Syllabus

of the educational component

Discipline name:	Radioecology and Fundamentals of Ecological	
	Toxicology	
Lovel of higher education:	the first (hecholor's)	
Level of higher education.	the first (bachelor's)	
Course page in Moodle:	https://dl.khadi.kharkov.ua/course/view.php?id=1336	
The scope of the	4 credits (120 hours)	
educational		
component:		
Final control form:	credit	
Consultations:	on schedule	
Name of the department:	Department of Chemistry and Chemical Technology	
Language of teaching:	Ukrainian	
Head of the course:	Khobotova Elina Borysivna, Dr. Chem. Sc., professor	
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Radioecology and Fundamentals of Ecological Toxicology

Brief content of the educational component:

The goal of studying the academic discipline is the training of specialists in the field of ecology, the possibility of using the acquired knowledge in future professional activities.

The subject of studying the discipline is the a pedagogically adapted system of concepts about the laws that determine the effect of ionizing radiation and the toxicity of chemical compounds and their use in various processes of protecting humans and the environment in ecology.

The main tasks of the discipline are

- substantiation and presentation of unified theoretical and methodological foundations of the theory of radioactivity and ionizing radiation;

- study of modern concepts and principles of environmental regulation of the action of ionizing radiation;

- formation of knowledge about the main forms of the action of toxic substances on the human organism, the criteria for the toxicity of industrial poisons, the patterns of toxic effects under the action of several harmful substances, the features of the intake, transport, distribution and release of industrial poisons from the organism, modern concepts of hygienic regulation and standardization;

- formation of skills for independent determination of the degree of radioactive contamination of the environment, the magnitude of exposure doses of organisms and the necessary methods of protection against ionizing radiation;

- formation of practical skills in the use of the main parameters of toxicity and danger of harmful substances, the regularities of the relationship between the composition, structure and properties of chemicals with indicators of toxic action, the assessment of the MPC of harmful substances in the air of the working area.

Teaching methods:

1) verbal: lectures, explanations, stories, etc.;

2) visual: method of illustrations, method of demonstrations

3) practical: traditional practical classes, laboratory work

Thematic plan Number of hours N⁰ Name of topics (LC, Lab, PR, IW) corresfull-time pondence 1 2 3 4 LC: Types of radioactivity. Law of radioactive decay. Nuclear 2 1 reactions. Lab: Radiation-chemical evaluation of different media and 2 1 materials. Experimental determination and calculation of doses of external exposure of a person at different irradiation geometries. 1 PR: The main representatives of natural radioactivity. Radioactive 2 families. Nuclear reactions. IW: Thermonuclear reactions. Implementation of thermonuclear 7 4 synthesis at the modern stage. LC: Ionizing radiation and their quantitative characteristics. 2 1 PR: Calculation of quantitative criteria for the action of ionizing 2 -2 radiation. IW: Components of external radiation: cosmic radiation, radiation 4 7 of soils, rocks, troposphere, water environment, etc. LC: Dosimetry and methods of dosimetry. 2 1 Lab: Assimilation of methods of dosimetric control. 2 1 3 Study of external y-radiation of building materials. IW: Methods of dosimetry. Wilson's camera. 4 7 LC: Radiation protection. 2 -PR: Solving problems on the topics "Dosimetry", "Radiation 2 4 protection". IW: Radiation protection from gamma and neutron radiation. 7 4 LC: Technogenically modified radiation background. 2 -PR: Assessment of radioactivity of building materials. 2 _ Lab: Evaluation of the activity of the components of 2 -5 technogenically modified radiation background. IW: Radioactivity due to the presence of radon. Other sources of 3 7 technologically modified background. LC: Accident-free nuclear power cycle. Radioactive waste (RW) 2 and methods of RW management. 6 IW: Radioactivity sources used in medicine. Emergency situations 3 7 at the NPP. LC: Nuclear and thermonuclear weapons. Contamination with 2 radionuclides after a nuclear explosion. 7 Lab: Determination of the amount of strontium-90 in milk. 2 -IW: Circulation of artificial radioisotopes in the outdoor 7 3 environment. Discriminants of radionuclides. LC: Fundamentals of radiobiology. 2 -IW: Relative biological effectiveness of ionizing 7 radiation. 4 8 Theoretical ideas about the mechanism of biological action of radiation. Genetic effect of ionizing radiation. Somatic mutations. LC: Migration of radionuclides along food chains. Radioprotective 2 _ means and their mechanism of action. 9 PR: Solving problems using the Pershin and Körber formulas to 2 determine LD₅₀. IW: Rational nutrition as a method of radiation protection. 3 7 LC: Classification of toxic substances. 2 1 10 IW: Hygienic classification of aerosols. 7 3 LC: Basic elements of toxicometry. 2 1 11 Lab: Quantitative criteria of toxicity of industrial poisons. 2 -

