



Urboecology

Working program of the discipline (Syllabus)

Details of the discipline

Level of higher education	<i>first (bachelor)</i>
Branch of knowledge	<i>16 Chemical and bioengineering</i>
Speciality	<i>161 Chemical technology and engineering</i>
Educational program	<i>Industrial ecology and resource efficient cleaner technologies</i>
Status of discipline	<i>Optional educational components</i>
Form of training	<i>full-time/remote/mixed</i>
Year of preparation, semester	<i>3rd year, autumn semester</i>
Volume of discipline	<i>4 (120)</i>
Semester control/ control measures	<i>final test</i>
Schedule of classes	<i>3 hours for week (2 hours of lectures and 1 hour of practical classes)</i>
Language of instruction	<i>Ukrainian</i>
Information about the course /teachers	Lecturer: https://eco-paper.kpi.ua/pro-kafedru/vykladachi/nosachova-yuliya-viktorivna.html
Course placement	https://do.ipk.kpi.ua/course/view.php?id=2153

Program of discipline

1. Description of the discipline, its purpose, subject of study and learning results

The discipline "Urboecology" is one of the disciplines of urban planning science and human ecology, studying the interaction of the city, its population with the environment surrounding it. The city, as an unbalanced geoecosystem, is under constant influence of engineering, transport and social infrastructure, which leads to a violation of the ability to self-restore the natural environment. The discipline is devoted to the consideration of systems that determine and ensure sustainable development of the quality of life of the urban population. Mainly, the city's systems belong to communal services and generally turn the urban environment into a supergeoecosystem.

"Urboecology" contributes to the formation of an ecological worldview regarding the unity and close relationship between the components of natural systems and the functioning of the city's engineering systems. The future ecologist should know the principles of the components of urban systems and be able to make organizational, regulatory, environmental and other decisions that ensure the environmentally safe functioning of the urban engineering and technical infrastructure.

The subject of the discipline is the city, urbanization, urbanized environment, functions of cities, urbanized landscapes, factors of urbanized environment, biological adaptation, ecological energy, vegetation, animal population, urbanized biotopes, biological damage, landscape engineering of urbanized environment, protected areas in cities.

To a large extent, the solution of this problem will be determined by the level of training of specialists working in the field of environmental protection, including environmental safety management institutions of the state, scientific institutions and organizations, enterprises.

In order to successfully solve the problems of protecting and preserving natural aquatic ecosystems, specialists should be free to have information, be able to solve complex environmental problems in cities from pollution at the highest scientific level.

The purpose of the discipline "Urboecology"

The purpose of studying the discipline "Urbokology" is the formation of students' complex knowledge, skills, skills necessary for qualified management of environmental activities at the level of industrial enterprises, institutions, organizations, at the level of units of the Ministry of Environmental Protection of Ukraine.

In accordance with the purpose of preparing bachelors in this specialty requires strengthening the competencies formed in students:

- the ability to use the theoretical fundamentals of ecology, environmental protection and sustainable nature management, the basic principles and components of environmental management.

The main tasks of the discipline

After mastering the discipline "Urboecology" should demonstrate the following learning outcomes:

- to participate in the development and implementation of projects aimed at optimal management and treatment of industrial waste;

- to understand the basic environmental laws, rules and principles of environmental protection and nature management.

Prerequisite and requisition disciplines (place in the structural and logical scheme of training according to the relevant educational program)

The study of the discipline "Urboecology" directly relies at least on the following disciplines belonging to the structural and logical scheme of bachelor's training: "Industrial ecology", "General and inorganic chemistry".

2. Contents of the discipline

Section 1. Concepts and principles of urboecology.

Topic 1: Dynamics of urbanization and the state of ecology of the urban environment.

The city as an artificial habitat. Signs of urban systems compared to settlements of other types. Urban agglomerations. Large industrial centers. World dynamics of urbanization. Natural, technogenic, socio-economic and socio-demographic subsystems. Flows of energy, substance and information through the urbosociogeosystem. Approaches to the study of cities: geographical, economic, sociological, engineering, general ecological, cultural and anthropological. Capacity of the territory, demographic and ecological capacity.

Topic 2: Functional zoning of the city's territories and environmental problems.

Selbyshcha, landscape-recreational, industrial. Three models of spatial urban structure. Natural, economic, socio-psychological factors affecting the location of urban settlements. Motorization, spatial organization of territories, natural and man-made danger. Ways of sustainable development of the urban environment. Assessment of the city development: ballroom, sustainable development index. Environmental problems of Ukrainian cities.

