NAVOI STATE UNIVERSITY

ECO402 ECOLOGICAL RISKS AND ENVIRONMENTAL SAFETY — COURSE SYLLABUS

Faculty of Natural Sciences & Medicine | Department of Ecology | Program: 60520200 Ecology & Environmental Protection

COURSE PASSPORT & ACADEMIC METADATA

Course Title:	Ecological Risks and Environmental Safety	**Course Code:**	ECO402
Course Type:	Mandatory	**Field of Study:**	500000 Natural Sciences / 520000 Environment
Program:	60520200 Ecology & Environmental Protection	**Academic Year:**	2026–2027
Semester:	1 (Autumn)	**Form of Education:**	Full-time
Language:	Uzbek	**Total Workload Allocation:**	150 Hours (Lectures, Practical) + Independent Study
Assessment:	Examination	**Aligned UN SDGs:**	SDG 13 (Climate Action), SDG 15 (Life on Land), SDG 6 (Clean Water)



1. Course Description & Scope

The course 'Ecological Risks and Environmental Safety' studies the theoretical, methodological, and practical frameworks of evaluating natural and anthropogenic ecological risks across regional and global scales. Students analyze industrial hazards, pollutant dispersion, climate change vulnerability, and regulatory safety frameworks.

In alignment with SDG 13 (Climate Action), SDG 15 (Life on Land), and SDG 6 (Clean Water & Sanitation), the course explores environmental protection strategies, disaster risk reduction, and sustainable management protocols.

2. Course Aims & Professional Competencies

Course Aim: To develop professional competencies in identifying, evaluating, modeling, and mitigating ecological risks and implementing environmental safety standards.

- **Knowledge:** Understand theoretical foundations of environmental safety, hazard classification, risk matrices, and environmental management systems (ISO 14001).
- **Analytical Skills:** Conduct quantitative risk assessments, construct GIS hazard maps, process environmental monitoring data, and model pollutant dispersion.
- **Conservation Applications:** Formulate disaster response plans, design industrial pollution prevention protocols, and implement environmental impact assessments (EIA).
- **SDG Competencies:** Contribute to United Nations Sustainable Development Goals (SDGs) by designing sustainable regional risk reduction policies.

3. Prerequisites

Prerequisites: General Ecology, Geoecology, Environmental Chemistry, Basics of Meteorology and Hydrology.

4. Course Structure & Workload Allocation

Activity Type	Curriculum Focus	Total Hours Allocation
Lectures	Ecological Risk Theory & Safety Frameworks	30 Contact Hours
Practical Classes	Hazard Mapping & Risk Matrix Calculations	20 Contact Hours
Independent Study	Regional Disaster Case Studies & Projects	40 Self-Directed Hours
Total Workload	**Full Academic Module**	**150 Hours Total (5 ECTS)**

5. Detailed Course Curriculum Outline

5.1 Lecture Syllabus Outline

- **L1: Introduction to Ecological Risk Assessment & Safety Concept:** Subject, history, research principles, structure of natural and anthropogenic hazards.
- **L2: Ecological Factors & Hazard Classification:** Climatic, edaphic, technogenic, and biotic risk drivers; hazard identification methodologies.
- **L3: Risk Matrix Analysis & Quantitative Evaluation:** Probability models, severity scoring, MacArthur-Wilson risk adaptation models, safety matrices.
- **L4: Atmospheric & Water Pollution Risks:** Pollutant dispersion modeling, water scarcity, industrial effluents, and air quality standards.
- **L5: Terrestrial Risks & Soil Degradation:** Soil contamination, heavy metal accumulation, desertification risks, and land degradation neutrality.

- **L6: Environmental Safety Foundations & EIA:** Environmental Impact Assessment (EIA), ISO 14001 management standards, protected area safety.
- **L7: Global Climate Adaptation & Legal Frameworks:** Climate vulnerability, disaster response plans, Law of Uzbekistan 'On Nature Protection', CBD & UN SDG protocols.

5.2 Practical & Laboratory Outline

- Mapping global and regional ecological risk hotspots using GIS and physical maps.
- Quantitative risk analysis: Calculating pollutant concentration indexes for water and soil samples.
- Constructing and evaluating 5x5 ecological risk assessment matrices for industrial enterprises.
- Evaluating species distribution limits under environmental contamination stress.
- Analyzing desertification and land degradation trends in Central Asian arid regions (Turan, Kyzylkum).
- Formulating Environmental Impact Assessment (EIA) reports for local manufacturing projects.
- Assessing technogenic risk mitigation protocols and developing regional emergency action plans.

5.3 Independent Study & Case Study Tasks

- Preparing a research report on ecological risk factors and Aral Sea environmental disaster consequences.
- Comparative analysis of international environmental safety standards (EU vs. USA vs. Uzbekistan).
- Case study on climate change-induced water scarcity and adaptation in Central Asian river basins.
- Mapping Uzbekistan's industrial hotspot areas and proposing risk mitigation measures.

6. Recommended Literature & Information Sources

- Boyirov Z.R. Ecological Management & Engineering Ecology. Qarshi, 2024.
- Yormatova D.Yo. Ecology and Nature Protection. Tashkent: Fan va Texnologiya, 2018.
- Kolluru, R. V. Environmental Risk Assessment and Management. McGraw-Hill Professional, 2020.
- IPCC. Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report.
- Law of the Republic of Uzbekistan 'On Nature Protection' and National Environmental Strategy Frameworks.