Name of subject	Ecology (ECTS 4)
Subject/module code	EKO1504
Science taught semester (s).	5th semester
Responsible teacher	Tuynazarova Iroda Abduboqiyevna, PhD, Associate Professor
Education language	Uzbek
Connection to the curriculum	Compulsory
Training hours (this including independent education)	**Total hours-120.** **Contact hours - 48.** Lecture training hour – 24 Laboratory training hour – 12 Practical training hour – 12 **Independent education -72 hours**
ECTS	4
The purpose and tasks of subject / learning outcomes	**The purpose** of teaching the discipline is to teach students the theoretical foundations of ecology, the consequences of disrupting the balance of interaction between nature and society, improving the environmental management system, and issues related to increasing the efficiency of natural resource use. **The task of the discipline** is to highlight the causes of problems in the field of environmental protection and ecology, the scientific foundations of nature conservation, the means of its protection, the application of effective methods, as well as environmental problems, environmental safety and environmental aspects of sustainable development. **Learning outcomes:** 1. anthropogenic impact of humans on nature; V.I.Vernadsky's doctrine of the biosphere; the cyclical movement of substances in the biosphere; classification of natural resources; structure and composition of atmospheric air; environmental monitoring; 2. sources of pollution of atmospheric air and water bodies; possession of an understanding of the protection of the lithosphere; rational use of natural resources; state and international cooperation in the field of the environment; methods of cleaning the air from dust and toxic cracks; 3. classification of wastewater; 4. methods of wastewater treatment; 5. basic principles of organizing waste-free technological processes; 6. assessment of the environmental situation of the relevant industrial enterprises; 7. have skills in studying environmental problems in industry and solving environmental problems arising in production; 8. identification of sources of environmental pollution, search for ways to neutralize them;
Course content (topics)	**I. Main Theoretical Part (Lecture Sessions)** **Topic 1:** The role of ecology in the system of scientific knowledge. Ecology as a theoretical basis for rational nature management and environmental protection. Basic terms and concepts of ecology. Ecological factors. **Topic 2:** Introduction to energy systems and sustainable development. Sustainable Development Program. **Topic 3:** V. I. Vernadsky and the modern scientific idea of the biosphere.Boundaries and main components of the biosphere.Natural resources, their classification. **Topic 4:** The impact of fossil fuels on production and the environment

Topic 5: General access to renewable energy sources

Topic 6: Fundamentals of atmospheric air protection, methods of its purification from sources of pollution, toxic gases and dust.

Topic 7: Waste and its types. Energy calculation and carbon emissions. Waste-free and low-waste technology.

Topic 8. Hydrosphere and its protection. Wastewater treatment methods.

Topic 9: Lithosphere and its problems. Demographic trends, changes in the Earth's population as a factor determining the intensity of anthropogenic impact.

Topic 10: The concept of monitoring, tasks, purpose, research object, methods, and types of environmental monitoring.

Topic 11: Climate mitigation strategies. Socio-ecological problems of Uzbekistan. Global environmental problems.

Topic 12: Energy policy and environmental standards. International cooperation in the field of ecology and environmental protection. Ecological education and upbringing.

II. Instructions and recommendations for organizing laboratory exercises.

In laboratory classes, students develop practical skills and abilities through determining indicators of ecological processes, conducting experiments, and using tables. Recommended topics are selected based on existing conditions and technical capabilities.

Recommended topics for laboratory work:

1. Approximate determination of wastewater turbidity.
2. Determining the technological parameters of horizontal settling tanks.
3. Determination of the amount of suspended substances in wastewater by gravimetric method by filtering through a filter.
4. Methods of physicochemical wastewater treatment.
5. Wastewater purification from organic substances by the adsorption method.
6. Determining the ecological properties of soil.

III. Practical training instructions and recommendations

The teacher's preparation for a practical training session begins with the study of preliminary documents (curriculum, thematic plan, etc.) and ends with the development of a lesson plan. The teacher should have an idea of the goals and objectives of the practical training session, the amount of work that each student must perform.

Methodological guidelines are the main methodological document of the teacher in preparing and conducting practical training sessions.

The purpose of the practical training session is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view.