Section 2. Ecological and climatic aspects and mobile environments of urbanized areas.

Topic 1: Microclimate of the city.

Bioclimatic conditions of the city territory (insolation, thermal, wind, humidity regimes of the city). Climatogram of the city. Ranking of microclimate types. Bioclimatic indicators: indices of the method of temperature scales (Misenard, Bodman, Hill), the method of thermal balance.

Topic 2: Ecological and microclimatic assessment of the city.

Method of integral ecological and microclimatic zoning of the city territories. Integral ecological map of the city. Ecological passport of the city. Influence of environmental factors on city development planning. Assessment of the impact of urban planning objects on the environment.

Topic 3: Formation of the air composition of the city.

Rationing of atmospheric air quality. Comprehensive indicators and assessment of the state of the city's air environment. Sources of emissions of pollutants into the environment.

Topic 4: Quality regulation and protection of the city's air environment.

Determination of the size of the sanitary protection zone. Methods of protection of atmospheric air of cities: urban planning, administrative and organizational, techno-technological, regulatory and legal. Assessment of the impact of urban planning objects on the environment.

Topic 5: Water environment of the city.

Indicators and assessment of the quality of natural waters. Sanitary and hygienic rationing. Water pollution index. Surface runoff from the territory of enterprises.

Topic 6: Regulation of quality and protection of the water environment of the city.

Technical and technological methods of preparation of drinking water. Urban planning methods of protection of water for economic and drinking purposes. Zones of sanitary protection. Wastewater of the city. Technical and technological methods of wastewater treatment.

Section 3. Energy pollution of the urban environment.

Topic 1: Radiation state of the urban environment.

Characteristics of radionuclide radionuclides and radiation doses. Radiation background and radioactivity of the environment of buildings. Measures to protect the premises from radioactive contamination.

Topic 2: Protection of the city from acoustic and vibration pollution.

Noise and vibration pollution. Parameters and classification. Sources of formation. Effects of acoustic pollution on humans. Principles of noise and vibration reduction.

Topic 3: Protection of the city from electromagnetic fields and video pollution.

Sources and extent of electromagnetic pollution. Sanitary rationing, role and biological action of electromagnetic fields. Protection from electromagnetic pollution of the population of cities.

Topic 4: Energy facilities of cities.

Structure and trends in the development of energy supply. Objects of small energy. The impact of energy objects on the environment. Helioenergy, wind power, small hydropower and heat pumps.

Section 4. Biocenoses, soils and waste management in urban areas.

Topic 1: Urban biocenoses and the impact of pollution on their health.

Urbanized biotopes. Structure and dynamics of urban populations. Microbiotopes. Hemerobicity of biotopes. Stages of formation of flora and fauna in urbanized areas. Reactions of organisms to the originality of the conditions of the urbanized environment. The impact of pollution on human health. Methods of research of flora and fauna in the city. Biological rhythms and urbanization. Diseases of urbanization.

Topic 2: Measures for the protection of vegetation cover in urban areas.

Degradation and ecological function of vegetation cover of urban areas. Indicators and assessment of the ecological state of the vegetation cover of urban areas. The main mechanisms of adaptation of organisms and populations. Measures for recovery and protection.

Topic 3: Measures for the protection of soils in urban areas.

Degradation and ecological function of urban soils. Indicators and assessment of the ecological state of urban soils. Technogenic and contaminated areas. Measures for recovery and protection.

Topic 4: Waste and the problem of their disposal in cities.

Industrial and household waste. Norms of accumulation of solid household waste (SOLID waste). Morphological composition, sanitary and bacteriological properties of SOLID. Collection and

transportation. Technical and technological methods of processing. Recycling issues. Landfills of solid waste.

Section 5. Regulatory aspects of optimization and protection of the urban environment.

Topic 1: Regulatory framework for regulating the quality of the urban environment.

Sources of environmental regulatory framework: constitution, laws in the field of environmental management and environmental protection, decrees and orders of the president and government decrees; normative acts of ministries and departments; normative decisions of local self-government bodies. Assessment of the quality of urban land. Land cadastral information. Protection of lands of cultural heritage and historical settlements.

Topic 2: Optimization of the urban environment and resource-saving technologies.

Planning activities of production zones, residential areas, public complexes and places of mass recreation. Hygienic justification of the optimal density of settlement and development. Monitoring of the urban environment. The use of underground space, multilevel solutions. Reconstruction of the city transport network.

