# NAVOI STATE UNIVERSITY

## SBM2306 CONSERVATION OF AQUATIC BIORESOURCES — COURSE SYLLABUS

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

### COURSE PASSPORT & ACADEMIC METADATA

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|---|---|---|---|
| **Course Title:** | Conservation of Aquatic Bioresources | **Course Code:** | SBM2306 |
| **Course Type:** | Mandatory (Master's) | **Field of Study:** | 500000 Natural Sciences / 520000 Environment |
| **Program:** | 70520202 Ecology (Master's Degree) | **Academic Year:** | 2026–2027 |
| **Semester:** | III (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 14 (Life Below Water), SDG 6 (Clean Water), SDG 13 (Climate Action) |




### 1. Course Description & Scope

The course 'Conservation of Aquatic Bioresources' (SBM2306) focuses on the biological, ecological, and economic aspects of aquatic organisms (algae, invertebrates, fish, and aquatic plants). Master's students examine global and regional aquatic bioresource statistics, hydrobiont classification,

sustainable aquaculture technologies, eco-friendly fisheries management, digital monitoring systems (GIS, IoT, UAVs), and legal frameworks regulating water body protection.

In alignment with SDG 14 (Life Below Water), SDG 6 (Clean Water & Sanitation), and SDG 13 (Climate Action), the course prepares specialists to evaluate aquatic ecosystem health, manage gene pools, mitigate anthropogenic pollution, and implement international conventions (FAO, CITES, UNCLOS).

### 2. Course Aims & Professional Competencies

**Course Aim:** To develop deep theoretical understanding, practical research skills, and professional management competencies in protecting aquatic bioresources, artificial propagation, and sustainable aquaculture governance.

- **Knowledge:** Understand hydrobiont ecological roles, biogeochemical cycles, pollution mechanisms (chemical, physical, biological), gene pool preservation (in vitro/in vivo), and aquaculture waste filtration technologies.
- **Analytical Skills:** Identify aquatic organisms across taxonomic ranks, conduct bioindication/water quality assessment, analyze plankton/benthos communities, and utilize digital monitoring tools (GIS, Remote Sensing, drones).
- **Conservation Applications:** Formulate water body rehabilitation plans, design eco-friendly aquaculture farm models, conduct artificial fish incubation experiments, and monitor rare/endangered species.
- **SDG Competencies:** Apply international frameworks (FAO, CITES, UNCLOS) and national environmental laws to resolve transboundary water bioresource conflicts and promote sustainable development.

### 3. Prerequisites

**Prerequisites:** Invertebrate Zoology, Vertebrate Zoology, Basics of Agriculture, Ichthyology.

### 4. Course Structure & Workload Allocation

| Activity Type | Curriculum Focus | Total Hours Allocation |
|---|---|---|
| Lectures | Aquatic Bioresource Theory, Aquaculture & Governance | 44 Contact Hours |
| Practical Classes | Bioindication, Taxon Identification & Monitoring | 46 Contact Hours |
| Independent Study | Analytical Reports, Startup Modeling & Research | 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: Concept and Classification of Aquatic Bioresources:** Global statistics, hydrobiont taxonomy, biological diversity, and classification criteria. [1, 2, 3, 9]
- **L2: Ecological Role of Hydrobionts:** Food chains, biogeochemical cycles, bioindication, and ecosystem stability. [1, 3, 5, 7]
- **L3: Aquatic Bioresources in Natural Equilibrium:** Oxygen circulation, water quality enhancement, and ecological balance. [1, 2, 3, 9, 13, 14]
- **L4: Fish Resources and Fisheries Management:** Commercial species, fishing gear/methods, catch quotas, and sustainable management concepts. [2, 3, 5, 6, 8, 9, 10]
- **L5: Algae and Microorganisms as Bioresources:** Macrophytes, phytoplankton/zooplankton, biotechnological and pharmaceutical applications. [1, 3, 7, 9, 11, 12]
- **L6: Aquaculture – Modern Directions:** Intensive/semi-intensive culture, economic advantages, state policy, and international practices. [2, 3, 5, 6, 8, 9]
- **L7: Environmental Impact of Aquaculture Waste:** Organic/inorganic waste filtration technologies and ecologically sustainable aquaculture. [2, 3, 5, 6, 8, 9, 14]
- **L8: Preservation of Hydrobiont Gene Pools:** Genetic diversity, endangered species preservation, molecular markers, in vitro and in vivo conservation. [1, 2, 3, 5, 7, 14, 15]
- **L9: Aquatic Ecosystem Pollution & Effects:** Pollutant types, biological/chemical/physical contamination, population impacts, and monitoring. [1, 3, 6, 7, 9, 13]
- **L10: Monitoring Systems for Aquatic Bioresources:** GIS, remote sensing, physical-chemical indicators, and international monitoring networks. [1, 3, 6, 7, 9, 11]
- **L11: Climate Change Impacts on Aquatic Bioresources:** Temperature/salinity fluctuations, fish migration shifts, disease dynamics, and adaptation. [1, 3, 6, 7, 9, 11, 15]
- **L12: Sustainable Development Strategies:** Resource recovery, economic-ecological balance, and future international development frameworks. [1, 3, 6, 10, 13]
- **L13: Aquatic Bioresource Ecology & Protection:** Ecosystem structure, abiotic/biotic factors, biological cycling, and anthropogenic stress. [2, 3, 5, 6, 8, 9]
- **L14: Environmental Legislation in Fisheries:** Uzbekistan constitutional norms, fishery regulations, and legal frameworks. [4, 8, 9]
- **L15: International Legislation in Aquatic Conservation:** UNCLOS, FAO, CITES conventions, EEZ fishing rights, and bilateral agreements. [7, 8, 11]
- **L16: Economically Important Hydrobiont Species:** Commercially significant crustaceans, mollusks, algae, and fish species. [1, 2, 3, 5, 9]
- **L17: Digital Technologies in Bioresource Monitoring:** GIS, Remote Sensing, IoT sensors, drones (UAVs), and satellite data analysis. [6, 8, 10]
- **L18: Water Body Rehabilitation Technologies:** Ecosystem-based rehabilitation, water quality restoration, and planning phases. [1, 2, 3, 8, 14]
- **L19: Local Entrepreneurship Based on Bioresources:** Aquaculture farms, value-added fish processing, and algal cultivation businesses. [2, 3, 5, 6, 8, 9]

