Name of subject	Ecology (ECTS 4)
Subject/module code	EKO1504
Science taught semester (s).	5th semester
Responsible teacher	Tuynazarova Iroda Abbuboqiyevna (PhD), associate professor.
Education language	Uzbek
Study to the program connection	Compulsory subject
Training hours (this including independent education)	**Total hours-120.** **Audience Training 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
Student assessment	Assessment of student knowledge is based on the mastery of the learning material during the semester and final control (tests, assignments, written and oral work results). During the ecology course, students are assessed on a 100-point scale. Of these, 50 points are allocated for the current and intermediate results (60% of the points are for current control, independent study, and 40% for intermediate control), and 50 points are allocated for the final control results. Students with a total score of less than 30 points for current and intermediate scores are not allowed to take the final control exam. A student who scores 30 or more points on the final exam is considered to have mastered the subject.
Requirements for exams	The student must have fully mastered the theoretical and practical concepts of the subject, be able to correctly reflect the results of the analysis. The student must have completed the tasks given in the current and intermediate forms of independent work, assessment. At the same time, he must have received the necessary points from the current, intermediate, independent education and final tests in the relevant subject within the specified time. A student who has not submitted current control, intermediate control and independent education tasks, as well as who has scored less than 30 points on these tasks and types of control, will not be included in the final type of control. Also, a student who has missed 25 or more percent of the classroom hours allocated to the subject without an excuse will be expelled from this subject, will not be allowed to take the final exam and will be considered as not having mastered the relevant credits in this subject. A student who fails the final exam or scores less than 30 points on this type of exam is considered academically indebted.
Recommended Literature	**Main literature:** 1. Richard O. Mines, Jr.”Environmental Engineering” This edition

first published 2014, Wiley & Sons, Inc, 111 River Street, Hoboken, New Jersey, 2014, XII, 637 p. ISBN 978-1-118-80145.
2. Xo‘janazarov O‘, Yakubjonova Sh. Ekologiya va tabiatni muhofaza qilish.
3.Sattorov Z. Ekologiya. Darslik. Sanoat standart.2018
4. Qudratov O. Sanoat ekologiyasi. O‘quv qo‘llanma-T. Chinor, 2005.
5. Цветкова Л.И, Алексеев М.И., Усанов Б.П. и др. Экология, Учебник для ВТУЗ ов.- М : издательство АСВ, СПб, Химизат, 2001.
6. Yodgorova D.Sh, Egamberdiyeva L.SH. Shahar ekologiyasi. Uslubiy qo‘llanma. Toshkent. O‘zMU nashriyoti, 2013.
7. Tursunov X.T, Raximova T,U. Ekologiya. O‘quv qo‘llanma. T.Chinor ENK, 2006

Additional literature:

8. Otaboyev SH, Nabiyev N.”Inson va Biosfera” Toshkent 1995.
9. Tursunov X.T. “Ekologiya”, Toshkent, Saodat RIA. 2007. O‘quv qo‘llanma.
10. Ibragimov N.I va boshqalar “Ekologiya” Toshkent 2007. O‘quv qo‘llanma.
11. OtaboyevSh, Malikov Z, Mamadaliyev Sh, Mirsovurov M, “Ekologiya” Toshkent 2011. O‘quv qo‘llanma.
12. Ergashev A.E. – “Umumiy ekologiya” Toshkent, “O‘qituvchi”. 2003 y.
13. A.Ergashev, T.Ergashev. “Ekologiya, biosfera va tabiatni muhofaza qilish”. Toshkent, “Yangi asr avlodi”, 2005
14. Xalilova R.X. “Ekologiya” Toshkent, “O‘zbekiston”. 2020.
15. R.Sultonov. Ekologiya va atrof muhitni muhofaza qilish asoslari. Musiqa T:2007 215-bet.
16. D Yormatova. Ekologiya. Toshkent “Fan va texnologiya”, 2012 yil 189-bet
17. Yu Shodimetov. “Ijtimoiy ekologiya” (Sotsioekologiya)1,2-darslik Toshkent 2017 y. 135-bet
18.T.Ergashev, A.Ergashev, “Gidroekologiya”. Toshkent, “Asian Book House”, 2020 9-bet.
19. S.Turabjanov – “Muhandislik ekologiyasi” Toshkent, “Asian Book House” 2020 y. 166-bet.

Web sites:

1. http: www.ecologye.ru
2. http: www.ecolog.com
3. http://iea.org/
4. http://www.renewableenergyworld.com/