Topic 3: Protection of the environment of buildings.

Meteorological indicators of the microclimate of premises. Regulation of the quality of the air environment of the premises. Protection against harmful volatile substances, asbestos fibers included in building and finishing materials. Norms and methods of noise protection of premises. Ecology of the residential environment. Technology of the "Smart Home". The concept of "Eco-house".

3. Educational materials and resources

Basic

1. *Urbokology: textbook for students of higher educational institutions / V.P. Kucheryavyy – Lviv, Publishing house "Novyi Svit-2000", 2021. – 460 p.*
2. *Urboecology and phytomelioration: textbook / L.M. Filipova, A.P. Stadnyk, V.V. Matskevych, etc. – Bila Tserkva, 2018. – 214 p.*
3. *Urboecology / I. A. Vasilenko, O. A. Pivovarov, I. M. Trus, A. V. Ivanchenko. Dnipro : Accent PE, 2017. 309s.*

Secondary

4. *Soluha B. V., Fuchs G. B. Urban Ecology. – K.: KNUBA, 2004. – 338 p.*
5. *Kucheryavyy V.O. Phytomelioration. – Lviv: Svit, 2003. – 539 p.*
6. *Chaika V.E. Urboecology. – Vinnytsia: 1999. – 368 p.*
7. *Bezlyubchenko O.S. Planning and improvement of cities: teaching. manual for students of all forms of education and students of the second higher education in the direction of training 0921 (6.060101)*

- "Construction" / O. S. Bezlyubchenko, O. V. Zavalny, T. O. Chernonosova; Hark. national academy of the city farm- H. : KHNAMG, 2011 - 191 p.
- 8. Law of Ukraine "On Improvement of Settlements" dated 06.09.2005 No 2807-IV/ VVRU - 2005 - No 49 - art. 527.
- 9. Law of Ukraine "On planning and development of territories" dated 20.04.2000 No 1699-III / VVRU - 2000 - No 31 - art. 250.
- 10. Law of Ukraine "On the General Scheme of Planning of the Territory of Ukraine" dated 7.02.2002, No. 3059-III / VVRU - 2002 - No. 30 - Art. 204.
- 11. Law of Ukraine "On fundamentals of urban planning" dated 16.11.1992 No 2780-XII / VVRU - 1992 - No 52 - art. 683.
- 12. Methodical indications for self-related work on discipline "Urboecology" for bachelors with the direction of preparation 6.040106 "Ecologistia, environmental protection and balanced nature management"/ Ukl.: O.M.Gorokhovskiy. –K.: NTUU "KPI", 2012. –47s.

Educational content

5. Methods of mastering the discipline (educational component)

Lecture classes

Lectures are aimed at:

- providing modern, holistic, interdependent knowledge in the discipline "Human Ecology", the level of which is determined by the target setting for each specific topic;
- ensuring in the process of lecturing the creative work of students together with the teacher;
- education of students of professional and business qualities and development of their independent creative thinking;
- formation of the necessary interest in students and providing direction for independent work;
- determination at the current level of development of science and technology in the field of environmental protection, forecasting their development for the coming years;
- display of methodological processing of the material (allocation of the main provisions, conclusions, recommendations, clear and adequate to their formulations);
- use for demonstration of visual materials, combining, if possible, them with the demonstration of results and samples;
- teaching research materials in a clear and high-quality language in compliance with structural and logical relations, explaining all the newly introduced terms and concepts;
- accessibility for perception by this audience.

No s/p	The name of the lecture topic and the list of main issues (list of didactic means, references to literature and tasks on the SRS)	Hours
Section 1. Concepts and principles of urboecology		
1	<p>Topic 1. Dynamics of urbanization and ecological state of the urban environment The city as an artificial habitat. Signs of urban systems compared to settlements of other types. Urban agglomerations. Large industrial centers. World dynamics of urbanization. Natural, technogenic, socio-economic and socio-demographic subsystems. Flows of energy, substance and information through the urbosociogeosystem.</p> <p>Literature: [1] p. 5-12; [3] p. 9-23; [6] p. 1 1-37.</p> <p>Tasks at the IWS: Approaches to the study of cities: geographical, economic, sociological, engineering, general ecological, cultural and anthropological. [6] p. 1-11.</p>	2
2	<p>Topic 2. Functional zoning of the city's territories and environmental problems Selbyshcha, landscape-recreational, industrial. Three models of spatial urban structure. Natural, economic, socio-psychological factors affecting the location of urban settlements. Motorization, spatial organization of territories, natural and man-made danger. Ways of sustainable development of the urban environment.</p> <p>Literature: [1] p. 12-22; [3] pp. 23-25; [6] p. 309-315</p> <p>Tasks at the IWS: Environmental problems of Ukrainian cities. [1] p. 30-49; [6] p. 37-47.</p>	2

