Name of subject	Sustainable development (ECTS 4)
Subject/module code	BRBI2204
Science taught semester (s).	2nd semester
Responsible teacher	Sultonov A., Associate Professor, Department of "Engineering Communications"
Education language	Uzbek
Connection to the curriculum	Elective
Training hours (this including independent education)	**Total hours – 120.** **Audience training hours – 36.** Lecture training hours – 18 Practical training hours – 18 **Independent education – 84 hours**
ECTS	4
The purpose and tasks of subject / learning outcomes	**The purpose of teaching the course –** to provide master's students with knowledge, based on a systems approach, of the concept of sustainable development and its environmental, social and economic dimensions; of resource flows, energy, climate change, ecosystems and water resources management; and of environmental sustainability issues in Central Asia and Uzbekistan (including those related to the Aral Sea). **The task of the course is** to teach master's students the principles of the economical use and management of resources, taking into account that all resources are limited; to analyse global and local sustainability problems; to assess the causes and consequences of climate change; to apply methods for quantitative measurement of sustainability; to justify sustainable solutions in the field of engineering communications; and to develop skills in preparing presentations in English and in critical thinking. **Prerequisites:** Ecology and environmental protection; Water supply and wastewater disposal and treatment systems; Economic theory. **Learning outcomes:** 1. Has an understanding of the most important problems of environmental sustainability globally and in Uzbekistan. 2. Knows the main causes of climate change, the climate crisis, and global efforts to mitigate it and adapt to it. 3. Knows the principles of sustainable management of resource flows, energy and water resources. 4. Knows the main mechanisms of local and regional water crises (including the Aral Sea disaster). 5. Knows the environmental sustainability problems of large cities and settlements. 6. Has skills in quantitative assessment of sustainability, measurement of resource flows, and analysis of engineering solutions from a sustainability perspective. 7. Is able to prepare and present information materials in English (slides, short videos) and to lead discussions based on critical thinking.
Course content (topics)	**I. Main Theoretical Part (Lecture Sessions)** **Topic 1:** Introduction. Concepts of sustainable development. Definition of sustainable development. Importance of sustainability. Interconnection of goals. Role of the United Nations. Global and local perspectives. Problems of sustainable development. [1] **Topic 2:** Resource flows. Definition of resource flows. Importance of resource flows. Ecosystem services. Economic impact. Environmental considerations. Resource management strategies. [2] **Topic 3:** Energy. Types of energy. Alternative energy sources. Use of secondary energy resources. [1]

Topic 4: Climate change. Definition of climate change. Causes of climate change. The greenhouse effect. Evidence of climate change. Impact on ecosystems. Social consequences. Global response. Mitigation and adaptation strategies. [1]

Topic 5: Ecosystems, land use, agriculture, forestry, water, salinization and biodiversity. Definition of ecosystems. Importance of ecosystems. Land use and its impact. Role of agriculture. Forestry practices. Water resources. [1]

Topic 6: Water use and management – cleaner production. Definition of water use and management. Importance of water resources. Challenges in water management. The concept of cleaner production. Water efficiency in industrial sectors. Sustainable agricultural practices. [1]

Topic 7: Global water policy – water cooperation in Central Asia. Overview of Central Asia. Water scarcity and challenges. Importance of water cooperation. Historical context. Key stakeholders. Global water policy. Transboundary water management. Role of international organizations. [1]

Topic 8: The Aral Sea. Geographical context. Historical significance. Environmental crisis. Impact on local communities. Loss of biodiversity. Economic consequences. International attention. Restoration efforts. Lessons learned. [2]

Topic 9: Water use and management – the importance of water for agriculture and sanitation. Water in agriculture. Types of irrigation. Water scarcity. Sanitation and water quality. Sustainable practices. Policy and regulation. Technological innovations. Community engagement. [2]

II. 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. Urbanization and the sustainable city. (2 hours)
2. Mobility culture and means of mobility. Energy of mobility. (2 hours)
3. Sustainable lifestyle and economic growth. (2 hours)
4. The dilemma of global justice and environmental sustainability. (2 hours)
5. Quantifying sustainability. (2 hours)
6. Measuring resource flows. (2 hours)
7. Processes of personal change. (2 hours)
8. Ways of solving the Aral Sea problems. (2 hours)
9. Discussion and conclusion. (2 hours)

