Osh State University "Ecology and Sustainable Development"

Name of Study Programme 520 200 Biology	
Name of Module: Ecology and Sustainable Development	
Module number	Block No. 1, Group A, Elective Part *(offered for the 2026-2027 academic year)*
Person responsible	Abdykaarov Abdimannap, Ph.D., Associate Professor
Duration of the module	1 spring semester
Semester	II semester
Frequency of the module	2nd academic semester
ECTS-Credits (CP)	4 credits
Semester hours per week, number of weeks	3-4 hours per week (14 weeks)
Workload	120 hours (1 credit 30 hours) Contact hours (Classroom hours): 48 hours Independent work: 72 hours
Type of module	Block No. 1, Group A (Compulsory), Variable part
Required prerequisites for the module	**Relevance of the Course** In the 21st century, the world has faced global environmental challenges such as climate change, depletion of natural resources, loss of biodiversity, and environmental pollution. Kyrgyzstan has not remained unaffected by these challenges. In this regard, the higher education system faces the need to equip students with ecological literacy, a respectful attitude towards nature, and an understanding of the principles of sustainable development. Today, society often demonstrates an insufficient level of awareness of environmental issues. As a result, sustainable development is frequently perceived merely as stable economic growth, which is a misconception. Such misunderstandings divert society from rational use of natural resources and may lead to the degradation of the biosphere. The principles of sustainable development must be based on the balance between human needs and the capacity of the biosphere. Therefore, the transition to a new strategy of natural resource use and ecological education based on the laws of the biosphere are essential conditions for sustainable development. In this context, it is important not only to integrate the Sustainable Development Goals (SDGs) into educational processes but also to place special emphasis on ecological awareness. This course contributes to shaping youth responsibility and fostering their development as conscious citizens. **Course Aim** To develop students' knowledge, ecological awareness, understanding of the fundamentals of the sustainable development concept and the principles of the green economy, as well as to foster a responsible attitude towards the environment. **Course Objectives** • Introduce the main concepts and principles of ecology; • Explain the concept of sustainable development and its key components (economic, environmental, and social); • Familiarize students with the fundamental principles of the green economy and analyze the possibilities of their practical

	application; • Analyze environmental problems of Kyrgyzstan and the world, and explore solutions to them; • Develop students' ecological thinking and ethical attitude toward nature; • Reveal the significance of national traditions and customs in the context of ecology and sustainable development; • Form a scientific understanding of cultural (green, sustainable) interaction between humans and the environment under conditions of increasing urbanization; • Promote the development of ecological competence for application in professional activities.
Recommended prior knowledge for the module	Since this discipline is taught in the first year, the fundamental natural science concepts learned in the school curriculum (in biology, geography, social studies) are a sufficient basis for its mastery.
Teaching language **Язык преподавания**	Kyrgyz, Russian, later also in English
Competencies gained / **Learning outcome**	**Learning Outcomes** Based on the knowledge gained from the discipline *"Ecology and Sustainable Development"*, the student will be able to analyze environmental problems and their causes, understand ecological patterns of nature, and organize activities aimed at achieving sustainable development. **Competencies** **Social and Personal Competence (SPC 1):** Demonstrates civic responsibility towards environmental issues, shows ethical and sustainable behavior oriented towards a healthy lifestyle and a respectful attitude to nature. **Instrumental Competence (IC 1):** Is able to apply appropriate methods and tools for collecting environmental information, its systematic analysis, and the assessment of ecological conditions. **General Professional Competence (GPC 1):** Has knowledge of the basic concepts in natural and social sciences related to ecology and sustainable development and is able to apply them to environmental analysis. **Professional Competence (PC 1):** Formed depending on the training profile and the specifics of the specialty.
Content of the module	**Course Program** **Introduction to Environmental Science** Relevance of ecology as a science in the modern world. The scope of ecology, its subject matter, and contemporary tasks. A brief history of ecology. Branches of ecology. Relationship of ecology with other sciences. The role of ecology in society. Ecological challenges in the global context. **Interaction of Living Organisms with the Environment** Habitats and living conditions of organisms. Resources. Environmental factors. Tolerance and adaptation. General principles of organism adaptation to abiotic factors. Main habitats of organisms. **Population Ecology: Structure, Dynamics, and Stability** Concept of population. Simple, ecological, and geographical populations. Population size, density, birth rate, and mortality. Declining, growing, and stable populations. Self-regulation of population size. Homeostasis and dynamic equilibrium of populations. Population structures. **Ecosystem and Its Structure** Ecosystems of Kyrgyzstan. Concepts of biocoenosis, biotope, biogeocoenosis, ecosystem. Types of interactions among organisms.