Section 2. Ecological and climatic aspects and mobile environments of urbanized areas		
3	<p>Topic 1. Microclimate of the city <i>Bioclimatic conditions of the city territory (insolation, thermal, wind, humidity regimes of the city). Climatogram of the city. Ranking of microclimate types. Bioclimatic indicators: indices of the method of temperature scales (Misenard, Bodman, Hill), the method of thermal balance.</i> Literature: [1] p. 232-240; [3] p. 107-108. Tasks on IWS: <i>Bioclimatic methods that are based on weather types. [1] p. 245-249.</i></p>	2
4	<p>Topic 2. Ecological and microclimatic assessment of the city <i>Method of integral ecological and microclimatic zoning of the city territories. Integral ecological map of the city. Ecological passport of the city. Influence of environmental factors on city development planning.</i> Literature: [1] p. 390-402; [3] p. 261-265, [8-11] Tasks at the IWS: <i>Assessment of the impact of urban planning objects on the environment. [7] p. 25-48.</i></p>	2
5	<p>Topic 3. Formation of the air composition of the city <i>Rationing of atmospheric air quality. Comprehensive indicators and assessment of the state of the city's air environment.</i> Literature: [1] p. 30-35; [3] p. 96-123; [6] p. 111-117. Tasks at the IWS: <i>Sources of emissions of pollutants into the environment. [1] p. 249-268.</i></p>	2
6	<p>Topic 4. Quality regulation and protection of the city's air environment <i>Determination of the size of the sanitary protection zone. Methods of protection of atmospheric air of cities: urban planning, administrative and organizational, technotechnological, regulatory and legal.</i> Literature: [2] p. 116-131 ; [6] p. 107-111. Tasks at the IWS: <i>Assessment of the impact of urban planning objects on the environment. [3] p. 231-233</i></p>	2
7	<p>Topic 5. Water environment of the city <i>Indicators and assessment of the quality of natural waters. Sanitary and hygienic rationing. Water pollution index.</i> Literature: [1] p. 35-42; [6] p. 100-107. Tasks at the IWS: <i>Surface runoff from the territory of enterprises. [2] p. 22-32.</i></p>	2
8	<p>Topic 6. Quality regulation and protection of the city's aquatic environment <i>Technical and technological methods of preparation of drinking water. Urban planning methods of protection of water for economic and drinking purposes. Zones of sanitary protection. Wastewater of the city.</i> Literature: [3] p. 60-93, [7] p. 41-46. Tasks at the IWS: <i>Technical and technological methods of wastewater treatment. [3] p. 69-74.</i></p>	2
Section 3. Energy pollution of the urban environment		
9	<p>Topic 1. Radiation state of the urban environment <i>Characteristics of radionuclide radionuclides and radiation doses. Radiation background and radioactivity of the environment of buildings.</i> Literature: [1] p. 47-49; [6] p. 63-65. Tasks at the IWS: <i>Measures to protect the premises from radioactive contamination. [6] p. 65-70.</i></p>	2

