NAVOI STATE UNIVERSITY

O'TB2306 BIOECOLOGY OF SOILS OF UZBEKISTAN — COURSE SYLLABUS

Faculty of Natural Sciences & Medicine | Department of Biology | Master's Program: 70520202 Ecology

COURSE PASSPORT & ACADEMIC METADATA

Course Title:	Bioecology of Soils of Uzbekistan	**Course Code:**	O'TB2306
Course Type:	Elective (Master's)	**Field of Study:**	500000 Natural Sciences / 520000 Environment
Program:	70520202 Ecology (Master's Degree)	**Academic Year:**	2026–2027
Semester:	3 (Autumn)	**Form of Education:**	Full-time (Uzbek)
ECTS Credits:	6 ECTS Credits	**Total Workload Allocation:**	180 Hours (44 Lectures, 46 Practical, 90 Independent)
Assessment:	Examination	**Aligned UN SDGs:**	SDG 15 (Life on Land), SDG 2 (Zero Hunger), SDG 13 (Climate Action)



1. Course Description & Scope

The course 'Bioecology of Soils of Uzbekistan' (O'TB2306) covers soil formation processes, physical-chemical properties, soil biological activity, humus dynamics, soil edaphon ecological groups, and fertility restoration in agricultural ecosystems. Master's students analyze vertical and horizontal soil

zonation, salinization prevention, erosion control, biohumus technologies, and soil land evaluation (bonitation).

In alignment with SDG 15 (Life on Land), SDG 2 (Zero Hunger), and SDG 13 (Climate Action), the course develops scientific competencies for sustainable soil management, land degradation neutrality, and agro-ecological conservation.

2. Course Aims & Professional Competencies

Course Aim: To master soil bioecology, soil genesis, humus formation mechanisms, soil biological activity, and practical land conservation strategies in Uzbek agricultural ecosystems.

- **Knowledge:** Understand soil formation laws (biological, physical, chemical), soil zonation, edaphon ecological groups, enzymatic activity, and soil legal/economic protection frameworks.
- **Analytical Skills:** Determine soil mechanical texture, physical/water properties, humus content, carbonate level, mineral element concentrations (N, P, Ca, Mg), and conduct soil bonitation.
- **Conservation Applications:** Formulate erosion control measures (water/wind), design shelterbelts, implement drip irrigation and leaching protocols, and apply biohumus production technologies.
- **SDG Competencies:** Enhance agricultural soil health and ecosystem resilience to support UN Sustainable Development Goals (SDG 15 & SDG 2).

3. Prerequisites

Prerequisites: Natural Science (TUO'M15608), Biochemistry (BK1304), Biological Foundations of Agriculture (3.04).

4. Course Structure & Workload Allocation

Activity Type	Curriculum Focus	Total Hours Allocation
Lectures	Soil Genesis, Bioecology & Melioration Theory	44 Contact Hours
Practical Classes	Laboratory Chemical/Physical Analysis & Bonitation	46 Contact Hours
Independent Study	Soil Type Analysis, Presentations & Research Tasks	90 Self-Directed Hours
Total Workload	**Full Academic Module**	**180 Hours Total (6 ECTS)**

5. Detailed Course Curriculum Outline

5.1 Lecture Syllabus Outline

- **L1: Introduction to Soil Bioecology of Uzbekistan:** Subject scope, aims, research methods, and historical development. [1, 2, 4, 6]
- **L2: Rock Weathering & Soil Genesis:** Biological, physical, and chemical drivers of soil formation. [2, 3, 4]

