



Лектор курсу
Контактна інформація
лектора (e-mail)
Сторінка курсу в eLearn

СИЛАБУС ДИСЦИПЛІНИ « Biological methods in radiation research »

Ступінь вищої освіти - Master
Спеціальність – 101 «Ecology»
Освітня програма « Ecology and Environmental Protection»
Рік навчання - 1-st, семестр 2-nd
Форма навчання - full-time education
Кількість кредитів ЄКТС - 6
Мова викладання - English

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COURSE DESCRIPTION

The purpose of teaching the discipline "Experimental Radioecology" is to study the sources of ionizing radiation in the environment, migration of radioactive substances in different ecosystems, features of physicochemical forms of radionuclides and assessment of environmental impact and risks associated with radioactive contamination. Formation of abilities and skills of carrying out radioecological researches with use of radioactive isotopes, methods of radiochemical separation and modern methods of measurement.

The task is to provide opportunities to use the acquired knowledge and skills to describe, analyze and predict the accumulation of radioactive isotopes and their migration in the environment under conditions of limited information, as well as to perform a master's thesis.

The student should know the characteristics of ionizing radiation and the physico-chemical basis of the interaction of ionizing radiation with substances, methods of radiometry and spectrometry of ionizing radiation, physical and chemical properties of natural and artificial radioactive isotopes of chemical elements, the basis of statistical processing of experimental data.

STRUCTURE OF COARSE

Topic	Hours (lectures/ practical works)	Results of study	Task	Evaluation
Module 1. Radionuclides in the environment				
Topic 1. Consequences of the largest radiation accidents and prospects for the use of contaminated areas for research	4/-	Know foliar uptake of radionuclides into plants. Receipt of soluble radionuclides in plants from the air. Influence of physico-chemical properties of radionuclides on their transition from soil to plants through the roots. Influence of biological characteristics of plants, phases of their development and physiological state on the	.	10 point

		<p>transition of radionuclides from the soil to plants.</p> <p>Understand features of migration of radionuclides in forest biogeocoenoses. Ways of radionuclides uptake into the body of animals. Quantitative indices of accumulation of radionuclides in the animal body: concentration factor (CF), absorption coefficient (C_a), biological elimination half-life of radionuclides (T_{biol}). The main ways of radionuclides withdrawal from the body of animals.</p>		
Topic 2. Biological effects of ionizing radiation Assessing impacts of ionizing radiation to man and the environment (principles, mechanisms, biomarkers)	4/-	<p>Know interaction of microorganisms with elements of nuclear fuel. Extremely radio-resistant microorganisms.</p> <p>Understand mechanisms of various interactions of bacteria and uranium: bioreduction, biomineralization, biosorption and bioaccumulation.</p>		10
Topic 3. Speciation of radionuclides in the environment	4/2	<p>Know metabolism of strontium in natural contaminated ecosystems. Biogeochemistry of cesium and its interaction with soil microorganisms.</p> <p>Understand accumulation of ^{137}Cs by bacteria and their effect on the biological availability of radionuclides.</p>	Delivery of practical work №1.	10
Total module 1				30
Module 2. Experiment in radioecological research				
Topic 4. Field sampling and statistics in radioecology	2/3	<p>Soil sampling methods for radiation control. Requirements for sampling devices and equipment. General requirements for the selection of test sites. Gamma survey of the surveyed area. Sampling. Soil sampling in rural settlements, on agricultural lands and in natural landscapes. Sampling in case of local emergency</p>	Delivery of practical work №2.	10

		radioactive contamination of the territory. Marking, transportation, storage and disposal of samples. Requirements for sampling devices and equipment. Determination of homogeneity of radioactive contamination. Sampling of plant products in storage places or during its transportation, in the field.		
Topic 5. Particularities of radionuclide contamination measurements	2/2	Requirements for error in determining the density of radioactive soil contamination. Determination of the number of soil samples to estimate the median density of radioactive contamination of the soil at the elementary site. Requirements for soil sampling and preparation and measurement of radionuclide activity in them.	Delivery of practical work №3.	10
Topic 6. Radioactive particles and solid state speciation	2/2	Know labeled atoms. Radioactive and stable isotopes. Labeled compounds. Indicative dose. Basic ways of using isotopic indicators in research with plants. Investigation of transport and distribution of separate elements in plant. Understand features of the use of radioactive isotopes in vegetative and field studies. Radioautography. Features of the use of stable isotopes.	Delivery of practical work №4.	10
Topic 7. Modeling within radioecology	4/2		Delivery of practical work №5.	10
Total module 2				40
Module 3. Features of studying the state of radioactive isotopes under different conditions				
Topic 8. Distribution, main fluxes and deposits of biologically active radionuclides (^{137}Cs and ^{90}Sr) in forest ecosystems.	2/2	Know extremely radioresistant bacterium <i>Deinococcus radiodurans</i> , <i>Arthrobacter radiotolerans</i> . Isolation of strains of radiosensitive bacteria in an environment with extreme conditions of existence.	Delivery of practical work №6.	10

		Understand radiosensitivity of micromycetes.		
Topic 9. Freshwater radioecology	2/2	Know assessment of microbial cenosis of territories contaminated by radioactive isotopes after the Chernobyl accident. Level of radioactivity of soil and biodiversity of soil microflora. Determination of soil cellulosic activity. Understand dynamics of ecological and trophic groups of soil microorganisms on contaminated radionuclide territories.	Delivery of practical work №7.	10
Topic 10. Terrestrial radioecology, transfer and countermeasures	4/-	Know Metagenomics as a complex branch of knowledge. Metageno data analysis. Sequencing metagenoids. Bioinformatics analysis of 16s rRNA metagenome data. Metadata in metagenome analysis and their integration. Determination of the main metrics of biodiversity. Check the quality of the sequencing data by the FastQC program. Understand MetaGenom data preprocessing in the QIIME software package. Clustering metagenome data in QIIME.		10
Total module 3				30
Additional points				10
Total for the semester (30+30+40)*0,7				70
Exam				30
Total for the course				100

EVALUATION POLICY

<i>Deadline and recompilation policy:</i>	Works that are submitted in violation of the deadlines for more than a week without good reason are evaluated at a lower score (maximum - 20% of the maximum). Rearrangement of modules takes place with the permission of the lecturer if there are good reasons (for example, hospital or family problems).
<i>Academic Integrity Policy:</i>	Writing while writing modular test papers and the final exam is prohibited. The use of mobile devices during these periods is also prohibited.

Visiting policy:	Attendance is mandatory. For objective reasons (for example, illness, international internship) training can take place individually (in online form in consultation with the dean of the faculty). In case of violations and abuses (non-attendance more than 50% of the time - non-admission to the exam)
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STUDENT EVALUATION SCALE

Rating of the applicant of higher education, points	The assessment is national for the results of examinations	
	exams	offsets
90-100	perfectly	credited
74-89	good	
60-73	satisfactorily	
0-59	unsatisfactorily	not credited