- **L20: Legal Foundations of Bioresource Use:** Quota allocation, licensing systems, state environmental control, and Red Book protection. [4, 8, 16]
- **L21: Concept of Sustainable Bioresource Governance:** Institutional frameworks, community participation, and multi-stakeholder management. [3, 7, 8, 11]
- **L22: Development Prospects & State of Bioresources in Uzbekistan:** Biodiversity preservation, water regime changes, and national aquaculture expansion. [5, 6, 7, 8, 9]

### 5.2 Practical & Laboratory Outline

- Introduction to aquatic bioresources and taxon diversity.
- Water quality determination methodologies in natural water bodies.
- Studying the biological resources of inland water bodies.
- Identifying biological and morphological characters of fish species.
- Plankton and benthos sampling and identification techniques.
- Taxonomic classification of aquatic crustaceans and mollusks.
- Identification and classification of aquatic plants and algae (macrophytes).
- Bioindication: Biological assessment of water pollution levels.
- Evaluating hydrobiont response mechanisms to anthropogenic stress.
- Fish population size estimation and assessment methods.
- Artificial propagation of aquatic bioresources (incubation processes).
- Ecological monitoring protocols for natural and artificial water basins.
- Identification and protective measures for rare and endangered bioresources.
- Setting up laboratory conditions for artificial incubation experiments.
- Measuring oxygen production capacities of various algae species.
- Water quality evaluation using biological indicator species.
- Climate-resilient bioresource management strategies.
- Ecological characteristics of bioresources in tropical regions.
- Transboundary aquatic bioresource management protocols.
- Implementing UN and FAO guidelines for bioresource governance.
- Designing a model model for an eco-friendly aquaculture farm.
- Comparative analysis of bioresource utilization practices in Central Asia.
- Ecological state assessment of aquatic bioresources in Navoi region water bodies.

### 5.3 Independent Study & Research Tasks

- MT1: Preparing analytical reports on aquatic bioresource conservation activities in Uzbekistan. (20 Hours)
- MT2: Researching biological diversity of aquatic bioresources and drafting scientific article abstracts. (10 Hours)
- MT3: Analyzing hydrobiont life cycles and ecological roles, including test creation (25 questions). (10 Hours)
- MT4: Investigating bioresource utilization in commercial fisheries and writing research papers. (10 Hours)

- MT5: Evaluating anthropogenic impacts on aquatic habitats and writing analytical essays. (20 Hours)
- MT6: Selecting suitable hydrobiont species for aquaculture, creating presentations and animation clips. (20 Hours)

## 6. Recommended Literature & Information Sources


- Datsun, V. M., Kim, E. N., & Levochkina, L. V. (2018). Aquatic Bioresources: Characteristics and Processing (2nd ed.). St. Petersburg: Lan.
- Babalyuk, A. K., et al. (2010). Aquatic Biological Resources and Aquaculture. Moscow: Kolos.
- Nazarov, G. I. (2008). Protection of Aquatic Biological Resources. St. Petersburg: Lan.
- FAO (2020). The State of World Fisheries and Aquaculture. Rome: FAO.
- Turakulov, B., & Asqarov, A. (2020). Fundamentals of Hydrobiology. Tashkent: Fan.
- Karimov, A. K., & Axmedov, M. S. (2018). Fundamentals of Water Management and Fisheries in Uzbekistan. Tashkent.
- Decree of the President of the Republic of Uzbekistan PQ-2939 'On Measures to Improve the Management System of the Fisheries Network' (2017).
- Aquatic Commons Database: http://aquaticcommons.org | FAO Aquaculture Portal: https://www.fao.org/fishery/en