The following topics are recommended for practical training:

1. Calculation of the norms for the release of harmful substances into the atmosphere and permissible emissions.
2. Calculation of dust emissions into the atmosphere and permissible norms.
3. Distribution of harmful gases into the atmosphere and calculation of their permissible limits.
4. Calculating the concentration of dust emitted into the atmosphere and comparing it with the REC.
5. Calculation of the REM and its comparison with the total emissions of the enterprise, as well as submission of proposals for reducing dust.

	6. Calculation of wastewater treatment level. **IV. Independent learning and independent work.** Independent learning competence serves to support students' independent self-development and increase the effectiveness of professional activities. Students perform independent work on their mobile devices under the guidance of a teacher in a traditional or electronic form. **Recommended topics for independent study:** 1. Nature and man. 2. Biosphere. Structure and function. 3. Man and the biosphere. 4. Global environmental problems. 5. Environmental problems of the Republic of Uzbekistan. 6. Urbanization process and environmental problems. 7. Ecology and demography (population growth). 8. Ecology and international relations. 9. Problems of air pollution. 10. Greenhouse effect. 11. Energy industry and environment. 12. Acid rains 13. Transport & Environment 14. Ozone layer depletion and its negative consequences 15. Alternative energy sources 16. Hydrosphere. Water use problems 17. Wastewater treatment methods 18. Lithosphere and related problems 19. Soil pollution 20. Plant and animal protection problems
Exam form	Written
Teaching/learning and examination requirements	Complete mastery of theoretical and methodological concepts and practical knowledge of the discipline, the ability to correctly reflect the results of analysis, independently reason about the processes being studied and carry out tasks in the current, intermediate forms of control and independent work, pass written work on the final control. When drawing up final exam questions, deviations from the content of the discipline program are not allowed. The bank of final exam questions for each discipline is discussed at the meeting and approved by the head of the department. No later than 1 week before the start of the final control, tickets signed by the head of the department, enclosed in an envelope, are sealed by the Dean's office and opened 5 minutes before the start of the exam in the presence of students. Final exam duration is 80 minutes. Answers to final exam questions are recorded in copybooks with the seal of the Dean's office. After completion of the final work, the work is immediately encrypted by a representative of the Dean's office, and the copybooks are handed over to the commission for verification. From the moment of completion of the final exam, a period of 72 hours is allotted for checking and posting the results on the electronic platform. The teacher who taught the students in this discipline is not involved in the process of conducting the exam and checking the students' answers. Student(s) who are dissatisfied with the final exam results may submit a written or oral appeal within 24 hours of the publication of the final exam results. Complaints submitted after 24 hours from the publication of the final exam results will not be accepted.
Scope of assessment criteria and procedure	CURRENT CONTROL Purpose: Determining and assessing the student's level of knowledge,

	practical skills, and competencies on course topics. Instructions: The student's activity in daily classes is assessed through the student's mastery of course topics, as well as constructively interpreting and analyzing the educational material, developing module-specific skills, acquiring practical skills (in terms of quality and the specified number) and competencies, solving problem situations aimed at applying professional practical skills, working in a team, preparing presentations, etc. Current control form: Activity in lessons Preparing educational materials Working with sources within the subject Using educational technologies Working in a team Preparing presentations Working with projects. MIDTERM CONTROL Purpose: Assessing the student's knowledge and practical skills and level of mastery of lecture material after completing the relevant section of the course. Form and procedure of intermediate control: Midterm examination is held during the semester during the training sessions after the completion of the relevant module of the curriculum of the subject. Midterm examination is held once in written form within the framework of this subject. Midterm examination questions cover all topics of the subject. INDEPENDENT LEARNING Purpose: Independent learning is aimed at fully covering the content of this course, expanding the theoretical knowledge acquired, and establishing independent learning activities for students. Form and procedure of independent education: independent work assignments are completed in the form of an educational project, presentation, case study, problem solving, information search, digest, colloquium, essay, article, abstract, etc. Completed assignments for independent study are placed in the electronic system and checked based on the anti-plagiarism program and evaluated by the subject teacher. In this case, the uniqueness of the completed assignment should not be less than 60%, otherwise the assignment will not be accepted for assessment. The number of independent work assignments, depending on the nature of the subject, should not be less than 3 for one subject (module). Independent work assignments account for 60% of the points allocated for current and intermediate control. FINAL CONTROL Purpose: The final examination is held at the end of the semester to determine the level of mastery of the student's theoretical knowledge and practical skills in the relevant subject. The final examination is held at a specified time according to the examination schedule created by the Registrar's Office on the electronic platform. Requirements: The student must have passed the current control, intermediate control and independent learning assignments by the deadline for the final control type in the relevant subject. A student who has not passed the current control, intermediate control and independent learning assignments, as well as who has received a score in the range of "0-29.9" for these assignments and control types, is not included in the final control type. Also, a student who has missed 25 percent or more of the classroom hours allocated to a subject without a reason is excluded from this subject and is not included in the final control type and is considered not to have mastered the relevant credits in this subject. A student who has not passed or was not included in the final control type and has received a score in the range of "0-29.9" for this type of control is considered to be an academic debtor. Final control form: The final examination in this subject will be