	Ecological structure of a biocoenosis (species ratios). Trophic links in a biocoenosis. Food chains. Significance of the abiotic environment for organisms. **Characteristics of Ecosystems in Kyrgyzstan** Living and non-living components: producers, consumers, decomposers. Significance of photosynthesis. Biogeochemical cycles and energy flow in ecosystems. Gross primary and net primary production, secondary production. Ecological succession. Specially protected natural areas of Kyrgyzstan: reserves and national parks. **Global and Regional Environmental Issues and Their Consequences** The biosphere. V.I. Vernadsky's doctrine of the biosphere. Structure and functions of the biosphere. Classification of biosphere substances. Biogeochemical cycles. The concept of the noosphere. Global, regional, and local environmental issues: ozone depletion, greenhouse effect, acid rains, biodiversity loss, the Aral Sea crisis. Consequences of extensive land use in Kyrgyzstan: water and air pollution, radioecological situation, glacier retreat. Urbanization, transport, industrial pollution. Radiation-hazardous zones of Kyrgyzstan. Sustainable development and radioecology. **Fundamentals of Sustainable Development: Concepts and Goals** Definitions of "development" and "sustainable development." Origin of the term and prerequisites for sustainable development. The Sustainable Development Concept of the Kyrgyz Republic. The Ecological Security Concept of the Kyrgyz Republic. Sustainable Development Goals (SDGs). Kyrgyzstan's initiatives for sustainable development. SDGs as a global program for restructuring the world. Environmental education as a key instrument for achieving the SDGs. **Climate Change and Its Consequences. Green City and Green Transport** Climatic features of Kyrgyzstan. Importance of glaciers and mountain peaks. Global climate change (greenhouse effect) and its consequences. Use of safe energy sources. Measures to improve air quality in cities. The concept of a green city and green transport. **SDG links:** Goal 3 – Good Health and Well-being; Goal 7 – Affordable and Clean Energy; Goal 13 – Climate Action. **Sustainable Management of Water and Land Resources of Kyrgyzstan** Characteristics of Kyrgyzstan's water resources: sources, reservoirs, hydropower plants. Current state of water use. Principles of rational water management. Water use in Islamic tradition. Characteristics of land resources: soil erosion and prevention measures, condition of pastures and their restoration, development of sustainable farming and agriculture. **SDG links:** Goal 1 – No Poverty; Goal 2 – Zero Hunger; Goal 3 – Good Health and Well-being; Goal 6 – Clean Water and Sanitation; Goal 8 – Decent Work and Economic Growth; Goal 12 – Responsible Consumption and Production; Goal 14 – Life Below Water; Goal 15 – Life on Land. **Sustainable Use of Forest and Recreational Resources of Kyrgyzstan** Characteristics of Kyrgyzstan's forests. Anthropogenic impacts. Specially protected natural areas: state reserves and national parks. Prospects for sustainable forest management. Opportunities for tourism development. Climatic resources and their sustainable use. Mineral waters and therapeutic muds of Kyrgyzstan: rational use. Recreational use of forests. **SDG links:** Goal 3 – Good Health and Well-being; Goal 12 – Responsible Consumption and Production; Goal 15 – Life on Land. **Biodiversity of Kyrgyzstan and Prospects for Its Rational Use** Specially protected natural areas (SPNAs): types, objectives, and

	significance. Natural ecosystems and biodiversity of Kyrgyzstan. Anthropogenic factors affecting biodiversity. Role of SPNAs in biodiversity conservation. Significance of biodiversity for tourism and economy. Ecotourism and the green economy as the basis for sustainable development. **SDG links:** Goal 12 – Responsible Consumption and Production; Goal 15 – Life on Land. **Green Economy and Eco-innovations as Drivers of Sustainable Development** Concept and goals of the green economy. Fundamental principles. Eco-innovations: technological and social. Sectors of the green economy. Status and prospects of Kyrgyzstan's transition to a green economy. National strategies. Examples of ecological innovation projects. **Food Security in Kyrgyzstan and Measures for Its Sustainable Assurance** State of food security. Food contaminants: nitrates, pesticides, GMOs — risks and precautions. Significance of iodine and prevention of its deficiency. Antioxidants and probiotics. Measures to ensure food safety. Potential of Kyrgyzstan's medicinal plants. **SDG links:** Goal 2 – Zero Hunger; Goal 3 – Good Health and Well-being. **Green Economy and Eco-innovations (Practical Aspects)** Green city, transport, energy, industry, agriculture, and waste management. **SDG links:** Goal 2 – Zero Hunger; Goal 3 – Good Health and Well-being; Goal 6 – Clean Water and Sanitation; Goal 7 – Clean Energy; Goal 8 – Decent Work; Goal 9 – Industry, Innovation, and Infrastructure; Goal 11 – Sustainable Cities; Goal 12 – Responsible Consumption; Goal 13 – Climate Action. **Environmental Policy and Legal Framework for Ecological Security** Environmental Code of the Kyrgyz Republic. Concepts of ecological security and the green economy. National Strategy for Sustainable Development of the Kyrgyz Republic. Codes on misconduct and violations. Regulatory and legal acts in environmental protection (laws, decrees, regulations). **SDG links:** Goal 3 – Good Health; Goal 5 – Gender Equality; Goal 10 – Reduced Inequalities; Goal 12 – Responsible Consumption; Goal 16 – Peace, Justice and Strong Institutions; Goal 17 – Partnerships for the Goals.
Applicability of the module	Corresponding educational programs: 520200 Biology. 550100 Natural Science Education. Offered for all areas of training.
Requirements for the award of credit points **(Study and exam requirements)**	**Course Policy** **1. Attendance and Participation** • Students are required to attend all lectures and practical (seminar) sessions. • Proper behavior and discipline must be maintained during classes, as established by the instructor. • Absences without a valid reason may result in a lower final grade. • Careful note-taking, theoretical preparation for each lesson, active participation, and timely completion of missed assignments are separately evaluated. • Late arrivals are discouraged; repeated lateness may lead to penalties at the instructor's discretion. **2. Academic Integrity and Plagiarism** • **Plagiarism** and academic dishonesty include copying someone else's work, cheating, and presenting another's material as one's