1	2	3	4
	IW: The main provisions of the theory of receptors. General and specific in the action of industrial poisons. The main types of acute and chronic poisoning at work.	4	7
	LC: Fundamentals of toxicokinetics.	2	-
12	Lab: Parameters of toxicokinetics.	2	-
	IW: Kinetics of toxic effect.	3	7
	LC: Relationship of the composition, structure and properties of compounds with indicators of toxic action.	2	1
13	Lab: Indicators of toxicity and MPC of organic compounds.	2	-
13	PR: Relationship of toxicity of inorganic compounds with their structure and physicochemical properties.	4	-
	IW: Indicators of toxicity of non-volatile compounds.	3	7
14	LC: Introduction, transport, distribution and isolation of industrial poisons from the human organism.	2	
	IW: Metabolism of poisonous compounds.	4	7
	LC: Hygienic regulation and standardization.	2	-
15	IW: Hygienic regulation of dust, pesticides, allergens, blastomogens and substances that cause genetic effects. Biological MPC and exposure tests.	3	7
	LC: Cumulation and combined action of toxic substances.	2	-
	Lab: Quantitative assessment of the cumulative properties of toxic substances.	2	-
16	PR: Graphic methods for assessing the combined action of poisons. MPC of harmful substances with their cumulative presence in the external environment.	2	-
	IW: Possible mechanisms of habituation. Toxic effects when exposed to vapor-gas-aerosol mixtures. Toxic effects under the combined action of chemical and physical factors of the production environment.	4	7
	LC	32	6
Total	Lab	16	2
TULAI	PR	16	-
	IW	56	112

Evaluation system and requirements:

Current performance

1 The current success of applicants for the performance of educational types of work in training sessions and for the performance of tasks of independent work is assessed using a four-point rating scale, followed by transfer to a 100-point scale. When assessing the current performance, all types of work provided for by the curriculum are taken into account.

1.1 Lectures are evaluated in determining the quality of the performance of specific tasks and tests.

1.2 Laboratory classes are evaluated by the quality of the reports on the implementation of laboratory work.

2 The assessment of the current performance of applicants for higher education is carried out on each laboratory work on a four-point scale ("5", "4", "3", "2"), the grades are recorded in the academic record book.

– "excellent": the applicant perfectly mastered the theoretical material, demonstrates deep knowledge of the relevant topic or academic discipline;

– "good": the applicant has mastered the theoretical material well, has the main aspects from the primary sources and recommended literature, and argues it; has practical skills, expresses his views on certain problems, but allows certain inaccuracies and errors in the logic of the presentation of theoretical content or in the analysis of practical material;

– "satisfactory": the applicant has basically mastered the theoretical knowledge of the educational topic or discipline, is guided by primary sources and recommended literature, but answers unconvincingly, confuses concepts, uncertainly answers additional questions, does not have stable knowledge; answering questions of a practical nature, reveals inaccuracies in knowledge, does not know how to evaluate facts and phenomena, to connect them with a future profession;

- "unsatisfactory": the applicant has not mastered the educational material of the topic (discipline), does not know scientific facts, definitions, almost does not orient himself in primary sources and recommended literature, there is no scientific thinking, practical skills are not formed.

