# ANALIZNA KEMIJA V KONTROLI OKOLJA Učni načrt predmeta/Course syllabus

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| Predmet: | ANALIZNA KEMIJA V KONTROLI OKOLJA |
| Course title: | ENVIRONMENTAL ANALYTICAL CHEMISTRY |
| Članica nosilka/UL Member: | UL FKKT |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020631 |
| Koda učne enote na članici/UL Member course code: | 10 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 20 | 20 | 20 |  |  | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Helena Prosen |

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| Izvajalci predavanj: | Marjan Veber |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet /Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij. Znanja iz temeljnih naravoslovnih disciplin. | Enrolment in the doctoral study programme. Prerequisite knowledge of basic natural sciences. |

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| Vsebina: | Content (Syllabus outline): |
| Vzorčenje. Plinasti, tekoči in trdni vzorci. Laboratorijska obdelava vzorcev (absorpcija, adsorpcija, ekstrakcije tekoče-tekoče, ekstrakcije tekoče-trdno, mikroekstrakcije, raztapljanje, razkroji). Analizne metode za določanje onesnažil. Plinska in tekočinska kromatografija z različnimi detektorji. Primer določanja hlapnih pesticidov v živilih. Avtomatizirane analize.  Metode atomske spektroskopije v analitiki okolja. Povezava spektroskopskih in kromatografskih metod. Pomen določanja različnih kovinskih zvrsti v vodah in v zemlji.  Vrednotenje analiznih rezultatov. Standardizacija analiznih metod in zagotavljanje kakovosti rezultatov. | Sampling. Gaseous, liquid and solid samples. Laboratory sample preparation (absorption, adsorption, liquid-liquid extractions, liquid-solid extractions, microextractions, dissolving, digestions). Analytical methods for pollutant determination. Gas and liquid chromatography with different detectors. Example of volatile pesticides determination in the foodstuffs. Automated analyses.  Methods of atomic spectroscopy in the environmental analysis. Hyphenation of spectroscopic and chromatographic methods. Usefulness of metal speciation in water bodies and soil.  Validation of analytical results.  Standardization of analytical methods and quality assurance. |

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| Temeljna literatura in viri/Readings: |
| Environmental Analytical Chemistry, Ed. F.W. Fifield, P.J. Haines, Blackwell Science, 2000, 483 str./pages |

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| Cilji in kompetence: | Objectives and competences: |
| Seznaniti študente s pristopi v okoljski analitiki ter principi najpomembnejših analiznih metod za določanje organskih in anorganskih onesnažil v okolju. | Present students with the approaches in the environmental analytics and principles of the most important analytical methods for the determination of the organic and inorganic pollutants in the environment. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Študentje bodo spoznali značilnosti (prednosti, slabosti in uporabnost) različnih analiznih metod in pristopov za določevanje sledov anorganskih in organskih spojin v okoljskih vzorcih.  Na osnovi pridobljenih znanj bodo sposobni izbrati in predlagati ustrezni analizni pristop za reševanje konkretnih analiznih problemov ter kritično oceniti in ovrednotiti analizne rezultate. | Knowledge and understanding:  Students will gain knowledge of the properties (advantages, disadvantages, applicability) of different analytical methods and approaches for the determination of trace inorganic and organic compounds in the environmental samples.  On the basis of the gained knowledge, they will be able to select and propose a suitable analytical approach to solve real-life analytical problems, as well as to critically evaluate the analytical results. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja, seminarji in laboratorijske vaje, konzultacije. | Lectures, seminar coursework, laboratory tutorial, consultations. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Ustno izpraševanje | 60,00 % | Oral exam |
| Seminarska naloga | 40,00 % | Seminar coursework |

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| Ocenjevalna lestvica: | Grading system: |
| 5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10 | 5 - 10, a student passes the exam if he is graded from 6 to 10 |

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| Reference nosilca/Lecturer's references: |
| **Helena Prosen:**  1. M. Mrzlikar, D. J. Heath, E. Heath, J. Markelj, A. Kandolf Borovšak, **H. Prosen**. Investigation of neonicotinoid pesticides in Slovenian honey by LC-MS/MS. *Lebensmittel-Wissenschaft + Technologie* *- LWT*, 2019,  104, 45-52; DOI: 10.1016/j.lwt.2019.01.017  2. I. Kraševec, **H. Prosen**. Determination of polar benzotriazoles in aqueous environmental samples by hollow-fibre microextraction method with LC-MS/MS and its comparison to a conventional solid-phase extraction method. *Microchem. J*., 2021, 166, 106191, 9 p.; DOI: 10.1016/j.microc.2021.106191.  3. B. N. Malinović, J. Markelj, A. Žgajnar Gotvajn, I. Kralj Cigić, **H. Prosen**. Electrochemical treatment of wastewater to remove contaminants from the production and disposal of plastics : a review. *Environmental Chem. Lett*., 2022, 20(6), 3765-3787; DOI: 10.1007/s10311-022-01497-8. |

# BIOGEOKEMIJSKA KROŽENJA Učni načrt predmeta/Course syllabus

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| Predmet: | BIOGEOKEMIJSKA KROŽENJA |
| Course title: | Biogeochemical cycles |
| Članica nosilka/UL Member: | UL BF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski (od študijskega leta 2025/2026 dalje) | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020632 |
| Koda učne enote na članici/UL Member course code: | 11 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 60 | 60 |  |  |  | 130 | 10 |

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| Nosilec predmeta/Lecturer: | Tjaša Danevčič |

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| Izvajalci predavanj: | Tjaša Danevčič, Jadran Faganeli, Ingrid Falnoga, Nastja Rogan Šmuc |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet /Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij. Predznanje temeljev kemije, mikrobiologije, biologije in geologije. | Inscription in the doctoral study programme. The basic knowledge of chemistry, microbiology, biology and geology. |

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| Vsebina: | Content (Syllabus outline): |
| Nastanek in razvoj Zemlje ter primerjava s sosednjima planetoma (Mars in Venera), Razvoj metabolnih poti, Molekulski geokemijski) biomarkerji, Biološki nastanek mineralov (biomineralizacija), Primarna produkcija, Razgradnja in ohranjanje, Anaerobni metabolizem in biogeni plini, Kroženje ogljika in globalne spremembe, Kroženje kisika, Kroženje dušika, Kroženje žvepla, Kroženje fosforja, Kroženje kovin (Fe, Mn, Hg, Pb), polkovin (As, Se) in radionuklidov (210Po), Transport, presnovni procesi in bioakumulacija, Človekov vpliv na biogeokemijska kroženja, Modeli biogeokemijskih kroženj | The formation of Earth and comparisom with neighbour planets (Venus and Mars), The origin and evolution of metabolic pathways, Molecular (geochemical) biomarkers, Biological formation of minerals (biomineralization), Primary production, Degradation and preservation, Anaerobic metabolism and biogenic gases, Carbon cycling and global changes, Oxygen cycling, Nitrogen cycling, Sulphur cycling, Phosphorus cycling, Metals, metalloids and radionuclides, Transport, metabolic pathways and bioaccumulation, Human impact on biogeochemical cycling, Modelling of biogeochemical cycles |

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| Temeljna literatura in viri/Readings: |
| W.H. Schlesinger, E.S. Bernhardt, 2013. Biogeochemistry: An analysis of global change, Academic, San Diego, 688 pp. (ISBN 9780123858740)  W.H. Schlesinger, 2004. Biogeochemistry, Treatise on geochemistry, vol. 8, Elsevier, Amsterdam, 720 pp. (ISBN 0080446426)  D.E. Canfield, B. Thamdrup, E. Kristensen, 2005: Aquatic geomicrobiology, Advances in Marine Biology, vol.48, Elsevier, 636 pp. (ISBN 0-12-158340-6)  A.H. Knoll, D.E. Canfield, K.O. Konhauser, 2012. Fundamentals of geobiology, Wiley-Blackwell, Oxford, 443 pp. (ISBN 978-1-4051-8752-7)  T.C. Malone, A. Malej, J. Faganeli (eds.), 2021. Coastal ecosystems in transition: A comparative analysis of the northern Adriatic and Chesapeake Bay, Geophysical monographs 256, AGU-Wiley, 235 pp. (ISBN 9781119543589)  J. Faganeli, I. Falnoga, N. Kovač, 2020. Mikrobna biogeokemija vod, NIB, Ljubljana, 350 pp. (ISBN 978-961-94802-6-7)  **Revije/Journals**  Biogeochemistry, Springer, ISSN 0168-2563  Global Biogeochemical Cycles, AGU, ISSN 0886-6236  Biogeosciences, Copernicus, ISSN 1726-4189  JGR Biogeosciences, AGU, ISSN 2169-8961  Geomicrobiology Journal, Taylor&Francis, ISSN 0149-0451  Geobiology, Wiley, ISSN 1472-4677  Organic Geochemistry, Elsevier, ISSN 0146-6380  Science of the Total Environment, Elsevier, ISSN 0048-9697  Journal of Soils and Sediments, Springer, ISSN 1439-0108  Elements, MSA, ISSN 1811-5209 |

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| Cilji in kompetence: | Objectives and competences: |
| Predmet seznanja študenta z dejavniki in procesi, vključno s človekovimi, ki uravnavajo biogeokemijska kroženja elementov v hidrosferi, litosferi, atmosferi in biosferi. Pomemben poudarek je na prikazu biogeokemijskega razvoja Zemlje v primerjavi s sosednjima planetoma, metodah študija biogeokemijskih tokov v preteklosti in danes, kemijskih, bioloških in geoloških reakcijah in procesih, ki uravnavajo porazdelitev, speciacijo in tokove elementov v glavnih rezervoarjih (sferah) in med njimi, pomenu speciacije elementov v kontroli mobilnosti in vlivu na biološke sisteme ter človekovih vplivih in spremembah v biogeokemijskih kroženjih pomembnih elementov. | In this course, students are informed about factors and processes, including anthropogenic, controlling the biogeochemical cycling of elements in hydrosphere, lithosphere, atmosphere and hydrosphere. Importnat aspects are devoted to biogeochemical evolution of Earth in comparison to neighbour planets, study of present and past biogeochemical fluxes, chemical, biological and geological reactions and processes that govern the distribution, speciation and fluxes of elements in the main reservoirs (spheres) and between them, the role of speciation of elements in their mobility and impact on biological systems as well as the human role and global changes. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Pridobljeno znanje bodo študenti sposobni uporabiti v eksperimentalnih pristopih za študij biogeokemijskih procesov in razumeti procese v biogeokemijskih kroženjih pomembnih elementov vključno z globalnimi spremembami. | Knowledge and understanding:  The students will be able to use the acquisited knowledge in experimental studies of biogeochemical processes and to understand processes involved in biogeochemical cyclings of importnat elements including their global changes. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja, seminarji, nastop, sodelovanje na predavanjih vabljenih domačih in tujih predavateljev. | Courses, seminars, presentations,, attendance at lectures of invited lecturers. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Predstavitev seminarske naloge | 40,00 % | Presentation of seminar work |
| Ustni izpit | 60,00 % | Oral exam |

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| Ocenjevalna lestvica: | Grading system: |
| 5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10 | 5 - 10, a student passes the exam if he is graded from 6 to 10 |

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| Reference nosilca/Lecturer's references: |
| **Doc. dr. Tjaša Danevčič**  ČERNOŠA, Anja, MARTÍNEZ CORTIZAS, Antonio, TRAORE, M. Mohamed, PODLOGAR, Matejka, **DANEVČIČ, Tjaša,** GUNDE-CIMERMAN, Nina, GOSTINČAR, Cene. A screening method for plastic-degrading fungi. *Heliyon*. 2024, vol. 10, issue 10, [article no.] e31130, str. 1-17, ilustr. ISSN 2405-8440. DOI: [10.1016/j.heliyon.2024.e31130](https://dx.doi.org/10.1016/j.heliyon.2024.e31130). [COBISS.SI-ID [195878915](https://plus.cobiss.net/cobiss/si/sl/bib/195878915)]  **DANEVČIČ, Tjaša,** DRAGOŠ, Anna, ŠPACAPAN, Mihael, ŠTEFANIČ, Polonca, DOGŠA, Iztok, MANDIĆ-MULEC, Ines. Surfactin facilitates horizontal gene transfer in *Bacillus subtilis*. *Frontiers in microbiology*. May 2021, vol. 12, str. 1-8, article 657407, ilustr. ISSN 1664-302X. [Repozitorij Univerze v Ljubljani – RUL](https://repozitorij.uni-lj.si/IzpisGradiva.php?id=134068), DOI: [10.3389/fmicb.2021.657407](https://dx.doi.org/10.3389/fmicb.2021.657407). [COBISS.SI-ID [58756355](https://plus.cobiss.net/cobiss/si/sl/bib/58756355)]  OPALIČKI, Maja, **DANEVČIČ, Tjaša**, HUG, Katrin, FILLINGER, Lucas, MANDIĆ-MULEC, Ines, GRIEBLER, Christian, BRANCELJ, Anton. Key drivers of microbial abundance, activity, and diversity in karst spring waters across an altitudinal gradient in Slovenia. *Aquatic microbial ecology*. 2021, vol. 86, str. 99-114. ISSN 0948-3055. <https://www.int-res.com/prepress/a01956.html>, DOI: [10.3354/ame01956](https://dx.doi.org/10.3354/ame01956). [COBISS.SI-ID [56743171](https://plus.cobiss.net/cobiss/si/sl/bib/56743171)]  **Prof. dr. Jadran Faganeli**  OGRINC, Nives, ŠEGEDIN, Urban, **FAGANELI, Jadran**. Methane and CO2CO2 production in the wetland Lake Podpeč (Slovenia). *Journal of soils and sediments*. [Online ed.]. 2023, vol. 23, str. 4163–4172, ilustr. ISSN 1614-7480. [COBISS.SI-ID [161912579](https://plus.cobiss.net/cobiss/si/sl/bib/161912579)]  FLOREANI, Federico, BARAGO, Nicolò, KLUN, Katja, **FAGANELI, Jadran,** COVELLI, Stefano. Dissolved gaseous mercury production and sea-air gaseous exchange in impacted coastal environments of the northern Adriatic Sea. *Environmental pollution*. 2023, vol. 332, [1]-16 str. ISSN 0269-7491. [COBISS.SI-ID [158532099](https://plus.cobiss.net/cobiss/si/sl/bib/158532099)]  CANTONI, Carolina, DE VITTOR, Cinzia, **FAGANELI, Jadran**, GIANI, Michele, KOVAČ, Nives, MALEJ, Alenka, OGRINC, Nives, TAMŠE, Samo, TURK, Valentina. Carbonate system and acidification of the Adriatic Sea. *Marine Chemistry*. [Online ed.]. Nov. 2024, vol. 267, [article no.] 104462, str. 1-19, ilustr. ISSN 1872-7581. [COBISS.SI-ID [213186563](https://plus.cobiss.net/cobiss/si/sl/bib/213186563)]  **Doc. dr. Ingrid Falnoga**  KLUN, Katja, ŠKET, Primož, BERAN, Alfred, **FALNOGA, Ingrid**, FAGANELI, Jadran. Composition of colloidal organic matter in phytoplankton exudates. *Water*. 2023, vol. 15, iss. 1, str. 1-10, ilustr. ISSN 2073-4441. [COBISS.SI-ID [137041411](https://plus.cobiss.net/cobiss/si/sl/bib/137041411)]  FAGANELI, Jadran, **FALNOGA, Ingrid**, KLUN, Katja, MAZEJ, Darja, MOZETIČ, Patricija, ZULIANI, Tea, KOVAČ, Nives. Metal(loid)s in suspended particulate matter and plankton from coastal waters (Gulf of Trieste, northern Adriatic Sea). *Journal of soils and sediments*. 2023, vol. 23, str. [1-13], ISSN 1614-7480. [COBISS.SI-ID [150795267](https://plus.cobiss.net/cobiss/si/sl/bib/150795267)]  BENEDIK, Ljudmila, ROVAN, Leja, **FALNOGA, Ingrid**, JERAN, Zvonka, LIPEJ, Lovrenc, PROSEN, Helena, FAGANELI, Jadran. Po-210 in plankton and fish from coastal waters (gulf of Trieste, northern Adriatic Sea). *Marine Chemistry*. [Print ed.]. 2024, vol. 265-266, art. 104425, 8 str. ISSN 0304-4203. DOI: [10.1016/j.marchem.2024.104425](https://dx.doi.org/10.1016/j.marchem.2024.104425). [COBISS.SI-ID [199372547](https://plus.cobiss.net/cobiss/si/sl/bib/199372547)]  **Izr. prof. Nastja Rogan Šmuc**  **ROGAN ŠMUC, Nastja**, KOVAČ, Nives, HAUPTMAN, Žan, ŠMUC, Andrej, DOLENEC, Matej, ŠOSTER, Aleš. A detailed insight into the detrital and diagenetic mineralogy of metal(oid)s : their origin, distribution and associations within hypersaline sediments. Minerals. [Online ed.]. 2021, vol. 11, iss. 11, str. 1-22. ISSN 2075-163X. Repozitorij Univerze v Ljubljani – RUL, DOI: 10.3390/min11111168. [COBISS.SI-ID 81999875]  KOVAČ, Nives, HAUPTMAN, Žan, DOLENEC, Matej, ŠKORNIK, Iztok, **ROGAN ŠMUC, Nastja**. Translocation signatures of major elements in halophytes from hypersaline environments : the case study from Sečovlje Salina (Republic of Slovenia). Journal of soils and sediments : protection, risk assessment and remediation. str. 1-14. ISSN 1439-0108. Repozitorij Univerze v Ljubljani – RUL, DOI: 10.1007/s11368-023-03654-0. [COBISS.SI-ID 165386243]  GRAČANIN, Nik, PODLOGAR, Matejka, SEMSARI PARAPARI, Sorour, BOULET, Pascal, RUIZ-ZEPEDA, Francisco, ŠTURM, Sašo, **ROGAN ŠMUC, Nastja**. Formation mechanisms and environmental influences on the crystal growth of wulfenite. *Scientific reports*. 2024, 14, str. 1-12. ISSN 2045-2322. DOI: [10.1038/s41598-024-60043-4](https://dx.doi.org/10.1038/s41598-024-60043-4). [COBISS.SI-ID [193706243](https://plus.cobiss.net/cobiss/si/sl/bib/193706243)] |

# BIOINDIKACIJA IN VARSTVO KOPENSKIH EKOSISTEMOV Učni načrt predmeta/Course syllabus

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| Predmet: | BIOINDIKACIJA IN VARSTVO KOPENSKIH EKOSISTEMOV |
| Course title: | BIOINDICATION AND CONSERVATION OF TERRESTRIAL ECOSYSTEMS |
| Članica nosilka/UL Member: | UL BF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020633 |
| Koda učne enote na članici/UL Member course code: | 12 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 30 | 15 |  |  | 15 | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Klemen Eler |

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| Izvajalci predavanj: | Hojka Kraigher |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij. | Enrollment in the doctoral study programme. |

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| Vsebina: | Content (Syllabus outline): |
| Splošni del: Definiranje bioindikacije ter drugih sorodnih dejavnosti in ved (biomonitoring, ekotoksikologija). Prednosti in omejitve bioindikacije pri ocenjevanju stanja, sprememb in kakovosti okolja, posebej z vidika antropogenih vplivov (onesnažila, raba tal, podnebne spremembe).  Ravni bioindikacije (indikatorske vrste, populacije, združbe in biološki procesi ter zgradba organizmov) ter načini bioindikacije (markerji, akumulatorji in monitorji). Značilnosti dobrih bioindikatorskih vrst in procesov. Bioindikacija v okoljski zakonodaji v Evropi in Sloveniji.    Specialni del: Bioindikacija onesnaženega zraka  - bioindikacija z epifitskimi lišaji in mahovi ter višjimi rastlinami. Uporaba bioindikatorjev za primere onesnaženja zraka z žveplovimi in dušikovimi spojinami, fotooksidanti, halogeni, obstojnimi organskimi polutanti in kovinami.  Bioindikacija v gozdnih ekosistemih – stanje gozdov v okviru nacionalne gozdne inventure in aktivnosti ICP Forests, bioindikacija gozdnih rastišč in (mikro)klimatskih razmer  Bioindikacija v vegetacijski znanosti – indikatorske vrednosti rastlinskih vrst (Ellenberg, Landolt), bioindikacija na podlagi funkcionalnih znakov rastlin, numerične metode v vegetacijski bioindikaciji  Indikatorji stanja okolja in rabe v agroekosistemih – plevelne in traviščne vrste in združbe kot indikator stanja kmetijskih zemljišč zaradi specifičnih pedoklimatskih dejavnikov in agrotehnoloških ukrepov (gnojenje, apnenje, obdelava tal, paša/košnja, požiganje, raba FFS).  Glive kot indikatorji stanja in onesnaženosti tal –mikobioindikacija tal in ekosistemov z uporabo/analizo gliv in mikorize. | General section: definition of bioindication and other related activities and sciences (biomonitoring, ecotoxicology). Advantages and limitations of bioindication in assessing the state, changes and quality of the environment, especially from the point of view of anthropogenic influences (pollutants, land use, climate change). Levels of bioindication (indicator species, populations, communities and biological processes and structure of organisms) and methods of bioindication (markers, accumulators and monitors). Characteristics of a good bioindicator. Bioindication in environmental legislation in Europe and Slovenia.    Special section: Bioindication of air pollution – bioindication with epiphytic lichens, mosses and higher plants. Use of bioindicators in air pollution with sulfur and nitrogen compounds, photo-oxidants, halogens, persistent organic pollutants and metals.  Bioindication in forest ecosystems – state of forests as part of the national forest inventory and ICP Forests activities, bioindication of forest habitats and (micro)climatic conditions.  Bioindication in vegetation science – indicator values of plant species (Ellenberg, Landolt), bioindication based on functional traits of plants, numerical methods in  vegetation bioindication  Indicators of the state of the environment and land use in agroecosystems – weed and grass species and communities as an indicator of the state of agricultural land due to specific soil-climatic factors and agrotechnological measures (fertilization, liming, tillage, grazing/mowing, burning, use of FFS).  Fungi as indicators of soil condition and pollution – mycobioindication of soil and ecosystems using/analysis of fungi and mycorrhizae. |

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| Temeljna literatura in viri/Readings: |
| Relevantni članki iz znanstvenih revij (npr. Ecological Indicators, Evironmental Pollution, Science of the Total Environment, Forest Ecology and Management)  / Relevant articles from scientific journals (e.g. Ecological Indicators, Environmental Pollution, Science of the Total Environment, Forest Ecology and Management) |

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| Cilji in kompetence: | Objectives and competences: |
| Študent spozna osnove ugotavljanja stanja v kopenskih ekosistemih (posebej zaradi antropogenih vplivov) na podlagi prisotnosti, številčnosti in funkcioniranja indikatorskih vrst rastlin in gliv ter sestave njihovih združb. Seznani se z nivoji in načini bioindikacije in biomonitoringa kopenskih ekosistemov kot komplementarne metode vrednotenja okolja predvsem v povezavi z onesnaževanjem okolja in načini rabe tal. | The student learns the basics of determining the state of terrestrial ecosystems (especially due to anthropogenic influences) based on the presence, abundance, and functioning of indicator species of plants and fungi and the composition of their communities. Student becomes familiar with the levels and methods of bioindication and biomonitoring of terrestrial ecosystems as complementary methods of environmental assessment, especially in the context of environmental pollution and methods of land use. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| *Znanje in razumevanje:*  Študent spozna principe in pomen uporabe organizmov za sledenje stanja okolja v kopenskih ekosistemih v primerjavi s fizikalno-kemijskimi meritvami. Spozna različne načine (odzivne, akumulatorske, monitorje) in ravni (celica, organizem, populacija, ekosistem; zgradba in funkcija) uporabe bioindikatorjev za sledenje antropogenih vplivov na okolje, zlasti onesnažil, podnebnih sprememb in rabe tal.  *Uporaba.*  Znanje bioindikacije slušatelji uporabljajo v okviru rednih (bio)monitoringov, ki se izvajajo v Sloveniji ter v okviru strokovnih nalog in znanstvenih raziskav, kjer se predvideva proučevanje učinkov človekovih dejavnosti na organizme, združbe in ekosisteme.  *Refleksija*.  Poznavanje metod bioindikacije študentu omogoča sledenje stanja okolja v naravnih kot antropogenih ekosistemih in študenta usmerja k uporabi sonaravnih tehnologij ter načrtovanju trajnostnega upravljanja z naravnimi in antropogenimi ekosistemi.  *Prenosljive spretnosti*.  Pri predmetu se študent nauči povezovati podatke, znanja in informacije s področja ekologije in okoljskih znanosti z različnimi tehnološkimi procesi in drugimi metodami spremljanja stanja okolja ob uporabi različnih virov (predavanj, laboratorijskih vaj, terena, podatkovnih baz s področja okoljskega monitoringa, literature,..) in jih uporabiti v različni obliki in situacijah. | *Knowledge and understanding*:  The student will learn the principles and importance of using organisms to monitor environmental conditions in terrestrial ecosystems as compared to physical and chemical measurements. Student gets familiar with the different types ( responsive, accumulator, monitor) and levels (cell, organism, population, ecosystem; structure and function) of using bioindicators to track anthropogenic impacts on the environment, particularly pollutants, climate change, and land use.  *Use.*  Students apply knowledge of bioindication in the context of regular (bio)monitoring in Slovenia and beyond and in the context of professional tasks and scientific research where the impact of human activities on organisms, communities and ecosystems will be studied.  *Reflection.*  Reflection. Knowledge of bioindication methods enables students to monitor the state of the environment in natural and anthropogenic ecosystems, and guides them to use green technologies and plan sustainable management of natural and anthropogenic ecosystems.  *Tranferable skills.*  In the course, the student learns to link data, knowledge and information from the field of ecology and environmental science with different technological processes and other methods of monitoring the state of the environment using different sources (lectures, laboratory exercises, field, databases of environmental monitoring, literature,... ) and apply them in different forms and situations. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja potekajo na klasičen način (ppt prosojnice). Vsebina se v veliki  meri predstavi skozi konkretne raziskave soizvajalcev. Terenski pouk bo potekal na izbrana območja v Sloveniji s perečo okoljsko problematiko, kjer je uporaba bioindikatorjev potrebna (močno onesnažena območja, območja z večjimi spremembami v rabi tal in prostora, območja velikih motenj v naravi in zaradi človekove dejavnosti,..). Na osnovi terenskega pouka ali zaradi interesa študenta se izbere naslov seminarske naloge, ki jo pripravi študent samostojno in jo predstavi na najprimernejši način. | Lectures will be delivered in classical format (ppt slides). Much of the content will be taught through actual research by the co-lecturers. Field teaching takes place in selected areas of Slovenia with urgent environmental problems where the use of bioindicators is necessary (heavily polluted areas, areas with major changes in land and space use, areas with major disturbances in nature and by human activities,...). Based on the field lessons or on the student's interest, the title of the seminar paper is chosen, which the student prepares independently and presents in the most appropriate way. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Seminar: ocena samostojnega dela študenta in poročilo iz vaj | 20,00 % | Seminar: students individual efforts and report from practical course |
| Predavanja: preverjanje znanja | 100,00 % | Lectures: assessment of the written exam |
| Seminar: seminar in predstavitev seminarja | 80,00 % | Seminar: students individual efforts and report from practical course, written seminar and its presentation |
| Končna ocena je povprečje ocen iz predavanj in seminarja |  | Final mark is average from marks on lectures and seminar. |
| Ocenjevalna lestvica, ki velja za vse preizkuse znanja: 51-60 %-zadostno (6), 61-70 %-dobro (7), 71-80 %-prav dobro (8), 81-90 %-prav dobro (9), 91-100 %-odlično (10). |  | Assessment scale: 51-60% sufficient (6), 61-70% good (7), 71-80% very good (8), 81-90% outstanding good (9), 91-100% excellent (10). |

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| Ocenjevalna lestvica: | Grading system: |
| 5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10 | 5 - 10, a student passes the exam if he is graded from 6 to 10 |