conducted in written form. If the final examination is conducted in written form, the requirements for assessment must also be reflected.

Criteria for assessing student knowledge

5 grade	100 points		Assessment criteria
5	90-100	Excellent	When a student is considered to be able to make independent conclusions and decisions, think creatively, observe independently, apply the knowledge he has gained in practice, understand, know, express, and narrate the essence of the subject, and have an idea about the subject.
4	70-89,9	Good	When the student is considered to be able to observe independently, apply the knowledge he has gained in practice, understand, know, express, and narrate the essence of the subject, and has an idea about the subject.
3	60-69,9	Satisfactory	When the student is found to be able to apply the knowledge he has gained in practice, understands, knows, can express, and narrate the essence of the subject, and has an idea about the subject.
2	0-59,9	Unsatisfactory	When it is determined that the student has not mastered the science program, does not understand the essence of the subject, and does not have an idea about the science.

Course assessment criteria and procedure

Assessment type	Total points allocated	Control (task) form	Distribution of points	Qualifying score
Current assessment	30 points	System tasks	20 points (divided by the number of tasks)	18 points
		Student activity (in seminars, practical, laboratory classes)	10 points	
Midterm assessment	20 points	Supervision: Written work	10 points	12 points
		System tasks	10 points (divided by the number of tasks)	
Final assessment	50 points	Written assignment (5 questions)	50 points (10 points per question)	30 points

* Note: 60% of the points allocated for current and intermediate control are allocated to independent work assignments. Independent work assignments are evaluated as system assignments through the electronic platform.

Recommended Literature

Main literature:

1. Xalilova R.X. “Ekologiya” Toshkent, “O‘zbekiston”. 2020.
2. Xo‘janazarov O‘, Yakubjonova Sh. Ekologiya va tabiatni muhofaza qilish.
3.Sattorov Z. Ekologiya. Darslik. Sanoat standart.2018
4. T.Ergashev, A.Ergashev, “Gidroekologiya”. Toshkent, “Asian Book House”, 2020 9-bet.

	5. S.Turabjanov – “Muhandislik ekologiyasi” Toshkent, “Asian Book House” 2020 y. 166-bet. 6. Xo‘janazarov O‘, Yakubjonova Sh. “Ekologiya va tabiatni muhofaza qilish” T., 2018 y. 7. Avazov M, Saydanov F. “Ekologiya va atrof-muhit muhofazasi”. Toshkent, “Ilm Ziyo”, 2017. **Additional literature:** 8. Xalilova R.X. “Ekologiya” Toshkent, “O‘zbekiston”. 2020. 9. Yu Shodimetov. “Ijtimoiy ekologiya” (Sotsioekologiya)1,2-darslik Toshkent 2017 y. 135-bet 10.T.Ergashev, A.Ergashev, “Gidroekologiya”. Toshkent, “Asian Book House”, 2020 9-bet. 11. S.Turabjanov – “Muhandislik ekologiyasi” Toshkent, “Asian Book House” 2020 y. 166-bet. **Internet resources:** 1. http: www.ecologye.ru 2. http: www.ecolog.com 3. http://iea.org/ 4. http://www.renewableenergyworld.com/