- **L3: Soil Types & Texture of Uzbekistan:** Morphological features, mechanical composition, and properties. [1, 3, 4]
- **L4: Soil Structure & Conservation Measures:** Structure importance, improvement techniques, and soil protection. [1, 2, 4, 5]
- **L5: Soil Erosion Types & Protection Methods:** Water and wind erosion mechanisms and prevention strategies. [1, 2, 4, 5]
- **L6: Physical Properties of Soil & Agricultural Systems:** Density, porosity, soil physics in farming systems. [1, 2, 4, 6]
- **L7: Water Properties of Uzbek Soil Types:** Soil hydrology, moisture dynamics across geographical regions. [1, 2, 4, 7]
- **L8: Spatial Distribution Laws & Soil Classification:** Vertical regional and horizontal zonal distribution laws. [2, 5]
- **L9: Soil Biological Processes & Humus Accumulation:** Humus formation mechanisms and soil organic carbon technologies. [2, 4]
- **L10: Biohumus Production & Agricultural Application:** Biohumus technology, impact on crop yields and microbiology. [2, 5, 6]
- **L11: Ecological Distribution of Soil Organisms:** Soil edaphon ecological groups and soil biota dynamics. [2, 4, 5]
- **L12: Anthropogenic Impacts on Soil Microflora & Fauna:** Ecological equilibrium, agricultural impact on soil biota. [2, 4, 5]
- **L13: Soil Microbiocenosis & Enzymatic Activity:** Microbiocenosis structure, enzymatic activity, and biodiagnostics. [2, 4, 5]
- **L14: Land Resources Monitoring in Uzbekistan:** State of irrigated land funds and monitoring protocols. [1, 2, 4]
- **L15: Legal & Economic Frameworks for Land Conservation:** Economic valuation and legal frameworks for land protection. [1, 2, 4]
- **L16: Soil Erosion Control & Fertility Protection:** Wind/water erosion impacts on long-term soil fertility. [2, 3, 5]
- **L17: Agromelioration & Shelterbelt Establishment:** Erosion control via forest shelterbelts and windbreaks. [2, 5, 6, 7]
- **L18: Soil Melioration & Salinization Control:** Salinization types, drainage networks, and water-saving melioration. [2, 5, 6, 7]
- **L19: Soil Salt Leaching & Irrigation Standards:** Leaching rates, schedules, and water consumption norms. [4, 6, 7]
- **L20: Leaching Technologies & Drip Irrigation:** Water-saving drip irrigation and salt leaching technologies. [4, 6, 7]
- **L21: Salt-Tolerant Crops & Land Reclamation:** Recultivation of saline lands via salt-tolerant cropping. [2, 3]
- **L22: Soil Quality Preservation & Degradation Prevention:** Integrated soil conservation and sustainable fertility management. [2, 3]

5.2 Practical & Laboratory Outline

- Determining mechanical texture of soil samples.
- Classifying soil structural aggregates and stability.
- Determining soil physical properties (bulk density, porosity).
- Measuring maximum hygroscopic moisture and water properties.
- Determining soil organic matter (humus) content.
- Preparing aqueous extract and measuring total mineral residue.
- Determining soil carbonate levels.
- Analyzing essential chemical elements in soil (Nitrogen, Phosphorus, Calcium, Magnesium).
- Conducting field soil profile investigation.
- Studying soil morphological profiles and horizons.
- Identifying eroded soils and erosion severity levels.
- Determining eroded lands using Molotkov and Polyanov methods.
- Measuring wind erosion impact and soil loss.
- Conducting soil bonitation (soil quality evaluation scoring).
- Performing economic valuation of soil quality and productivity.

5.3 Independent Study & Research Tasks

- MT1: Preparing digital report on agricultural significance of soil texture and soil types. (10 Hours)
- MT2: Developing presentation on soil water properties, plant growth role, and distribution laws. (15 Hours)
- MT3: Compiling electronic data on soil structure, fertility enhancement, and agrotechnical methods. (20 Hours)
- MT4: Creating comprehensive glossary on soil organic matter, humus formation, and crop productivity. (20 Hours)
- MT5: Gathering electronic database on taxonomy, nomenclature, types, and subtypes of soils of Uzbekistan. (15 Hours)
- MT6: Formulating detailed presentation on desert zone soil characteristics of Uzbekistan. (10 Hours)

6. Recommended Literature & Information Sources

- Kushakov, A. J. (2023). Biological Foundations of Agriculture [Textbook]. Tashkent: Bookmany Print.
- Kushakov, A. J. (2022). Biological Foundations of Agriculture: Laboratory Guide [Study Guide]. Tashkent: Bookmany Print.
- Haney, Rich. L., & Haney, E. B. (2020). Fundamentals of Soil Ecology. Excelic Press (TOP-300 University Textbook).
- Tojiev, U., & Namozov, X. (2002). Soils of Uzbekistan. Bukhara.
- Azimboev, S. A. (2006). Fundamentals of Farming, Soil Science, and Agrochemistry. Tashkent: Iqtisod-Moliya.
- Soil Ecology Databases & Information Portals: www.urss.ru | www.kubnet.ru