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| Reference nosilca/Lecturer's references: |
| **ELER, Klemen**, KERMAVNAR, Janez, MARINŠEK, Aleksander, KUTNAR, Lado. Short-term changes in plant functional traits and understory functional diversity after logging of different intensities : a temperate fir-beech forest experiment. *Annals of forest research*. 2018, vol. 61, iss. 2, str. 223-241, ilustr. ISSN 1844-8135. <https://doi.org/10.15287/afr.2018.1192>, <http://www.afrjournal.org/index.php/afr/article/view/1192>, DOI: [10.15287/afr.2018.1192](https://dx.doi.org/10.15287/afr.2018.1192). [COBISS.SI-ID [5299878](https://plus.cobiss.net/cobiss/si/sl/bib/5299878)]  ČOP, Jure, **ELER, Klemen**. Effect of fertiliser application and cutting regime on temporal differentiation of mesic semi-natural grassland vegetation. *Italian journal of agronomy*. 2019, vol. 14, no. 3, str. 153-161, ilustr. ISSN 1125-4718. DOI: [10.4081/ija.2019.1405](https://dx.doi.org/10.4081/ija.2019.1405). [COBISS.SI-ID [9280377](https://plus.cobiss.net/cobiss/si/sl/bib/9280377)]  VODNIK, Dominik, GRIČAR, Jožica, LAVRIČ, Martina, FERLAN, Mitja, HAFNER, Polona, **ELER, Klemen**. Anatomical and physiological adjustments of pubescent oak (Quercus pubescens Willd.) from two adjacent sub-Mediterranean ecosites. *Environmental and Experimental Botany*. [Print ed.]. 2019, vol. 165, str. 208-2018, ilustr. ISSN 0098-8472. <https://doi.org/10.1016/j.envexpbot.2019.06.010>, DOI: [10.1016/j.envexpbot.2019.06.010](https://dx.doi.org/10.1016/j.envexpbot.2019.06.010). [COBISS.SI-ID [9243513](https://plus.cobiss.net/cobiss/si/sl/bib/9243513)]  MRAK, Tanja, **ELER, Klemen**, BADEA, Ovidiu, HOSHIKA, Yasutomo, CARRARI, Elisa, PAOLETTI, Elena, KRAIGHER, Hojka. Elevated ozone prevents acquisition of available nitrogen due to smaller root surface area in poplar. *Plant and soil*. [Print ed.]. 2020, vol. 450, iss. 1-2, str. 585-599, ilustr. ISSN 0032-079X. <https://doi.org/10.1007/s11104-020-04510-7>, <http://dirros.openscience.si/IzpisGradiva.php?id=12154>, <https://link.springer.com/article/10.1007/s11104-020-04510-7>, DOI: [10.1007/s11104-020-04510-7](https://dx.doi.org/10.1007/s11104-020-04510-7). [COBISS.SI-ID [19207171](https://plus.cobiss.net/cobiss/si/sl/bib/19207171)] |

# BIOMONITORING Učni načrt predmeta/Course syllabus

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| Predmet: | BIOMONITORING |
| Course title: | BIOMONITORING |
| Članica nosilka/UL Member: | UL BF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020634 |
| Koda učne enote na članici/UL Member course code: | 13 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 30 | 30 |  |  | 30 | 160 | 10 |

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| Nosilec predmeta/Lecturer: | Romana Marinšek Logar |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij. Znanja iz temeljnih naravoslovnih disciplin. | Enrollment in a doctoral study. Knowledge of basic science disciplines. |

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| Vsebina: | Content (Syllabus outline): |
| Študenti se najprej pregledno seznanijo z načini za spremljanje stanja v okolju in določanja stopenj onesnaženosti. Dalje predmet seznani s prednostmi bioloških načinov spremljanja stanja v okolju v primerjavi s čisto kemijsko in fizikalno analitiko in z osnovnimi zakonitostmi, ki jih je potrebno upoštevati pri razvijanju in uporabi metod okoljskega biomonitoringa. Študenti dobijo pregled nad indikatorskimi organizmi po skupinah (mikrobi, rastline, živali) in se seznanijo z metodami pasivnega in aktivnega biomonitoringa za spremljanje stopenj onesnaževanja zraka, voda in tal. Sledi seznanitev z najpogosteje uporabljanimi specifičnimi in priznanimi metodami okoljskega biomonitoringa (ki vključuje tudi humani biomonitoring) ter zaključni del, ki obravnava vrednotenje in interpretacijo z analizami dobljenih rezultatov in ocenjevanje okoljskih tveganj.  Zaradi sodobnega 3R koncepta (reduction, replacement, refinement) v toksikologiji in genotoksikologiji danes na področju spremljanja stanja okolja uporabljamo številne nativne ali genetsko modificirane mikroorganizme kot testne organizme in na tem področju intenzivno iščemo in razvijamo nove in še boljše pristope. 3R koncept vzpodbuja uporabo mikroorganizmov zaradi njihove enostavne kultivacije, študij na velikih populacijah in odsotnosti etičnih ovir. Predmet zajame uporabo bakterij, protozojev, alg in gliv v klasičnih biotestnih konceptih, ki temeljijo na fiziologiji mikroorganizmov, v testih za dokazovanje genotoksičnosti, nadaljuje z imunotesti in biotesti za endokrine motilce in zaključi z novejšimi genomskimi in proteomskimi prostopi v monitoringu okolja.  Podamo tudi pregled uporabe posameznih biomonitoring metod v Sloveniji in študente seznanimo z inštitucijami, ki jih izvajajo. V zaključku sledi pregled in analiza možnosti za ustanavljanje majhnih biotehnoloških podjetij s tovrstno dejavnostjo. | Students are first informed about theprinciples of environmental monitoring and determining the levels of pollution. Next, the subject informs about the benefits of biological methods of environmental monitoring in comparison with traditional chemical and physical analyses and the basic principles that should be considered when developing and applying methods of environmental biomonitoring. Students get an overview of test and indicator organisms (microbes, plants, animals) and get acquainted with the methods of passive and active biomonitoring for monitoring levels of air pollution, water and soil. Followed by familiarization with the most commonly used and recognized specific environmental biomonitoring methods (which also includes human biomonitoring) and the final part, which deals with the evaluation and interpretation of analyses results and assessment of environmental risks. Due to the modern 3R concept (reduction, replacement, refinement) in toxicology and genotoxicology today a number of native or genetically modified micro-organisms are used for this area and we are looking intensively for the develop of new and better approaches. 3R concept promotes the use of micro-organisms due to their easy cultivation, studies on large populations and the absence of ethical obstacles. The subject covers the use of bacteria, protozoa, algae and fungi in classical biotest concepts based on the physiology of microorganisms, in the test for the genotoxicity continues with the immunotests and bioassays for endocrine disrupters, and ends up with recent genomic and proteomic approaches in environmental monitoring. An overview of the use of certain methods of biomonitoring in Slovenia is given, too, and the students are fammiliarized with the institutions that implement them. In conclusion, an overview and analysis of options for the creation of small biotech companies with this type of activity is discussed. |

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| Temeljna literatura in viri/Readings: |
| - Biomonitoring in the water environment. 1997. (Ed.: Zimmer, R.), NY, Water Environment Federation, ISBN 157278038X, 159 pp.  - Environmental biomonitoring: Exposure assessment and specimen banking. 1997.(Ed.: Subramanian, K.S., Iyengar, G.V.) NY, American Chemical Society, ISBN 0-8412-3477-9, 298 pp.  -Environmental Biomonitoring: The biotechnology ecotoxicology interface. 1998. (Ed.:Lynch, J.M., Wiseman, A.), London, Cambridge University Press, ISBN 0521621410, 299 pp.  -relevantni novejši znanstveni čalnki/relevant recent scientific articles |

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| Cilji in kompetence: | Objectives and competences: |
| Slušatelji se teoretično in praktično seznanijo z metodami biološkega monitoringa in njihovim pomenom za relevantno spremljanje stanja v okolju, tudi stopenj onesnaženosti. Seznanijo se s kriteriji za testne in indikatorske organizme, z ekonomičnostjo in zakonitostmi, ki veljajo pri razvoju novih biomonitoring metod. Poudarek bo na novejših metodah (genomski in proteomski pristopi). Pridobljeno znanje naj bi v povezavi z ostalimi pridobljenimi znanji v okviru doktorskega študija Varstva okolja slušateljem omogočalo tudi načrtovanje lastnih malih biotehnoloških podjetij. | Students gain theoretical and practical knowlege about the methods of biological monitoring and their importance for relevant environmental monitoring and pollution levels. Students will learn the criteria for test and indicator organisms, the economics and the laws valid for the development of new biomonitoring methods. Emphasis will be given on modern methods (genomic and proteomic approaches). The acquired knowledge should, in conjunction with other lessons learned in the context of doctoral study of environmental protection allow students to plan their own small biotechnology companies that offer services of biomonitoring. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  -študent razume osnovne principe biomonitoringa in 3R koncept  -pozna najbolj uporabljane metode biomonitoringa  - pozna potrebne lastnosti testnih organizmov za biomonitoring  -pozna in razume bioindikacijo  -zna načrtovati in razvijati nove metode biomonitoringa | Knowledge and understanding:  -students understand the basic principles of biomonitoring and 3R concept -know the most frequently used methods of biomonitoring - know the necessary properties of test organisms for biomonitoring -know and understand bioindication -know how to design and develop new methods of biomonitoring |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| - predavanja  - konzultacije  - priprava seminarja  - priprava načrta za krajše projektno delo  - izvedba krajšega projektnega dela v laboratoriju  - priprava poročila o izvedenem krajšem projektnem delu | - lectures - consultations - preparation of a seminar - preparation of a short project work plan - a short project work in the laboratory - Preparation of a report on the short project work |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Seminar | 30,00 % | Seminar |
| Projektno delo s poročilom | 30,00 % | Project work with the report |
| Ustni izpit | 40,00 % | Oral exam |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| LAH, Barbara, VIDIC, Tatjana, GLASENČNIK, Erika, ČEPELJNIK, Tadej, GORJANC, Gregor, MARINŠEK-LOGAR, Romana. Genotoxicity evaluation of water soil leachates by Ames test, Comet assay, and preliminary trandescantia micronucleus assay. *Environ. monit. assess.*, 2008, 1-3, 139, str. 107-118.  VIDIC, Tatjana, LAH, Barbara, BERDEN ZRIMEC, Maja, MARINŠEK-LOGAR, Romana. Bioassays for evaluating the water-extractable genotoxic and toxic potential of soils polluted by metal smelters. *Environ. toxicol.*, 2009, 5, 24, str. 472-483  RAJAPAKSE, Katarina, DROBNE, Damjana, KASTELEC, Damijana, MARINŠEK-LOGAR, Romana. Experimental evidence of false positive Comet test results due to TiO2 particle - assay interactions. *Nanotoxicology*, 2012, 32 str., [in press], doi: [10.3109/17435390.2012.696735](http://dx.doi.org/10.3109/17435390.2012.696735). |

# Doktorski seminar s predstavitvijo rezultatov raziskovalnega dela in javni zagovor Učni načrt predmeta/Course syllabus

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| Predmet: | Doktorski seminar s predstavitvijo rezultatov raziskovalnega dela in javni zagovor |
| Course title: | Doctoral seminar with presentation of the results of the research work and public defence |
| Članica nosilka/UL Member: |  |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) | 4. letnik |  | obvezni |

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| Univerzitetna koda predmeta/University course code: | 0138204 |
| Koda učne enote na članici/UL Member course code: | 68 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
|  |  |  |  | 125 |  | 5 |

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| Nosilec predmeta/Lecturer: |  |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: |  |

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| Jeziki/Languages: | Predavanja/Lectures: |  |
|  | Vaje/Tutorial: |  |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
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| Vsebina: | Content (Syllabus outline): |
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| Temeljna literatura in viri/Readings: |
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| Cilji in kompetence: | Objectives and competences: |
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| Predvideni študijski rezultati: | Intended learning outcomes: |
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| Metode poučevanja in učenja: | Learning and teaching methods: |
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| Načini ocenjevanja: | Delež/Weight | Assessment: |
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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
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# Doktorski seminar s predstavitvijo teme doktorske disertacije Učni načrt predmeta/Course syllabus

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| Predmet: | Doktorski seminar s predstavitvijo teme doktorske disertacije |
| Course title: | Doctoral |
| Članica nosilka/UL Member: |  |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) | 2. letnik |  | obvezni |

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| Univerzitetna koda predmeta/University course code: | 0020667 |
| Koda učne enote na članici/UL Member course code: | 66 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
|  |  |  |  | 125 |  | 5 |

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| Nosilec predmeta/Lecturer: |  |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: |  |

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| Jeziki/Languages: | Predavanja/Lectures: |  |
|  | Vaje/Tutorial: |  |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
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| Vsebina: | Content (Syllabus outline): |
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| Temeljna literatura in viri/Readings: |
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| Cilji in kompetence: | Objectives and competences: |
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| Predvideni študijski rezultati: | Intended learning outcomes: |
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| Metode poučevanja in učenja: | Learning and teaching methods: |
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| Načini ocenjevanja: | Delež/Weight | Assessment: |
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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
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# EKOFIZIOLOGIJA RASTLIN Učni načrt predmeta/Course syllabus

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| Predmet: | EKOFIZIOLOGIJA RASTLIN |
| Course title: | PLANT ECOPHYSIOLOGY |
| Članica nosilka/UL Member: | UL BF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020635 |
| Koda učne enote na članici/UL Member course code: | 14 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 30 |  | 10 |  | 20 | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Dominik Vodnik |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij. | Immatriculation to the doctoral study programe. |

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| Vsebina: | Content (Syllabus outline): |
| Rastlina in okolje. Vodna bilanca rastline, regulacija. Vodna bilanca pri različnih tipih rastlin in na nivoju rastlinskih združb. Vodni stres. Meritve vsebnosti vode, vodnega potenciala rastlin, ksilemskega toka, transpiracije in stomatalne prevodnosti.  Mineralna prehrana: razpoložljivost mineralnih hranil v tleh, procesi v rizosferi, minerali ter razporejanje asimilatov v rastlini (razmerja vir:ponor). Vpliv okoljskih dejavnikov na sprejem, premeščanje in asimilacijo mineralnih hranil. S habitatom povezani vidiki mineralne prehrane, kroženje mineralnih hranil na nivoju rastlinskih združb. Mineralna prehrana rastlin in stres (interakcije). Uporaba fizioloških meritev, izotopskih sledilcev in molekularnih metod pri proučevanju mineralne prehrane.  Asimilacija ogljika, primarna produkcija: vpliv okoljskih dejavnikov na fotosintezo (C3, C4, CAM) in respiracijo; bilanca ogljika na nivoju rastline ter rastlinske združbe, pretvorbe energije na nivoju rastlinske odeje. Meritve fotosinteze (izmenjava plinov, fluorescence), meritve odvisnosti od različnih dejavnikov, diskriminacijska analiza 13C/14C. Rast in razvoj, vpliv okoljskih dejavnikov. Fiziologija stresa: splošnen pregled, pregled po posameznih stresnih dejavnikih . Multipli stres. | Plants and environment. Plant water regime and its regulation. Water balance of different plant species types and their communities. Measurements of plant water content, plant water potential, xylem flow, transpiration and stomatal conductance.  Mineral nutrition: availability of nutrients in soil and proceses in the rhizosphere, distribution and translocation of minerals and assimilates in plants (source-sink relations). Effect of environmental factors on uptake, translocation and assimilation of mineral nutrients. Habitat related aspects of mineral nutrition, cycling of minerals on the level of plant community. Stress and mineral nutrition. Use of physiological measurements, isotopic tracers and molecular methods in study of mineral nutrition.  Carbon assimilation, primary productivity: impact of environmental factors on photosynthesis (C3, C4, CAM) and respiration; carbon balance on the plant level and plant community; energy transformation in the plant canopy. Measurements of photosynthesis (exchange of gasses, fluorescence) in relation to environmental factors; 13C/14C discrimination analysis. Plant growth and development; effects of environmental factors. Stress physiology: general aspects and overview of single stressors: Multiple stress. |

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| Temeljna literatura in viri/Readings: |
| Lambers, H., Chapin, S. F., Pons, T. L. 2008. Plant Physiological Ecology. Springer New York, 2008. ISBN - 0-387-78340-7; 0-387-78341-5. https://plus.cobiss.net/cobiss/si/sl/bib/1000000000492435  **Dopolnilni viri**  Larcher W. 2002. Physiological Plant Ecology. Ecophysiology and Stress Physiology of Functional Groups. četrta izdaja, Springer, Berlin: 506 s. ISBN 3-540-43516-6  Izbrani znanstveni članki / selected scientific papers |

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| Cilji in kompetence: | Objectives and competences: |
| Spoznati, kako okoljski dejavniki vplivajo na različne procese v rastlinah; spoznati odzive in prilagoditve rastlin na stresne dejavnike, spoznati metode, s katerimi lahko spremljamo odziv fizioloških procesov v realnih razmerah. | To know how environmental factors influence on diverse processes in plant; to recognise the responses and adaptations and acclimatisation in plants to stressors; to get acquainted with methods for analysing and monitoring response of physilogical processes in plants in nature. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Študent pridobi znanje o odzivu rastlin na dejavnike rasti in razvoja v naravnih in antropogenih ekosistemih. Pozna vpliv dejavnikov na posamezne fiziološke procese ter mehanizme, s pomočjo katerih se rastlina odziva na spremembe v okolju, vključujoč odzive na stresne dejavnike. Pridobi in nadgradi znanje o mineralni prehrani rastlin. Omenjena znanja so, tudi s stališča varstva okolja, ključna za uspešno trajnostno upravljanje z ekosistemi. | Knowledge and understanding:  Student gets knowledge on plant response to parameters of growth and development in natural and antropogenic ecosystems. Knows influence of single parameters on separate physiological processes and mechanismes by which plants respond to environmental changes including to stressors. Obtains and improves knowledge on plant mineral nutrition, including knowledge connected to environmental protection and sustainable menagement of ecosystems. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja potekajo v predavalnici, opremljeni za računalniško projekcijo in z internetno povezavo.  Praktične vaje potekajo v laboratoriju in na laboratorijskem polju ter v rastlinjaku Biotehniške fakultete. Pri vajah se uporablja laboratorijska tehnika (standardna oprema + spektrofotometer, mikroskop) in prenosna ekofiziološka oprema (tlačna komora za meritve vodnega potenciala, porometer, merilnik fotosinteze, fluorescence, ipd.). Vaje so metodološka priprava na izvedbo projektnega dela.  Projektno delo se izvaja v manjših skupinah, ki rešujejo posamezne raziskovalne naloge (problemsko usmerjeno učenje). Poteka v laboratoriju ali na izbranih lokacijah v okviru laboratorijskega polja in na lokacijah izven BF. Pri projektnem delu se uporablja raziskovalna oprema Katedre za aplikativno botaniko, ekologijo in fiziologijo rastlin, Oddelka za agronomijo BF. Sestavni del projektnega dela so konzultacije in končna predstavitev poročil, ki je predvidena v okviru seminarja. | Lectures are given in classroom equiped with computer and internet.  Practical par takes place in laboratory and in the field. In the laboratory courses standard technics and methods are used (standard laboratory equipment for plant physiology, microscope, transportable equipment for ecophysilogical measurements (pressure chamber, IRGA analyser for measurements of photosynthesis and transpiration and other parameters, fluorometer, etc.). Laboratory course is preparation for the project work which is carried out in smaller groups or individually, taking place in the laboratory or in the field. In the measurement for project all necessary equipment available at Chair of applied botany,.. Department of Agronomy BF is used. Consultations, presentations of reports and final presentation of the seminar are parts of the project work. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Predavanja: ocena samostojnega dela študenta | 20,00 % | Lectures: assessment of the student efforts |
| Predavanja: preverjanje znanja | 80,00 % | Lectures: examination |
| Vaje: ocena samostojnega dela študenta | 20,00 % | Coursework: assessment of the student efforts |
| Vaje: projekt in predstavitev seminarja | 80,00 % | Coursework: project and seminar presentation |
| Končna ocena je povprečje ocen iz predavanj in vaj. |  |  |

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| Ocenjevalna lestvica: | Grading system: |
| 5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10 | 5 - 10, a student passes the exam if he is graded from 6 to 10 |

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| Reference nosilca/Lecturer's references: |
| **prof dr. Dominik Vodnik:**  **VODNIK, Dominik**, VOGRIN, Žiga, ŠIRCELJ, Helena, GROHAR, Mariana Cecilia, MEDIČ, Aljaž, CAROVIĆ-STANKO, Klaudija, SAFNER, Toni, LAZAREVIĆ, Boris. Phenotyping of basil (*Ocimum basilicum* L.) illuminated with UV-A light of different wavelengths and intensities. Scientia horticulturae. [Print ed.]. 2023, vol. 309, art. 111638, 10 str. ISSN 0304-4238. https://www.sciencedirect.com/science/article/pii/S0304423822007531, DOI: 10.1016/j.scienta.2022.111638.  PLESTENJAK, Gregor, ELER, Klemen, MIHELIČ, Rok, FERLAN, Mitja, OGRINC, Nives, KRAJNC, Bor, **VODNIK, Dominik**. Can additional air supply enhance decomposition processes in sludge treatment reed beds?. Journal of environmental management. 2021, vol. 277, art no.111511, 1-8. ISSN 0301-4797. DOI: 10.1016/j.jenvman.2020.111511.  GRIČAR, Jožica, HAFNER, Polona, LAVRIČ, Martina, FERLAN, Mitja, OGRINC, Nives, KRAJNC, Bor, ELER, Klemen, **VODNIK, Dominik**. Post-fire effects on development of leaves and secondary vascular tissues in *Quercus pubescens*. Tree physiology. Spletna izd. 2020, vol. 40, iss. 6, str. 796-809. ISSN 1758-4469. https://doi.org/10.1093/treephys/tpaa030, http://dirros.openscience.si/IzpisGradiva.php?id=11209, https://academic.oup.com/treephys/article/40/6/796/5807499, https://dirros.openscience.si/IzpisGradiva.php?id=11209, DOI: 10.1093/treephys/tpaa030. |

# EKOHIDROLOGIJA Učni načrt predmeta/Course syllabus

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| Predmet: | EKOHIDROLOGIJA |
| Course title: | EKOHYDROLOGY |
| Članica nosilka/UL Member: | UL FGG |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020636 |
| Koda učne enote na članici/UL Member course code: | 15 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 20 | 10 | 10 |  |  | 210 | 10 |

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| Nosilec predmeta/Lecturer: | Simon Rusjan |

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| Izvajalci predavanj: | Gorazd Urbanič |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet /Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Predhodna izobrazba s področij hidrologije in biologije ali opravljeni ustrezni temeljni predmeti.  Prednost: predhodna izobrazba BSc Biologija, BSc Vodarstvo in okoljsko inženirstvo, MSc Ekologija in biodiverziteta, MSc Vodarstvo in okoljsko inženirstvo. | Previous education in hydrology and biology, or subjected to the appropriate core courses.  Priority: previous education BSc Biology, BSC Water Management and Evironmental Engineering, MSc Ecology and Biodiversity, MSc Water Management and Evironmental Engineering. |

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| Vsebina: | Content (Syllabus outline): |
| Hidrološki parametri vodnega okolja, analiza hidroloških razmer. Pomen in določanje posameznih hidroloških parametrov pomembnih za vodne habitate. Prepoznavanje hidroloških kontrolnih mehanizmov.  Pomen lastnosti vodnega toka za vodne organizme. Vplivi na različne združbe v tekočih vodah.  Sonaravno upravljanje s padavinskim odtokom.  Interakcije med vodnim krogom in kroženjem snovi v okolju.  Morfološke in fiziološke prilagoditve organizmov na vodni tok.  Ekoregije, bioregije, ekološki tipi vodotokov, definicije in določanje.  Harmonizacija slovenske zakonodaje z evropsko vodno direktivo. Biološki elementi in podporni elementi vrednotenja ekološkega stanja vodotokov.  Ekosistemski pristop v upravljanju voda.  Vplivi na samočistilno sposobnost vodnih teles.  Ekološko sprejemljivi pretok: definicije, pomen in določanje.  Ekološko sprejemljivi vodni režim.  Vpliv vodnih in obvodnih okolij na vodni režim in vodne združbe, zaščita habitatov in združb.  Metode terenskega monitoringa in modeliranja ekohidroloških procesov. | Hydrological parameters of the aquatic environment, analysis of hydrological conditions. The importance of determining individual hydrological parameters important for aquatic habitats.  The importance water flow characteristics for aquatic organisms. Effects on the various communities in running waters.  Sustainable management of rainfall runoff.  Interactions between water cycle and cycling of matter in the environment.  Morphological and physiological adaptations of organisms to the water flow.  Ecoregions, bioregions, ecological types, definition and determination.  European Harmonization of Slovenian legislation with EU Water Framework Directive. Biological quality elements and supportive quality elements of ecological status assessment of rivers.  Ecosystem approach in the river basin management.  Impacts on the self-purification ability of water bodies.  Ecologically acceptable flow: definition, meaning and determination.  Ecologically acceptable flow regime.  Impact of aquatic and riparian environments on the water regime and aquatic communities. Protection of habitats and communities.  Methods of field monitoring and modeling of ecohydrological processes. |

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| Temeljna literatura in viri/Readings: |
| Allan J.D., Castillo M.M., (2007). Stream Ecology, Structure and function of running waters. 2nd ed. Springer, 436 pages.  ISBN: 9781402055829.  Brilly, M., Šraj M. (2005). Osnove hidrologije. Univerza v Ljubljani, Fakulteta za gradbeništvo in geodezijo, Ljubljana.  Likens, G. E. (2013). Biogeochemistry of a forested ecosystem. 3rd ed., Springer New York.  Moss, B. (2010). Freshwater Ecology. A view for the Twenty-first Century. Wiley-Blackwell, A John-Wiley and Sons, Ltd. Publication, 470 pages. ISBN: 978-1-4443-3474-6.  Wohl, E., & Springer International Publishing AG. (2018). Sustaining river ecosystems and water resources. Cham, Springer, Switzerland.  Wood, P. J., Hannah, D. M., & Sadler, J. P. (Eds.). (2008). Hydroecology and ecohydrology: past, present and future. John Wiley & Sons. |

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| Cilji in kompetence: | Objectives and competences: |
| Pridobivanje znanja o hidroloških pojavih in procesih pomembnih za naravne življenjske združbe in njihov sukcesijski razvoj. | Gaining knowledge of hydrological phenomena and processes important for life communities and their succession. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Znanje potrebno za določanje ekoregij, ekološko sprejemljivega pretoka in ekološko sprejemljivega režima voda. | Knowledge and understanding:  Knowledge necessary to determine the ecoregions, ecologically acceptable flow and ecologically acceptable water regime. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja, seminarske in terenske vaje. | Lectures, tutorials and field work. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Seminarska naloga | 40,00 % | Seminar work |
| Ustni zagovor seminarja | 60,00 % | Oral presentation of the seminar work |

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| Ocenjevalna lestvica: | Grading system: |
| 5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10 | 5 - 10, a student passes the exam if he is graded from 6 to 10 |

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| Reference nosilca/Lecturer's references: |
| **Rusjan, S.**, Vidmar, A. The role of seasonal and hydrological conditions in regulating dissolved inorganic nitrogen budgets in a forested catchment in SW Slovenia. Science of the Total Environment, 2017,  575, 1109-1118.  Lebar, K., Kastelec, D., & **Rusjan, S.** (2023). Investigating the interplay of the hydrometeorological and seasonal forest vegetation role in regulating the nitrate flushing in a small torrential catchment. Science of the Total Environment, 874, 162475.  **Rusjan, S.**, Lebar, K., & Bezak, N. (2023). Insight into heterogeneous karst catchment by the dynamical system approach. Advances in Water Resources, 180, 104524.  **Rusjan, S.**, Sapač, K., Petrič, M., Lojen, S., & Bezak, N. (2019). Identifying the hydrological behavior of a complex karst system using stable isotopes. Journal of Hydrology, 577, 123956.  **Urbanič, G.,** Mihaljevič, Z., Petkovska, V., Pavlin Urbanič M. (2020) Disentangling the effects of multiple stressors on large rivers using benthic invertebrates : a study of Southeastern European large rivers with implications for management. *Water,* 12, iss. 3, str. 1-25.  **Urbanič, G.**, Politti, E., Rodríguez-González, P.M., Payne, R., Schook, D, Alves, M. H., Anđelković, A. Bruno D., Chilikova-Lubomirova, M., di Lonardo, S, Egozi, R., Mihaljević, Z., Pavlin Urbanič, M., et al. (2022) Riparian zones-from policy neglected to policy integrated. *Frontiers in environmental science*. 10, str. 1-8,  Knehtl, M., Podgornik, S., **Urbanič, G.** 2021. Scale-depended effects of hydromorphology and riparian land-use on benthic invertebrates and fish : implications for large river management. *Hydrobiologia,* 848, str. 3447-3467,  Knehtl, M., Petkovska, V., **Urbanič, G.** 2018. Is it time to eliminate field surveys from hydromorphological assessments of rivers? : comparison between a field survey and a remote sensing approach. *Ecohydrology,* 11, issue 2, str. 1-12,  **Urbanič, G,** Debeljak, B., Kuhar, U., Germ, M., Gaberščik, A. 2023 River Macrophyte Index for ecological status assessment of the non-karst and Dinaric karst waters. *Ecological Engineering,* 192, [art. no.] 106975, str. 1-12. |