	own. • Any cases of plagiarism or dishonesty on exams or assignments will result in grade penalties or other measures according to university regulations. **3. Deadlines and Late Submission Penalties** • All homework, projects, and other assignments must be submitted by the specified deadlines. • Late submissions will incur point deductions. • Arriving late to class or leaving without a valid reason affects participation evaluation. **4. Retake and Appeal Policy** • Retake of exams and assessments follows the procedure established by the instructor. • Grade appeals must be submitted in writing within the timeframe set by the instructor. **5. Use of Gadgets in Class** • The use of phones, laptops, and other devices during lectures is allowed only with instructor approval or for learning purposes. **6. Formatting and Citation Rules** • All written work must comply with university formatting requirements. • Proper citation and a complete list of references are mandatory. **7. Consultations and Office Hours** • Consultation schedules and office hours are set for individual consultations and guidance on independent student work (ISR). • More details: Consultation Schedule **8. Academic Integrity Declaration** • All students must sign a declaration confirming compliance with the university's academic integrity policy. • Regulation: "Organization of the Educational Process at OshSU" A-2024-0001, 03.01.2024 **Course Grading System (100 points)** **Module 1 – 25 points** • Lecture: 4 points • Practical (seminar) session: 6 points • Independent student work (ISR): 6 points • Practical independent work (PIR): 4 points • Control work (CW): 5 points **Module 2 – 25 points** • Lecture: 4 points • Practical (seminar) session: 6 points • Independent student work (ISR): 6 points • Practical independent work (PIR): 4 points • Control work (CW): 5 points **Final Exam – 50 points**
Learning and teaching types	**Forms of Instruction** • Lectures • Seminars • Independent student work (ISR, PIR) **Assessment Methods** • **Ongoing assessment**: tests, essays, reports • **Final exam** **Teaching Methods** • **Lectures** using multimedia technologies.

	• **Practical sessions** in the form of case studies, situation analysis, and project development. • **Independent student work (ISR, PIR)**: preparation of essays, presentations, reports, and the final project. **Forms of Assessment** • **Ongoing assessment**: evaluation of practical sessions, tests, essays. • **Intermediate assessment**: defense of presentations, case studies, and reports. • **Final assessment**: development and defense of an environmental program project.
Literature (latest editions) and other instruction material	**Electronic Textbooks** 1. Development of Ecotourism in the Kyrgyz Republic and Its Significance in the Transition to a Green Economy Link 2. Environmental Culture and Ways of Its Formation Link 3. Prospects of Green Tourism in Kyrgyzstan: Waste Management as a Key Issue Link **Legal and Regulatory Acts** 1. Collection of Legal and Regulatory Acts of the Kyrgyz Republic in the Field of Environmental Protection. Volume 2 "Bylaws and Instructional-Methodological Documentation", Part 1 Dj.E. Bekkulova, Zh.A. Kadoeva, A.Sh. Djailoobaev, V.V. Grebnev, A.K. Nurbekov – Bishkek, 2016. – 536 pages. 2. Collection of Legal and Regulatory Acts of the Kyrgyz Republic in the Field of Environmental Protection. Volume 2 "Bylaws and Instructional-Methodological Documentation", Part 2 Dj.E. Bekkulova, Zh.A. Kadoeva, A.Sh. Djailoobaev, V.V. Grebnev, A.K. Nurbekov – Bishkek, 2016. – 542 pages. 3. Environmental Code of the Kyrgyz Republic **Textbooks** 1. Kulnazarov B.K. General Ecology – Moscow, 2000. – 352 pages. 2. Mansurova T.B. Ecology of Kyrgyzstan: For University Students, Public Fund "Phoenix South" – Bishkek, 2000. – 190 pages. 3. Mursaliev A.M. General Ecology: A Textbook for Students of Natural Science and Humanities Faculties of Higher Education Institutions of the Kyrgyz Republic