III. 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. Overcoming poverty: ending poverty in all its forms everywhere. (5 hours) 2. International cooperation in the field of sustainable development. (5 hours) 3. Gender equality: achieving gender equality and empowering all women and girls. (5 hours) 4. Environmental problems of Jizzakh region and their solutions. (5 hours) 5. History, current state and future prospects of sustainable development issues. (5 hours) 6. Climate action: taking urgent action to combat climate change and its impacts. (5 hours) 7. Types of environmental problems. Environmental problems of Uzbekistan. (5 hours) 8. Education and upbringing for environmental protection and sustainable development. (5 hours) 9. Sustainable cities and communities: making cities and human settlements inclusive, safe, resilient and sustainable. (5 hours) 10. Waste collection and recycling. (5 hours) 11. Natural water sources and basins and their water quality indicators. Consumer requirements for water quality. (5 hours) 12. Decent work and economic growth: promoting sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all. (5 hours) 13. Industry, innovation and infrastructure: building resilient infrastructure, promoting inclusive and sustainable industrialization and fostering innovation. (6 hours) 14. Participation of Uzbekistan in international agreements and conventions. (6 hours) 15. Official standard requirements for water quality. Study and analysis of the drinking water standard UzDSt 950-2011. (6 hours) 16. Natural and anthropogenic processes adversely affecting environmental protection and sustainable development in Uzbekistan. (6 hours)
Exam form	Written
Teaching/learning and examination requirements	**Teaching technologies and methods:** lectures; interactive case studies; seminars (logical thinking, rapid questions and answers); group work; preparing presentations; individual projects; team projects to be completed and defended. Full mastery of the theoretical and methodological concepts of the course, the ability to correctly present the results of analysis, independent reasoning on the processes studied, completion of the tasks and assignments given in the current and midterm assessments, and submission of a written paper for the final assessment. 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. Atkinson A. How Can Sustainable Development Change the World? Moscow: Binom, 2015. 455 p., pp. 6-10. (in Russian) 2. Zozulya V.V. Sustainable Development: Urban Planning, Ecology, Law. Moscow: Rusains, 2017. 270 p. (in Russian) 3. Allaberdiyev R. "Environmental Protection and Sustainable Development". Teaching and methodological complex. National University of Uzbekistan, 2022. 101 p. (in Uzbek) 4. Gadaev A.N. Natural Water Intake Structures. Textbook. Samarkand, 2021. 230 p. (in Uzbek) **Additional literature** 5. The Constitution of the Republic of Uzbekistan. Tashkent, 2023. 6. O'zDSt 950:2011. Drinking water. Hygienic requirements and quality control. Approved by Order No. 346 of the Ministry of Health of the Republic of Uzbekistan dated 23 December 2010. 7. Saidov S.S., Gadaev A.N. Natural Water Intake and Treatment Structures. Study guide. Tashkent, 2022. 200 p. (in Uzbek) 8. Michael Edelstein, Astrid Cerny, Abror Gadaev. Disaster by Design: Aral Sea Sustainability and its lessons. UK, London, 2012. 9. Cleaner Production Strategies Technology for Environmental Protection, KTH, 2011, Sweden. **Internet resources:** 1. www.gov.uz – Government portal of the Republic of Uzbekistan. 2. www.lex.uz – National database of legislation of the Republic of Uzbekistan. 3. www.prezident.uz – Press service of the President of the Republic of Uzbekistan. 4. www.scopus.com – international scientific database. 5. http://www.uzreport.uz 6. http://www.uza.uz 7. http://gtmarket.ru/ratings/education-index/education-index-info 8. http://www.lex.uz/pages/getpage.aspx?lact_id=3107036 9. t.me/minstroyuz – official channel of the Ministry of Construction and Housing and Communal Services. 10. t.me/JizPI_ARM – official channel of the electronic library of the Information Resource Centre of Jizzakh Polytechnic Institute.