# EKOLOGIJA PODZEMELJSKIH HABITATOV Učni načrt predmeta/Course syllabus

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| Predmet: | EKOLOGIJA PODZEMELJSKIH HABITATOV |
| Course title: | ECOLOGY OF SUBTERRANEAN HABITATS |
| Članica nosilka/UL Member: | UL BF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020637 |
| Koda učne enote na članici/UL Member course code: | 16 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 20 | 40 |  |  | 30 | 160 | 10 |

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| Nosilec predmeta/Lecturer: | Cene Fišer |

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| Izvajalci predavanj: | Maja Zagmajster |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet /Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| * Poznavanje osnov ekologije, * Poznavanje sistematske zoologije, * Poznavanje osnov varstvene biologije | * Basic knowledge of ecology, * Basic knowledge of systematic zoology, * Basic knowledge of conservation biology |

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| Vsebina: | Content (Syllabus outline): |
| - pregled podzemeljskih habitatov,  - biotske in abiotske značilnosti podzemnega okolja,  - pregled ključnih podzemnih organizmov  - vzorci biodiverzitete, od lokalne ravni do globalne  - prilagoditve na podzemno okolje, s poudarkom na lastnostih, ki podzemne organizme naredijo ranljive,  -ekosistemske storitve  - grožnje podzemlju,  - zakonodajni okvir varstva podzemne favne. | - an overview of subterranean habitats,  - abiotic and biotic characteristics of the subterranean environment,  - a review of the selected subterranean organisms,  - biodiversity patterns from a local to global scale,  - adaptations to subterranean life in relation to species’ vulnerability,  -ecosystem services  - threats,  - legislation framework |

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| Temeljna literatura in viri/Readings: |
| |  | | --- | | - Culver, D.C., Pipan, T., 2019. Biology of caves and other subterranean habitats, Oxford university press, 336p.  - White, W.B., Culver, D.C., Pipan, T. (Eds). 2019. Encyclopedia of caves, 3rd Edition, Academic Press. 1224.  - Moldovan O., Kovač L., Halse S. (Eds.), 2018. Cave Ecology. Springer. | |

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| Cilji in kompetence: | Objectives and competences: |
| -razumeti pomen podzemnega okolja (naravna in kulturna dediščina, ekosistemske storitve),  -razumeti ranljivost podzemlja in njegovo ogroženost  - razumeti kompleksnost in posebnosti pristopov vzorčenja v podzemnih habitatih. | - to understand the importance of the subterranean environment (cultural and natural heritage, ecosystem services)  - to understand the vulnerability of this environment and threats.  - to understand the complexity and specifics of sampling in subterranean habitats. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| -ozaveščenost o podzemlju, njegovi ranljivosti ter zahtevi po njegovem varstvu,  -individualno usposabljanje študenta o varstveni problematiki po njegovi izbiri na primeru podzemnih habitatov.  - izdelana individualna/seminarska naloga na izbrano temo | |  | | --- | | - raised awareness of the subterranean environment, its vulnerability and need to protect it.  - individually tailored hands-on-training on a selected topic using subterranean habitats as a case model.  - individual/seminar work on selected theme prepared | |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Študij literature, konsultacije, praktična naloga po dogovoru. | Study of literature, consultations, practical training on a topic beneficial to student. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Poročilo praktične naloge | 100,00 % | Written report on training. |

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| Ocenjevalna lestvica: | Grading system: |
| 5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10 | 5 - 10, a student passes the exam if he is graded from 6 to 10 |

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| Reference nosilca/Lecturer's references: |
| 1. **BORKO Š**, ALTERMATT F, **ZAGMAJSTER M**, **FIŠER C** (2022) A hotspot of groundwater amphipod diversity on a crossroad of evolutionary radiations. *Diversity and Distributions, in press*  *2.* WYNNE JJ, […] **FIŠER C**, **[…]**, **ZAGMAJSTER M**, ZHAO Y (2021). A conservation roadmap for the subterranean biome. *Conservation Letters*, e12834  3. MAMMOLA S, CARDOSO P, CULVER D, DEHARVENG L, FERREIRA R, **FIŠER C**, GALASSI D, GRIEBLER C, HALSE S, HUMPHREYS B, ISAIA M, MALARD F, MARTINEZ A, MOLDOVAN OT, NIEMILLER M, PAVLEK M, REBOLEIRA AS, SOUZA-SILVA M, TEELING EC, WYNNE J, **ZAGMAJSTER M** (2019) Scientists’ warning on conservation of subterranean ecosystems. *BioScience* **69**(8): 641-650.  4. **ZAGMAJSTER, Maja**, POLAK, Slavko, FIŠER, Cene. Postojna-Planina cave system in Slovenia, a hotspot of subterranean biodiversity and a cradle of speleobiology. Diversity. 2021, vol. 13, iss. 6, str. 1-18,  5. **PREMATE E, BORKO Š, DELIĆ T**, MALARD F, SIMON L, **FIŠER C** (2021). Cave amphipods reveal co-variation between morphology and trophic niche in a low-productivity environment. *Freshwater Biology* **66**(10): 1876-1888. |

# EKOLOGIJA Z VARSTVOM NARAVE Učni načrt predmeta/Course syllabus

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| Predmet: | EKOLOGIJA Z VARSTVOM NARAVE |
| Course title: | ECOLOGY WITH NATURE CONSERVATION |
| Članica nosilka/UL Member: | UL BF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020619 |
| Koda učne enote na članici/UL Member course code: | 5 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 30 | 30 |  |  |  | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Gorazd Urbanič |

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| Izvajalci predavanj: | Ivan Kos, Irena Maček |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Temeljni predmet/Core course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij Varstvo okolja. | Enrolment in the doctoral study Environment protection. |

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| Vsebina: | Content (Syllabus outline): |
| Ekologija (začetki ekologije in njen razvoj, pomen za človeka, nove usmeritve ekologije-ekologija in trajnostni razvoj).  Osnove ekologije (znanstvene osnove, koncept ekosistema, pretok energije in kroženje snovi, odziv organizmov na abiotske in biotske dejavnike, omejitve okolja, aklimatizacija in adaptacija, kompeticija in sukcesija). Atmosfera (zgradba, spremembe v Zemeljini zgodvini).  Celinske vode (abiotski in biotski dejavniki, stoječe in tekoče vode, omejujoči dejavniki biološke produkcije, življenski prostori in življenske združbe v vodnih telesih).  Kopensko okolje (osnovni biomi, značilnosti in raznolikosti ekosistemov v Evropi in Sloveniji).  Sevanje in klima (globalne razmere na zemlji, v Evropi in posebnosti v Sloveniji, vpliv klime, topoklime in mikroklime ter svetlobe na organizme, populacije in ekosisteme). Primarna produkcija-osnovni proces tvorbe organskih snovi na Zemlji (vloga rastlin v ekosistemih, vpliv vegetacije na energetsko bilanco in kroženje vode, rastline vezane na posebna rastišča).  Živalske združbe kot del življenskih združb ter vloga v ekosistemu (trofična organiziranost ekosistemov, pretok energije in kroženje snovi ter specifična vloga živali).  Biodiverziteta-osnova stabilnosti ekosistemov (grožnje biodiverziteti, tujerodni organizmi, ohranjanje biodiverzitete).  Stres-motnja ali sindrom-naravne omejitve okolja (sevanje, skrajne temperature, poplavljenje, suša, slana okolja).  Človek in okolje (obremenjevanje in degradacija okolja, lokalne in globalne spremembe okolja).  Upravljanje z naravnim okoljem in načrtovanje trajnostnega razvoja. | Ecology (ecology and its development, new trends in ecology, sustainable development).  Fundamentals of ecology (scientific basis, concept of ecosystem, through flow of energy and nutrient cycling, the response of organisms to abiotic and biotic factors, acclimation and adaptation, competition and succession).  Atmosphere (structure and changes in Earth history).  Inland waters (abiotic and biotic parameters, standing and running waters, factor constraining production, habitats, communities in water bodies).  Terrestrial environment (biomes, ecosystem properties and diversity in Europe and Slovenia).  Radiation and climate (global environment on Earth, influence of climate, regional climate, microclimate and radiation on organisms, populations and ecosystems).  Primary productivity, the basic process of organic matter production on Earth (the role of plants in ecosystems, the influence of vegetation on energy balance and water cycling, plants of different habitats).  Animal communities as a part of biotic communities and their role in ecosystems (trophic organisation of ecosystems, trough flow of energy and cycling of matter, specific role of animals).  Biodiversity as a basis for ecosystem stability (threats to biodiversity, alien organisms, biodiversity conservation).  Stress and natural constraint of environment (radiation, extreme temperatures, floods, drought, saline environment).  Man and environment (pollution and environment degradation, local and global changes of environment).  Nature management and sustainable development planning. |

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| Temeljna literatura in viri/Readings: |
| Begon, M., Townsend, C.R. Ecology. 2021. 5th Ed., Wiley Blackwell, 844 pp., ISBN: 9781119279358.  Smith, R.L., Smith, T.M., 2001. Ecology and Field Biology. Addison Wesley Longman, Benjamin Cummings, 699-720, ISBN 0-321-04290-5.  Van der Valk, A.G., 2012. The Biology of Freshwater Wetlands. Second ed., Oxford University Press, ISBN: 9780199608942.  Moos B. 2010. Ecology of freshwaters: a view for the twenty-first century. 4th ed. Chichester (West Sussex) : Wiley-Blackwell. ISBN - 978-1-4443-3474-6; 978-1-4051-1332-8  Aktualni znanstveni članki na tem področju |

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| Cilji in kompetence: | Objectives and competences: |
| Pridobivanje znanja o naravi in delovanju abiotskih in biotskih dejavnikov na organizme. Razumevanje energijske, materialne in funkcionalne povezanosti med posameznimi komponentami ekosistemov in posledice delovanja človeka. Seznanjanje z izbranimi ekosistemi in s problemi onesnaževanja, obremenjevanja in degradacije okolja in naravne dediščine zaradi človekovega delovanja. Spoznavanje teženj onesnaževanja in spreminjanja okolja in ukrepov za zmanjšanje škodljivih učinkov. | Students will gain knowledge on nature as well as influences of biotic and abiotic parameters on organisms. They will become aware of the energetic, material and functional relations among the components of ecosystems. They will gain knowledge about specific ecosystems and problems of pollution and environment degradation, as well as natural heritage due to human impacts. They will be able to recognize, explain and discuss the trends of pollution and changes in ecosystems and measures to mitigate the effects. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje: Poznavanje osnovnih zakonitosti naravnih sistemov.  Uporaba: Razumevanje kompleksnosti našega okolja, dinamike ekosistemov, človekovih vplivov na okolje in njihovih posledic.  Refleksija: Aplikacija znanj o nižjih nivojih naravnih sistemov na nivoju ekosistema.  Prenosljive spretnosti – niso vezane le na en predmet: Uporaba domače in tuje literature in drugih virov, zbiranje in razlaga podatkov, analiza podatkov pridobljenih z meritvami, njihova sinteza in pisanje poročil, delo v skupini. | Knowledge and understanding. Students will gain a comprehensive overview on basic principles of natural systems.  Application. They will understand the complexity of environment, ecosystem dynamic, human influences and its consequences. Reflection. The application of the knowledge about lower organizational levels to higher levels of ecosystem. Transferable skills. The use of Slovenian and foreign literature and other sources, gathering and interpretation of results, analyses of data, their synthesis, writing reports, working in a group. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predmet se izvaja v obliki predavanj in seminarjev. Predavanja so interaktivna s predstavitvijo novih znanj ter aktivnim povezovanjem novega in že obstoječega znanja v skupnih razpravah. | The course includes lectures in seminars. Lectures are interactive with the presentation of new skills, and active integration of new and existing knowledge in joint discussions. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Pisni izpit | 50,00 % | Exam: written |
| Seminar | 50,00 % | Seminar |
| Oddano poročilo o opravljenih vajah |  | Grading scale: from 1-10: 1-5 (negative) and 6-10 (positive). |

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| Ocenjevalna lestvica: | Grading system: |
| 5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10 | 5 - 10, a student passes the exam if he is graded from 6 to 10 |

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| Reference nosilca/Lecturer's references: |
| **Prof. dr. Gorazd Urbanič:**  1. **URBANIČ, Gorazd**, MIHALJEVIĆ, Zlatko, PETKOVSKA, Vesna, PAVLIN URBANIČ, Maja. Back to ecology : reference conditions as a basis for assessment, restoration and sustainable management of large rivers. *Water*. 2 Sep. 2021, iss. 18, [article] 2596, str. 1-19, ilustr. ISSN 2073-4441. <https://www.mdpi.com/2073-4441/13/18/2596>, DOI: [10.3390/w13182596](https://dx.doi.org/10.3390/w13182596). [COBISS.SI-ID [77634051](https://plus.cobiss.net/cobiss/si/sl/bib/77634051)]  2. **URBANIČ, Gorazd**, POLITTI, Emilio, RODRÍGUEZ-GONZÁLEZ, Patricia María, PAYNE, Robin, SCHOOK, Derek, ALVES, Maria Helena, ANĐELKOVIĆ, Ana, BRUNO, Daniel, CHILIKOVA-LUBOMIROVA, Mila, DI LONARDO, Sara, EGOZI, Roey, MIHALJEVIĆ, Zlatko, PAVLIN URBANIČ, Maja, et al. Riparian zones-from policy neglected to policy integrated. *Frontiers in environmental science*. 28 Apr. 2022, vol. 10, str. 1-8, ilustr. ISSN 2296-665X. <https://www.frontiersin.org/articles/10.3389/fenvs.2022.868527/full>, DOI: [10.3389/fenvs.2022.868527](https://dx.doi.org/10.3389/fenvs.2022.868527). [COBISS.SI-ID [108563715](https://plus.cobiss.net/cobiss/si/sl/bib/108563715)]  3. KNEHTL, Miha, PODGORNIK, Samo, **URBANIČ, Gorazd.** Scale-depended effects of hydromorphology and riparian land-use on benthic invertebrates and fish : implications for large river management. *Hydrobiologia*. Apr. 2021, vol. 848, str. 3447-3467, ilustr. ISSN 1573-5117. <https://link.springer.com/article/10.1007/s10750-021-04589-8>, DOI: [10.1007/s10750-021-04589-8](https://dx.doi.org/10.1007/s10750-021-04589-8). [COBISS.SI-ID [67497475](https://plus.cobiss.net/cobiss/si/sl/bib/67497475)]  **Izr. prof. Ivan Kos:**  1. PERETTI, Emiliano, CECCHIN, Chiara, FUSCO, Giuseppe, GREGNANIN, Luca, **KOS, Ivan**, BONATO, Lucio. Shedding light on species boundaries in small endogeic animals through an integrative approach : species delimitation in the centipede Clinopodes carinthiacus (Chilopoda: Geophilidae) in the south-eastern Alps. *Zoological journal of the Linnean Society*. 2022, vol. 196, iss. 2, str. 902-923, ilustr. ISSN 0024-4082. <https://doi.org/10.1093/zoolinnean/zlac008>, DOI: [10.1093/zoolinnean/zlac008](https://dx.doi.org/10.1093/zoolinnean/zlac008). [COBISS.SI-ID [122464003](https://plus.cobiss.net/cobiss/si/sl/bib/122464003)]  2. STRONEN, Astrid Vik, KONEC, Marjeta, BOLJTE, Barbara, BOŠKOVIĆ, Ivica, GAČIĆ, Dragan P., GALOV, Ana, HELTAI, Miklós, JELENČIČ, Maja, KLJUN, Franc, **KOS, Ivan**, KOVAČIČ, Tamara, LANSZKI, József, PINTUR, Krunoslav, POKORNY, Boštjan, SKRBINŠEK, Tomaž, SUCHENTRUNK, Franz, SZABÓ, László, ŠPREM, Nikica, TOMLJANOVIĆ, Kristijan, POTOČNIK, Hubert. Population genetic structure in a rapidly expanding mesocarnivore : golden jackals in the Dinaric-Pannonian region. *Global ecology and conservation*. 2021, vol. 28, str. 1-11. ISSN 2351-9894. <https://www.sciencedirect.com/science/article/pii/S2351989421002572?via%3Dihub>, <https://repozitorij.uni-lj.si/IzpisGradiva.php?id=138665>, DOI: [10.1016/j.gecco.2021.e01707](https://dx.doi.org/10.1016/j.gecco.2021.e01707). [COBISS.SI-ID [68526339](https://plus.cobiss.net/cobiss/si/sl/bib/68526339)]  3. KURALT, Žan, RATAJC, Urška, PAJEK ARAMBAŠIĆ, Neža, FERLE, Maja, GABOR, Matic, **KOS, Ivan**. Inventory and DNA-barcode library of ground-dwelling predatory arthropods from Krokar virgin forest, Slovenia. *Biodiversity Data Journal*. 2022, vol. 8, str. 1-19, ilustr. ISSN 1314-2828. <https://bdj.pensoft.net/article/77661/>, DOI: [10.3897/BDJ.10.e77661](https://dx.doi.org/10.3897/BDJ.10.e77661). [COBISS.SI-ID [101968131](https://plus.cobiss.net/cobiss/si/sl/bib/101968131)]  **Izr. prof. dr. Irena Maček:**  1. **MAČEK, Irena**, CLARK, Dave R., ŠIBANC, Nataša, MOSER, Gerald, VODNIK, Dominik, MÜLLER, Christoph, DUMBRELL, Alex J. Impacts of long-term elevated atmospheric CO2 concentrations on communities of arbuscular mycorrhizal fungi. *Molecular Ecology*, 2019, 28, 3445-3458, [COBISS.SI-ID 9242489]  2. **MAČEK, Irena**, PINTARIČ, Sara, ŠIBANC, Nataša, RAJNIŠ, Tatjana, KASTELEC, Damijana, LEŠTAN, Domen, SUHADOLC, Marjetka. Plants play a crucial role in the development of soil fungal communities in the remediated substrate after EDTA washing of metal-contaminated soils, *Frontiers in Environmental Science*, 2022, 10:978850, doi: 10.3389/fenvs.2022.978850, [COBISS.SI-ID 121915395]  3. PAWLOWSKI, Jan, BRUCE, Kat, PANKSEP, Kristel, AGUIRRE, F.I., **MAČEK, Irena**, WEIGAND, A, FAZI, Stefano, et al. Environmental DNA metabarcoding for benthic monitoring: A review of sediment sampling and DNA extraction methods. *Science of the Total Environment,* 2022, 818, doi: 10.1016/j.scitotenv.2021.151783. [COBISS.SI-ID 86251267 |

# EKOLOŠKI PROCESI V MORJU Učni načrt predmeta/Course syllabus

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| Predmet: | EKOLOŠKI PROCESI V MORJU |
| Course title: | Marine ecological processes |
| Članica nosilka/UL Member: | UL FPP |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020638 |
| Koda učne enote na članici/UL Member course code: | 17 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 60 | 60 |  |  |  | 130 | 10 |

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| Nosilec predmeta/Lecturer: | Lovrenc Lipej |

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| Izvajalci predavanj: | Jadran Faganeli , Ingrid Falnoga, Alenka Malej, Patricija Mozetič |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski program. Predznanje temeljev biologije, mikrobiologije, kemije in geologije. | Inscription in the doctoral study programme. The basic knowledge of biology, microbiology, chemistry and geology. |

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| Vsebina: | Content (Syllabus outline): |
| 1. Morska voda, Morski sediment 2. Morski ekosistem, Struktura in funkcija, Stabilnost in nihanja ekosistemov, Principi odzivnosti, odpornost, vztrajnost, Prostorska morska ekologija 3. Primarni producenti, ključni dejavniki, potrošniki 4. Ekološka niša v morskem ekosistemu, Razporeditev biodverzitete, Epibioza, Simbioza in drugi ekološki odnosi, Prilagoditve morskih organizmov, Spremembe v morski biodiverziteti 5. Biogeokemijska kroženja in masna bilanca, Biogeokemijski modeli morja, Uporaba stabilnih in radioaktivnih izotopov ter biomarkerjev (biogeokemijskih sledilcev), Paloeoocenaografske rekonstrukcije, Onesnaževanje in kroženje pomembnih onesnaževal v morju z ekotoksikološkimi vplivi 6. Ekološke lastnosti nekaterih pomembnih morskih bazenov (Sredozemlje, severni Jadran in Tržaški zaliv) 7. Nove metode in pristopi v morski ekologiji, Nedestruktivne tehnike vzorčevanja | 1. Seawater, marine sediment  2. Marine ecosystem, Structure and function, Stability and variability of ecosystems,  Response, resistivity, persistence, Spatial marine ecology  3. Primary producers, key drivers, consumers  4. Ecological niche in the marine ecosystem, Distiribution of biodiversity, Epibiosis,  Simbiosis and other ecological relations, Adaptation of marine organisms, Changes in  marine biodiversity  5. Biogeochemical cyclings and mass balances, Biogeochemical models of the sea, Use of  stable and radioactive isotopes and geochemical biomarkers (tracers), Paleoceanographical reconstructions, Pollution, ecotoxicological impact  and cycling of major pollutants in the sea  6. Ecological properties of some important marine basins; Mediterranean, northern Adriatic, Gulf of Trieste  7. New methods and approaches in marine Ecology, Undestuctive sampling methods |

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| Temeljna literatura in viri/Readings: |
| Knjige/Textbooks  S.M. Libes, 2009. Introduction to Marine Biogeochemistry, Academic, Amsterdam, 909 pp. (ISBN: 9780120885305)  I Valiela, 2018. Marine Ecological Processes. 3rd Edition, Springer, 597 pp. (ISBN: 9781493979097)  F.K. McKinney, 2007. The northern Adriatic ecosystem, Deep time in a shallow sea. Columbia University Press, New York, 328 pp. (ISBN: 978-0231-13242-8)  J. Blasco, P.M. Chapman, O. Campana, M. Hampel, 2016. Marine ecotoxicology. Elsevier, Amsterdam 321pp. (ISBN: 978-0-12-80o3371-5)  T.C., Malone, A. Malej, L.W. Harding, N. Smodlaka, R.E. Turner (eds.), 1999. Ecosystems at the land-sea margin, Drainage basin to coastal sea, AGU Washington, 381 pp. (ISBN: 087590-269-3)  L. Lipej, R. Turk, T. Makovec, 2006. Ogrožene vrste in habitatni tipi v slovenskem morju. Zavod R Slovenije za varstvo narave, Ljubljana, 264 pp. (ISBN: 961-91505-4-6)  L. Lipej, M.Orlando Bonaca, B. Mavrič, 2016*.* Biogenic formations in the Slovenian sea. National Institute of Biology, Marine Biology Station, Piran, 206 pp. (ISBN: 978-961-93486-4-2)  T.C. Malone, A. Malej, J. Faganeli (eds.), 2021. Coastal ecosystems in transition: A comparative analysis of the northern Adriatic and Chesapeake Bay, Geophysical monographs 256, AGU-Wiley, 235 pp. (ISBN: 9781119543589)  T. Turk, P. Mozetič, J. France, T. Turk Demastia, 2018. Dinoflagelati, diatomeje, njihovi toksini in zastrupitve z morsko hrano, NIB, Ljubljana,185 pp. (ISBN: 978-961-93486-9-7)  **Revije/Journals**  Marine Ecology Progress Series, Inter-Research  Limnology and Oceanography, ASLO  Marine Ecology, Wiley  Marine Biology, Springer  Journal of Experimental Marine Biology and Ecology, Elsevier  Marine Chemistry, Elsevier  Estuarine, Coastal and Shelf Science, Elsevier  Progress in Oceanography, Elsevier  Oceanography, Oceanographical Society  Marine Pollution Bulletin, Elsevier  Frontiers in Marine Science  Estuaries and Coasts, Springer  ICES Journal of Marine Science |

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| Cilji in kompetence: | Objectives and competences: |
| Predmet seznanja študenta z dejavniki, vključno s človekovimi, ki uravanavajom ekološke procese v morju. Pomemben poudarek je na prikazu lastnosti morske vode in sedimentov ter sestavi in delovanju ekosistemov s poudarkom na biodiverziteti, produkciji, ekoloških odnosih, prilagoditvah organizmov, bioinvazijah in pomenu ekosistemskih uslug, biogeokemijskih kroženj in masnih bilanc pomembnih biogenih elementov in onesnaževal, biogeokemijskih modelov, uporabi izotopov in biomarkerjev ter pomena človekovih vplivov in sprememb vključno s klimatskimi spremembami. Študenti se spoznajo tudi z globalnimi morskimi ekološkimi enotami in osnovami translacijske ekologije. | In this course, students are informed about factors, including anthropogenic, controlling the marine ecological processes. Important aspects are devoted to description of seawater and sediment properties, and composition and function of ecosystems comprising biodiversity, ecological relations, adaptation of organisms, bioinvasions and the role of ecosystem services, biogeochemical cyclings and mass balances of important biogenic elements and pollutants, biogeochemical models, use of isotopes and biomarkers as well as anthropogenic impacts and global changes. Students will become familiar with global marine eciological units and fundamentals of translational ecology. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Pridobljeno znanje bodo študenti sposobni uporabiti v eksperimentalnih pristopih v morski ekologiji in razumeti ekološke procese v morju vključno z globalnimi spremembami. | Knowledge and understanding:  The students will be able to use the acquisited knowledge in the experimental studies in marine ecology and to understand ecological processes in the sea including global changes. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja, seminarji, terenska ekskurzija, nastop, sodelovanje na predavanjih domačih in tujih predavateljev. | Courses, seminars, field excursion, presentations,, attendance at lectures of invited lecturers. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Predstavitev seminarske naloge | 40,00 % | Presentation of seminar work |
| Ustni izpit | 60,00 % | Oral exam |

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| Ocenjevalna lestvica: | Grading system: |
| 5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10 | 5 - 10, a student passes the exam if he is graded from 6 to 10 |