10	<p>Topic 2. Protection of the city from acoustic and vibration pollution Noise and vibration pollution. Parameters and classification. Sources of formation. Sound map of the city. Effects of acoustic pollution on humans. <i>Literature:</i> [1] p. 47-49; [3] p. 108-117 <i>Tasks at the IWS:</i> Principles for reducing noise and vibration. [3] p. 239-241.</p>	2
11	<p>Topic 3. Protection of the city from electromagnetic fields and video contamination Sources and scale of electromagnetic and light pollution. Sanitary rationing, role and biological action of electromagnetic fields. <i>Literature:</i> [3] p. 108-117 <i>Tasks at the IWS:</i> Protection from electromagnetic pollution of the population of cities. [4] p. 54-58.</p>	2
12	<p>Topic 4. Energy facilities of cities Structure and trends in the development of energy supply. Objects of small energy. The impact of energy objects on the environment. <i>Literature:</i> [3] p. 124-145, [6] p. 225-231. <i>Tasks at the IWS:</i> Helio energy, wind energy. [3] p. 137-145.</p>	2
Section 4. Biocenoses, soils and waste management in urban areas		
13	<p>Topic 1. Urban biocenoses and the impact of pollution on their health Urbanized biotopes. Structure and dynamics of urban populations. Microbiotopes. Hemerobicity of biotopes. Stages of formation of flora and fauna in urbanized areas. Reactions of organisms to the originality of the conditions of the urbanized environment . The impact of pollution on human health. <i>Literature:</i> [1] p. 170-191; [3] p. 221-231; [6] p. 295-321. <i>Tasks at the IWS:</i> Methods of research of flora and fauna in the city. Biological rhythms and urbanization. [1] p. 331-355; [3] p. 221-227.</p>	2
14	<p>Topic 2. Measures for the protection of vegetation cover in urban areas Degradation and ecological function of vegetation cover of urban areas. Indicators and assessment of the ecological state of the vegetation cover of urban areas. <i>Literature:</i> [1] p. 236-253; [3] pp. 205-209. <i>Tasks at the IWS:</i> The main mechanisms of adaptation of organisms and populations. [1] p. 312-319, 299-300.</p>	2
15	<p>Topic 3. Measures for the protection of soils in urban areas Degradation and ecological function of urban soils. Indicators and assessment of the ecological state of urban soils. Technogenic and contaminated areas. <i>Literature:</i> [1] p. 201-245; [6] p. 93-100. <i>Tasks at the IWS:</i> Recovery and protection measures. [6] p. 269-287.</p>	2
16	<p>Topic 4. Waste and the problem of their disposal in cities Industrial and household waste. Norms of accumulation of solid household waste (SOLID waste). Morphological composition, sanitary and bacteriological properties of SOLID. Collection and transportation. Technical and technological methods of processing. Recycling issues. <i>Literature:</i> [3] p. 146-164 <i>Tasks at the IWS:</i> Landfills of solid waste. [3] p. 156-159.</p>	2
Section 5. Regulatory and legal aspects of optimization and protection of the urban environment		

17	<p>Topic 1. Regulatory framework for regulating the quality of the urban environment</p> <p>Sources of environmental regulatory framework: constitution, laws in the field of environmental management and environmental protection, decrees and orders of the president and government decrees; normative acts of ministries and departments; normative decisions of local self-government bodies. Assessment of the quality of urban land.</p> <p>Literature: [8-11].</p> <p>Tasks at the IWS: Land cadastral information. Protection of lands of objects of cultural heritage and historical settlements [8-11].</p>	2
18	<p>Topic 2. Optimization of the urban environment and resource-saving technologies</p> <p>Planning activities of production zones, residential areas, public complexes and places of mass recreation. Hygienic justification of the optimal density of settlement and development. Monitoring of the urban environment.</p> <p>Literature: [1] pp. 329-355; [3] p. 209-213.</p> <p>Tasks at the IWS: Use of underground space, multi-level interchanges. [3] p. 193-196</p>	1
19	<p>Topic 3. Protection of the environment of buildings</p> <p>Meteorological indicators of the microclimate of premises. Regulation of the quality of the air environment of the premises. Protection against harmful volatile substances, asbestos fibers included in building and finishing materials. Norms and methods of noise protection of premises. Ecology of the residential environment.</p> <p>Literature: [3] p. 181-193; [7]</p> <p>Tasks at the IWS: Technologies of the "Smart House". [3] p. 193.</p>	1
	Total hours	36

Practical classes

In the system of professional training of students in this discipline, practical classes occupy 14% of the classroom load. The ability to use special terminology, allow you to test knowledge, and this type of work is an important means of operational feedback.

The main tasks of the cycle of practical classes:

- to help the student to systematize, consolidate and deepen knowledge of a theoretical nature in the field of modern principles of urban ecosystem formation;
- teach students techniques for solving practical problems, promote mastering the skills and abilities of performing calculations, graphic and other tasks;
- teach them to work with scientific and reference literature and normative documents;
- to form the ability to learn independently, that is, to master the methods, methods and techniques of self-study, self-development and self-control.

