

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Radioekologija
Course title:	Radioecology

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Ekotehnologije, 2. stopnja	/	1	2
Ecotechnologies, 2 nd cycle	/	1	2

Vrsta predmeta / Course type Izbirni / Elective

Univerzitetna koda predmeta / University course code: EKO2-741

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
15	15			15	105	5

**Navedena porazdelitev ur velja, če je vpisanih vsaj 15 študentov. Drugače se obseg izvedbe kontaktnih ur sorazmerno zmanjša in prenese v samostojno delo. / This distribution of hours is valid if at least 15 students are enrolled. Otherwise the contact hours are linearly reduced and transferred to individual work.*

Nosilec predmeta / Lecturer: Prof. dr. Borut Smodiš
Prof. dr. Peter Stegnar
Doc. dr. Marko Štok

Jeziki / Languages: **Predavanja / Lectures:** Slovenski ali angleški / Slovene or English
Seminar: Angleški / English

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Zaključen študij prve stopnje naravoslovne ali tehniške smeri ali zaključen študij drugih smeri z dokazanim poznavanjem osnov področja predmeta (pisna dokazila, pogovor).

Prerequisites:

Completed first level studies in natural sciences or engineering or completed second level studies in other fields with proven knowledge of fundamentals in the field of this course (certificates, interview).

Vsebina:

Vpliv radioaktivnih snovi in ionizirajočih sevanj na okolje:

- Viri ionizirajočega sevanja in radionuklidi v okolju;
- Vloga radioaktivnih snovi v ekosistemih;
- Porazdelitev in prenos radionuklidov v okolju;
- Učinki ionizirajočih sevanj na organizme in na ekosisteme;
- Radiološke ocene izpustov radionuklidov v okolje;
- Ukrepanje v primeru radioaktivnih izpustov v okolje;
- Nezgodni izpusti radioaktivnosti v okolje in

Content (Syllabus outline):

Influence of radioactive substances and ionising radiation to the environment:

- Sources of ionizing radiation and radionuclides in the environment;
- Role of radioactive substances in ecosystems;
- Dispersion and transport of radionuclides in the environment;
- Effects of ionizing radiation on organisms and ecosystems;
- Assessing the radiological impact of radionuclides releases to the environment;
- Management of radioactive releases to the environment;

protiukrepi.

- Accidental releases of radioactivity in the environment and countermeasures.

Temeljni literatura in viri / Readings:

- E. Van der Stricht, R. Kirchman (eds.). Radioecology: radioactivity & ecosystems. International Union for Radioecology, Fortemps, 2001.
- David A. Atwood (ed.), Radionuclides in the environment, Wiley, 2010.
- Handbook of parameter values for the prediction of radionuclide transfer in terrestrial and freshwater environments, Technical Reports Series No. 472, International Atomic Energy Agency, Vienna, 2010.
- S. Fesenko, B.J. Howard (eds.), Guidelines for remediation strategies to reduce the radiological consequences of environmental contamination, Technical Reports Series No. 475, International Atomic Energy Agency, Vienna, 2013.
- Handbook of parameter values for the prediction of radionuclide transfer to wildlife, Technical Reports Series No. 475, International Atomic Energy Agency, Vienna, 2014.
- Ciljani izbor znanstvenih objav. / Targeted selection of scientific publications.

Cilji in kompetence:

Cilj predmeta je študentu pojasniti vplive ionizirajočih sevanj na ekosisteme.

Cilj se navezuje na kompetence:

- Obvladovanje raziskovalnih metod, postopkov in procesov ter razvoj kritične in samokritične presoje;
- Sposobnost uporabe znanja na akademski ravni in v praksi;
- Razvoj komunikacijskih sposobnosti in spretnosti, posebej komunikacije v mednarodnem okolju;
- Kooperativnost, delo v skupini in v mednarodnem okolju;
- Uporaba teoretskih in eksperimentalnih metod pri razreševanju problemov, povezanih z vplivi ionizirajočih sevanj na ekosisteme.

Objectives and competences:

The objective of the course is to explain a student the effects of ionising radiation on ecosystems.

This objective is related to competences:

- Command of research methods, procedures and processes, and well-formed skills for critical judgment;
- Critical thinking at both academic level and in practice;
- Communication ability and skills in the international environment;
- Ability to work in a team and in international environment;
- Ability to apply theoretical and experimental methods in solving problems related to the effects of ionising radiation on ecosystems.