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| Reference nosilca/Lecturer's references: |
| **Prof. dr. Lovrenc Lipej**  **LIPEJ, Lovrenc**, MAVRIČ, Borut, ORLANDO-BONACA, Martina, MALEJ, Alenka. State of the art of the marine non-idigenous flora and fauna in Slovenia. *Mediterranean Marine Science*, ISSN 1108-393X, 2012, vol 13, str. 243-249. [COBISS.SI-ID [2632783](https://plus.si.cobiss.net/opac7/bib/2632783?lang=sl)]  IVAJNŠIČ, Danijel, **LIPEJ, Lovrenc**, ŠKORNIK, Iztok, KALIGARIČ, Mitja. The sea level rise impact on four seashore breeding birds: the key study of Sečovlje Salina Nature Park. *Climatic change*, ISSN 0165-0009, 2017, vol. 140, iss. 3-4, str. 549-562, ilustr., doi: [10.1007/s10584-016-1854-3](https://doi.org/10.1007/s10584-016-1854-3). [COBISS.SI-ID [4117071](https://plus.si.cobiss.net/opac7/bib/4117071?lang=sl)]  **LIPEJ, Lovrenc,** KOVAČIĆ, Marcelo, DULČIĆ, Jakov.An Analysis of Adriatic Ichthyofauna—Ecology, Zoogeography, and Conservation Status. Fishes, s 2022, 7, 58. https://  doi.org/10.3390/fishes7020058 [COBISS.SI-ID [100659971](https://plus.cobiss.net/cobiss/si/sl/bib/100659971)]  **Prof. dr. Jadran Faganeli**  KORON, Neža, OGRINC, Nives, METZGER, Eduard, RIEDEL, Bettina, **FAGANELI, Jadran**. The impact of induced redox transitions on nutrient diagenesis in coastal marine sediments (Gulf of Trieste, northern Adriatic Sea). *Journal of soils and sediments : protection, risk assessment and remediation*, 2015, vol. 15, no. 12, str. 2443-2452, ISSN 1439-0108. [COBISS.SI-ID [28778535](https://plus.si.cobiss.net/opac7/bib/28778535?lang=sl)]  PAVONI, Elena, CROSERA, Matteo, PETRANICH, Elisa, ADAMI, Gianpiero, **FAGANELI, Jadran**, COVELLI, Stefano. Partitioning and mixing behaviour of trace elements at the Isonzo/Soča River mouth (Gulf of Trieste, northern Adriatic Sea). *Marine Chemistry*. [Print ed.] 2020, vol. 223, 103800, str. 1-14, ilustr. ISSN 0304-4203. <https://www.sciencedirect.com/science/article/pii/S0304420320300542>, [COBISS.SI-ID [14224899](https://plus.cobiss.net/cobiss/si/sl/bib/14224899)]  PETRANICH, Elisa, COVELLI, Stefano, ACQUAVITA, Alessandro, DE VITTOR, Cinzia, **FAGANELI, Jadran**, CONTIN, Marco. Benthic nutrient cycling at the sediment-water interface in a lagoon fish farming system (northern Adriatic Sea, Italy). *Science of the total environment*, , 2018, vol. 644, str. 137-149. ISSN 0048-9697. [COBISS.SI-ID [4971343](https://plus.si.cobiss.net/opac7/bib/4971343?lang=sl)]  **Prof. dr. Alenka Malej:**  **MALEJ, Alenka**, TIRELLI, Valentina, LUČIĆ, Davor, PALIAGA, Paolo, VODOPIVEC, Martin, GORUPPI, A., ANCONA, S., BENZI, Margherita, BETTOSO, Nicola, CAMATTI, Elisa, ERCOLESSI, M., FERRARI, C.R. Mnemiopsis leidyi in the northern Adriatic: Here to stay?. *Journal of sea research*, ISSN 1385-1101, 2. maj 2017, vol. 124, str. 10-16, ilustr., doi: [10.1016/j.seares.2017.04.010](https://doi.org/10.1016/j.seares.2017.04.010). [COBISS.SI-ID [4309327](https://plus.si.cobiss.net/opac7/bib/4309327?lang=sl)]  KOGOVŠEK, Tjaša, VODOPIVEC, Martin, RAICICH, Fabio, SHIN-ICHI, Uye, **MALEJ, Alenka**. Comparative analysis of the ecosystems in the northern Adriatic Sea and the Inland Sea of Japan : can anthropogenic pressures disclose jellyfish outbreaks?. *Science of the total environment*, ISSN 0048-9697, 2018, vol. 626, str. 982-994. <http://dx.doi.org/10.1016/j.scitotenv.2018.01.011>, doi: [10.1016/j.scitotenv.2018.01.011](https://doi.org/10.1016/j.scitotenv.2018.01.011). [COBISS.SI-ID [4618831](https://plus.si.cobiss.net/opac7/bib/4618831?lang=sl)]  ENRIQUE-NAVARRO, Angélica, HUERTAS, Emma, FLANDER-PUTRLE, Vesna, BARTUAL, Ana, NAVARRO, Gabriel, RUIZ, Javier, **MALEJ, Alenka**, PRIETO, Laura. Living inside a jellyfish: the symbiosis case study of host-specialized dinoflagellates, “Zooxanthellae”, and the Scyphozoan *Cotylorhiza* *tuberculata*. *Frontiers in marine science*. 2022, 9, 1-16, ISSN 22967745. <https://www.frontiersin.org/articles/10.3389/fmars.2022.817312/full>, DOI: [10.3389/fmars.2022.817312](https://dx.doi.org/10.3389/fmars.2022.817312). [COBISS.SI-ID [100662531](https://plus.cobiss.net/cobiss/si/sl/bib/100662531)]  **Prof. dr. Patricija Mozetič**  **MOZETIČ, Patricija**, CANGINI, Monica, FRANCÉ, Janja, BASTIANINI, Mauro, BERNARDI AUBRY, Fabrizio, BUŽANČIĆ, Mia, CABRINI, Marina, CERINO, Federica, ČALIĆ, Marijeta, D'ADAMO, Raffaele, DRAKULOVIĆ, Dragana, FINOTTO, Stefania, FORNASARO, Daniela, GRILLI, Federica, KRAUS, Romina, KUŽAT, Nataša, MARIĆ PFANNKUCHEN, Daniela, NINČEVIĆ GLADAN, Živana, POMPEI, Marinella, ROTTER, Ana, SERVADEI, Irene, SKEJIĆ, Sanda. Phytoplankton diversity in Adriatic ports: Lessons from the port baseline survey for the management of harmful algal species. *Marine pollution bulletin*. 2019, vol. 147, str. 117-132. ISSN 0025-326X. <https://www.sciencedirect.com/science/article/pii/S0025326X17310561>, DOI: [10.1016/j.marpolbul.2017.12.029](https://dx.doi.org/10.1016/j.marpolbul.2017.12.029). [COBISS.SI-ID [4546383](https://plus.cobiss.net/cobiss/si/sl/bib/4546383)]  TURK DERMASTIA, Timotej, CERINO, Federica, STANKOVIĆ, David, FRANCÉ, Janja, RAMŠAK, Andreja, TUŠEK-ŽNIDARIČ, Magda, BERAN, Alfred, NATALI, Vanessa, CABRINI, Marina, **MOZETIČ, Patricija**. Ecological time series and integrative taxonomy unveil seasonality and diversity of the toxic diatom Pseudo-nitzschia H. Peragallo in the northern Adriatic Sea. *Harmful algae*. Mar. 2020, vol. 93, 101773, str. 1-20, ilustr. ISSN 1568-9883. <https://www.sciencedirect.com/science/article/pii/S1568988320300536?via%3Dihub>, <https://dirros.openscience.si/IzpisGradiva.php?id=11205>, DOI: [10.1016/j.hal.2020.101773](https://dx.doi.org/10.1016/j.hal.2020.101773). [COBISS.SI-ID [40469253](https://plus.cobiss.net/cobiss/si/sl/bib/40469253)]  ZINGONE, Adriana, ESCALERA, Laura, ALIGIZAKI, Katarine, FERNANDEZ-TEJEDOR, Margarita, ISMAEL, Amany, MONTRESOR, Marina, **MOZETIČ, Patricija**, TAŞ, Seyfettin, TOTTI, Cecilia. Toxic marine microalgae and noxious blooms in the Mediterranean Sea : a contribution to the Global HAB status report. *Harmful algae*. Feb. 2021, vol. 102, str. 1-17, ilustr. ISSN 1568-9883. DOI: [10.1016/j.hal.2020.101843](https://dx.doi.org/10.1016/j.hal.2020.101843). [COBISS.SI-ID [19864579](https://plus.cobiss.net/cobiss/si/sl/bib/19864579)]  **Doc. dr. Ingrid Falnoga**  FAGANELI, Jadran, **FALNOGA, Ingrid**, HORVAT, Milena, KLUN, Katja, LIPEJ, Lovrenc, MAZEJ, Darja. Selenium and mercury interactions in apex predators from the Gulf of Trieste (Northern Adriatic Sea). *Nutrients*. 2018, vol. 10, no. 3, str. 278-1-278-11. ISSN 2072-6643. [COBISS.SI-ID [31236391](https://plus.cobiss.net/cobiss/si/sl/bib/31236391)]  ORLANDO-BONACA, Martina, PITACCO, Valentina, BAJT, Oliver, **FALNOGA, Ingrid**, JAGODIC HUDOBIVNIK, Marta, MAZEJ, Darja, ŠLEJKOVEC, Zdenka, BONANNO, Giuseppe. Spatial and temporal distribution of trace elements in Padina pavonica from the northern Adriatic Sea. *Marine pollution bulletin*. 2021, vol. 172, str. [1]-12, ilustr., zvd. ISSN 0025-326X. <https://doi.org/10.1016/j.marpolbul.2021.112874>, [COBISS.SI-ID [74288643](https://plus.cobiss.net/cobiss/si/sl/bib/74288643)]  FAGANELI, Jadran, **FALNOGA, Ingrid**, KLUN, Katja, MAZEJ, Darja, MOZETIČ, Patricija, ZULIANI, Tea, KOVAČ, Nives. Metal(loid)s in suspended particulate matter and plankton from coastal waters (Gulf of Trieste, northern Adriatic Sea). *Journal of soils and sediments*. 2023, vol. 23, str. [1-13], ISSN 1614-7480. [COBISS.SI-ID [150795267](https://plus.cobiss.net/cobiss/si/sl/bib/150795267)] |

# EKONOMIKA IN PRAVO OKOLJSKEGA MANAGEMENTA Učni načrt predmeta/Course syllabus

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| Predmet: | EKONOMIKA IN PRAVO OKOLJSKEGA MANAGEMENTA |
| Course title: | Economic and Law of Environmental Management |
| Članica nosilka/UL Member: | UL PF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020620 |
| Koda učne enote na članici/UL Member course code: | 9 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 7 | 3 |  |  |  | 240 | 10 |

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| Nosilec predmeta/Lecturer: | ALEKSANDAR KEŠELJEVIĆ, Senko Pličanič |

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| Izvajalci predavanj: | ALEKSANDAR KEŠELJEVIĆ, Senko Pličanič |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Temeljni predmet/Core course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Ni posebnih pogojev. | No special requirements. |

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| Vsebina: | Content (Syllabus outline): |
| **Vsebina predmeta:**  1. Ekonomski vidiki varstva okolja. Okolje in trajnostni razvoj. Regulacija in samoregulacija ekonomskih sistemov. Stroški in okoljska učinkovitost. Problem družbenih stroškov. Ekološke in ekonomske politike. Politična ekonomija izrabe naravnih virov.  2. Pravni okviri trajnostnega razvoja. Okoljske institucije in razvoj zakonodaje. Regulacija in samoregulacija pravno ekonomskih sistemov. Okoljska regulacija in konkurenčnost.  3. Evropski okoljski pravni red. Evropske okoljske razmere. Globalne institucije. Multilateralni okoljski sporazumi. Stroški okoljske učinkovitosti in tržni instrumentarij.  4. Slovenski okoljski pravni red. Okoljska regulacija. Okoljske strategije in politike. Koncept zelene reforme.  5. Institucionalno okolje in okoljski managerski sistemi. Managerianje okoljskih sistemov. Trajnostni razvoj in organizacije. Kontingetno vrednotenje. Vrednost vsakdanjega življenja s pravnega vidika.  6. Managerska orodja za okoljski ekonomski in pravni management. Strateško vrednotenje in obvladovanje tveganj. Komuniciranje z deležniki.  7. Ključne okoljske teme in managiranje rešitev. Onesnaženje, biodiverziteta, klimatske spremembe in energetika. Okoljska prihodnost in tragedija skupnega. Vpliv ekonomije in prava na managerske okoljske politike. | Course content:  Economics and Environmental Protection. Environment and Sustainable Development. Regulation and Self-Regulation. The Problem of Social Cost. Ecological and Economic Policies. Political Economy of Natural Resource Extraction.  Legal Framework for Sustainable Development. Environmental Institutions and Legislation. Regulation and Self-Regulation of Legal Systems. Environmental Regulation and Competitiveness.  European Environmental Legal System. European Environmental Conditions. Global Environmental Institutions. Multilateral Environmental Agreements. Costs and Benefits of Environmental Efficiency and Market Mechanism.  Slovenian Legal Framework for Environmental Protection. Environmental Regulation. Environmental Strategies and Public Policies. Green Reform Concept.  Institutional Environment and Environmental Managerial Systems. Managing Environmental Systems. Organizations and Sustainable Development. Contingency Valuation. Legal Aspect of Statistical Value of Life.  Managerial Tools for Environmental Economics, Law and Management. Strategic Evaluation and Risk Assessment. Stakeholder Communication.  Key Topics and Managing Solutions. Pollution, Biodiversity, Climate Change, Energy Economics, Environmental Future and Tragedy of the Commons. Economic and Legal Effects on Managerial Environmental Policies. |

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| Temeljna literatura in viri/Readings: |
| |  | | --- | | **- Ecological Economics: Principles and Applications: Daly Herman, Joshua Farley: Second Edition, Island Press, 2011 (bo dostopno v CEK, EF, UL).**  **- Izbrana poglavja v Environmental Economics: R. Turner, D.Pearce, Prentica Hall, London, 1994 (FU, UL).**  **- PLIČANIČ, Senko, Temelji ekološkega prava, 2003, Cankarjeva založba, Ljubljana. (dostopno v knjižnici PF)**  **- Marjan Peeters and Mariolina Eliantonio (ed.), 2020, Research Handbook on EU Environmental.**  **- Law, Edward Elgar Publishing Limited, UK. (dostopno v knjižnici PF).**  **- Ustava RS.**  **- Zakonodaja s področja varstva okolja in urejanja prostora v Republiki Sloveniji.**  **- EU pravo s področja varstva okolja.** | |

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| Cilji in kompetence: | Objectives and competences: |
| Predmet razvija ekonomska in pravna znanja s področja managementa okolja na ravni organizacij (podjetje, lokalne skupnosti, država). Razumevanje logike pravnega in ekonomskega okolja, uporaba orodij okoljskega menedžmenta pri reševanju okoljskih problemov, oblikovanje strateških vidikov trajnostnega razvoja. | To develop economic and legal knowledge of environmental management on different layers of organization. To understand the logic behind economic and legal environment. To apply the tools of environmental management in solving environmental problems. To facilitate the understanding of strategic aspects of sustainable development. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Razumevanje okoljskih problemov in politik za njihovo reševanje.  Rešitve posameznih problemov s pravnega in ekonomskega vidika.  Analiza in uporaba različnih analitičnih orodij pri reševanju okoljskih problemov. | Knowledge and understanding:  Understanding environmental issues and policies to tackle environmental dilemmas.  Problem solutions from a legal and economic standpoint.  Analysis and the use of analytical tools in solving environmental issues. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja, seminarsko delo, vaje v obliki debatnih diskusij.  Obravnava problemov iz managerske prakse.  Analiza pravnih in ekonomskih vsebin okoljskih politik na državni in lokalni ravni. | Lectures, paper assignment, problem sets based on debate and discussion.  Discussion of key managerial issues.  Analysis of legal and economic aspects of environmental policies at different layers of government. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Pisni izpit | 70,00 % | Written assignment |
| Seminarsko delo | 30,00 % | Paper assigment |

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| Ocenjevalna lestvica: | Grading system: |
| 5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10 | 5 - 10, a student passes the exam if he is graded from 6 to 10 |

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| Reference nosilca/Lecturer's references: |
| KEŠELJEVIĆ, Aleksandar, SOKOLOVSKA, Iskra. Does sustainability pay off? : a multi-factor analysis on regional DJSI and renewable stock indices. *Ekonomska istraživanja*. 2019, vol. 32, iss. 1, str. 423-439.  KEŠELJEVIĆ, Aleksandar, KOMAN, Matjaž. Analysis of the effects of introduction of an additional carbon tax on the Slovenian economy considering different forms of recycling. *Economic and business review*. 2014, vol. 16, no. 3, str. 247-277, 369-370,  KEŠELJEVIĆ, Aleksandar, REDEK, Tjaša, ŽABKAR, Vesna. Toward a sustainable future : challenges ahead. V: ŽABKAR, Vesna (ur.), REDEK, Tjaša (ur.). *Challenges on the path toward sustainability in Europe : social responsibility and circular economy perspectives*. 1st ed. Bingley: Emerald, 2021. Str. 297-311.  1. PLIČANIČ, Senko, 2004, Temelji ekološkega prava: (kako uzakoniti zmernost pri človekovih odnosih z živalmi, rastlinami in neživim svetom), (Zbirka Scientia iustitia, 04). V Ljubljani: Cankarjeva založba, 2004. ISBN 961-231-390-3. [COBISS.SI-ID 213213696]  2. PLIČANIČ, Senko, 2007, Ustavnopravni temelji ekološkega prava. Javna uprava, 2007, letn. 43, št. 1, str. 83-98. [COBISS.SI-ID 8900177]  3. PLIČANIČ, Senko, 2014, Trajnostno prostorsko načrtovanje in trajnostni gospodarski razvoj Slovenije – vloga prava in države, Javna Uprava, št. 3-4/ 2014. [COBISS.SI-ID 14420561]  4. PLIČANIČ, Senko, 2016, Sreča, trajnostni razvoj in pravo, Pravnik 2016, let. 71 (133) št. 1- 2.  3. PLIČANIČ Senko: Človek ali Narava? – novoveško pravo narave: »anthropeioi nomos« ali »nomos theios« (razprava o razlogih »uničenja narave« in novoveškem pravu kot pravu uničevalcev narave, 1999, ZZR PF v Ljubljani.  4. PLIČANIČ, Senko. Foundations of ecocentric law. Russian law journal. [Tiskana izd.]. 2021, vol. 9, no. 4, str. 72-98. ISSN 2309-8678. https://www.russianlawjournal.org/jour/article/view/1279/305, DOI: 10.17589/2309-8678-2021-9-4-72-98. [COBISS.SI-ID 87140355] |

# EKOTOKSIČNOST IN OCENA TVEGANJA KEMIKALIJ ZA OKOLJE Učni načrt predmeta/Course syllabus

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| Predmet: | EKOTOKSIČNOST IN OCENA TVEGANJA KEMIKALIJ ZA OKOLJE |
| Course title: | ECOTOXICITY AND ENVIRONMENTAL RISK ASSESSMENT OF CHEMICALS |
| Članica nosilka/UL Member: | UL BF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0180747 |
| Koda učne enote na članici/UL Member course code: | 18 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 15 | 40 | 10 |  | 60 | 125 | 10 |

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| Nosilec predmeta/Lecturer: | Anita Jemec Kokalj |

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| Izvajalci predavanj: | Damjana Drobne, Primož Zidar |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Slovenščina |
|  | Vaje/Tutorial: | Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij. Znanja iz temeljnih naravoslovnih disciplin. | Enrolment in PhD study. Knowledge of basic natural sciences. |

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| Vsebina: | Content (Syllabus outline): |
| * zgodovina ekotoksikologije, njena definicija in koncept * osnovni koncept upravljanja tveganja s kemikalijami: identifikacija tveganja, ocena izpostavljenosti, ocena učinka, ocena tveganja, zmanjšanje tveganja in komunikacija tveganja * testi strupenosti * primeri vodnih in kopenskih ekotoksikoloških študij * Razumevanje in interpretacija rezultatov ekotoksikoloških študij * kvaliteta kemijskih in ekotoksikoloških podatkov za oceno tveganja kemikalij za okolje * aktualne tematike s stališča tveganja za okolje (nanomateriali, mikroplastika, motilci hormonskega sistema) * multidisciplinaren pristop pri oceni tveganja za okolje * ekotoksikološke študije v okoljski zakonodaji, interpretacija in soustvarjanje okoljske zakonodaje (regulative) | * history of ecotoxicology, its definition and concept * basic concept of chemical risk management: Hazard identification, exposure assessment, effect assessment, risk characterisation, risk reduction, risk communication * toxicity testing * examples of aquatic and terrestrial ecotoxicological studies * understanding and interpretation of the results obtained in ecotoxicological studies * quality of chemical and ecotoxicological data in research studies dealing with effects on environment * emerging topics from the environmental risk point of view (nanomaterials, microplastic, endocrine disrupting compounds) * multidisciplinary approach in environmental risk assessment * ecotoxicological studies in environmetal regulations, interpretation and co-creation of environmental regulation. |

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| Temeljna literatura in viri/Readings: |
| * Aktualni znanstveni članki   /     Topical scientific papers |

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| Cilji in kompetence: | Objectives and competences: |
| **Cilji:** Študenti se bodo seznanili z načini pridobivanja ekotoksikoloških podatkov, interpretacijo rezultatov in postopki upravljanja s tveganji, ki jih predstavljajo kemikalije. Predstavljeni bodo primeri ekotoksikoloških študij v vodnem in kopenskem okolju. Študenti bodo seznanjeni s problematiko najbolj perečih okoljskih onesnaževal. Ekotoksikologija je multidisciplinarna veda, zato je za dosego željenega rezultata potrebno uspešno sodelovanje strokovnjakov iz področja naravoslovja, tehnike in razumevanje družboslovja. Praktični primeri bodo zasnovani tako, da bodo vključevali različna znanja in veščine. Pri predmetu bo poudarek na multidisciplinarnem pristopu pri reševanju okoljskih problemov.  **Kompetence:** Študent bo sposoben poiskati in ustrezno interpretirati strokovno in znanstveno literaturo na področju ekotoksikologije. Sposoben bo razumeti poročilo o oceni tveganja kemikalij za okolje ne glede na njegovo predizobrazbo in področje.Sposoben bo delovati v multidisciplinarnem timu pri reševanju okoljske problematike. Študent bo poglobil znanje iz svojega področja in dobil osnovno razumevanje drugih področij. | **Objectives:** Students will learn how to obtain ecotoxicological data, interpret the obtained results and get acquainted with basic principles of chemical environmental risk management. Examples of some ecotoxicological studies in aquatic and terrestrial environment will be presented. Some most evident emerging contaminants will be dicussed. As ecotoxicology is a multidisciplinary science and the desired results could be obtained only by successful cooperation between experts from natural, technical and social sciences, a multidisciplinary approach will be emphasized. Students will learn practical examples that will incorporate different knowledge and skills.  **Competences:** Students, irrespective of previous education, will be able to find and properly interpret scientific and professional ecotoxicological literature. They will be able to understand basic chemical environmental risk assessment report. Students will be able to work in a multidisciplinary team to solve environmental problems. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Razumevanje osnovnih principov v ekotoksikologiji, uporaba pridobljenih ekotoksikoloških znanj v praksi, poznavanje aktualne okoljske problematike. | Knowledge and understanding:  Understanding the basic principles of ecotoxicology, application of ecotoxicological data in practice, information of the most emerging evironmental topics. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja, konzultacije, seminarji, laboratorijske vaje in problemsko orientirano učenje- projekt. | Lectures, individual lectures, seminars, tutorials, problems oriented learning - project. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Izdelana in predstavljena seminarja | 40,00 % | Written and presented seminars |
| Ustno preverjanje znanja po vseh končanih obveznostih | 60,00 % | Oral exam |

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| Ocenjevalna lestvica: | Grading system: |
| 5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10 | 5 - 10, a student passes the exam if he is graded from 6 to 10 |

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| Reference nosilca/Lecturer's references: |
| **Anita Jemec Kokalj**  **JEMEC KOKALJ,** Anita, FIŠER, Žiga, DOLAR, Andraž, NOVAK, Sara, DROBNE, Damjana, BRAČKO, Gregor, FIŠER, Cene. Screening of NaCl salinity sensitivity across eight species of subterranean amphipod genus Niphargus. Ecotoxicology and environmental safety. May 2022, vol. 236, art. 113456, str. 1-9,  **JEMEC KOKALJ, Anita,** DOLAR, Andraž, DROBNE, Damjana, ŠKRLEP, Luka, SEVER ŠKAPIN, Andrijana, MAROLT, Gregor, NAGODE, Ana, GESTEL, Cornelis A. M. van. Effects of microplastics from disposable medical masks on terrestrial invertebrates. Journal of hazardous materials. [Print ed.]. 2022, vol. 438, [article no.] 129440, str. 1-9, ilust  **JEMEC KOKALJ, Anita,** HARTMANN, Nanna B., DROBNE, Damjana, POTTHOFF, Annegret, KÜHNEL, Dana. Quality of nanoplastics and microplastics ecotoxicity studies : refining quality criteria for nanomaterial studies. Journal of hazardous materials. [Print ed.]. Avg. 2021, vol. 415, str. 1-12. ISSN 0304-3894.  BONDARENKO, Olesja, HEINLAAN, Margit, SIHTMÄE, Mariliis, IVASK, Angela, KURVET, Imbi, JOONAS, Elise, **JEMEC KOKALJ, Anita**, MANNERSTRÖM, Marika, HEINONEN, Tuula, ROHIT, Rekulapally, SINGH, Shashi, ZOU, Jing, PYYKKÖ, Ilmari, DROBNE, Damjana, KAHRU, Anne. Multilaboratory evaluation of 15 bioassays for (eco)toxicity screening and hazard ranking of engineered nanomaterials : FP7 project NANOVALID. Nanotoxicology. 2016, vol. 10, iss. 9, str. 1229-1242. ISSN 1743-5390  KOS, Monika, KAHRU, Anne, DROBNE, Damjana, SINGH, Shashi, KALČÍKOVÁ, Gabriela, KÜHNEL, Dana, ROHIT, Rekulapally, ŽGAJNAR GOTVAJN, Andreja, **JEMEC KOKALJ, Anita**. A case study to optimise and validate the brine shrimp Artemia franciscana immobilisation assay with silver nanoparticles : the role of harmonisation. Environmental pollution. [Print ed.]. 2016, vol. 213, str. 173-183 |

# ETIČNI ODNOS DO NARAVE Učni načrt predmeta/Course syllabus

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| Predmet: | ETIČNI ODNOS DO NARAVE |
| Course title: | The Ethics of Nature |
| Članica nosilka/UL Member: | UL FF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020640 |
| Koda učne enote na članici/UL Member course code: | 19 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 30 | 30 |  |  |  | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Borut Ošlaj |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet /Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Slovenščina |
|  | Vaje/Tutorial: |  |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študijski program. | Enrollment in doctoral program. |

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| Vsebina: | Content (Syllabus outline): |
| 1. Človek in problem etičnega delovanja. Problem prehoda iz teorije (vednosti) k praksi (delovanju).  2. Kratka predstavitev etike kot filozofske discipline ter tistih teorij, šol in metod, ki posredno tematizirajo problem, okolja, narave ali življenja.  3. Temeljni naravoetični koncepti in metode:  a) tradicionalne religije in narava (arhaične religije, judovska religija, budizem),  b) kontroverza med biocentristi (zlasti globinska ekologija: Leopold, Naess) in antropocentristi (Descartes, Kant, Ferry),  c) konceptualno-terminološka razlika med okoljem in naravo ter med sekundarno in primarno odgovornostjo. Človekova razpetost med okoljem in naravo ter moralno-etične dileme,  d) utilitarizem (Bentham, Singer),  e) etika življenja (Schweitzer),  f) etika odgovornosti (Jonas),  g) Wilberjeva kritika površinske ekologije,  h) Koncept svetosti življenja,  i) diaforična etika narave (telo kot estetični posrednik med naravo in umom),  j) Nova vloga narave/življenja v možnem procesu humanizacije človeka in izhod iz postmoderne. | 1. Human being and the problem of ethical action. The problem of transition from theory (knowledge) to practice (action).  2. Short exposition of ethics as a philosophical discipline as well as those theories, schools of thought and methods which indirectly tackle issues relating to environment, nature or life.  3. Basic concepts and methods of Ethics of Nature:   a) Traditional religions and nature (archaic religions, Jewish religion, Buddhism).   b) The controversy among Biocentrists (especially depth ecology: Leopold Naess) and Anthropocentrists (Descartes, Kant,Ferry).   c) Conceptual-terminological difference between environment and nature and between secondary and primary responsibility. The human being’s tornness between environment and nature, and moral-ethical dilemmas.   d) Utilitarianism (Bentham, Singer).   e) Ethics of life (Schweitzer).   f) Ethics of responsibility (Jonas).   g) Wilbers criticism of shallow ecology.   h) The concept of the sanctity of life.   i) Diaphoric ethics of nature (body as the mediator between nature and mind).   j) New role of nature/life in the possible humanisation process of humans and the way out of postmodernity. |

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| Temeljna literatura in viri/Readings: |
| 1. Ferry, Luc: Novi ekološki red – Drevo, žival in človek, Ljubljana 1992. 2. Jonas, Hans: The Imperative of Responsibility, Chicago 1985. 3. Wilber, Ken: A Brief History of Everything, Boston 1996. 4. Schweitzer, Albert: Etika spoštovanja do življenja, Nova revija, št. 113-114, september-oktober 1991. 5. Lovelock, John, E.: Gaja, nov pogled na življenje na zemlji, Ljubljana 1994. 6. Singer, Peter: Animal Liberation, New York 2001. 7. Johnson, Lawrence E.: A Morally Deep World, Cambridge 1993. 8. Ošlaj, Borut: Človek in narava – Osnove diaforične etike narave, Ljubljana 2000. 9. Ošlaj, Borut: Ethica, quo vadis? Albert Schweitzer in vprašanje renesanse etične kulture, Ljubljana 2010. |

