computational energy modeling. Students gain hands-on expertise in designing solar photovoltaic and thermal installations, wind turbine systems, hybrid energy plants, energy storage frameworks, and microgrids. The program places strong emphasis on supporting Uzbekistan's green economy transition, optimizing industrial energy efficiency, and leveraging the extensive solar and wind energy potential of the Navoi region and central Uzbekistan.

Graduates of this program are fully equipped to pursue careers as renewable energy engineers, energy auditors, clean tech project managers, green energy consultants, research scientists in energy institutes, and academic staff in higher education institutions, 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 Renewable Energy Sources to ensure continuous learning, engineering competence, environmental awareness, and scientific rigor.

### 1. Course-based assessment

- **Presentations and seminars** – assess students' ability to analyze, present, and defend clean energy technologies, system designs, energy yield calculations, and research literature in academic and industrial settings.
- **Mini-tests, quizzes, and oral exams** – monitor understanding of core theoretical concepts, semiconductor photovoltaics, aerodynamic wind energy principles, thermodynamics, and power grid integration standards.

- **Midterm and final examinations** – evaluate technical depth, energy system calculation capabilities, and engineering problem-solving through written exams and practical lab assignments.
  - **Portfolio assignments** – compile renewable energy project blueprints, simulation reports (using PVSyst, Homer, MATLAB), field test data logs, and research paper drafts demonstrating technical progression.
  - **Independent assignments** – encourage independent energy modeling, feasibility studies, carbon offset assessments, and system efficiency optimization tasks.
2. **Research-based assessment**
- **Scientific Research Work (ITI)** – evaluated through research proposals, energy experimental data reports, prototype testing, and defense of research outcomes before the department.
  - **Scientific and Pedagogical Work (IPI)** – evaluated via teaching practice, preparation of renewable energy laboratory manuals, practical exercises, and academic reporting.
  - **Master’s Thesis (MD/M)** – evaluated based on overall scientific rigor, engineering innovation, technical and economic feasibility, thesis writing quality, and public defense before the State Attestation Commission.
3. **Practice-based assessment**
- **Industrial and Laboratory Practice** – evaluated through performance at solar/wind power plants, energy industrial enterprises (e.g., NGMK energy departments), green energy firms, and research institutes, accompanied by comprehensive practice reports.
  - **Pre-graduation practice** – assessed on the deployment, simulation, and testing of clean energy systems and final thesis preparation.
4. **Work-integrated learning**
- **Renewable Energy System Design Projects** – assessed on system efficiency, power output reliability, economic payback periods, safety protocols, and compliance with national/international energy standards.

## Academic Requirements

**Admission Requirements**-Applicants applying for the Master’s degree program in Renewable Energy Sources (Code: 70710413) must satisfy the following criteria:

- **Educational background** – A Bachelor’s degree (or equivalent qualification) in renewable energy, power engineering, electrical engineering, physics, mechanical engineering, thermal power engineering, or related engineering/physics 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 Renewable Energy Sources, 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 (field renewable energy practice, teaching internship, and pre-graduation practice) with positive supervisor evaluations.
- Fulfill all research requirements (Scientific Research Work and Scientific-Pedagogical Work).
- Prepare, submit, and successfully defend a **Master's Thesis** demonstrating original engineering research and practical system optimization before the State Attestation Commission.
- Pass all required state attestation processes.

## Courses Offered

### Year 1

#### Compulsory:

- Research Methodology and Technical Writing in Energy Systems
- Reforms in the Education System under the Development Strategy of New Uzbekistan
- Physics and Technology of Solar Energy Conversion (PV and Solar Thermal)
- Wind Power Systems Engineering and Aerodynamics
- Energy Storage Technologies and Hydrogen Energy Systems

#### Elective:

- Computer Simulation and Modeling of Renewable Energy Systems (PVSyst, Homer, MATLAB)
- Smart Grids and Power Electronics for Renewable Integration
- Biomass, Biogas, and Geothermal Energy Technologies
- Regulatory Documents, Energy Laws, and Safety Standards in Clean Energy
- Small Hydropower Plants and Water Energy Systems

### Year 2

#### Compulsory:

- Energy Efficiency, Energy Auditing, and Conservation Management
- Hybrid and Autonomous Renewable Power Systems Design
- Economics, Investment, and Feasibility of Green Energy Projects