Predvideni študijski rezultati (izidi):

- Poznati in razumeti osnovne principe radioekologije;
- Pojasniti porazdelitev in prenos radionuklidov v različnih ekosistemih;
- Oceniti vlogo izbranega radionuklida v ekosistemu;
- Ugotoviti vpliv ionizirajočih sevanj na ekosisteme;
- Načrtovati ukrepe v primeru radioloških nesreč v zunanjem okolju;
- Priporočati primerne tehnike za zmanjšanje oziroma odstranitev radioaktivnih onesnaževal

Intended learning outcomes:

- Know and understand basic principles of radioecology;
- Explain distribution and transfer of radionuclides in various ecosystems;
- Assess the role of a selected radionuclide in the environment;
- Find out the effects of ionising radiation on ecosystems;
- Plan countermeasures in case of radiological accidents in the environment;
- Recommend appropriate techniques for reducing and/or eliminating radioactive contaminants

iz okolja;
 • Vzpostaviti sposobnost komunikacije v angleškem jeziku na področju radioekologije.

from the environment;
 • Establish the ability to communicate in English in the field of radioecology.

Metode poučevanja in učenja:

Predavanja.
 Seminar.
 Vključevanje v projekte za reševanje izbranih problemov.
 Priprava seminarske predstavitve.

Learning and teaching methods:

Lectures.
 Seminar work.
 Participation in projects for solving selected problems.
 Preparation of the seminar presentation.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Seminarska naloga. Zagovor seminarske naloge, pri katerem študent dokaže osvojitve vseh študijskih izidov z vsaj po enim konkretnim primerom.	50 % 50 %	Seminar work. Defense of the seminar work where the student demonstrates the achievement of all learning outcomes with at least one specific case for each outcome.

Reference nosilca / Lecturer's references:

- PLANINŠEK, Petra, SMODIŠ, Borut, BENEDIK, Ljudmila. Simultaneous determination and uptake assessment of selected radionuclides in plants grown in substrate contaminated with U-mill tailings. *Journal of radioanalytical and nuclear chemistry*, ISSN 0236-5731, 2016, vol. 309, no. 1, str. 351-365, doi: [10.1007/s10967-016-4881-7](https://doi.org/10.1007/s10967-016-4881-7). [COBISS.SI-ID [29521447](#)],
- MATVEYEVA, Ilona, JAČIMOVIĆ, Radojko, PLANINŠEK, Petra, SMODIŠ, Borut, BURKITBAYEV, Mukhambetkali. Uptake of uranium, thorium and radium isotopes by plants growing in dam impoundment Tasotkel and the Lower Shu region (Kazakhstan). *Radiochimica Acta*, ISSN 0033-8230, 2016, vol. 104, iss. 1, str. 51-57, doi: [10.1515/ract-2015-2457](https://doi.org/10.1515/ract-2015-2457). [COBISS.SI-ID [29006375](#)],
- SMODIŠ, Borut, ČERNE, Marko, JAČIMOVIĆ, Radojko, BENEDIK, Ljudmila. Transfer of uranium and radium to Chinese cabbage from soil containing elevated levels of natural radionuclides. *Journal of radioanalytical and nuclear chemistry*, ISSN 0236-5731, 2015, vol. 306, iss. 3, str. 685-694, doi: [10.1007/s10967-015-4198-y](https://doi.org/10.1007/s10967-015-4198-y). [COBISS.SI-ID [28785447](#)],
- SMODIŠ, Borut, ŠTOK, Marko, ČERNE, Marko. Radioecology around a closed uranium mine. *Journal of radioanalytical and nuclear chemistry*, ISSN 0236-5731, 2014, vol. 299, issue 1, str. 765-771, doi: [10.1007/s10967-013-2697-2](https://doi.org/10.1007/s10967-013-2697-2). [COBISS.SI-ID [27172647](#)],
- ŠTOK, Marko, SMODIŠ, Borut. Soil-to-plant transfer factors for natural radionuclides in grass in the vicinity of a former uranium mine. *Nuclear Engineering and Design*, ISSN 0029-5493. [Print ed.], 2013, vol. 261, str. 279-284, doi: [10.1016/j.nucengdes.2013.03.036](https://doi.org/10.1016/j.nucengdes.2013.03.036). [COBISS.SI-ID [26695975](#)],