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| Cilji in kompetence: | Objectives and competences: |
| Študenti se seznanijo s temeljnimi naravoetičnimi koncepti, metodami ter z njihovimi osnovnimi vprašanji in dilemami. Študenti spoznajo probleme etičnega delovanja in jih znajo kritično premisliti v kontekstu sodobnega odnosa posameznika in družbe do okolja oz. narave. Sposobnost razumevanja antropoloških predpostavk človekovega problematičnega odnosa do njegovega okolja. Študenti spoznajo temeljna izhodišča za možnost avtonomne etične drže in ravnanja do okolja oz. narave na sploh. | Students acquire the ability to understand basic concepts and methods of Ethics of Nature, as well as its basic questions and dilemmas. Students gain knowledge of the problems of ethical action, acquiring ability of their critical re-examination within the context of contemporary relation of individuals and society to their environment. Ability to understand anthropological presuppositions of human being’s problematic attitude to their environment. Students acquire knowledge of basic starting points for the possibility of autonomous ethical stance and action towards environment or nature in general. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Osnovno poznavanje in kritično razumevanje razvoja teoretskih konceptov etike okolja in narave. Smiselno ločevanje in razumevanje razlike med okoljem in naravo, med biocentrizmom in antropocentrizmom, med sekundarno in primarno odgovornostjo. | Knowledge and understanding:  Basic knowledge and critical understanding of the development of theoretical concepts of environment and nature. Meaningful differentiation between and understanding of the difference between environment and nature, Biocentrism and Anthropocentrism, secondary and primary responsibility. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Klasična predavanja in problemsko naravnane diskusije (sodelovalno učenje). | Lectures and issue-oriented discussions (cooperative learning). |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Ali ustni izpit ali seminarsko delo – od 6-10 (pozitivno) oz. 1-5 (negativno) |  | Oral exam or seminar paper – 6-10 (positive) viz. 1-5 (negative) |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| OŠLAJ, Borut. Hans Jonas und die Möglichkeit einer diaphorischen Natur-Ethik. V: Čović, Ante (ur.), Hoffmann, Thomas Sören (ur.). Bioethik und kulturelle Pluralität – Bioethics and Cultural Plurality. Sankt Augustin, Academia Verlag, 2005, str. 93-102.  OŠLAJ, Borut. Človek in narava : osnove diaforične etike narave, (Zbirka Sophia, 2000, 3). Ljubljana: Znanstveno in publicistično središče, 2000. 261 str. ISBN 961-6294-24-5.  OŠLAJ, Borut. Ethica, quo vadis? : Albert Schweitzer in vprašanje renesanse etične kulture, (Zbirka Razprave FF). Ljubljana: Znanstvena založba Filozofske fakultete, 2010. 231 str. ISBN 978-961-237-358-0. |

# FITOFARMACEVTSKA SREDSTVA IN NJIHOVE ALTERNATIVE Učni načrt predmeta/Course syllabus

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| Predmet: | FITOFARMACEVTSKA SREDSTVA IN NJIHOVE ALTERNATIVE |
| Course title: | Plant Protection Products and Their Alternatives |
| Članica nosilka/UL Member: | UL BF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020641 |
| Koda učne enote na članici/UL Member course code: | 20 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 20 |  | 60 |  |  | 170 | 10 |

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| Nosilec predmeta/Lecturer: | Stanislav Trdan |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij. | Enrollment to Doctoral Study. |

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| Vsebina: | Content (Syllabus outline): |
| Škoda na rastlinah zaradi škodljivcev, bolezni in plevelov. Zgodovina in etika uporabe FFS. Prednosti in slabosti uporabe FFS. FFS v vodi, tleh, zraku. Ostanki FFS v živilih. Strupenost FFS za neciljne organizme. Posledice zmanjšane uporabe FFS in uporaba FFS na vodozbirnih območjih. Preprečevanje škodljivega delovanja FFS. Zmanjševanje škodljivih posledic FFS. FFS in odpornost (rezistenca) škodljivih organizmov nanje. Načini preseganja rezistence škodljivih organizmov na FFS. Pridelava živeža brez FFS.  Koncepti in mehanizmi delovanja naravnih sovražnikov pri biotičnem zatiranju škodljivih organizmov. Pomen agrotehnike pri gospodarskem pomenu rastlinskih škodljivih organizmov in njihovih biotičnih agensov: kolobar, obdelava tal, čas in gostota sajenja (setve). Mešane saditve in setve, naravna fitofarmacevtska sredstva. Pomen zavetišč (refugijev) za škodljive in koristne žuželke in druge organizme. | Plant damage caused by pests, diseases and weeds (harmful organisms). History and ethics of plant protection products (PPPs) use. Benefits and problems of PPPs use. PPPs in the water, soil, and air. PPPs residues in food. Toxicity of PPPs to non-target organisms. Consequences of diminished use of PPPs and the use of PPPs in water collection areas. Preventing harmful activity of PPPs. Diminishing the harmful consequences of PPPs use. PPPs and resistance of harmul organisms. The ways of overcoming the resistance of harmful organisms to PPPs. Food production without the use of PPPs. Concepts and mechanisms of biological control agents activities in controlling harmful organisms. The role of agrotechnics in economic importance of harmful organisms and their natural enemies: rotation, soil cultivation, time and density of sowing/seeding/plantation. Mixed cropping, natural PPPs. The role of refugia for harmful and beneficial insects and other organisms. |

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| Temeljna literatura in viri/Readings: |
| **- Temeljni viri / Basic literature sources:**  Pimentel, D. 2002. Encyclopedia of pest management. Taylor & Francis, Boca Raton, London, New York, Singapore: 929 str., ISBN 0-8247-0632-3.  **- Dodatna literatura / Supplementary literature sources:**  **Monografije / Učbeniki**  Abrol, D.P., Shankar, U. 2012. Integrated Pest Management – principles and practice. CAB International, 502 str., ISBN-13: 978 1 84593 8086  Hawkins, B.A., Cornell, H.V. 1999. Theoretical approaches to biological control. Cambridge University Press: 412 str., ISBN 0 521 57283 5.  Koul, O., Cuperus, G. W. 2007. Ecologically based integrated pest management. CAB International, 462 str., ISBN-10: 1 84593 064 9  Krieger, R. 2001. Handbook of pesticide toxicology. 2nd Edition. Vol. 1-2. Academic Press, San Diego etc.: 1908 str., ISBN 0-12-426260-0.  Pimentel, D., Lehman, H. 1993. The pesticide question – environment, economics and ethics. Chapman & Hall, New York and London, 441 str. ISBN 0-412-03581-2 (izbrana poglavja)  Pimentel, D. 2007. Encyclopedia of pest management. Volume II. CRC Press, Taylor & Francis Group, Boca Raton, London, new York: 728 str., ISBN 978-1-4200-5361-6.  **Revijalni članki s področja, tekoča periodika, učna gradiva (dostopno na Biotehniški fakulteti).** |

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| Cilji in kompetence: | Objectives and competences: |
| Temeljni izobraževalni cilj je poglobitev znanja za samostojno raziskovalno delo na področju fitofarmacevtskih sredstev in njihovih alternativ ter seznanjenje s problemi onesnaževanja okolja zaradi nestrokovne rabe fitofarmacevtskih sredstev (FFS) ter z načini varovanja okolja, s poudarkom na pravilni rabi FFS in uporabi alternativnih načinov zdravstvenega varstva rastlin pred škodljivimi organizmi.  Predviden študijski rezultat je kandidata usposobiti za izvedbo omenjenih raziskav, rezultati katerih bodo predstavljali pomembne prispevke temeljni ali aplikativni znanosti na področju varstva okolja. | Basic aim of education is deepening the knowledge for the purpose of individual research work in the field of PPPs and their alternatives, and acquaintance with the problems of environmental pollution on account of unprofessional use of PPPs as well as with the ways of environmental protection, which are based upon suitable use of PPPs and alternative methods of plant protection against harmful organisms.  Expected result of the study is to qualify the candidate for performing the researches, results of which will present important contributions to fundamental or applied science in the field of environmental protection. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Slušatelji spoznajo zgodovinski razvoj fitofarmacevtskih sredstev in njihovih alternativ ter pomen obeh skupin varstva rastlin nekoč in danes. Študenti spoznajo škodo, ki jo škodljivi organizmi povzročajo na rastlinah in posledice neustrezne rabe FFS za okolje. Študenti razumejo mehanizme delovanja naravnih sovražnikov in drugih posrednih varstvenih ukrepov pri zmanjševanju gospodarskega pomena škodljivih organizmov.    Uporaba. Študenti pridobijo poglobljeno znanje o prednostih in slabostih uporabe FFS in o alternativnih načinih zatiranja škodljivih organizmov za vodenje lastnih raziskav in strokovno podporo zainteresiranim inštitucijam in pridelovalcem živeža.    Refleksija. Kritično spremlja/zaznava problematiko FFS, ki ji prej, zaradi pomanjkljivega znanja, ni namenjal pozornosti.    Prenosljive spretnosti. Seznanijo se z osnovno domačo in tujo literaturo s področja FFS in alternativnih načinov zatiranja škodljivih organizmov, prav tako s strokovnjaki, ki v Sloveniji delujejo na omenjenih področjih. Usposobijo se za ustno in pisno poročanje, ko analizirajo izbrani strokovni problem, vezan na uporabo/neuporabo FFS. | Knowledge and understanding:  Students learn about the historical development of PPPs and their alternatives, as well as the role of both groups of plant protection in the past and today. They are acquainted with the types of plant damage caused by different harmful organisms and the environmental consequences of unsuitable use of PPPs. The students understand the mechanisms of activity of the biological control agents and other indirect measures of pest control in diminishing their economic importance.    Use of knowledge: The students acquire deep knowledge on the benefits and problems of the PPPs use and on alternative methods for controlling harmful organisms. They are able to perform they own investigations and they are qualified to offer professional support to the interested institutions and food producers.    Reflection: Students are able to critically percept the problems of the PPPs, which they were not able to do earlier, because of insufficient knowledge.    Skills: Students are acquainted with the basic domestic and foreign professional literature from the field of PPPs and their alternatives as well with the Slovenian specialists from the mentioned fields. They are qualified for oral or written reporting, when analyzing the scientific problem connected with the use/unuse of PPPS. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja, seminarske vaje, laboratorijske vaje, samostojno delo. | Lectures, seminar exercises, laboratory exercises, individual work. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Pisni izpit | 70,00 % | Written exam |
| Samostojno delo študenta | 30,00 % | Individual work of the student |
| Pogoja za opravljanje študijskih obveznosti – pisnega izpita: prisotnost na laboratorijskih vajah, zagovor seminarske vaje |  | Conditions for performing study obligations - written exam: practicals participation, seminar exercises performed |

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| Ocenjevalna lestvica: | Grading system: |
| 5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10 | 5 - 10, a student passes the exam if he is graded from 6 to 10 |

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| Reference nosilca/Lecturer's references: |
| NOVLJAN, Monica, BOHINC, Tanja, KREITER, Serge, DÖKER, Ismail, **TRDAN, Stanislav**. 2023. The indigenous species of predatory mites (Acari: Phytoseiidae) as biological control agents of plant pests in Slovenia. Acarologia, 63, 4: 1048-1061. ISSN 0044-586X. https://www1.montpellier.inra.fr/CBGP/acarologia/article.php?id=4653, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=151622. [COBISS.SI-ID 168199939].  BATISTIČ, Luka, BOHINC, Tanja, HORVAT, Aleksander, KOŠIR, Iztok Jože, **TRDAN, Stanislav.** 2023. Laboratory Investigation of Five Inert Dusts of Local Origin as Insecticides against the Colorado Potato Beetle (Leptinotarsa decemlineata [Say]). Agronomy, 13, 4, art. 1165: 21 str., ISSN 2073-4395. https://www.mdpi.com/2073-4395/13/4/1165, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=145394. [COBISS.SI-ID 149888259].  **TRDAN, Stanislav**, LAZNIK, Žiga, BOHINC, Tanja. 2023. Native natural enemies of plant pests in Slovenia with an emphasis on species suitable for mass rearing. Journal of insect science, 23, 5, art. 3, 12 str., ISSN 1536-2442. https://doi.org/10.1093/jisesa/iead015, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=151594. [COBISS.SI-ID 167970563]. |

# FIZIOLOGIJA V POSEBNIH RAZMERAH Učni načrt predmeta/Course syllabus

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| Predmet: | FIZIOLOGIJA V POSEBNIH RAZMERAH |
| Course title: | Physiology under special conditions |
| Članica nosilka/UL Member: | UL MF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020642 |
| Koda učne enote na članici/UL Member course code: | 95 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 10 | 20 |  |  | 60 | 160 | 10 |

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| Nosilec predmeta/Lecturer: | Uroš Kovačič |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis na doktorski študij. | Enrollment in the doctoral studies. |

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| Vsebina: | Content (Syllabus outline): |
| V okviru predmeta se bodo študenti seznanili z mehanizmi delovanja človeškega organizma v razmerah, ki se lahko pojavijo v kriznih okoliščinah. Po krajšem uvodu v človeško fiziologijo, bodo študentje obravnavali naslednje teme: odziv na stres, krvavitev, šok , znižana telesna temperatura, zvečana telesna temperatura, stradanje, vnetje, hipoksije, spremembe zračnega pritiska, dehidracija, zmečkaninski sindrom, opekline, pnevmotoraks, bolečina, zastrupitev z organofosfati, motnje zavesti, električna poškodba, obsevalna bolezen, motnje prebave. | Students will get insight into the mechanisms underlying functioning of the human organism under normal conditions and in the circumstances met at disasters of various causes. After short introduction into the human physiology following themes are presented and discussed: response to stress, bleeding, shock, decreased body temperature, increased body temperature, starvation, inflammation, hypoxia, alterations in atmospheric pressure, dehydration, crush syndrome, burns, pneumothorax, pain, organophosphate poisoning, impaired consciousness, electricity-related accidents, radiation-related impairements, disorders of the gastrointestinal tract. |

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| Temeljna literatura in viri/Readings: |
| Temeljna literatura:  - Grubič Z in sod.: študijsko gradivo, prilagojeno izvajanju vsake posamične teme  Dodatna literatura:  Izbrana poglavja iz naslednjih učbenikov:  - Patofiziologija s temelji fiziologije (2002; tretja, popravljena in dopolnjena izdaja), Ljubljana, Medicinska fakulteta, Inštitut za patološko fiziologijo  v pripravi je nova izdaja učbenika – izšla bo predvidoma v marcu 2014)  - Temelji patološke fiziologije (2011); 2. izdaja, Ljubljana, Medicinska fakulteta, Inštitut za patološko fiziologijo.  - Seminarji iz patološke fiziologije (2012); 2. izdaja, Ljubljana, Medicinska fakulteta, Inštitut za patološko fiziologijo |

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| Cilji in kompetence: | Objectives and competences: |
| Predmet je zasnovan tako, da bodo diplomanti drugostopenjskih programov s področij kot so tehnika, družboslovje in naravoslovje, in ki nimajo predznanja iz fiziologije, dobili vpogled v delovanje človeškega organizma v normalnih in patoloških razmerah. Glede slednjih bodo obravnavane predvsem teme, ki so ožje povezane s kriznimi razmerami. | Program of this course is adjusted in order to be comprehensive also for the students graduating from humanities or natural and technical sciences, who do not have prior knowledge in physiology. Students will get insight into the functioning of the human organism under normal and pathological conditions. As for the latter, diseases and disorders closely related to the various disasters are selected. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Predmet omogoči študentu razumevanje patoloških sprememb v človeškem organizmu, ki jih povzročijo krizna stanja in njihovi učinki oziroma vplivi. | Course will enable students to understand pathological changes in the human organism caused by the conditions met at various disasters. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Seminarji. | Seminars. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Pisni test | 100,00 % | Written exam |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| **doc. dr. Uroš Kovačič**  Kovačič U, Sketelj J, Bajrović FF (2009). Age-related differences in the reinnervation after peripheral nerve injury. Review. V: Essays on peripheral nerve repair and regeneration, Edited by Stefano Geuna; Pierluigi Tos and Bruno Battiston. Int Rev Neurobiol. 2009; 87:465-482. Amsterdam: Academic Press, cop. doi: 10.1016/S0074-7742(09)87026-8. ISSN 0074-7742. ISBN: 978-0-12-375084-6. [COBISS.SI-ID 26737369]  Kovačič U, Žele T, Tomšič M, Sketelj J, Bajrović F (2012). Influence of breaching the connective sheaths of the donor nerve on its myelinated sensory axons and on their sprouting into the end-to-side coapted nerve in the rat. Journal of neurotrauma. 29 (18): 2805-2815.  Slabe Damjan, Tatar Dajana, Jereb Gregor, Kovačič Uroš (2018). Uporaba dvostranske metalizirane folije za oskrbo amputiranega dela telesa = The use of space blankets in the first aid treatment of an amputated body part. Ujma : revija za vprašanja varstva pred naravnimi in drugimi nesrečami, ISSN 0353-085X, 2018, št. 32, str. 194-199, ilustr. <http://www.sos112.si/slo/tdocs/ujma/2018/194-199.pdf>. [COBISS.SI-ID 5533291] |

# GEOKEMIJA OKOLJA Učni načrt predmeta/Course syllabus

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| Predmet: | GEOKEMIJA OKOLJA |
| Course title: | Environmental Geochemistry |
| Članica nosilka/UL Member: | UL NTF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020643 |
| Koda učne enote na članici/UL Member course code: | 21 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 25 | 35 |  |  |  | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Nina Zupančič |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij. Predznanje temeljev kemije in geologije. | Inscription to PhD programe. Basic knowledge of geology and chemistry. |

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| Vsebina: | Content (Syllabus outline): |
| - geokemija atmosfere in precipitatov, kisli dež, ozonska plast in nekateri onesnaževalci zraka,  - globalni ogljikov cikel, geokemija stabilnih izotopov, globalna klima: preteklost, sedanjost, prihodnost,  - energija, tehnologija, naravni viri,  - težke prvine kamninah, tleh in vodah – naravne in nenaravne porazdelitve, (bio)geokemija Fe-Mn,  - fosfati in nitrati v okolju,  - kemično preperevanje, nastanek tal, geokemija glin,  - jezera, reke – preobremenjenost s hranili, osiromašenja s kisikom, urbane odplake, rudniške vode,  - oceani, kemija morja, primarna produkcija, morski sedimenti – zapis globalne zgodovine okolja, geokemija lahkih izotopov,  - geomedicina. | - Geochemistry of atmosphere and its precipitates, acid rain, ozone layer and selected air pollutants.  - The global carbon cycle, stable isotope geochemistry, global climate: past, present, future.  - Energy, technology, natural resources.  - Heavy elements in rocks, soils and waters - natural and unnatural distribution, (bio) geochemistry of Fe-Mn.  - Phosphates and nitrates in the environment.  - Chemical weathering, soil formation, clay geochemistry.  - Lakes, rivers - overload of nutrients, oxygen depletion, urban sewage, mine waters.  - Oceans, marine chemistry, primary production, marine sediments - record of global history of environmental, light isotope geochemistry.  - geomedicine. |

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| Temeljna literatura in viri/Readings: |
| Izbrana poglavja iz knjig/Selected chapters from books:  - Montgomery, C. W. 2006: Environmental geology. Mc Graw Hill, 540 pp., Boston.  - Li Y. H. 2000: A compendium of geochemistry. Princeton University Press, 475 str., Princeton.  - Albarède, F. 1995: Introduction to geochemical modelling. Cambridge University Press, 543 str., Cambridge.  - Hill, M. K. 2004: Understanding environmental pollution. Cambridge, 467 pp.  - Strangeways, I. 2003: Measuring teh natural environment. Cambridge, 534 pp.  - Wright, D. A. & Welbourn, P. 2002: Environmentla toxicology. Cambridge, 630 pp.   Revijalni članki s področja/Journal papers from the topics |

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| Cilji in kompetence: | Objectives and competences: |
| Študentje spoznajo naravne geokemične procese na Zemljini površini in v notranjosti Zemlje, ki vplivajo na porazdelitev prvin na površini (kamnine, sedimenti, tla, voda) ter človeške vplive na okolje, ki te porazdelitve spreminjajo. Seznanijo se z metodami, rezultati in interpretacijo lokalnih in globalnih geoloških pojavov iz kemičnega vidika, interakcijo naravno in antropogeno spremenjega zraka, hidrosfere in trdne snovi s kamninami, sedimenti in tlemi. | Students learn about the natural geochemical processes of the Earth's surface and interior, which are affecting the distribution of elements on the surface (rocks, sediments, soil, water) and human impacts on the environment, which change these distribution. Get acquainted with the methods, results and interpretation of local and global geological phenomena from the chemical point of view, interaction of naturally and anthropogenically changed air, hydrosphere and solids with rocks, sediments and soils. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Razumevanje ciklov posameznih geogeno-antropogenih prvin. | Knowledge and understanding:  Understanding of selected geogene- anthropogene cycles of elements. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja, seminarji in osebne konzultacije. | Lectures, seminars and personal consultations. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Predstavitev seminarske naloge | 40,00 % | Presentation of seminar work |
| Ustni izpit | 60,00 % | Oral examination |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| 1. **ZUPANČIČ, Nina**. Lead contamination in the roadside soils of Slovenia. Environ. geochem. health, 1999, no. 1, vol. 21, 37-50.  2. **ZUPANČIČ, Nina**, ŠEBELA, Stanka, MILER, Miloš. Mineralogical and chemical characteristics of black coatings in Postojna cave system. Acta carsol*.*, 2011, vol. 40, no. 2, 307-317  3**.** SKOBE, Simona, MANIATIS, Yannis, DOTSIKA, E., TAMBAKOPOULOS, D., **ZUPANČIČ, Nina**. Scientific charaterization of the Pohorje marbles, Slovenia. Archaeometry, 2010, vol. 52, issue 2, 177-190. |

# GEOLOGIJA OKOLJA Učni načrt predmeta/Course syllabus

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| Predmet: | GEOLOGIJA OKOLJA |
| Course title: | Environmental Geology |
| Članica nosilka/UL Member: | UL NTF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020644 |
| Koda učne enote na članici/UL Member course code: | 22 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 25 | 35 |  |  |  | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Nina Zupančič |

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| Izvajalci predavanj: | Andrej Šmuc |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij. | Inscription to PhD programe. |

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| Vsebina: | Content (Syllabus outline): |
| Pregled okolja na Zemlji  - Minerali in kamnine.  - Tektonika plošč.  - Potresi.  - Vulkani.  - Poplave.  - Plazovi.  - Geologija in klima: ledeniki, puščave in globalni klimatski trendi.  - Viri surovin: voda, mineralne surovine, energijske surovine – fosilna goriva in alternativni viri.  - Odlagališča odpadkov.  - Onesnaženje tal, vode in zraka. | Overview of the Earth’s environment  - Minerals and rocks.  - Plate tectonics.  - Earthquakes.  - Volcanoes.  - Floods.  - Landslides.  - Geology and climate: glaciers, deserts and global climate trends.  - Sources of raw materials: water, mineral resources, energy - fossil fuels and alternative sources.  - Waste dumps.  - Contamination of soil, water and air. |

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| Temeljna literatura in viri/Readings: |
| Izbrana poglavja iz knjig/Selected chapters from books:  - Montgomery, C. W. 2006: Environmental Geology. Mc Graw Hill, 540 pp., Boston.  - Keller, E. A. 1999: Environmental Geology (8th Edition). [Prentice-Hall, Inc.](http://www.prenhall.com/), 562 pp., New Jersey.  - Foley, D., McKenzie, G. D. & Utgard, R. O. 1999: Investigations in Environmental Geology (2nd Edition) [Prentice-Hall, Inc.](http://www.prenhall.com/), 365 pp.., New Jersey.  - Perry, C., & Taylor, K. 2007: Environmental Sedimentology. Blackwell Publishing, 441 pp. Malden.  Revijalni članki s področja/Journal papers from the topics. |

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| Cilji in kompetence: | Objectives and competences: |
| Študent se seznani z osnovami geologije (minerali, kamnine, zgradba Zemlje), spozna delovanje endogenih (tektonika plošč, potresi, vulkanizem) in eksogenih (preperevanje, erozija, transport, sedimentacija) procesov, ki oblikujejo Zemljino površje ter z nastankom, razporeditvijo in dostopnostjo virov koristnih surovin (kovinske, nekovinske, organske), ravnanjem z njimi ter vplivi geoloških faktorjev na onesnaženje okolja in človekovo zdravje. | Students learn about the basics of geology (minerals, rocks, structure of the Earth), realizes the action of endogenous (plate tectonics, earthquakes, volcanism) and exogenous (weathering, erosion, transportation, sedimentation) processes that shape Earth's surface; formation, distribution and accessibility of resources of raw materials (metals, non-metallic, organic), their handling and impacts of geological factors on contamination of the environment and human health. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Razume delovanje sistemov na Zemlji ter zna geološko znanje interdisciplinarno uporabiti. | Knowledge and understanding:  Understands functioning of the Earth’s systems and can inter-disciplinary use geological knowledge. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja, seminarji in osebne konzultacije. | Lectures, seminars and personal consultations. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Predstavitev seminarske naloge | 40,00 % | Presentation of seminar work |
| Ustni izpit | 60,00 % | Oral examination |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| **Nina Zupančič**  1. DOBNIKAR, Meta, DOLENEC, Tadej, **ZUPANČIČ, Nina**, ČINČ JUHANT, Breda. The Karavanke Granitic Belt (Slovenia) - a bimodal Triassic alkaline plutonic complex. Schweiz. Mineral. Petrogr. Mitt., 2001, bd. 81, str. 23-38.  2. MÁRTON, Emö, TRAJANOVA, Mirka, **ZUPANČIČ, Nina**, JELEN, Bogomir. Formation, uplift and tectonic integration of a Periadriatic intrusive complex (Pohorje, Slovenia) as reflected in magnetic parameters and palaeomagnetic directions. *Geophys. j. int. (Print)*, 2006, vol. 167, is. 3, str. 1148-1159.  3. JARC, Simona, **ZUPANČIČ, Nina**. A cathodoluminescence and petrographical study of marbles from the Pohorje area in Slovenia. *Chem. Erde*, 2008. |

# GEOLOGIJA ŽIVLJENSKEGA OKOLJA Učni načrt predmeta/Course syllabus

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| Predmet: | GEOLOGIJA ŽIVLJENSKEGA OKOLJA |
| Course title: | Geology of living environment |
| Članica nosilka/UL Member: | UL NTF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020645 |
| Koda učne enote na članici/UL Member course code: | 23 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 25 | 30 |  |  |  | 195 | 10 |

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| Nosilec predmeta/Lecturer: | Nina Zupančič |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective course |

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| --- | --- | --- |
| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij. | Inscription to PhD programe. |

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| Vsebina: | Content (Syllabus outline): |
| Minerali kot nosilci esencialnih in toksičnih prvin  - Struktura in stabilnost mineralov in kamnin.  - Biološka razpoložljivost mineralov.  - Tvorba biomineralov.  - Naravni : antropogeni viri kemijskih prvin.  - Načini vnosa prvin v žive organizme.  - Pomanjkanje in toksičnost prvin.  - Aktualni primeri obolevnosti zaradi geogenih dejavnikov. | Minerals as carriers of essential and toxic elements  - Structure and stability of minerals and rocks.  - The bioavailability of minerals.  - Formation bio-minerals.  - Natural: anthropogenic sources of chemical elements.  - Ways of elements input s in living organisms.  - Lack and toxicity of elements.  - Current examples of illness due to geogene factors. |

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| Temeljna literatura in viri/Readings: |
| Izbrana poglavja iz knjig/Selected chapters from books:  -Sahai, N., Schoonen, M.A.A, 2006: Medical mineralogy and geochemistry. MSA, Virginia, 332 p.p.  - Selinus, O. (ed.),2000: Essentials of medical geology. Elsevier, 545 p.p.  - Revijalni članki s področja/Journal papers from the topics. |

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| Cilji in kompetence: | Objectives and competences: |
| Študent se seznani z geološkimi materiali (minerali, kamnine), ki gradijo ali preko hrane, vode in zraka vstopajo v človeško telo in so nosilci različnih kemijskih prvin. Seznanijo se z njihovo strukturo, sestavo, razpadom, načinom vstopanja v tla, vodo in zrak ter njihovim obnašanjem v transportnih medijih. | Students learn about geological materials (minerals, rocks) that build or through food, water and air enter the human body and are carriers of different chemical elements. They learn about their structure, composition, dissolution, ways of entering the ground, water and air as well as their behavior in the transport media. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Razume vpliv geoloških dejavnikov življenjskega okolja na živa bitja in je sposoben sprejemanja varovalnih ukrepov. | Knowledge and understanding:  Understands the impact of geological factors of the environment on living organisms and is capable of taking protective measures. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja, konzultacije, laboratorijske vaje in izdelava seminarske naloge v okviru seminarskih vaj. | Lectures, consultations, laboratory excersises and seminar work in frame of seminar. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Izdelana seminarska naloga | 40,00 % | Presentation of seminar work |
| Ustni izpit | 60,00 % | Oral examination |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| **ZUPANČIČ, Nina**. Lead contamination in the roadside soils of Slovenia. Environ. geochem. health, 1999, no. 1, vol. 21, str. 37-50.  **ZUPANČIČ**, **Nina**, PIRC, Simon. Calcium distibution in soil and stream sediments in Istria Croatia) and the Slovenian littoral. J. geochem. explor.. [Print ed.], 1999, vol. 65, str. 205-218, ilustr.  **ZUPANČIČ, Nina**. The influence of vegetation type on metal content in soils = vpliv vrste vegatacije na vsebnost težkih kovin v tleh. *RMZ-mater. geoenviron.*, 2012, vol. 59, no. 2/3, str. 229-244. |