No s/p	The name of the topic of practical training and the list of main issues (list of didactic support, reference to literature and tasks on the SRS)	Hours
1	<p>Topic 1. Ecological equilibrium of urbanized territory, calculation of indicators of demographic capacity of the territory [3]. Assessment of bioclimatic conditions of the city [3].</p> <p>Tasks at the IWS: Capacity of the territory, demographic and ecological capacity. [3] p. 247-251. Bioclimatic methods based on weather types. [3] p. 261-262; [1 2].</p>	3

2	<p><i>Topic 2. Methods for assessing the impact of enterprises, road transport and roads on the quality of the city's atmospheric air. Measurement of the main indicators of water quality of water sources of water supply of the city and their comparative analysis. Calculation of the total volume of surface runoff and annual removal of pollutants from the city territory. Measurement, analysis and forecasting of acoustic pollution of the urban area. [3] pp. 238-239</i></p> <p><i>Tasks at the IWS: Sources of emissions of pollutants into the environment. Assessment of the impact of urban planning objects on the environment. [3] p. 233-235. Surface runoff from the territory of enterprises. [2] p. 32-38. Measures to protect premises from radioactive contamination. [3] p. 239-241.</i></p>	3
3	Writing MCW	2
4	<p><i>Topic 3. Engineering-protective and architectural-planning phytomelioration. sanitary and hygienic assessment of green plants in settlements. Bioindication as an approach to environmental assessment.</i></p> <p><i>Tasks at the IWS: Protection from electromagnetic pollution of the population of cities. [1] p. 340-350, [2] p. 116-170.</i></p>	2
	Total hours	18

6. Independent work of the student

Independent work takes 51% of the time to study the credit module, including preparation for the test. should learn to deeply analyze modern approaches to the development and implementation of the latest approaches to the formation and maintenance of dynamic ecological balance in the context of global urbanization.

No s/p	Name of the topic submitted for self-study	Number of hours of SRS
Section 1. Concepts and principles of urbooecology		
1	<i>Topic 1. Dynamics of urbanization and state of ecology of urban environment Approaches to the study of cities: geographical, economic, sociological, engineering, general ecological, cultural and anthropological. Capacity of the territory, demographic and ecological capacity. [6] p. 3-5.</i>	2
2	<i>Topic 2. Functional zoning of the city's territories and environmental problems Environmental problems of Ukrainian cities. [1] p. 386-402.</i>	3
Section 2. Ecological and climatic aspects and mobile environments of urbanized areas		
3	<i>Topic 1. Microclimate of the city Bioclimatic methods that are based on weather types. [3] p. 107-108.</i>	2
4	<i>Topic 2. Ecological and microclimatic assessment of the city Assessment of the impact of urban planning objects on the environment. [1] p. 245-249.</i>	3
5	<i>Topic 3. Formation of the air composition of the city Sources of emissions of pollutants into the environment. [1] p. 30-35; [3] p. 96-107.</i>	3
6	<i>Topic 4. Quality regulation and protection of the city's air environment Assessment of the impact of urban planning objects on the environment. [3] p. 107-123.</i>	2
7	<i>Topic 5. Water environment of the city Surface runoff from the territory of enterprises. [1] p. 35-42.</i>	3
8	<i>Topic 6. Quality regulation and protection of the city's aquatic environment Technical and technological methods of wastewater treatment. [3] p. 62-74.</i>	2

Section 3. Energy pollution of the urban environment		
9	<i>Topic 1. Radiation state of the urban environment Measures to protect the premises from radioactive contamination. [6] p. 65-70.</i>	3
10	<i>Topic 2. Protection of the city from acoustic and vibration pollution Principles of noise and vibration reduction. [6] p. 65-70.</i>	2
11	<i>Topic 3. Protection of the city from electromagnetic fields and video contamination Protection from electromagnetic pollution of the population of cities. [6] p. 71-81.</i>	3
12	<i>Topic 4. Energy facilities of cities Helioenergy, wind power, small hydropower and heat pumps. [3] p. 137-145.</i>	2
Section 4. Biocenoses, soils and waste management in urban areas		
13	<i>Topic 1. Urban biocenoses and the impact of pollution on their health Methods of research of flora and fauna in the city. Biological rhythms and urbanization. Diseases of urbanization. [1] p. 410-414; [3] p. 227-231.</i>	3
14	<i>Topic 2. Measures for the protection of vegetation cover in urban areas The main mechanisms of adaptation of organisms and populations. Measures for recovery and protection. [1] p. 340-350; [2] p. 116-170.</i>	2
15	<i>Topic 3. Measures for the protection of soils in urban areas Measures for recovery and protection. [1] p. 201-225.</i>	3
16	<i>Topic 4. Waste and the problem of their disposal in cities Landfills of solid waste. [3] p. 147-155; [7] p. 80-100.</i>	2
Section 5. Regulatory and legal aspects of optimization and protection of the urban environment		
17	<i>Topic 1. Regulatory framework for regulating the quality of the urban environment Land cadastral information. Protection of lands of objects of cultural heritage and historical settlements [8-11].</i>	2
18	<i>Topic 2. Optimization of the urban environment and resource-saving technologies The use of underground space, multilevel solutions. Reconstruction of the city transport network. [3] p. 193-196</i>	3
19	<i>Topic 3. Protection of the environment of buildings Technology of the "Smart Home". The concept of "Eco-house". [3] p. 193.</i>	2
20	<i>Preparation for MCW</i>	5
21	<i>Execution of HCW</i>	10
22	<i>Preparation for the exam</i>	6
	<i>Total hours</i>	66

