Course title	Protection of Air and Water Resources (ECTS 4)
Subject/module code	HSRMQ2204 (Master's programme)
Semester(s) in which the course is taught	3rd semester (2026–2027 academic year)
Assigned instructor	Pirnazarov I., acting associate professor, Department of Engineering Communications
Language of instruction	Uzbek
Course type	Elective
Study workload (including independent study)	**Total workload – 120 hours** **Contact hours – 36** Lecture hours – 18 Laboratory hours – none Practical class hours – 18 **Independent study – 84 hours** Course work – none
ECTS	4
Course aims and objectives / learning outcomes	**The aim of the course is to teach students the theoretical foundations of protecting air and water resources, the sources and types of pollution, treatment systems and equipment, and the fundamentals of their design and calculation, and to develop skills in applying in practice the laws and principles of protecting air and water resources.** **The objective of the course is to develop in students theoretical knowledge, practical skills, a methodological approach and a scientific outlook regarding the processes of protecting air and water resources, and to teach them to calculate and forecast the pollution of the atmosphere and water bodies and to develop measures to reduce it.** **Prerequisites: Ecology (bachelor's level); Water Supply and Sewerage (bachelor's level); (STT1106) Water Treatment Technologies.** **Learning outcomes:** **Professional competencies:** 1. Has a thorough command of the theoretical foundations, theoretical models and main mechanisms of protecting air and water resources. 2. Is able to calculate and forecast the pollution of the atmosphere and water bodies and to evaluate empirical methods. 3. Is able to identify the most relevant literature in the field, evaluate the work of other researchers, and collect and analyse data. 4. Knows the laws, regulatory documents and sanitary requirements for environmental protection and is able to apply them in practice. **Skills:** 5. Applies empirical knowledge in the analyses being carried out. 6. Expresses own opinion and justifies and defends it.
Course content (topics)	**I. Main theoretical section (Lectures) – 18 hours** **Topic 1: Introduction to the course. The current state of the environment in the Republic of Uzbekistan and its future challenges. (2 hours)** [1, 3] **Topic 2: Physical and chemical processes in the atmosphere. Protection of the air basin from pollution; standardisation of pollution. (2 hours)** [1] **Topic 3: Schematic diagrams of air purification from the main pollutants. Methods of treating and neutralising gaseous emissions. (2 hours)** [1, 3] **Topic 4: Calculation of harmful substances emitted from equipment, flanged joints and motor vehicles. (2 hours)** [3] **Topic 5**: Forecasting atmospheric pollution. Dispersion of harmful substances from high, low and elevated sources. (2 hours)**

[1, 3]

Topic 6: Natural water sources and their use for water supply. Surface water, groundwater and mine water. (2 hours) [4]

Topic 7: Sanitary assessment of natural water quality. Reservoirs. Sanitary protection zones of water sources. (2 hours) [4]

Topic 8: Protection of water resources from process waste. Wastewater and treatment facilities. (2 hours) [2, 5]

Topic 9: Low-level and high-level pollution sources. Economic damage from atmospheric air pollution. (2 hours) [1]

** Topics developed on the basis of the curricula of universities ranked in the TOP-300 of the QS and THE rankings: National University of Singapore (NUS; QS – 8, THE – 17), module ESE3201 "Air Quality Management" (pollution sources and pollutants, air pollution models, control strategies and devices). Topic 5 – forecasting atmospheric pollution and dispersion of harmful substances from high, low and elevated sources.

II. Guidelines and recommendations for practical classes – 18 hours

Practical classes consolidate the theoretical material of the lectures and develop master's students' skills in calculating emissions and the dispersion of harmful substances in the atmosphere, determining permissible emission limits and background concentrations, and calculating wastewater discharges and sanitary protection zones.

Recommended practical topics (2 hours each):

1. Calculating the emission of harmful substances.
2. Calculating the evaporation of harmful substances from open surfaces.
3. Calculating the atmospheric dispersion of harmful substances discharged through tall stacks.
4. Calculating atmospheric pollution by emissions from low and elevated sources.
5. Calculating the short-term concentration of harmful substances from ground-level sources.
6. Determining the permissible limit of harmful substances emitted into the atmosphere.
7. Calculating background concentrations.
8. Calculating the pollutants discharged from wastewater disposal systems.
9. Industrial wastewater. Methods of protecting water bodies; determining sanitary protection zones.

III. Laboratory classes

Laboratory classes are not provided for in the curriculum of this course.

IV. Independent study – 84 hours

Independent study develops master's students' ability to learn autonomously, to work with scientific and technical literature, regulatory documents and electronic resources, and to apply the knowledge gained in research and professional activity. Assignments are completed under the teacher's guidance in traditional or electronic form.