# GORIVA, ZAGOREVANJE IN OKOLJE Učni načrt predmeta/Course syllabus

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| Predmet: | GORIVA, ZAGOREVANJE IN OKOLJE |
| Course title: | Fuels, Combustion and Environment |
| Članica nosilka/UL Member: | UL FS |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020646 |
| Koda učne enote na članici/UL Member course code: | 24 |

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| --- | --- | --- | --- | --- | --- | --- |
| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 30 | 30 |  |  |  | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Andrej Senegačnik |

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| Izvajalci predavanj: | Tomaž Katrašnik |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet /Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij. Predznanje s področja tehnike ali naravoslovja. | Enrolment in doctoral studies. Background in engineering or science. |

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| Vsebina: | Content (Syllabus outline): |
| Primarni energetski viri v svetu in v naši državi, delež fosilnih goriv pri preskrbi z energijami, prognoze za bodočnost, možnosti oskrbe z energijo v Sloveniji.  Sestava in lastnosti trdnih, tekočih in plinastih goriv ter njihove kemične in fizikalne karakteristike. Skladiščenje, transport in priprava za zgorevanje. Vrste kurjav za premoge, kvaliteta mletja, kurjave za kapljevita in plinasta goriva in regulacija zgorevalnega zraka.  Osnovni zakoni pri zgorevanju. Reakcije pri zgorevanju in temperature. Stehiometrija zgorevanja za trdna, tekoča in plinasta goriva. Procesi vžiganja, pogoji, značilnosti in meje samovžiga. Produkti zgorevanja, sestava dimnih plinov, razmernik in presežek zraka. Zgorevalna toplota in kurilnost. Kontrola zgorevanja, merjenje sestave dimnih plinov in postopki za nadzor in krmiljenje kurjenja.  Nastajanje polutantov pri zgorevanju. Nepopolno zgorevanje, ogljikov monoksid in nezgoreli ogljikovodiki. Dušikovi oksidi, ukrepi za preprečevanje nastajanja NOX, low-NOX kurjave, primeri uspešnih rekonstrukcij. Žveplovi oksidi in kisline, mokri in suhi postopki za razžvepljevanje. CO2 in efekti tople grede, procesi za lovljenje in shranjevanja ogljikovega dioksida. Emisijski kuponi, trajnostna goriva, trajnostni razvoj.  Vplivi na okolje pri izkopavanju premoga za kurjenje v termoelektrarnah, predstavitev ukrepov za preprečevanje emisij pri izkopu in možnosti za sanacijo okolja zaradi izkopavanja premoga in odlaganja pepela in žlindre.  Biomasa, lesni ostanki in biogoriva kot primarni energetski vir, njihova priprava za zgorevanje, vrste zgorevalnih naprav. Etika uporabe biogoriv in ovrednotenje pozitivnih efektov pri njihovi uporabi. Napredne tehnologije za pridobivanje toplote in električne energije in okoljevarstveni vidiki. | Primary energy sources in the world and in Slovenia, share of fossil fuels in the present supply, future prognosis, future energy supply of Slovenia. Structure and properties of solid, liquid and gaseous fuels and their chemical and physical characteristics. Storage, transport and preparation for combustion. Types of coal heating, quality of grinding, use of liquid and gaseous fuels, combustion control. The basic laws of combustion. Reactions and combustion temperature. Stoichiometry of combustion of solid, liquid and gaseous fuels. Ignition processes, conditions, characteristics and limits of self-ignition. Products of combustion, flue gas composition, and excess air ratio. Heat of combustion and calorific value. Control of combustion, flue gas composition measurement and procedures for the control of burning. Formation of pollutants, incomplete combustion, carbon monoxide and unburned hydrocarbons. Nitrogen oxides, measures to prevent NOX, low-NOX heating, examples of successful reconstructions. Sulphur oxides and acid, wet and dry desulphurisation processes. CO2 and the greenhouse effect, the processes for capturing and storing carbon dioxide. Allowances sustainable fuels, sustainable development. The environmental impacts of coal mining for burning in power plants, the presentation of mitigation actions in the excavation and the potential for environmental remediation of coal mining and disposal of ash and slag. Biomass, biofuels and wood waste as a primary energy source, their preparation for combustion, types of combustion sources. The ethics of biofuels and evaluation of the positive effects of their use. Advanced technologies for the production of heat and electricity and environmental aspects. |

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| Temeljna literatura in viri/Readings: |
| [1] J. Oman, Generatorji toplote, Fakulteta za strojništvo, 2005, ISBN - 961-6238-97-3, COBISS.SI-ID – 222144256  [2] I. Glassman, Combustion, 3rd ed. Academic Press, 1996, ISBN - 0-12-285852-2, COBISS.SI-ID - 5466139  [3] D.A. Tillman, N.S. Harding, Fuels of opportunity : characteristics and uses in combustion systems,        Elsevier, 2004, ISBN - 0-08-044162-9, COBISS.SI-ID – 26042373  [4] J. Warnatz, U. Mass, R.W. Dibble, Combustion : physical and chemical fundamentals, modeling and simulation, experiments, pollutant formation, 3rd ed., Springer, 2001, ISBN - 3-540-67751-8, COBISS.SI-ID - 23305989  [5] A.H. Lefebvre, D.R. Ballal, Gas turbine combustion : alternative fuels and emissions, 3rd ed. CRC press, 2010, ISBN - 978-1-4200-8604-1, COBISS.SI-ID – 11708699  [6] K. Schofield, Combustion emissions : formation, reaction, and removal of trace metals in combustion products, Academic Press, 2020, ISBN - 978-0-12-819126-2, COBISS.SI-ID - 147985923 |

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| Cilji in kompetence: | Objectives and competences: |
| Vsebina predmeta in način podajanja omogočita študentu da pridobi znanje o razpoložljivosti goriv, virov primarnih energij, lastnostih in kartakteristikah goriv z energetskega stališča in načinih uporabe posameznih vrst goriv. | Course content and way of subject delivery allow students to gain knowledge about the availability of fuels, sources of primary energy, fuels properties and characteristics from the energy point of view and various types of fuel uses. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Kandidati pridobijo sposobnost razumevanja mehanizmov zgorevanja in znanje o stehiometričnih izračunih produktov zgorevanja, o kontroli zgorevanja in krmiljenju zgorevalnih naprav, usposobljeni so za razpoznavanje pogojev nastanka škodljivih emisij in osvojijo znanje o postopkih za njihovo odpravo in preprečevanje nastajanja. Pridobijo strokovno suverenost in sposobnost za avtonomno raziskovanje na področju energetike in varstva okolja ter sposobnost interdisciplinarnega povezovanja znanja. | Knowledge and understanding:  Candidates acquire the ability to understand the mechanisms of combustion and knowledge of the stoichiometric calculations of combustion products, control of combustion and combustion control devices. They are trained for the identification of harmful emissions requirements and knowledge about procedures for their removal and prevention. An expert sovereignty and the ability to autonomously explore the field of energy and environmental protection, and the ability to interdisciplinary knowledge. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Seminar oz. predavanja pri večjem številu kandidatov. | Seminar work or lectures in a large number of candidates. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Izdelava in predstavitev, projektne naloge | 60,00 % | The preparation and presentation of a research paper |
| Ustni izpit | 40,00 % | Oral exam |

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| Ocenjevalna lestvica: | Grading system: |
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| --- |
| Reference nosilca/Lecturer's references: |
| **prof. dr. Tomaž Katrašnik**   1. KATRAŠNIK, Tomaž. An advanced real-time capable mixture controlled combustion model. *Energy*, ISSN 0360-5442. [Print ed.], Jan. 2016, vol. 95, str. 393-403. [COBISS.SI-ID [14407195](https://plus.cobiss.net/cobiss/si/sl/bib/14407195?lang=sl)]. 2. VIHAR, Rok, ŽVAR BAŠKOVIČ, Urban, SELJAK, Tine, KATRAŠNIK, Tomaž. Combustion and emission formation phenomena of tire pyrolysis oil in a common rail Diesel engine. *Energy conversion and management*, ISSN 0196-8904. [Print ed.], Oct. 2017, vol. 149, str. 706-721. [COBISS.SI-ID [15296027](https://plus.cobiss.net/cobiss/si/sl/bib/15296027?lang=sl)]. 3. SELJAK, Tine, KATRAŠNIK, Tomaž. Emission reduction through highly oxygenated viscous biofuels : use of glycerol in a micro gas turbine. *Energy*, ISSN 0360-5442. [Print ed.], Feb. 2019, vol. 169, str. 1000-1011. [COBISS.SI-ID [16434459](https://plus.cobiss.net/cobiss/si/sl/bib/16434459?lang=sl)]. 4. KRAVOS, Andraž, SELJAK, Tine, RODMAN OPREŠNIK, Samuel, KATRAŠNIK, Tomaž. Operational stability of a spark ignition engine fuelled by low H2 content synthesis gas: Thermodynamic analysis of combustion and pollutants formation. Fuel, Feb 2020, vol. 261, https://doi.org/10.1016/j.fuel.2019.116457 [COBISS.SI-ID 16879643]. 5. VIHAR, Rok, ŽVAR BAŠKOVIČ, Urban, KATRAŠNIK, Tomaž. Real time capable virtual NOx sensor for diesel engines based on a two-zone thermodynamic model. *Oil & gas science and technology*, ISSN 1953-8189, Apr. 2018, vol. 73, f. 1-17. [COBISS.SI-ID [16019995](https://plus.cobiss.net/cobiss/si/sl/bib/16019995?lang=sl)]   **izr. prof. dr. Andrej Senegačnik**   1. SENEGAČNIK, Andrej, STROPNIK, Rok, SEKAVČNIK, Mihael, RODMAN OPREŠNIK, Samuel, MLAKAR, Urška, IVANJKO, Štefan, STRITIH, Uroš. Integration of Renewable energy sources for sustainable energy development in Slovenia till 2050. *Sustainable cities and society*. [Spletna izd.]. Sep. 2023, vol. 96, str. 1-11, ilustr. ISSN 2210-6715. <https://www.sciencedirect.com/science/article/pii/S2210670723002792>, DOI: [10.1016/j.scs.2023.104668](https://dx.doi.org/10.1016/j.scs.2023.104668). [COBISS.SI-ID [153519363](https://plus.cobiss.net/cobiss/si/sl/bib/153519363)] 2. KUŠTRIN, Igor, JURJEVČIČ, Boštjan, SENEGAČNIK, Andrej. An electrostatic measuring technique for monitoring particle size in dilute pneumatic transport. *Thermal science*. 2020, iss. 6, pt. b, str. 4061-4073, ilustr. ISSN 0354-9836. <http://www.doiserbia.nb.rs/Article.aspx?ID=0354-98361900332K#.XcPxJtV7laQ>, DOI: [10.2298/TSCI190417332K](https://dx.doi.org/10.2298/TSCI190417332K). [COBISS.SI-ID [16889883](https://plus.cobiss.net/cobiss/si/sl/bib/16889883)] 3. KUŠTRIN, Igor, SENEGAČNIK, Andrej. Hypothetical replacement of Slovenian coal-fired thermal power plants with photo-voltaic pumped-storage hydroelectric power plant. V: LAKOVIĆ-PAUNOVIĆ, Mirjana (ur.), STOJILJKOVIĆ, Mladen (ur.). *SimTerm 2019 : energy - ecology - efficiency : proceedings*. 19th International Conference on Thermal Science and Engineering of Serbia, Sokobanja, October 22-25, 2019. Niš: Faculty of Mechanical Engineering, 2019. F. 127-137, ilustr. ISBN 978-86-6055-124-7. <http://simterm.masfak.ni.ac.rs/docs/proceedings/simterm_2019-proceedings.zip>. [COBISS.SI-ID [17001499](https://plus.cobiss.net/cobiss/si/sl/bib/17001499)] 4. STRITIH, Uroš, BUTALA, Vincenc, SENEGAČNIK, Andrej, SEKAVČNIK, Mihael, RODMAN OPREŠNIK, Samuel, IVANJKO, Štefan. Integration of Renewable energy sources and Forecast of development of electricity consumption in the Slovenian transmission network till 2050. V: KITANOVSKI, Andrej (ur.), POREDOŠ, Alojz (ur.). *ECOS 2016 : proceedings of the 29th International Conference on Efficiency, Cost, Optimisation, Simulation and Environmental Impact of Energy Systems, June 19. - 23. 2016, Portorož, Slovenia*. Ljubljana: Faculty of Mechanical Engineering, 2016. Datoteka p576\_integration of renewable energy sources ... (15 f.), ilustr. ISBN 978-961-6980-15-9. [COBISS.SI-ID [14711579](https://plus.cobiss.net/cobiss/si/sl/bib/14711579)] 5. SENEGAČNIK, Andrej, KUŠTRIN, Igor. Technology-related limitations during wood gas co-firing in industrial. V: EKINOVIĆ, Sabahudin (ur.), YALÇIN, Senay (ur.), VIVANCOS CALVET, Joan (ur.). *TMT 2015 : proceedings*. 19th International Research/Expert Conference "Trends in the Development of Machinery and Associated Technology", 22-23 July 2015, Barcelona, Spain. Zenica [etc.]: Faculty of Mechanical Engineering [etc.], 201 Str. 197-200, ilustr. TMT Proceedings, Year 19, no. 1. ISSN 1840-4944. [COBISS.SI-ID [14108955](https://plus.cobiss.net/cobiss/si/sl/bib/14108955)] |

# GOSPODARJENJE Z ODPADKI Učni načrt predmeta/Course syllabus

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| Predmet: | GOSPODARJENJE Z ODPADKI |
| Course title: | WASTE MANAGEMENT |
| Članica nosilka/UL Member: | UL FKKT |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski (od študijskega leta 2025/2026 dalje) | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020647 |
| Koda učne enote na članici/UL Member course code: | 25 |

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| --- | --- | --- | --- | --- | --- | --- |
| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 25 | 30 | 5 |  |  | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Andreja Žgajnar Gotvajn |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective course |

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| --- | --- | --- |
| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis na doktorski študijski program. Zaželena so naravoslovna oz. tehnična predznanja. | Fullfilment of entry conditions for the study. Basic knowledge in life and technical sciencies. |

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| Vsebina: | Content (Syllabus outline): |
| - Strateške usmeritve EU za trajnostno rabo virov in gospodarjenje z odpadki, mednarodne konvencije o nevarnih odpadkih, direktive EU, nacionalna zakonodaja na področju odpadkov, operativni programi.  - Katalogi odpadkov, nevarnostni razredi odpadkov, kriteriji za klasifikacijo odpadkov, metode za vzorčenje in karakterizacijo odpadkov, glavne vrste in izvori odpadkov.  - Trajnostni koncepti za ravnanje z viri in odpadki: preprečevanje nastajanja na viru, ločeno zbiranje, ponovna uporaba uporabnih strukturnih komponent in recikliranje, energetska izraba odpadkov.  - Načrti ravnanja z odpadki pri povzročiteljih; analize življenskega cikla (surovina-izdelek-odpadek).  - Predelava odpadkov: mehansko-biološka obdelava (kompostiranje, anaerobna predelava); fizikalno/kemijska solidifikacija; incineracija (sežig v namenskih pečeh), sosežig v industrijskih napravah; goriva iz odpadkov (plinasta, tekoča, trdna), piroliza in uplinjanje; termična obdelava v plazmi.  - Stabilizacija odpadkov z mehanskimi, biološkimi in termičnimi postopki (MBT) za potrebe odlaganja.  - Odlaganje preostankov odpadkov; vrste odlagališč, konstrukcija, izcedne vode, bioplin, nadzor, ravnanje z deponijskimi izcednimi vodami.  - Posebne vrste odpadkov (nevarni, bolnišnični, azbestni, radioaktivni, elektronski...)  - Načrtovanje organizacijskih in tehnoloških sistemov za zbiranje, predelavo in odstranjevanje odpadkov. | - Definitions of wastes, waste sources and types, waste management strategies, policies and action plans; waste hierarchy; legislation on waste (European, national).  - Waste lists and catalogues, waste classification according to various criteria (origin, hazard, physical form, chemical properties, recycling potential.  - Waste sampling and testing; standard methods for waste analysis and testing.  - Sustainable waste treatment: integral solutions; techniques for waste prevention and minimisation, separate waste collection, reuse, recovery and recycling.  - Waste treatment in order to promote recycling of material or energy: biological treatment (composting, anaerobic digestion); biomass utilisation.  - Detoxification, stabilisation, fixation, solidification of waste by physical-chemical methods.  - Mechanical-biological treatment (MBT) of mixed solid waste prior to disposal or incineration.  - Waste incineration: types of incinerators, design, construction and operation; gas treatment; monitoring; advanced thermal treatment: pyrolisis, gasification, plasma processes.  - Waste disposal at landfills: types of landfills; design, construction and operation;; monitoring, landfill leachate management and treatment options.  - Old landfills, contaminated sites remediation.  - Management of selected types of wastes: C&D waste, packaging waste, hospital waste, WEEE, industrial hazardous waste. |

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| Temeljna literatura in viri/Readings: |
| P.T.Williams: Waste treatment and disposal, Wiley, 2005 H.M.Freeman: Standard handbook of hazardous waste treatment and disposal, McGraw-Hill,1998 Revijalni in znanstveni članki s področja, tekoča periodika, učna gradiva s predavanj/Review and scientific papers in journals; lecture handouts. |

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| Cilji in kompetence: | Objectives and competences: |
| Študent nadgradi in poglobi znanja iz tematike predmeta. Razvije sposobnost za kritično primerjavo, izbiro in optimizacijo procesov, tehnologij in izboljšav v proizvodnih in drugih postopkih. Pridobi znanje za vrednotenje vpliva svojega dela  na lokalni in globalni ravni ter zavedanje o družbenem vplivu svojih odločitev v ustreznih ekonomskih, družbenih in zakonskih okvirjih. | Upgrading knowledge in topics of the subject, acquisition of skills for critical evaluation, selection and optimisation of processes and technologies. Assessing accomplished work in terms of the impacts on local and global environment; to solve actual  environmental problems within economical, social and legislative limits. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Razumevanje vsebin, navedenih v vsebini predmeta in zmožnost prenašanja in uporabe v praksi. | Understanding the aquired knowledge and its transfer and application in practice. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| - Predavanja - Samostojna izdelava izbrane projektne naloge. - Konzultacije | - Lectures, - Project work. - Consultations. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| ustni izpit | 50,00 % | Oral Exam |
| Projektna naloga s predstavitvijo in zagovorom | 50,00 % | Project work and its presentation. |

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| Ocenjevalna lestvica: | Grading system: |
| 5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10 | 5 - 10, a student passes the exam if he is graded from 6 to 10 |

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| Reference nosilca/Lecturer's references: |
| 1.  KORICA, Predrag, CIRMAN, Andreja, ŽGAJNAR GOTVAJN, Andreja. Comparison of end-of-life vehicles management in 31 European countries : a LMDI analysis. *Waste management & research*. [Print ed.]. 2022, vol. 40, iss. 8, str. 1156-1166. ISSN 0734-242X. [Repozitorij Univerze v Ljubljani – RUL](https://repozitorij.uni-lj.si/IzpisGradiva.php?id=135439), DOI: [10.1177/0734242X221074118](https://dx.doi.org/10.1177/0734242X221074118). [COBISS.SI-ID [95590147](https://plus.cobiss.net/cobiss/si/sl/bib/95590147)].  2.  ŽGAJNAR GOTVAJN, Andreja, KALČÍKOVÁ, Gabriela. Delamination of plastic-coated waste paper by enzymes of the white rot fungus Dichomitus squalens. *Journal of environmental management*, ISSN 0301-4797, Dec. 2018, vol. 228, str. 165-168, ilustr. <https://www.sciencedirect.com/science/article/pii/S0301479718309885>, doi: [10.1016/j.jenvman.2018.08.111](https://doi.org/10.1016/j.jenvman.2018.08.111). [COBISS.SI-ID [1537957827](https://plus.si.cobiss.net/opac7/bib/1537957827?lang=sl)].  3.  KORICA, Predrag, POŽGAJ, Đurđica, CIRMAN, Andreja, ŽGAJNAR GOTVAJN, Andreja. Decomposition analyses of the municipal waste generation and management in Croatian and Slovenian regions. *Journal of material cycles and waste management : official journal of the Japan Society of Waste Management Experts*. [Print ed.]. Jan. 2018, vol. 20, iss. 1, str. 254-265. ISSN 1438-4957. DOI: [10.1007/s10163-016-0573-1](https://dx.doi.org/10.1007/s10163-016-0573-1). [COBISS.SI-ID [1537314243](https://plus.si.cobiss.net/opac7/bib/1537314243?lang=sl). |

# GOZD IN OKOLJE Učni načrt predmeta/Course syllabus

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| Predmet: | GOZD IN OKOLJE |
| Course title: | FOREST AND ENVIRONMENT |
| Članica nosilka/UL Member: | UL BF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020648 |
| Koda učne enote na članici/UL Member course code: | 89 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 20 | 30 | 10 |  |  | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Andrej Bončina |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Slovenščina |
|  | Vaje/Tutorial: | Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študijski program.  Diplomanti biotehniških in naravoslovno matematičnih usmeritev. | Inscription to doctoral study program.  Master degree in life sciences or master degree in natural sciences. |

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| Vsebina: | Content (Syllabus outline): |
| Gozdi ekosistem in gozdni prostor  Gozd in okolje  Gozd in družba  Funkcije gozda  Trajnostno in sonaravno gospodarjenje  Večnamensko gospodarjenje  Načrtovanje in monitoring  Gozdovi in podnebne spremembe  Sestojna dinamika  Primeri (varovalni, mestni, zasebni gozdovi) | Forest ecosystem and forest land  Forest and environment  Forest and society  Forest ecosystem services  Sustainable and close-to-nature forest management  Multi-objective forest management  Forest planning and monitoring  Forests and climate change  Stand dynamics  Case studies (protection forests, urban forests, private forests) |

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| Temeljna literatura in viri/Readings: |
| Izbrani članki / selected articles. |

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| Cilji in kompetence: | Objectives and competences: |
| Študent dobi pregled nad gozdovi in njihovimi spremembami, seznani se s funkcijami gozda in koncepti upravljanja in načrtovanja. | The goals of the course are to get knowledge on forests and their changes, forest ecosystem services, and basic concepts of forest management and planning. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Znanje o gozdovih in gozdnem prostoru. Razumevanje funkcij gozda. Razumevanje trajnostnega in večnamenskega upravljanja gozdov. Razumevanje sestojne dinamike gozdov in ogroženosti gozdov. | Knowledge and understanding:  Knowledge on forest ecosystems and forest land. Understanding of forest ecosystem services. Understanding of multi-objective and sustainable forest management. Understanding of stand dynamics, main disturbances and dangers for forest ecosystems. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja (20 ur) in voden seminar (30 ur) potekajo v učilnici, vaje (10 ur) v računalniškem laboratoriju. | Lectures (20 h), seminars (30 h) in the classroom, lab exercises in the computer cabinet. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Ustni ali pisni izpit | 50,00 % | Oral or written examination |
| Seminar | 50,00 % | Seminar |

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| Ocenjevalna lestvica: | Grading system: |
| 5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10 | 5 - 10, a student passes the exam if he is graded from 6 to 10 |

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| Reference nosilca/Lecturer's references: |
| **prof. dr. Andrej Bončina:**  **BONČINA, Andrej**, KLOPČIČ, Matija, TRIFKOVIĆ, Vasilije, FICKO, Andrej, SIMONČIČ, Primož. Tree and stand growth differ among soil classes in semi-natural forests in Central Europe. Catena : an interdisciplinary journal of soil science, hydrology- geomorphology focusing on geology and landscape evolution. [Print ed.]. 2023, vol. 222, art. 106854, 13 str. ISSN 0341-8162. https://doi.org/10.1016/j.catena.2022.106854. [COBISS.SI-ID 135570691]  FICKO, Andrej, **BONČINA, Andrej**. Public attitudes toward environmental protection in the most developed countries: : the environmental concern Kuznets curve theory. Journal of environmental management. 2019, vol. 231, iss. 1, str. 968-981, ilustr. ISSN 0301-4797. https://doi.org/10.1016/j.jenvman.2018.10.087, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=114167, DOI: 10.1016/j.jenvman.2018.10.087. [COBISS.SI-ID 5248678]  **BONČINA, Andrej**, SIMONČIČ, Tina, ROSSET, Christian. Assessment of the concept of forest functions in Central European forestry. Environmental science & policy. 2019, vol. 99, str. 123-135, ilustr. ISSN 1462-9011. https://doi.org/10.1016/j.envsci.2019.05.009, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=114156, DOI: 10.1016/j.envsci.2019.05.009. [COBISS.SI-ID 5412262]  GUČEK, Matjaž, **BONČINA, Andrej**. Opredelitev gozdnih območij s poudarjeno zaščitno funkcijo = Identification of forest areas with emphasized protective function. Acta Silvae et Ligni. [Tiskana izd.]. 2018, [št.] 116, str. 15-31, ilustr. ISSN 2335-3112. <https://doi.org/10.20315/ASetL.116.2>. [COBISS.SI-ID 5236390] |

# HIBRIDNO MODELIRANJE OKOLJSKIH SISTEMOV Učni načrt predmeta/Course syllabus

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| Predmet: | HIBRIDNO MODELIRANJE OKOLJSKIH SISTEMOV |
| Course title: | HYBRID MODELLING OF ENVIRONMENTAL SYSTEMS |
| Članica nosilka/UL Member: | UL FGG |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020649 |
| Koda učne enote na članici/UL Member course code: | 26 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 30 | 30 |  |  |  | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Nataša Atanasova |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij.  Predznanje matematike, fizike ter drugih naravoslovnih in tehniških predmetov. | Enrolment to Ph.D. studies.  Knowledge of mathematics, physics and other natural sciences and technology subjects |

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| Vsebina: | Content (Syllabus outline): |
| osnovni okoljski modeli populacijske dinamike, nekataliziranih in encimatskih kemijskih reakcij, kompleksni bio-geo-kemijski modeli, hidrološki in hidravlični modeli  konceptualni in eksperimentalni modeli  modelna paradigma: konceptualni vs. empirični model  hibridno modeliranje z uporabo obeh pristopov  uvod v metode strojnega učenja iz podatkov  uporaba programa WEKA  priprava podatkov za dinamično modeliranje z nedinamičnimi orodji  priprava podatkov za podatkovno in procesno intenzivne rutine  knjižnice domenskega znanja  hibridno modeliranje  uporaba modelov za izračun scenarijev in tolmačenje le-teh | basic environmental and population dynamics models, noncatalytic and enzymatic chemical reactions, complex bio-geo-chemical models, hydrological and hydraulic models  conceptual and experimental models  modelling paradigm: conceptual vs. empirical models  hybrid modelling using both modelling approaches  introduction to machine learning from data, data mining  use of the WEKA program  data preparation for dynamic modelling with nondynamic tools  data preparation for data and process intensive routines  domain knowledge libraries  hybrid modelling  Use of models for scenario evaluation and their interpretation |

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| Temeljna literatura in viri/Readings: |
| Steven C. Chapra, 1996. Surface Water Quality Modeling  Jerald L. Schnoor, 1996. Environmental Modeling: Fate and Transport of Pollutants in Water, Air, and Soil. John Wiley & Sons, Inc.  ATANASOVA, Nataša, KOMPARE, Boris. Data Mining and EDSS. In: GARRIDO BASERBA, Manel (Ed.). Environmental Decision Support Systems (EDSSs) : a tool for wastewater management in the XXI century, (Novedar\_Consolider, Vol. 8). [Gerona]: Universitat de Girona, 2011, str. 117-144, ilustr. [COBISS.SI-ID 6055009]  Ian Witten, Eibe Frank and Mark Hall. Data Mining: Practical Machine Learning Tools and Techniques. Third Edition. January 2011, Morgan Kaufman Publishers (ISBN: 978-0-12-374856-0).  Revija / Journal Ecological Modelling  Revija / Journal Ecological Engineering  Elektronski viri / Electronic (internet) sources:  WEKA 3: Data Mining Software in Java  spletne strani e-revij / web based journals   svetovni splet vključujoč intranet FGG / web, including intranet of UL FGG |