3 The final score for the current activity is recognized as the arithmetic mean of the scores for each lesson, current tests according to the formula:

$$C^{current} = \frac{C_1 + C_2 + \dots + C_n}{n},$$

where: *C*^{current} – final assessment of academic performance based on the results of current control;

 C_1 , C_2 , C_n - assessment of academic performance of the *n*-th activity of the current control;

n - number of monitoring measures.

Grades are converted to points on a conversion scale (Table 1).

4 point scale	100 point scale	4 point scale	100 point scale	4 point scale	100 point scale	4 point scale	100 point scale
5	100	4,45	89	3,90	78	3,35	67
4,95	99	4,4	88	3,85	77	3,3	66
4,9	98	4,35	87	3,80	76	3,25	65
4,85	97	4,3	86	3,75	75	3,2	64
4,8	96	4,25	85	3,7	74	3,15	63
4,75	95	4,20	84	3,65	73	3,1	62
4,7	94	4,15	83	3,60	72	3,05	61
4,65	93	4,10	82	3,55	71	3	60
4,6	92	4,05	81	3,5	70	from 1,78 to 2,99	from 35 to 59
re-taking							
4,55	91	4,00	80	3,45	69	from 0 to 1,77	from 0 to 34
4,5	90	3,95	79	3,4	68	repeate	d training

 Table 1 - Recalculation of the average score for current activities on a multipoint scale

Final grade

1 The applicant for higher education receives a credit at the last lesson in the discipline based on the results of the current assessment. The average rating for current activities is converted into points on a 100-point scale, according to the recalculation table (Table 1).

Applicants for higher education who have an average current grade in the discipline below "3" (60 points) can increase their current score at the last lesson by passing tests in the discipline.

Assessment of applicants' knowledge by testing is carried out on a scale:

- "Excellent": at least 90% of correct answers;

- "Very good": from 82% to 89% correct answers;

- "Good": from 74% to 81% of correct answers;

- "Satisfactory": from 67% to 73% of correct answers;

- "Satisfactory enough": from 60% to 66% of correct answers;

- "Unsatisfactory": less than 60% correct answers.

The condition for receiving a credit is:

- working off all missed classes;

- the average current grade of the discipline is not lower than "3" (60 points).

2 For the performance of individual independent work and for participation in scientific events, applicants are awarded additional points.

2.1 The number of additional points awarded for different types of individual tasks depends on their volume and significance:

 prizes in the discipline at the international / All-Ukrainian competition of scientific student works – 20 points;

prize-winning places in the discipline at the All-Ukrainian Olympiads – 20 points;

 participation in the international/All-Ukrainian competition of scientific student works – 15 points

 participation in international/All-Ukrainian scientific conferences of students and young scientists – 12 points;

- participation in the All-Ukrainian Olympiads in discipline - 10 points;

participation in olympiads and scientific conferences of KhNAHU in the discipline – 5 points;

– performance of individual research (training and research) tasks of increased complexity – 5 points.

2.2 The number of additional points cannot exceed 20 points.

3 The learning outcome is assessed (select one):

on a two-point scale (passed/failed);

- on a 100-point scale (for a differentiated test) according to Table 3.

The final score, together with additional points, cannot exceed 100 points.

Table 2 - Scale for transferring points to the national assessment system

On a 100-point scale	On a national scale
from 60 points to 100 points	passed
less than 60 points	failed

Table 3 - The scale for assessing the knowledge of applicants based on the results of the final control of the academic discipline