Politics and control

7. Policy of discipline (educational component)

Rules for attending classes and behavior in classes

Students are obliged to take an active part in the educational process, not to be late for classes and not to miss them without a good reason, not to interfere with the teacher to conduct classes, not to be distracted by actions that are not related to the educational process.

Rules for assigning incentive and penalty points

- *encouraging points can be credited by the teacher only for the performance of creative works in the discipline or additional passage of online specialized courses with the receipt of the appropriate certificate:*
- https://courses.prometheus.org.ua/courses/course-v1:IRF+WST101+2019_T2/about. Course "Household waste actions now"
- https://courses.prometheus.org.ua/courses/IRF/URBAN101/2015_T1/about. Urbanism course: a modern city | Prometheus

- <https://www.coursera.org/learn/gte-sustainable-cities> "Landscaping" of economics: ustoychoe razvytye gorodov.
- <https://www.coursera.org/learn/sharing-cities> Sharing Cities: Governance and Urban Sustainability
- <https://www.coursera.org/learn/urban-nature> Urban Nature: Connecting Cities, Nature and Innovation.

But their amount can not exceed 10 % of the rating scale.

- penalty points within the discipline are not provided.

Polika deadlines and re-assemblys

In case of debts in the discipline or any force majeure circumstances, students should contact the teacher through accessible (provided by the teacher) communication channels to solve problematic issues and coordinate the algorithm of actions for working out.

Academic Integrity Policy

Plagiarism and other forms of dishonest work are unacceptable. Plagiarism includes the absence of references when using printed and electronic materials, quotes, opinions of other authors. Invalid hints and write-offs when writing tests, conducting classes; passing the credit for another graduate student; copying of materials protected by the copyright system without the permission of the author of the work.

The policies and principles of academic integrity are defined in Section 3 of the Code of Honor of the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute". Read more: <https://kpi.ua/code>

Policy of academic behavior and ethics

Students should be tolerant, respect the opinion of others, object to formulate in the correct form, constructively maintain feedback in the classroom.

The norms of ethical behavior of students and employees are defined in Section 2 of the Code of Honor of the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute". Read more: <https://kpi.ua/code>

8. Types of control and rating system for assessing learning outcomes (RCOs)

Distribution of educational time by types of classes and tasks in the discipline according to the working curriculum:

Semester	School time		Distribution of training hours				Control measures		
	ECTS Credits	acad. H.	Lecture	Practical	Lab. woks.	IWS	MCW	HCW	Semester control
6	4	120	36	18	–	66	1	1	final test

The student's rating in the discipline consists of points that he receives for:

The rating of a student from the credit module is calculated from 100 points, of which 52 points are the starting scale.

The starting rating (during the semester) consists of points that the student receives for:

- work in practical classes (9 lessons);
- implementation of modular control work (MCW is divided into 3 works lasting 30 minutes);
- doing home control work.

System of rating (weight) points and evaluation criteria

Criteria for scoring:

Work in practical classes:

- active creative work – 2 points;
- fruitful work – 1 point;
- absence from class without good reason – -1 point.

"unsatisfactory" – the answer does not meet the requirements for "satisfactory" – 0 points.

Control works are estimated at 5 points:

- "excellent" – full answer (at least 90% of the necessary information) – 5 points;
- "good" – a sufficiently complete answer (at least 75% of the required information), or a full answer with minor inaccuracies – 4 points;
- "satisfactory" – incomplete answer (at least 60% of the necessary information) and minor errors – 3-1 points;
- "unsatisfactory" – the answer does not meet the requirements for "satisfactory" – 0 points.