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| Cilji in kompetence: | Objectives and competences: |
| **Cilji:**  seznanitev s temeljnimi bio-geo-kemijskimi procesi v okolju  modelirna paradigma – eksperiment vs. teorija, induktivni vs. deduktivni modeli  možnosti in metode združitve obeh modelirnih pristopov v hibridni pristop  orodja za hibridno modeliranje in priprava podatkov ter interpretacija rezultatov  **Kompetence**:  zna uporabljati rezultate okoljskih monitoringov, uporablja in išče po bazah podatkov,  razume osnovne principe (procese), ki opisujejo obravnavani okoljski sistem.  **zna izdelati, tolmačiti in uporabljati (1) empirične (statistične), (2) teoretične (konceptualne), predvsem pa (3) hibridne matematične modele,**  zna pripraviti osnutek inženirskih okoljskih rešitev in jih zna vrednotiti in zagovarjati. | **Objectives:**  basic bio-geo-chemical processes in the environment  modelling paradigm – experiment vs. theory, inductive vs. deductive models  possibilities and methods to combine both approaches into the hybrid approach  tools for hybrid modelling, data preparation and interpretation of the results  **Competences**:  to use the results of the environmental monitorings, to use and to search data bases,  to understand basic principles (processes) that describe the environmental system.  **to know how to elaborate, interpret and use (1) empirical (statistical), (2) theoretical (conceptual), and mostly (3) hybrid mathematical models,**  know how to draft environmental engineering solutions and to defend them. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  študent zna optimalno izkoristiti tako teoretično znanje kot izvedene meritve  zna zasnovati robusten, a uporaben model obravnavanega okoljskega sistema | Knowledge and understanding:  the student can optimally use the theory as well as the experimental measured data  can concept a robust, but useful model of the considered environmental system |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja, seminarske vaje za utrditev vsebine predavanj in s praktičnimi primeri dela, ter izdelava individualne seminarske naloge na izbrano temo. | Ex chatedra lectures, seminary work for building up the knowledge acquired by lectures and by practical hands-on work, elaboration of individual seminary work tailored to suit the student's background. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| (1) Zagovor seminarske naloge na izbrano temo ali | 50,00 % | (1) Defence of the seminary work on the selected subject, or |
| (2) Ustni izpit, ki se opravi takoj po zagovoru seminarske naloge. | 50,00 % | (2) Oral exam right after the defence of the seminary work. |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| (1) **ATANASOVA, Nataša**, TODOROVSKI, Ljupčo, DŽEROSKI, Sašo, KOMPARE, Boris. Application of automated model discovery from data and expert knowledge to a real-world domain: Lake Glumsø. *Ecol. model.*. [Print ed.], 2008, vol. 212, no. 1/2, str. 92-98.  (2) KOMPARE, Boris, LEVSTEK, Meta, **ATANASOVA, Nataša**. Dva pristopa k modeliranju čistilne naprave za odpadno vodo = Two approaches to wastewater treatment plant modelling. *Acta hydrotech. (Online)*. [Spletna izd.], 2006, letn. 24, št. 40, str. 45-64, ilustr. <ftp://ksh.fgg.uni-lj.si/acta/a40bk.pdf>.  (3) **ATANASOVA, Nataša**, DŽEROSKI, Sašo, KOMPARE, Boris, TODOROVSKI, Ljupčo, GAL, Gideon. Automated discovery of a model for dinoflagellate dynamics. Environmental Modelling & Software, ISSN 1364-8152. [Print ed.], 2011, vol. 26, no. 5, str. 658-668, doi: 10.1016/j.envsoft.2010.11.003. [COBISS.SI-ID 24367399]  (4) ŠKERJANEC, Mateja, **ATANASOVA, Nataša**, ČEREPNALKOSKI, Darko, DŽEROSKI, Sašo, KOMPARE, Boris. Development of a knowledge library for automated watershed modelingM. Environmental Modelling & Software, ISSN 1364-8152. [Print ed.], 2014, letn. 54, str. 60-72. http://www.sciencedirect.com/science/article/pii/S1364815213003204. [COBISS.SI-ID 6485601]  (5) **ATANASOVA, Nataša**, TODOROVSKI, Ljupčo, DŽEROSKI, Sašo, KOMPARE, Boris. Constructing a library of domain knowledge for automated modelling of aquatic ecosystems. *Ecol. model.*. [Print ed.], 2006, vol. 194, no. 1-3, str. 14-36, graf. prikazi. |

# Individualno raziskovalno delo 1 Učni načrt predmeta/Course syllabus

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| Predmet: | Individualno raziskovalno delo 1 |
| Course title: | Individual research work |
| Članica nosilka/UL Member: |  |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) | 1. letnik |  | obvezni |

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| Univerzitetna koda predmeta/University course code: | 0020665 |
| Koda učne enote na članici/UL Member course code: | 86 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
|  |  |  |  |  | 500 | 20 |

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| Nosilec predmeta/Lecturer: |  |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: |  |

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| Jeziki/Languages: | Predavanja/Lectures: |  |
|  | Vaje/Tutorial: |  |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
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| Vsebina: | Content (Syllabus outline): |
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| Temeljna literatura in viri/Readings: |
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| Cilji in kompetence: | Objectives and competences: |
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| Predvideni študijski rezultati: | Intended learning outcomes: |
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| Metode poučevanja in učenja: | Learning and teaching methods: |
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| Načini ocenjevanja: | Delež/Weight | Assessment: |
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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
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# Individualno raziskovalno delo 2 Učni načrt predmeta/Course syllabus

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| Predmet: | Individualno raziskovalno delo 2 |
| Course title: | Individual research work 2 |
| Članica nosilka/UL Member: |  |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) | 2. letnik |  | obvezni |

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| Univerzitetna koda predmeta/University course code: | 0020668 |
| Koda učne enote na članici/UL Member course code: | 65 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
|  |  |  |  | 1125 |  | 45 |

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| Nosilec predmeta/Lecturer: |  |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: |  |

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| Jeziki/Languages: | Predavanja/Lectures: |  |
|  | Vaje/Tutorial: |  |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
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| Vsebina: | Content (Syllabus outline): |
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| Temeljna literatura in viri/Readings: |
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| Cilji in kompetence: | Objectives and competences: |
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| Predvideni študijski rezultati: | Intended learning outcomes: |
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| Metode poučevanja in učenja: | Learning and teaching methods: |
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| Načini ocenjevanja: | Delež/Weight | Assessment: |
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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
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# Individualno raziskovalno delo 3 Učni načrt predmeta/Course syllabus

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| Predmet: | Individualno raziskovalno delo 3 |
| Course title: | Individual research work 3 |
| Članica nosilka/UL Member: |  |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) | 3. letnik |  | obvezni |

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| Univerzitetna koda predmeta/University course code: | 0138203 |
| Koda učne enote na članici/UL Member course code: | 67 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
|  |  |  |  | 1500 |  | 60 |

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| Nosilec predmeta/Lecturer: |  |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: |  |

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| Jeziki/Languages: | Predavanja/Lectures: |  |
|  | Vaje/Tutorial: |  |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
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| Vsebina: | Content (Syllabus outline): |
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| Temeljna literatura in viri/Readings: |
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| Cilji in kompetence: | Objectives and competences: |
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| Predvideni študijski rezultati: | Intended learning outcomes: |
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| Metode poučevanja in učenja: | Learning and teaching methods: |
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| Načini ocenjevanja: | Delež/Weight | Assessment: |
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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
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# Individualno raziskovalno delo 4 Učni načrt predmeta/Course syllabus

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| Predmet: | Individualno raziskovalno delo 4 |
| Course title: | Individual Research Work 4 |
| Članica nosilka/UL Member: |  |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) | 4. letnik |  | obvezni |

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| Univerzitetna koda predmeta/University course code: | 0138275 |
| Koda učne enote na članici/UL Member course code: | 345 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
|  |  |  |  | 1375 |  | 55 |

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| Nosilec predmeta/Lecturer: |  |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: |  |

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| Jeziki/Languages: | Predavanja/Lectures: |  |
|  | Vaje/Tutorial: |  |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
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| Vsebina: | Content (Syllabus outline): |
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| Temeljna literatura in viri/Readings: |
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| Cilji in kompetence: | Objectives and competences: |
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| Predvideni študijski rezultati: | Intended learning outcomes: |
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| Metode poučevanja in učenja: | Learning and teaching methods: |
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| Načini ocenjevanja: | Delež/Weight | Assessment: |
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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
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# INDUSTRIJSKA EKOLOGIJA Učni načrt predmeta/Course syllabus

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| Predmet: | INDUSTRIJSKA EKOLOGIJA |
| Course title: | INDUSTRIAL ECOLOGY |
| Članica nosilka/UL Member: | UL FKKT |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020651 |
| Koda učne enote na članici/UL Member course code: | 28 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 50 | 10 |  |  |  | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Andreja Žgajnar Gotvajn |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Diplomanti študijskih programov tehniških in naravoslovnih smeri. | Finished second level of university study in technical or natural sciences. |

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| Vsebina: | Content (Syllabus outline): |
| *Industrijska ekologija*: definicija, vzporednice med industrijskim procesom in biološkimi sistemi, povezava industrijskih sistemov z naravo in človekom, etika industrijske proizvodnje, etika in družbene posledice inženirskih odločitev, čistejša proizvodnja kot aplikacija industrijske ekologije v praksi za izboljšanje materialnih in energijskih izkoristkov.  *Orodja:* preprečevanje onesnaženja, eko-učinkovitost, čistejša proizvodnja, zelena topila, nadzor masnih in energijskih bilanc, matematično modeliranje procesov, multidisciplinaren pristop, koncept minimizacije, zamenjava surovin, optimizacija procesov, recikliranje, ponovna uporaba odpadkov in stranskih produktov, razgradnja, sekundarne surovine, ciklični procesi, koncept proizvodnje brez odpadkov, zakonodaja.  *Pristop k industrijski ekologiji:* integrirana strategija preventive, LCA (Life Cycle Assessment) in LCD (Life Cycle Design) s svojimi osnovnimi pristopi, ekooptimizacija proizvodnega procesa, ekooptimizacija produkta, učinkovit transport, učinkovita izraba energije, uporaba obnovljivih virov energije (sodobna hidro energija, biogoriva, solarna energija in energija vetra), uporaba obnovljivih surovin, učinkovita podpora industrijski proizvodnji (vodenje), ekonomska optimizacija, nenehen nadzor in izboljševanje sistema, eko parki, vključevanje lokalne in širše skupnosti pri sprejemanju odločitev, globalen pristop, koncept trajnosti.  *Uporaba koncepta industrijske ekologije na primeru:* primer industrije ali izdelka, relevanten času in slovenskemu prostoru. | * *Industrial Ecology:* definitions, comparison of industrial and natural biological processes, connections of industrial systems with nature and humans, ethics of industrial production, ethics and social aspects and consequences of engineering decisions, cleaner production as application of concept of industrial ecology for better material and energy efficiency. * *Tools:* pollution prevention, eco-efficiency, cleaner production, green solvents, mass and energy balances, mathematical modelling of processes, multidisciplinary approach, minimization, new materials, optimization of processes, recycling, reuse, resource usage, regeneration, recovery, remanufacturing, degradation, zero waste management, ethical investments, legislation. * *Industrial Ecology Approach:* Integrated pollution prevention, LCA (Life Cycle Assessment), LCD (Life Cycle Design) and their basic approaches and principles, eco-optimization of the production processes, eco-optimization of the products, efficient transport, efficient energy use, renewable energy sources (hydro energy, bio fuels, solar energy, wind energy), use of renewable raw materials, industrial production support and management, economic efficiency, monitoring and improvement of processes, eco parks, the meaning of local and global community in decision making, global approach, sustainability concept. * *The concept of industrial ecology: A case study, relevant to Slovenia.* |

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| Temeljna literatura in viri/Readings: |
| * Greadel, T.E., Allenby, B.R. *Industrial Ecology*, 2nd Ed., Prentice Hall. * Braden, A. R., Richards, D.J.: *The Greening of Industrial Ecosystems*, National Academy Press, 1994 * Revijalni in znanstveni članki s področja, tekoča periodika, učna gradiva s predavanj/Review and scientific papers in journals; lecture handouts. |

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| Cilji in kompetence: | Objectives and competences: |
| Študent nadgradi poznavanje koncepta industrijske ekologije in ga zna uporabiti na specifičnem področju. Razvije sposobnost za kritično primerjavo, izbiro in optimizacijo postopkov. Pridobi znanje za vrednotenje vpliva svojega dela  na lokalni in globalni ravni ter zavedanje o družbenem vplivu svojih odločitev v ustreznih ekonomskih, družbenih in zakonskih okvirjih. | The student improves his knowledge of the concept of industrial ecology and knows how to apply it in a specific field. Develops the ability to critically compare, select and optimize procedures. Acquire the knowledge to evaluate the impact of own work at the local and global level and to be aware of the social impact of decisions in the relevant economic, social and legal frameworks. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| |  | | --- | | Študent pridobi znanje za vrednotenje vpliva svojega dela na lokalni in globalni ravni ter zavedanje o družbenem vplivu svojih odločitev. Razvije sposobnost za kritično uporabo osvojenih znanj pri reševanju znanstvenih in družbenih problemov. | | |  | | --- | | The ability for critical approach regarding different advantages and disadvantages after application of new or improved technology/concept is developed. The knowledge for assessing impacts of his work at local and global level is being gained. Student develops awareness of importance of his decisions to broader society. The capability for critical application of gained knowledge during solving scientific, professional and other social problems is developed. | |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja, konzultacije, projektno delo. | Lectures, consultations, project work. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Ustni izpit | 50,00 % | Oral examination |
| Projektno delo s predstavitvijo in zagovorom | 50,00 % | Project with its presentation |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| 1. ROZMAN, Ula, KALČÍKOVÁ, Gabriela, MAROLT, Gregor, SKALAR, Tina, ŽGAJNAR GOTVAJN, Andreja. Potential of waste fungal biomass for lead and cadmium removal : characterization, biosorption kinetic and isotherm studies. *Environmental technology & innovation*. May 2020, vol. 18, str. 1-9, ilustr. ISSN 2352-1864. [COBISS.SI-ID [1538556611](https://plus.si.cobiss.net/opac7/bib/1538556611?lang=sl)]. 2. JEMEC KOKALJ, Anita, NOVAK, Sara, TALABER, Iva, KONONENKO, Veno, BIZJAK-MALI, Lilijana, VODOVNIK, Maša, ŽEGURA, Bojana, ELERŠEK, Tina, KALČÍKOVÁ, Gabriela, ŽGAJNAR GOTVAJN, Andreja, KRALJ, Slavko, MAKOVEC, Darko, ČALOUDOVA, Hana, DROBNE, Damjana. The first comprehensive safety study of Magnéli phase titanium suboxides reveals no acute environmental hazard. *Environmental science, Nano*, ISSN 2051-8153, 2019, vol. , iss. , 13 str., [in press], doi: [10.1039/C8EN01119B](https://doi.org/10.1039/C8EN01119B). [COBISS.SI-ID [4990031](https://plus.si.cobiss.net/opac7/bib/4990031?lang=sl). 3. BOŠEVSKI, Igor, ŽGAJNAR GOTVAJN, Andreja. The impact of single step ozonation of antibiotics-contaminated waste sludge to biogas production. *Chemosphere*. [Print ed.]. May 2021, vol. 271, str. 1-8, ilustr. ISSN 0045-6535. <https://www.sciencedirect.com/science/article/pii/S0045653520337255>, DOI:10.1016/j.chemosphere.2020.12952746960643J. |

# INFORMACIJSKI PRISTOPI V NARAVOSLOVJU IN TEHNIKI Učni načrt predmeta/Course syllabus

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| Predmet: | INFORMACIJSKI PRISTOPI V NARAVOSLOVJU IN TEHNIKI |
| Course title: | Information Approaches in Science and Technology |
| Članica nosilka/UL Member: | UL NTF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020650 |
| Koda učne enote na članici/UL Member course code: | 27 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 30 | 30 |  |  |  | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Danica Dolničar |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet /Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij.  Poznavanje znanstvene terminologije na področju doktorske naloge. | Enrollment in the doctoral study programme.  Familiarity with the scientific terminology in the field of doctoral thesis. |

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| Vsebina: | Content (Syllabus outline): |
| Merila informacijske pismenosti. Informacijski servisi, zbirni iskalniki in profesionalne bibliografske zbirke v naravoslovju in tehniki: zgradba, lastnosti, primeri za področje stroke. Iskalna sintaksa, napredne iskalne tehnike, priprava kompleksnih iskalnih profilov. Iskanje z dodano vrednostjo za prepoznavanje in interpretacijo trendov. Faktografske podatkovne zbirke za področje stroke: tipi, uporaba, dostopnost, iskalne strategije. Vrednotenje virov in informacij. Intelektualna lastnina: avtorske pravice, tipi licenc, patenti, blagovne znamke, zaščiteni modeli in vzorci – pregled, pomen, zbirke. Analiza in strukturiranje podatkov iz patentne literature na izbranih primerih naravoslovja in tehnologije.  Metode in orodja za pridobivanje raziskovalnih podatkov. Hevristične informacijske metode in tehnike za urejanje podatkov v sisteme. Vizualizacija raziskovalnih podatkov. Zaščita in varnost podatkov. Vsebinska zasnova, načrtovanje in izdelava projektnega/ doktorskega dela, znanstvenega članka, patenta.Metodološki pristopi in računalniška programska orodja za kvalitetno predstavitev rezultatov lastnega raziskovalnega dela na področju disertacije. | Information literacy standards. Information services, search engines and professional bibliographic database in science and technology: structure, properties, examples. Search syntax, advanced search techniques, preparation of advanced search profiles. . Value-added searches for the identification and interpretation of trends. Factual databases in the field of study: types, uses, access, search strategies. Evaluation of sources and information. Intellectual property: authors rights, licence types, patents, trademarks, industrial designs and models – applications, uses, databases. Analysis and structuring of information from patent literature in the selected fields of science and technology.  Methods and tools for obtaining research data. Heuristic information methods and techniques for organisation of data into systems. Visualization of scientific data. Safety and protection of data. Scientific design, contents and production of a project / dissertation, scientific paper, patent. Methodological approaches and software tools for presentation of the research results of the PhD thesis. |

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| Temeljna literatura in viri/Readings: |
| 1. 4) Danica Dolničar: študijska gradiva za študente v spletni učilnici   1) Watson, R. T. Data management : databases and organizations, 6th edition, e-Green Press & Prospect Press, 2013 (izbrana poglavja)  2) Corti L. et al.: Managing and sharing research data, 1st edition, London: Sage, 2014 (izbrana poglavja)  3) Kirk A. Data visualisation : a handbook for data driven design, London: Sage, 2016 (izbrana poglavja) |

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| Cilji in kompetence: | Objectives and competences: |
| Predmet študente neposredno podpira v načrtovanju in izdelavi doktorskega dela. Informacijske vsebine spoznavajo in študirajo na primerih svojih doktorskih tem.  **Splošne kompetence:**  informacijska pismenost,  obvladovanje zahtevnejših informacijskih strategij,  sposobnost interdisciplinarnega povezovanja informacijskih, naravoslovnih in tehnoloških vsebin.  **Predmetnospecifične kompetence**:  poglabljanje informacijske pismenosti in sposobnosti naravoslovno-tehničnega mišljenja,  usposobljenost za samostojno iskanje, zajemanje, vrednotenje in obdelavo znanstvenih in tehničnih informacij s primeri za področje varstva okolja,  suverena uporaba hevrističnih informacijskih metod za urejanje in sintezo informacij v znanje,  usposobljenost za informacijsko podprto načrtovanje raziskovalnega dela ter interpretacijo rezultatov. | The course is directly supporting students in the design and preparation of the doctoral dissertation. Information contents are studied and learnt on the cases of their PhD themes.  **General competences:**  Information literacy,  mastering of advanced information strategies,  ability of interdisciplinary combining information, scientific and technological contents.  **Subject-specific competencies:**  enhancing information literacy skills and scientific-technical thinking,  ability of autonomous data searching, acquisition, evaluation and processing of scientific and technical information, on examples of environmental protection,  sovereign application of heuristic information methods for data management and synthesis of information into knowledge,  capacity for information-aided design of research, and interpretation of research results. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Študenti se usposobijo za:  iskanje podatkov v podatkovnih bazah na področju naravoslovja in tehnike, vključno s sintakso zahtevnejših iskalnih profilov in uporabo metod dodane vrednosti za zasledovanje trendov temeljnih in aplikativnih raziskav;  analizo podatkov iz znanstvene in patentne literature z metodo strukturiranja podatkov v sisteme in z metodo informacijske gostote za sintezo razpršenih in fragmentiranih podatkov v znanje;  prepoznavanje hrbtenic postopkov, načrtovanje raziskovalnih hipotez, prepoznavanje nezasedenih niš za razvoj novih izdelkov in postopkov;  izdelavo informacijskih študij in zasnovo strukture doktorskega dela;  vsebinsko in časovno načrtovanje doktorskega dela in drugih raziskovalnih projektov;  urejanje, vizualizacijo in učinkovito predstavljanje rezultatov lastnih raziskav s pomočjo računalniške podpore z multimedijskimi orodji. | Knowledge and understanding:  Students become able to:  search data in the databases of science and technology, including advanced search syntax profiles, and usage of value-added methods for recognition of trends in basic and applied research;  analyse data from the scientific and patent literature, with applications of methods of structuring data into systems, and the information density, for the synthesis of dispersed and fragmented information into knowledge;  identify process backbones, design research hypotheses, identify unoccupied niches for the development of new products and processes;  prepare information studies, and define the contents and structure of the doctoral dissertation,  plan the scientific contents and timeframe of the doctoral dissertation and other research projects;  edit, visualize, and effectively present the research results by computer supported multimedia tools. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja potekajo v računalniško opremljeni učilnici - podprta so z multimedijskimi predstavitvami in dopolnjena z individualnim interaktivnim delom študentov.  Seminarske vaje potekajo v računalniški učilnici (delo v interakciji z učiteljem ter vodeno samostojno učenje), v povezavi s projektnim delom in razpravami. Zaključijo se z individualnim nastopom oz. zagovorom seminarskega dela podiplomskega študenta na študentski konferenci. | Lectures take place in a computer equipped classroom. They are supported by multimedia presentations and supplemented by interactive individual work of students.  Seminar tutorials take place in the computer lab (students work in interaction with the teacher and by guided self-learning), and are linked with PhD project work and discussions. Seminar works are individually presented and discussed at the students’ conference. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Aktivno sodelovanje pri predavanjih in seminarskih vajah, vključno z razpravami in sprotnim izpolnjevanjem delovnih listov. | 10,00 % | Active participation at lectures and tutorials, including discussions and completion of the study worksheets. |
| Izdelava in predstavitev projektne seminarske naloge. | 40,00 % | Preparation and presentation of the seminar project. |
| Ustni izpit iz teoretičnih vsebin. | 50,00 % | Oral exam in theoretical contents. |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| **Dolničar, D.**, Boh Podgornik, B. Factors influencing information literacy of university students. V: Waller, L., Waller, S. K. (ur.). *Higher Education - Reflections From the Field.* London: IntechOpen, 2023. Str. 1-16.  **Dolničar, D.**, Boh Podgornik, B. Undergraduate students' information literacy : challenges and opportunities. V: Nata, R. V. (ur.). *Progress in education*. New York: Nova Science Publishers, 2020. Str. 153-185.  **Boh Podgornik, B.**, Dolničar, D., Glažar, S. A. Does the information literacy of university students depend on their scientific literacy?. *Eurasia journal of mathematics, science and technology education*, 2017, vol. 13, iss. 7, str. 3869-3891.  Dolničar, D., **Boh Podgornik, B.,** Bartol, T. A. comparative study of three teaching methods on student information literacy in stand-alone credit-bearing university courses. *Journal of information science*, 2017, vol. 43, iss. 5, str. 601-614.  Šorgo, A., Bartol, T., Dolničar, D., **Boh Podgornik, B**. Attributes of digital natives as predictors of information literacy in higher education. *British journal of educational technology*, 2017, vol. 48, no. 3, str. 749-767.  **Boh Podgornik, B.**, Dolničar, D., Šorgo, A., Bartol, T. Development, testing, and validation of an information literacy test (ILT) for higher education. *Journal of the Association for Information Science and Technology*, 2016, vol. 67, iss. 10, str. 2420-2436. |

# INTERDISCIPLINARNI VIDIKI VAROVANJA OKOLJA NA PODEŽELJU Učni načrt predmeta/Course syllabus

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| Predmet: | INTERDISCIPLINARNI VIDIKI VAROVANJA OKOLJA NA PODEŽELJU |
| Course title: | The Interdisciplinary Aspects of Rural Areas Protection |
| Članica nosilka/UL Member: | UL BF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020652 |
| Koda učne enote na članici/UL Member course code: | 29 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 15 | 15 | 15 |  |  | 205 | 10 |

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| Nosilec predmeta/Lecturer: | Majda Černič Istenič |

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| Izvajalci predavanj: | Marina Pintar, Andrej Udovč |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet /Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij. | Enrollment in doctoral studies. |

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| Vsebina: | Content (Syllabus outline): |
| • Presoja učinkov različnih kmetijskih praks, kmetijske politike in okoljevarstvenih direktiv EU ter mednarodnih konvencije na področju varovanja okolja v kmetijstvu/na podeželju na varovanje podeželskega okolja (zavarovanih območij).  • Ekološke posledica delovanja transnacionalnih korporacij in globalizacije živilskega trga na podeželski prostor.  • Sociološki vidiki učinkov biotehnologij v pridelovanju živeža na podeželsko okolje (prednosti in tveganja).  • Triada enega zdravja.  • Varstvo vodnih virov v kmetijski krajini.  • Vloga ekološkega kmetijstva v varovanju narave, ohranjanju biodiverzitete in kulturne krajine.  • Prednosti in slabosti slovenskega kmetijstva in podeželja z vidika varovanja okolja. Izkušnje konkretnih razvojnih projektov na slovenskem podeželju in njihova kritična presoja.  • Nosilci/akterji varovanja okolja na podeželju v svetu in Slovenji – na državni in lokalni ravni - npr. podeželski prebivalci kot nosilci varovalnih funkcij ekosistemov, proizvajalci in distributerji fitofarmacevtskih sredstev, pridelovalci hrane in njeni potrošniki. Obveščenost, ozaveščenost, ravnanja in nadzor pri posegih v podeželski prostor.  • Vzgoja pridelovalcev in potrošnikov hrane ter obiskovalcev podeželja (npr. turistov) za varovanje naravnih virov. | • Assessment of the effects of various agricultural practices, agricultural and environmental policies of the EU directives and international conventions in the field of environmental protection in agriculture / rural areas in rural environmental protection (protected areas).  • Ecological consequences of transnational corporations and globalization of food market in the rural areas.  • Sociological aspects of the effects of food biotechnology for the rural environment (benefits and risks).  • One Health Triad.  • Protection of water resources in the agricultural landscape.  • The role of organic agriculture in nature conservation, conservation of biodiversity and cultural landscape.  • Advantages and disadvantages of Slovenian agriculture and rural in terms of environmental issues. Experience of concrete development projects in the Slovenian countryside and their critical assessment.  • Holders /actors of environmental protection in rural areas on the global and Slovenian level- at the state and local level – e.g. rural people as holders of protective functions of ecosystems, producers and distributors of plant protection products, food producers and its consumers. Information, awareness, treatment and control in interventions in rural areas.  • Raise the awareness of food producers and food consumers and rural visitors (e.g. tourists) for protection of natural resources. |