Score in	National scale score		ECTS score		
points			Grade	Criteria	
	exam	credit			
	CXdiff	create	Δ	The theoretical meaning of the course has been	
90-100	Excellent	Passed		mastered completely, without gaps, the necessary practical skills for working with the mastered material have been formed, all the training tasks provided for by the training program have been completed, the quality of their implementation has been assessed by a number of points close to the maximum	
80–89	Good	Passed	В	The theoretical meaning of the course is mastered completely, without gaps, practical skills of working with the mastered material are basically formed, all training tasks provided for by the training program are completed, the quality of most of them is estimated by a number of points close to the maximum	
75-79			С	The theoretical content of the course has been mastered completely, without gaps, some practical skills in working with the mastered material are not sufficiently formed, all the training tasks provided for by the training program have been completed, the quality of none of them has been assessed with a minimum number of points, some types of tasks have been completed with errors	
67-74	Satisfactory		D	The theoretical content of the course has been partially mastered, but the gaps are not significant, practical skills are needed to work with the mastered material, basically formed, most of the training tasks provided for by the training program have been completed, some of the completed tasks may contain errors	
60–66	outisidetory		E	The theoretical content of the course has been partially mastered, some practical work skills have not been formed, many training tasks provided for by the training program have not been completed, or the quality of some of them has been assessed with a number of points close to the minimum	
35–59	Unsatisfactory	Failed	FX	The theoretical content of the course has been partially mastered, the necessary practical work skills have not been formed, most of the provided training programs for training tasks have not been completed, or the quality of their implementation has been assessed with a number of points close to the minimum; with additional independent work on the course material, it is possible to improve the quality of the implementation of training tasks (with the possibility of re-composing)	
0–34	Unacceptably		F	The theoretical content of the course has not been mastered, the necessary practical work skills have not been developed, all completed training tasks contain gross errors, additional independent work on the course material will not lead to any significant improvement in the quality of the training tasks (with a mandatory re-course)	

Course policy:

- the course provides for teamwork, the environment in the classroom is friendly, creative, open to constructive criticism;

- the development of the discipline involves the mandatory attendance of lectures and practical classes, as well as independent work;

 independent work involves the study of individual topics of the academic discipline, which are submitted in accordance with the program for independent processing, or were considered briefly;

- all tasks stipulated by the program must be completed on time;

 if the applicant for higher education is absent from classes for a good reason, he presents completed assignments during self-study and consultation with the teacher;

- when studying the course, applicants for higher education must comply with the rules of academic virtue set forth in the following documents: "Rules of academic virtue for participants in the educational process of KhNAHU" (https://www.khadi.kharkov.ua/fileadmin/P_Standart/pologeniya/stvnz_67_01_do broch_ 1.pdf), "Academic integrity. Checking the text of academic, scientific and qualifying works for plagiarism» (https://www.khadi.kharkov.ua/fileadmin/P Standart/pologeniya/stvnz 85 1 01. pdf), "Moral code of participants in the educational process of KHNADU" (https://www.khadi.kharkov.ua/fileadmin/P Standart/pologeniya/stvnz 67 01 M EK 1.pdf).

- in case of detection of the fact of plagiarism, the applicant receives 0 points for the task and must re-perform the task provided for in the syllabus;

- cheating during tests and exams is prohibited (including using mobile devices). Mobile devices are only allowed to be used for online testing.

Recommended literature

1. Khobotova E.B. Human ecology: a textbook // Kharkiv: KhNAHU, 2019. – 344 p. [in Ukrainian]

2. Khobotova E.B. Human ecology (section "Ecological and hygienic aspects of human nutrition"): Lecture notes. // Kharkiv: KhNAHU, 2009. – 84 p. [in Ukrainian]

3. Human ecology: a textbook / L. I. Solomenko. // Kyiv: "Center for Educational Literature", 2016. – 120 p. [in Ukrainian]

4. Human ecology: a textbook / I.I. Zalessky, M.A. Klimenko. // Rivne, 2020 - 340 p. [in Ukrainian]

5. Human ecology / I.A. Vasilenko, I.M. Rabbit, O.A. Pivovarov, L.A. Frolova // Dnepr: Accent PP, 2017. – 183 p. [in Ukrainian]

6. Nekos A.N., Bagrova L.A., Klimenko M.A. Human ecology. A textbook. - 2nd ed. // Kharkiv: KhNU named after V.N. Karazin, 2013. - 284 p. [in Ukrainian]

Additional sources

1. Course-resource of the discipline "Hum https://dl.khadi.kharkov.ua/course/view.php?id=2254

"Human Eo

Ecology"

The developer of the syllabus of the academic discipline

E.B. Khobotova

Head of the Department

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