Topics recommended for independent study (14 hours each):

1. Legal foundations of environmental protection: laws and regulatory documents on the protection of water resources and the air basin.
2. Sanitary protection zones.
3. Measures to reduce emissions of harmful substances.
4. Measures to reduce the short-term concentration of harmful substances emitted from ground-level sources.
5. Wastewater from industrial enterprises and its treatment.
6. Causes of the problems of the Aral Sea and the Aral Sea region and

	ways of mitigating them. **V. Teaching technologies and methods** – lectures; – interactive case studies; – seminars (brainstorming, cluster, blitz survey, rapid question-and-answer sessions); – group work; – presentations; – individual projects.
Student assessment	Student assessment is based on the level of mastery of the learning materials during the semester and final assessment (tests, assignments, and written and oral work). Throughout the "Protection of Air and Water Resources" course, students are assessed on a 100-point scale. Of this total, 50 points are allocated to current and midterm assessment (60% of these 50 points for ongoing assessment and independent study, and 40% for the midterm assessment), while 50 points are allocated to the final assessment. Students whose combined current and midterm score is below 30 points are not admitted to the final examination. A student who obtains 30 or more points in the final assessment is considered to have passed the course. **Assessment criteria:** **a) A grade of "5" (excellent) requires the student to:** – fully explain the essence and content of the course; – present the topics of the course in a scientific and logically consistent manner, without scientific errors or inaccuracies; – have a clear understanding of the theoretical or practical importance of the course material; – demonstrate the ability to think independently and freely within the scope of the course; – give clear and concise answers to the questions asked; – have a thoroughly prepared set of lecture notes; – complete independent assignments fully and accurately; – have mastered all the practical skills and competencies; – be able to apply theoretical knowledge in various situations; – take a systematic approach and maintain continuity. **b) A grade of "4" (good) requires the student to:** – understand the essence and content of the course and present its topics without scientific or logical inaccuracies; – understand the practical importance of the course content; – complete the tasks and assignments for the course within the scope of the syllabus; – give correct answers to the questions asked on the course; – have a well-prepared set of lecture notes for the course; – complete the independent assignments for the course in full; – have made an effort to master all the practical skills and competencies. **c) A grade of "3" (satisfactory) requires the student to:** – have a general understanding of the course; – cover the topics of the course within a narrow scope, allowing some inaccuracies in presentation; – complete the independent assignments for the course in full; – the presentation is not fluent; – answers to questions on the course are vague and confused; – the written work on the course is not carefully prepared. **d) A grade of "2" (unsatisfactory) may be given in the following cases:** – the student has not prepared for classes on the course;

	– the student has no understanding of the content of the classes; – the independent assignments for the course have not been completed in full; – there are signs that written work has been copied from others; – the written work contains serious errors and inaccuracies; – no answers are given to questions on the course, i.e. the student does not know the course.
Examination requirements	To earn the credits, the student must have fully mastered the theoretical and methodological concepts of the course, be able to present the results of analysis correctly, reason independently about the processes studied, complete the tasks and assignments given in the current and midterm assessment, and submit the final assessment assignment. Students who do not submit current assessment, midterm assessment and independent study assignments, or who score fewer than 30 points for these assignments and assessment components, are not admitted to the final assessment. Furthermore, a student who, without a valid reason, misses 25 percent or more of the contact hours allocated to the course will be withdrawn from the course, will not be admitted to the final examination, and will be considered not to have earned the relevant credits for the course. A student who fails the final examination or receives a score in the range of "0–29.9" for this examination is considered to have an academic debt.
Recommended literature	**Main literature:** 1. Xalilova R.X. Ekologiya [Ecology]. Textbook. – Tashkent: O'zbekiston, 2020. – 294 p. 2. Djalilova A., Xamidov A., Abduqodirova M. Kanalizatsiya va oqova suvlarni tozalash [Sewerage and Wastewater Treatment]. Study guide. – Tashkent: Voris-nashriyot, 2012. – 200 p. 3. Musayev M.N. Sanoat chiqindilarini tozalash texnologiyasi asoslari [Fundamentals of Industrial Waste Treatment Technology]. Textbook. – Tashkent, 2011. – 498 p. 4. Qutlimurodov U.M. Suv ta'minoti va oqova suvlarni oqizish tizimlari [Water Supply and Wastewater Disposal Systems]. Textbook. – Tashkent: Mega Island LLC, 2021. – 237 p. 5. Qutlimurodov U.M. Oqova suvlarni oqizish tizimlarini ekspluatatsiya qilish va boshqarish [Operation and Management of Wastewater Disposal Systems]. Monograph. – Jizzakh, 2020. – 103 p. **Additional literature:** 6. Mirziyoyev Sh.M. Tanqidiy tahlil, qat'iy tartib-intizom va shaxsiy javobgarlik – har bir rahbar faoliyatining kundalik qoidasi bo'lishi kerak [Critical Analysis, Strict Discipline and Personal Responsibility Should Be the Daily Rule of Every Leader's Activity]. – Tashkent: O'zbekiston, 2016. – 55 p. 7. Mirziyoyev Sh.M. Qonun ustuvorligi va inson manfaatlarini ta'minlash – yurt taraqqiyoti va xalq farovonligining garovi [Ensuring the Rule of Law and Human Interests Is the Guarantee of the Country's Development and the People's Well-Being]. – Tashkent: O'zbekiston, 2016. – 47 p. 8. Zokirov X.X. Tabiiy resurslardan oqilona foydalanish [Rational Use of Natural Resources]. Textbook. – Termez State University, 2018. 9. Zokirov U.T., Bo'riyev E.S. Suv ta'minoti va oqova suvlarni oqizish va tozalash asoslari [Fundamentals of Water Supply and Wastewater Disposal and Treatment]. – Tashkent: Bilim, 2012. – 315 p. **Internet resources** 10. www.ziyonet.uz – Educational portal. 11. www.natlib.uz – Alisher Navoi National Library of Uzbekistan.