#### Elective:

- Operation, Maintenance, and Diagnostics of Renewable Energy Plants
- Climate Change, Carbon Markets, and Environmental Impact Assessment
- High-Voltage Engineering and Grid Connection Protocols
- Professional Morality and Ethics in Engineering and Technology
- Materials Science for Photovoltaics and Clean Energy Applications
- Decentralized Power Generation and Microgrid Control
- Solar Desalination and Industrial Thermal Applications

## Career Opportunities

Graduates of the Master's degree program in Renewable Energy Sources acquire comprehensive engineering design, energy auditing, and green technology implementation skills, enabling them to pursue careers across energy, industrial, environmental, governmental, and academic sectors:

- **Renewable Energy Engineer / Systems Designer** in solar and wind power plants, clean energy construction companies, and independent power producers (IPPs).
- **Energy Audit Specialist / Energy Manager** in major industrial combines (e.g., NGMK, AGMK), industrial plants, manufacturing enterprises, and commercial facilities.
- **Research Scientist / Senior Specialist** at the Institute of Material Sciences, Physical-Technical Institute of the Academy of Sciences of Uzbekistan, and energy R&D laboratories.
- **Renewable Energy Lecturer / Instructor** in higher education institutions, energy technical colleges, specialized vocational institutes, and training centers.
- **Green Energy Project Manager / Consultant** in international renewable energy corporations, engineering consultancy firms, and clean tech startups.
- **Specialist / Inspector** in the Ministry of Energy of the Republic of Uzbekistan, Ministry of Ecology, Environmental Protection and Climate Change, and Energy Market Regulatory Authority.
- **Smart Grid & Power Electronics Specialist** in regional electric grid companies (Uzbekenergo / National Electric Grids) managing renewable energy grid integration.
- **International Green Development Officer** in global development agencies (UNDP, World Bank, ADB, EBRD, GIZ) coordinating renewable transition initiatives.

## 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 Renewable Energy Sources

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

#### 1. Knowledge

- **1.1.** Demonstrate advanced knowledge of the physical mechanisms, thermodynamic principles, and engineering design of solar, wind, biomass, hydro, and geothermal energy conversion systems.
- **1.2.** Understand power electronics, energy storage technologies (lithium-ion, flow batteries, hydrogen fuel cells), and smart grid integration protocols.
- **1.3.** Explain methodologies for energy auditing, energy conservation, thermal insulation analysis, and industrial energy efficiency management.
- **1.4.** Demonstrate knowledge of specialized software tools for clean energy modeling, yield forecasting, and economic feasibility calculation (PVSyst, Homer, MATLAB/Simulink).
- **1.5.** Recognize national legal standards, energy laws, grid connection codes, safety protocols, and global carbon reduction frameworks (Paris Agreement, ESG standards).

## 2. Skills

- **2.1.** Design, size, calculate, and optimize solar PV plants, wind farms, solar thermal units, and hybrid renewable energy installations.
- **2.2.** Conduct comprehensive energy audits of industrial, residential, and commercial facilities to identify energy losses and propose efficiency solutions.
- **2.3.** Perform technical and economic feasibility analyses, payback period estimations, and life-cycle cost assessments for clean energy projects.
- **2.4.** Utilize modern diagnostic tools and simulation software to evaluate power plant performance, degradation rates, and grid stability.
- **2.5.** Prepare technical documentation, engineering blueprints, energy audit reports, environmental impact statements, and publishable scientific research papers.
- **2.6.** Effectively present renewable energy project proposals, green transition strategies, and technical research findings to industrial executives, energy boards, and academic audiences in national and foreign languages.

## 3. Competences

- **3.1. Engineering & Research Competence** – Conduct independent, scientifically rigorous research and engineering design to address fundamental and applied clean energy challenges.
- **3.2. Green Energy Project Leadership Competence** – Direct power plant construction projects, lead energy audit teams, and manage clean technology implementation in industrial and municipal sectors.
- **3.3. Methodological & Educational Competence** – Teach renewable energy and power engineering subjects in academic institutions using practical laboratory training methods.
- **3.4. Sustainable Innovation Competence** – Conceptualize and implement novel energy storage, smart microgrid, and decarbonization technologies to support regional green economy goals.
- **3.5. Ethical & Environmental Responsibility Competence** – Uphold rigorous engineering safety standards, environmental stewardship, occupational safety regulations, and sustainable resource ethics.
- **3.6. Lifelong Learning Competence** – Continuously adopt rapid advancements in clean energy technology, green hydrogen innovations, and international renewable energy industry standards through ongoing self-directed research and professional development.