Home control work is estimated at 25 points according to the following criteria:

- "excellent" – creative approach to solving the problem – 25-18 points;
- "good" – deep disclosure of the problem, reflected own position – 17-10 points;
- "satisfactory" – reasonable disclosure of the problem with certain shortcomings – 9-1 points;
- "unsatisfactory" – the task is not completed, the HCW is not credited – 0 points.

For each week of delays in the submission of HCW, points of -2 points (no more than 8 points) are awarded. The presence of a positive assessment of the HCW is a condition for admission to the standings.

The condition for the first certification is to receive at least 8 points. The condition for the second certification is to receive at least 22 points and enroll home control work.

The condition for admission to the standings is the enrollment of at least one control work, the HCW starting rating of at least 25 points.

At the test, students perform written control work consisting of 48 test questions.

The amount of starting points and points for scoring control work is transferred to the scoring assessment according to the table:

<i>Points: practical classes + HCW + MCW + scoring control work</i>	<i>Score</i>
<i>100... 95</i>	<i>Perfectly</i>
<i>94... 85</i>	<i>Verygood</i>
<i>84... 75</i>	<i>Well</i>
<i>74... 65</i>	<i>Satisfactory</i>
<i>64... 60</i>	<i>Enough</i>
<i>Less than 60</i>	<i>Disappointing</i>
<i>Modular control works have not been handed over or are not credited to the HCW or starting rating less than 25 points</i>	<i>Not allowed</i>

9. Additional information on the discipline (educational component)

Approximate list of questions submitted to the MKR

1. To cite the principles of rationing of the permissible anthropogenic burden on the environment provided for by the Law on Environmental Protection?
2. Describe climatic parameters and regimes are taken into account when planning and building urban settlements, designing buildings and structures?
3. Do the factors of the natural environment affect the microclimatic conditions of the area?
4. Do the factors of the urban environment affect the formation of the microclimate of the city?
5. Specify the microclimatic variability of general climatic modes in certain areas of the territory of a large city.
6. Specify bioclimatic indicators of weather conditions.
7. Give the methods used to assess the bioclimate of the city?
8. Describe what meteorological factors determine the dispersion of impurities and aerosols in the air?
9. Explain what is the essence of the concept of "Potential for air pollution"?
10. What are the environmental criteria for assessing the city's microclimate?

11. Give a description of ecological and microclimatic zoning of the city.
12. Specify the main composition of engineering research for construction as sources of information about natural and man-made conditions and the ecological state of the building area?
13. To cite the methods used for a comprehensive assessment of the impact on the urban environment of natural and anthropogenic factors?
14. Explain what climatic and natural-man-made factors are taken into account when developing urban planning and project documentation for the regulation, protection and environmental safety of the urban environment?
15. Give the classification of pollutants and sources of pollution of the urban environment.
16. Give examples of methods to protect the environment of buildings from internal and external vibration.
17. Specify measures to protect the environment of the premises from electromagnetic fields.
18. Explain the reasons why radiation pollution of the environment of buildings is caused?
19. Give the requirements of radiation hygiene at the stages of construction and operation of the building.
20. What are the factors that determine the quality of the residential environment at the urban planning level and on the scale of a separate building?

Approximate from theawds submitted to the DKR

1. Calculate the demographic capacity of the territory.
To determine the factors that most limit the demographic capacity of the territory, to propose measures to increase it.
Calculate the reproductive capable and oxygen supply of the territory.
To conclude about the sufficiency of the reproductive ability of the territory for oxygen.
2. Calculate the air pollution index (ISA) in the city and the comprehensive air pollution index (KIZA).
Assess the level of air pollution in the city.
3. Calculate the flow of water coming from various sources of natural and man-made nature, as well as the content of pollutants in them.
4. Calculate the area of the solid waste landfill and the volume is allocated during the decomposition of biogas waste in general and by components.
5. Determine the degree of danger of pollution of urban soils, establish which pollutants make the greatest contribution to the total pollution indicator. Describe the detected geochemical anomalies, establishing which pollutants pose the greatest danger to ecosystems and human health. Data of field observations are presented in tables.
6. Develop an assortment of resistant plants and prepare proposals for the greening of various functional areas of the city.

Work program of the discipline (syllabus):

Compiled assoc., Ph.D., Nosachova Y.V.

Approved by the Department E and TRP (protocol No. 14 of 08.06.2022 2)

Approved by the IHF Methodical Council (Protocol No. 10 of 24.06.2022)