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| Temeljna literatura in viri/Readings: |
| **• Obvezna literatura/compulsory readings**  Dunlap, R. E., & Michelson, W. M. (2002) Handbook of environmental sociology. Westport (Conn.): Greenwood Press. 602 str. ISBN: 0-313-26808-8  Lowe, P., Clark, J., Seymour, S., & Ward, N. (1997) Moralizing the environment: countryside change, farming and pollution. London, Bristol: UCL Press: University College London, 224 str. ISBN: 1-85728-839-4.  Mander, Ü., Wiggering, H., Helming, K. 2007. Multifunctional Land Use. Meeting Future Demands for Landscape Goods and Services. Springer, Berlin, 421 s. ISBN 98-3-540-36762-8 (Izbrana poglavja).  Wiggering, H., Ende, H. P., Knierim, A., Pintar, M.I2010. Innovations in European rural landscapes. Heidelberg [etc.]: Springer, 161 str., ilustr. ISBN 978-3-642-04171-6. ISBN 978-3-642-04172-3 (zbrana poglavja).  • **Priporočena literatura/suggested readings**  Shultis, J.D. Paul A. W. (2006) Changing Conceptions of Protected Areas and Conservation: Linking Conservation, Ecological Integrity and Tourism Management. Journal of Sustainable Tourism 14(3):223–237.  Hanley, N. (ed.) 1991. Farming and the Countryside: An Economic Analysis of External Costs and Benefits. CAB International, Wallingford, 328 str. ISBN: 0 85198 713 3  Huylenbroeck, G. Van, Whitby, M. (ed.) 1999. Countryside Stewardship: Farmers, Policies and Markets. Pergamon, Amsterdam, 232 str. ISBN: 0 08 043587 4  Helming, K., Wiggering, H., 2003. Sustainable Development of Multifunctional landscapes. Springer, Berlin, 286 s. ISBN 3-540-00008-9 (Izbrana poglavja).  Ažururan seznam aktualnih člankov iz naslednjih revij: Sociologia Ruralis, Journal of Rural Studies, Agriculture and Human Values, Sociologija sela, Journal of Environemt and Development, Journal of Sustainable Tourism, Agriculture, Ecosystems and Environment, Journal of Environmental Managemen |

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| Cilji in kompetence: | Objectives and competences: |
| Cilj predmeta je razviti interdisciplinarne vsebinske, upravljavske in raziskovalne sposobnosti študentov/tk.  Omogočen jim je vpogled v delovanje različnih družbenih procesov, akterjev, vzvodov in kontekstov, ki oblikujejo različne družbene prakse rabe naravnih virov ter ohranjanja biodiverzitete in kulturne krajine v podeželskem prostoru. | The aim of the course is to develop interdisciplinary content, management and research skills of students.  To enable them the insight into various social processes, actors, levers and contexts that shape different social practices of use of natural resources and conservation of biodiversity and cultural landscapes in rural areas. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Študenti/tke se seznanijo tako s konceptualnimi vidiki kot s številnimi empiričnimi evidencami raznolikih posegov družbenih dejavnosti (kmetijstvo, gozdarstvo, turizem, ipd.) v podeželski (zavarovani) prostor ter z njihovimi sociološkimi, ekonomskimi in okoljskimi posledicami. | Knowledge and understanding:  Students are introduced both with conceptual aspects and numerous empirical records of the interventions of diverse social activities (agriculture, forestry, tourism, etc...) within rural (protected) areas and their sociological, economic and environmental consequences. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja, seminarji, terenske delavnice. | Lectures, seminars, field workshops. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Izdelava seminarske naloge z njenim zagovorom. | 100,00 % | Seminar work with its defense. |
| Ocenjevalna lestvica, ki velja za vse preizkuse znanja: 51-60 %-zadostno (6), 61-70 %-dobro (7), 71-80 %-prav dobro (8), 81-90 %-prav dobro (9), 91-100 %-odlično (10). |  | Grading scale, which applies to all examinations: 51-60%-sufficient (6), 61-70%-good (7), 71-80%, very good (8), 81-90%, very good (9 ), 91-100%-perfect (10). |

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| Ocenjevalna lestvica: | Grading system: |
| 5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10 | 5 - 10, a student passes the exam if he is graded from 6 to 10 |

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| Reference nosilca/Lecturer's references: |
| **Majda Černič Istenič:**  **ČERNIČ ISTENIČ, Majda.** Perception of the safety of a place by the urban and rural population in Slovenia. Revija za kriminalistiko in kriminologijo, ISSN 0034-690X, okt.-dec. 2021, letn. 72, št. 4, str. 297-308.  **ČERNIČ ISTENIČ, Majda**, KNEŽEVIĆ HOČEVAR, Duška. The organisation of care for older people in rural communities : two case studies from Slovenia. Sociální studia, ISSN 1214-813X, 2018, vol. 15, no. 1, str. 65-81.  **ČERNIČ ISTENIČ, Majda**, CHARATSARI, Chrysanthi. Women farmers and agricultural extension/education in Slovenia and Greece. V: BOCK, Bettina Barbara (ur.), SHORTALL, Sally (ur.). Gender and rural globalization: international perspectives on gender and rural development. Boston; Wallingford: CABI Publishing. 2017, str. 129-147. |

# Interdisciplinarno znanstveno raziskovalno delo Učni načrt predmeta/Course syllabus

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| Predmet: | Interdisciplinarno znanstveno raziskovalno delo |
| Course title: | Interdisciplinary Scientific Research Work |
| Članica nosilka/UL Member: | UL FF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) | 1. letnik |  | obvezni |

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| Univerzitetna koda predmeta/University course code: | 0020660 |
| Koda učne enote na članici/UL Member course code: | 1 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 45 | 15 |  |  | 190 |  | 10 |

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| Nosilec predmeta/Lecturer: | Katja Vintar Mally |

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| Izvajalci predavanj: | Maša Kovič Dine, Olga Markič, Matjaž Mikoš , Anja Podlesek, Gregor Skok, Tomaž Skrbinšek, ROK SPRUK, Gorazd Urbanič, Andreja Žgajnar Gotvajn |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Metodološki predmet/Methodological course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: |  |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij | Enrolment in doctoral studies |

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| Vsebina: | Content (Syllabus outline): |
| Definicije in organizacija znanstveno raziskovalnega dela. Značilnosti temeljnega, uporabnega in razvojnega raziskovalnega dela. Preverjanje znanstvenih hipotez in teorij v interdisciplinarnem smislu na področju okoljskih ved. Induktivni in deduktivni raziskovalni pristopi. Laboratorijske in terenske raziskave. Znanstvene metode, kvalitativne in kvantitativne metode, opazovanje in eksperimenti, analize in sinteza. Testiranje hipotez in znanstvena razlaga.  Terenske ekološke raziskave z vidika kvantitativnih in kvalitativnih vzorcev. Multivariatne in klasterske analize in metode, prikazane na konkretnih ekoloških znanstvenih in aplikativnih raziskavah v različnih ekosistemih.  Kritično vrednotenje statističnih metod, potrebnih pri opisu variabilnih in nepredvidljivih pojavov, metod parametričnega in neparametričnega statističnega preverjanja hipotez ter uporabe statističnih metod pri spremljanju kakovosti procesov (monitoring).  Povezovanje prostorskih in humanističnih znanstveno raziskovalnih metod. Spoznavanje ključnih družboslovnih raziskovalnih strategij – kvalitativnega in kvantitativnega raziskovanja. Metodologija psiholoških raziskav: različni raziskovalni načrti, merjenje psiholoških pojavov, etika v psihološkem raziskovanju. Primeri raziskovalnega dela s področja meteorologije. Geografski/prostorski modelni pristopi k preučevanju degradacije okolja. Kritično vrednotenje in okoljska tveganja pri načrtovanju in vpeljavi konceptov zelene tehnologije v obstoječi ali na novo načrtovani proizvodni sistem, pomen transdisciplinarnega pristopa. Lokalna in globalna vpetost industrijskih ter energetskih procesov v okolje. Drugi izbrani aktualni raziskovalni izzivi.  Vloga Science Citation Index (SCI) in Social Sciences Citation Index (SSCI) ter uporaba Web of Science (WoS), COBISS in SICRIS v raziskovalnem delu. Baze podatkov za različna raziskovalna področja in orodja za iskanje v njih. Praktične usmeritve za izdelavo (dispozicij) doktorskih disertacij. Poseben poudarek na timskem delu in etiki v znanosti. | Definitions and organisation of scientific research work. Characteristics of basic, applied and development research work. Testing scientific hypotheses and theories from the interdisciplinary point of view in the field of environmental sciences. Inductive and deductive research approaches. Laboratory and field research. Scientific methods, qualitative and quantitative methods, observation and experiments, analyses and synthesis. Hypothesis testing and scientific explanation.  Field ecological research using qualitative and quantitative samples. Multivariate and cluster analyses and methods, illustrated by concrete ecological scientific and applied research in different ecosystems.  Critical evaluation of statistical methods, needed to describe variable and unpredictable phenomena, methods of parametric and non-parametric statistical verification of hypothesis, and of the use of statistical methods in evaluating the quality of processes (monitoring).  Integration of spatial and humanistic scientific research methods. Learning about key social science research strategies – qualitative and quantitative research. Methodology of psychological research: different research designs, measurement of psychological phenomena, ethics in psychological research. Examples of research work in meteorology. Geographical/spatial model approaches to the study of environmental degradation. Critical evaluation and environmental risks in the planning and implementation of green technology concepts in an existing or newly planned production system, the importance of a transdisciplinary approach. Local and global embeddedness of industrial and energy processes in the environment. Other selected emerging research challenges.  The role of the Science Citation Index (SCI) and the Social Sciences Citation Index (SSCI) and the use of Web of Science (WoS), COBISS and SICRIS in research. Databases for different research fields and tools for searching them. Practical guidelines for the doctoral dissertation (proposal). Special emphasis on teamwork and ethics in science. |

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| Temeljna literatura in viri/Readings: |
| * Gauch, H. G., 2002. Scientific Method in Practice. Cambridge: Cambridge University Press. COBISS.SI-ID – 4033633 * Kanazawa, M., 2018. Research Methods for Environmental Studies. Abingdon, New York: Routledge. COBISS.SI-ID – 68466530 * Montello, D. R., Sutton, P. C., 2013. An Introduction to Scientific Research Methods in Geography & Environmental Studies. Los Angeles: Sage. COBISS.SI-ID – 53840482 * Rogers, P. P., Jalal, K. F., Boyd, J. A., 2010. An Introduction to Sustainable Development. London, Washington: Earthscan. COBISS.SI-ID – 35591429 * Druga temeljna literatura je odvisna od izbrane teme doktorske disertacije in se določi individualno. / Further core readings depend on the chosen topic of the doctoral dissertation and are set individually. |

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| Cilji in kompetence: | Objectives and competences: |
| Doktorandi bodo pridobili temeljna načela ter osnovne metode in tehnike za raziskovalno delo. Naučili se bodo pripraviti projekte in odmevne znanstvene članke. | PhD students will acquire the core principles and basic methods and techniques for scientific and research work. They will learn how to prepare projects and high-profile scientific articles. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Raziskovalno delo na področju varstva okolja  Priprava projektov  Pisanje znanstvenih člankov | Knowledge and understanding:   * Research work in the field of environmental protection * Project preparation   Writing scientific research articles |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja z uporabo PP prezentacije  Razprave na predavanjih  Predstavitve seminarskih nalog z razpravo | Lectures using PP presentation  Lecture discussion  Seminar presentations with discussion |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Seminarska naloga s predstavitvijo | 100,00 % | Seminar paper with presentation |

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| Ocenjevalna lestvica: | Grading system: |
| opravil z odliko/opravil/ni opravil | passed with distinction/passed/failed |

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| Reference nosilca/Lecturer's references: |
| **Prof. dr. Katja Vintar Mally:**  Vintar Mally, K., Bobovnik, N., Kimovec, L., Lampič, B., 2022. Changes in (sustainable) development of Slovenian small towns. European Countryside. 14, 1, str. 87–103, doi: 10.2478/euco-2022-0005.  Vintar Mally, K., 2021. Trends in regional development in Slovenia in the light of the goals of sustainable development. European Journal of Geography, 12, 2, str. 36–51, doi: 10.48088/ejg.k.mal.12.2.36.51.  Vintar Mally, K., 2020. The environmental price of socio-economic development: worldwide trends from 1990 to 2016. European Journal of Geography, 11, 2, str. 137–153, doi: 10.48088/ejg.k.mal.11.2.137.153.  Vintar Mally, K., 2018. Regional differences in Slovenia from the viewpoint of achieving Europeʼs sustainable development. Acta Geographica Slovenica, 58, 2, str. 31–46, doi: 10.3986/AGS.3309.  Vintar Mally, K., Ogrin, M., 2015. Spatial variations in nitrogen dioxide concentrations in urban Ljubljana, Slovenia. Moravian Geographical Reports, 23, 3, str. 27–35, doi: 10.1515/mgr-2015-0015. |

# INŽENIRSKO MODELIRANJE EKOLOŠKIH PROCESOV V POVRŠINSKIH VODAH Učni načrt predmeta/Course syllabus

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| Predmet: | INŽENIRSKO MODELIRANJE EKOLOŠKIH PROCESOV V POVRŠINSKIH VODAH |
| Course title: | Engineering Modelling of Ecological Processes in Surface Waters |
| Članica nosilka/UL Member: | UL FGG |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020653 |
| Koda učne enote na članici/UL Member course code: | 30 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 20 | 40 |  |  |  | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Matjaž Četina |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski program. | Enrolment in Ph.D. programme. |

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| Vsebina: | Content (Syllabus outline): |
| Pomen modeliranja kot orodja pri prognozi vplivov človekovih posegov na spremembo kvalitete površinskih voda.  Principi matematičnega modeliranja: hidrodinamični, transportno-disperzijski in biogeokemični modul, povezava v kompleksne ekološke modele. Enodimenzijski, dvodimenzijski in trodimenzijski modeli.  Osnovne enačbe: kontinuitetna, dinamična, konvekcijsko-difuzijska enačba za transport snovi, izvorni členi za opis biokemičnih procesov pri širjenju hraniv, kemičnih ali bioloških polutantov, naftnih derivatov in težkih kovin (npr. živo srebro).  Analitične in numerične metode reševanja, vloga modelov turbulence, vpliv toplotne in gostotne stratifikacije, opis računalniških programov.  Verifikacija, analiza občutljivosti, umerjanje in validacija modelov.  Primeri praktične uporabe modelov za račun širjenja polutantov v rekah, jezerih in morju. | A role of modelling as a tool to predict the influence of human activities on the quality of surface waters.  Principles of mathematical modelling: hydrodynamic, transport-dispersion and biogeochemical modules and their connection into complex ecological models. One-dimensional, two-dimensional and three-dimensional models.  Basic equations: continuity, momentum and advection – diffusion equations, source terms for biogeochemical processes of different pollutants (nutrients, chemical or biological substances, oil spreading, heavy metals, mercury cycle).  Analytical and numerical methods of solution, the role of turbulence models, the influence of temperature or density stratification, a description of computer codes.  Verification, sensitivity analysis, calibration and validation of models.  Examples of practical application of models to compute the spreading of pollutants in rivers, lakes and the sea. |

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| Temeljna literatura in viri/Readings: |
| Wainwright, J., Mulligan, M. (2003). Environmental Modelling: Finding Simplicity in Complexity, John Wiley & Sons, Inc., 430 pp.  Jørgensen, S.E., Bendoricchio, G. (2001). Fundamentals of Ecological Modelling, 3rd Ed., Elsevier, 530 pp.  Članki v revijah/Articles in Journals: Ecological Modelling, Science of the total environment  Učna gradiva / Study materials  Internet:  Web pages of e-journals  WWW, inclusive of intranet of Faculty of Civil and Geodetic Engineering (FGG) |

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| Cilji in kompetence: | Objectives and competences: |
| **Cilji:**  Uvajanje kandidatov v izrazito interdisciplinarno področje inženirskega modeliranja.  Seznanitev s transportno-disperzijskimi procesi v površinskih vodah.  Povezovanje znanj s področij tehnike in naravoslovja v kompleksnih ekoloških modelih.  **Kompetence**:  Odločanje o uporabi ustreznih modelnih orodij za simulacijo procesov v površinskih vodah.  Na podlagi razumevanja osnovnih procesov sposobnost oceniti točnost in zanesljivost napovedi procesov v površinskih vodah, dobljenih s pomočjo modelnih simulacij.  **Poleg kvalitativnega poznavanja procesov tudi njihovo inženirsko kvantitativno ovrednotenje.**  Analiziranje in zagovarjanje predlaganih rešitev pred kritično strokovno javnostjo. | **Aims:**  To introduce candidates into interdisciplinary work of engineering modelling.  To understand transport-dispersion processes in surface waters.  To join knowledge from technical and natural sciences in complex ecological models.  **Competences**: Students can:  Choose the most appropriate modelling tools to simulate processes in surface waters.  Assess accuracy and realiability of modelling predictions because they understand processes in surface waters.  **Assess environmental processes qualitatively and quantitatively by engineering means.**  **Analyse and defend proposed professional solutions in brain storming debates.** |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Študenti znajo uporabljati kompleksne ekološke modele pri oceni vplivov na okolje.  Zna načrtovati potrebne meritve okoljskih parametrov, potrebnih za umerjanje modelov. | Knowledge and understanding:  Students are able to use complex ecological models in environmental studies.  Students can make a plan of necessary measurements to calibrate ecological models. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja, prikazi praktičnih primerov modeliranja ter izdelava individualne seminarske naloge. | Lectures, practical examples of modelling with case studies, elaboration and defence of seminar work. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Pisni izpit | 25,00 % | Examination |
| Ustno izpraševanje | 25,00 % | Oral |
| Naloge | 25,00 % | Coursework |
| Projekt | 25,00 % | Project |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| Žagar, D., Petkovšek, G., Rajar, R., Sirnik, N., Horvat, M., Voudouri, A., Kallos, G., **Četina, M.**, Modelling of mercury transport and transformations in the water compartment of the Mediterranean Sea, ***Marine Chemistry***, 2007, Vol.107, pp. 64-88.  Žagar, D., Knap, A., Warwick, J.J., Rajar, R., Horvat, M., **Četina, M.**, Modelling of mercury transport and transformation processes in the Idrijca and Soča river system, ***Science of the Total Environment***, 2006, Vol.368, pp. 149-163.  Rajar, R., Žagar, D., **Četina, M.**, Akagi, H., Yano, S., Tomiyasu, T., Horvat, M., Application of three-dimensional mercury cycling model to coastal seas, ***Ecological modelling***, 2004, Vol.171, pp. 139-155. |

# Izbirni predmet 1 Učni načrt predmeta/Course syllabus

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| Predmet: | Izbirni predmet 1 |
| Course title: | Elective course 1 |
| Članica nosilka/UL Member: |  |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) | 1. letnik |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020663 |
| Koda učne enote na članici/UL Member course code: | 98 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
|  |  |  |  | 250 |  | 10 |

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| Nosilec predmeta/Lecturer: |  |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: |  |

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| Jeziki/Languages: | Predavanja/Lectures: |  |
|  | Vaje/Tutorial: |  |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
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| Vsebina: | Content (Syllabus outline): |
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| Temeljna literatura in viri/Readings: |
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| Cilji in kompetence: | Objectives and competences: |
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| Predvideni študijski rezultati: | Intended learning outcomes: |
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| Metode poučevanja in učenja: | Learning and teaching methods: |
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| Načini ocenjevanja: | Delež/Weight | Assessment: |
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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
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# Izbirni predmet 2 Učni načrt predmeta/Course syllabus

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| Predmet: | Izbirni predmet 2 |
| Course title: | Elective course 2 |
| Članica nosilka/UL Member: |  |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) | 2. letnik |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020666 |
| Koda učne enote na članici/UL Member course code: | 99 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
|  |  |  |  | 250 |  | 10 |

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| Nosilec predmeta/Lecturer: |  |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: |  |

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| Jeziki/Languages: | Predavanja/Lectures: |  |
|  | Vaje/Tutorial: |  |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
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| Vsebina: | Content (Syllabus outline): |
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| Temeljna literatura in viri/Readings: |
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| Cilji in kompetence: | Objectives and competences: |
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| Predvideni študijski rezultati: | Intended learning outcomes: |
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| Metode poučevanja in učenja: | Learning and teaching methods: |
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| Načini ocenjevanja: | Delež/Weight | Assessment: |
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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
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# KEMIJA IN TEHNOLOGIJA OKOLJA Učni načrt predmeta/Course syllabus

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| Predmet: | KEMIJA IN TEHNOLOGIJA OKOLJA |
| Course title: | ENVIRONMENTAL CHEMISTRY AND TECHNOLOGY |
| Članica nosilka/UL Member: | UL FKKT |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski (od študijskega leta 2025/2026 dalje) | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020621 |
| Koda učne enote na članici/UL Member course code: | 8 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 50 | 10 |  |  |  | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Andreja Žgajnar Gotvajn |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Temeljni predmet/Core course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Diplomanti študijskih programov tehniške ali naravoslovne smeri. | Finished second level of university study in technical or natural sciences. |

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| Vsebina: | Content (Syllabus outline): |
| *Prenos snovi in energije. Kemija okolja. Ekosistem*, trajnostni razvoj, vplivi človeka, inženirski pristop, etična izbira, ekonomski principi.  *Onesnaženje:* viri, tipične vrste in vplivi onesnaženja, dinamika onesnaženja, mehanizmi transporta, elementi in principi ekologije, kinetika (bio)kemijskih reakcij, večfazni sistemi in interakcije, masne in toplotne bilance ekosistemov, zakonodaja.  *VODE: Vrednotenje kvalitete vod:* vzorčevanje in osnovne preiskave ter njihov pomen*. Preskrba z vodo:* hidrološki cikel, podtalnica in površinske vode kot vir za pridobivanje pitne vode, priprava vode, koagulacija in flokulacija, usedanje, filtracija, desinfekcija*. Procesne vode:* hladilne vode, energetske vode (napajalne vode, kotlovne vode, kondenzat). *Odpadne vode:* zbiranje odpadnih vod, vrste in karakteristike odpadnih vod, čiščenje odpadnih vod. *Obdelava in odlaganje blata iz čistilnih naprav:* stabilizacija, zgoščevanje in odvodnavanje, kompostiranje, deponije, sežig*. Zakonodaja.*  *TRDNI ODPADKI. Komunalni trdni odpadki:* zbiranje, možnosti dispozicije, sanitarne deponije, zmanjšanje volumna pred odlaganjem*. Recikliranje odpadkov:* separacija pri viru, procesi seaparacije trdnih odpadkov*. Nevarni odpadki:* problematika, procesiranje, ravnanje, transport, možnosti recikliranja, naprave za upravljanje z nevarnimi odpadki: izbira lokacije, incineratorji, deponije*. Zakonodaja.*  *ZRAK.* *Onesnaženje zraka*: tipi onesnaženja, viri onesnaženja, primarni in sekundarni polutanti, vpliv na zdravje ljudi, vegetacijo, živali, materiale in atmosfero. *Meteorologija in onesnaženje zraka:* horizontalna in vertikalna disperzija polutantov, atmosferska disperzija, čiščenje atmosfere*.*  *Kontrola onesnaženja zraka:* korekcije pri viru nastajanja, recikliranje, čiščenje*. Zakonodaja.* | *Mass and energy transfer. Environmental chemistry. Ecosystem*, sustainability, human impacts, engineering aproaches, ethics and engineering decisions, economics and the environment.  *Pollutants*: origins, types, effects, fate in the environment, transport mechanisms, transformation, elements and principles of ecology, kinetics of (bio)chemical reactions and interactions. Mass and energy balances in the environment. Legislation*.*  *WATER. Water quality assessment:* sampling, basic investigation*. Water supply and treatment.* Hidrological cycle, resources – groundwater and surface water and their treatment-coagulation, flocculation, sedimentation, filtration, disinfection*. Process water:* steam production and cooling water treatment*. Wastewater:* collection, types and characteristics, treatment. *Sludge treatment and disposal:* stabilisation, thickening, dewatering, composting, landfilling, vitrification, incineration. Legislation.  *SOLID WASTE*: *municipal solid waste* collection and disposal, resource recovery. *Hazardous waste* processes and handling, resource recovery alternatives, management facilities, regulatory aspects. Remediation of contaminated soils and groundwater. Legislation.  *AIR. Pollution:* types and sources, primary and secondary pollutants, influence on humans, vegetation, animals, materials and atmosphere*. Meteorology and air pollution:* horizontal and vertical dispersion of pollutants, atmospheric dispersion, measurement of air quality,treatment*. Air pollution control. Legislation.*  *Practical case discussions.* The environmental isues in chemical industry. |

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| Temeljna literatura in viri/Readings: |
| * Vesilind, P. A., Morgan, S. M.: *Introduction to* *Environmental Engineering,* 2nd Ed., Thomson Brooks/Cole, London, 2004. * Masters G.M., Wendel E: *Introduction to* *Environmental Engineering and Science*. 3rd Ed., Prentice-Hall International, London, 2008. * Baird,C., Cann, M.: *Environmental Chemistry*, 4th Ed., W.H. Freeman and Company, New York, 2008. * Revijalni in znanstveni članki s področja, tekoča periodika, učna gradiva s predavanj/Review and scientific papers in journals; lecture handouts. |

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| Cilji in kompetence: | Objectives and competences: |
| Slušatelj se seznani z lokalnimi, regionalnimi in globalnimi okoljskimi problemi. Pridobi si razumevanje in sposobnost osnovne uporabe znanj, ki so potrebna za aplikativno tehnološko reševanje okoljskih problemov na področju celovitega gospodarjenja z okoljem. | To familiarise students with the principles of local, regional and global environmental problems. To understand principles and methods for basic engineering approach as the means of implementing  solutions to a range of environmental issues. To provide an understanding of integrated pollution control in the practice. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Študent pridobi znanja na področjih: poznavanje osnovnih procesov v okolju. znanje o modernih konceptih trajnostnega razvoja. znanje o implementaciji inženirskih orodij za reševanje okoljskih problemov na področju celovitega gospodarjenja z okoljem (zrak, voda, tla) ob upoštevanju ekonomskih in etičnih kriterijev. Razvije sistematični pristop k ustvarjanju, pridobivanju in prenosu znanja v prakso. | Student aquires knowledge on basic environmental processes, on modern concepts of sustainable development and is able of implementation of basic engineering tools in solving environmental problems including integrated pollution control considering economic and social criteria. Capability for critical application of gained knowledge for solving scientific, professional and other social problems is developed. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja, konzultacije, projektno delo. | Lectures, consultations, project work. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Ustni izpit | 50,00 % | oral examination |
| Projektna naloga s predstavitvijo in zagovorom | 50,00 % | Project with its presentation |

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| Ocenjevalna lestvica: | Grading system: |
| 5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10 | 5 - 10, a student passes the exam if he is graded from 6 to 10 |

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| Reference nosilca/Lecturer's references: |
| |  |  | | --- | --- | | |  | | --- | | 1.  MARQUES, Susana, MESTRE, Ana S., MACHUQUEIRO, Miguel, ŽGAJNAR GOTVAJN, Andreja, MARINŠEK, Marjan, CARVALHO, Ana Paula. Apple tree branches derived activated carbons for the removal of ß-blocker atenolol. *Chemical engineering journal*, ISSN 1385-8947. [Print ed.], Aug. 2018, vol. 345, str. 669-678, ilustr. <https://www.sciencedirect.com/science/article/pii/S1385894718300925>, doi: [10.1016/j.cej.2018.0076](https://doi.org/10.1016/j.cej.2018.01.076). [COBISS.SI-ID [1537707971](https://plus.si.cobiss.net/opac7/bib/1537707971?lang=sl)]  2.  KRAVOS, Aleksander, ŽGAJNAR GOTVAJN, Andreja, LAVRENČIČ ŠTANGAR, Urška, MALINOVIĆ, Borislav N., PROSEN, Helena. Combined analytical study on chemical transformations and detoxification of model phenolic pollutants during various advanced oxidation treatment processes. *Molecules*. Mar. 2022, vol. 27, iss. 6, [article no.] 1935, str. 1-20, ilustr. ISSN 1420-3049.https://www.mdpi.com/1420-3049/27/6/1935.  3.  BOŠEVSKI, Igor, KALČÍKOVÁ, Gabriela, CERKOVNIK, Janez, ŽGAJNAR GOTVAJN, Andreja. Ozone as a pretreatment method for antibiotic contaminated wastewater and sludge. *Ozone: science & engineering*. [Print ed.]. 2020, vol. 42, iss. 2, str. 128-135, ilustr. ISSN 0191-9512. <https://www.tandfonline.com/doi/full/10.1080/01919512.2019.1624149>, DOI: [10.1080/01919512.2019.1624149](https://dx.doi.org/10.1080/01919512.2019.1624149). [COBISS.SI-ID [1538249667](https://plus.cobiss.net/cobiss/si/sl/bib/1538249667)]. | | |

# KEMIJSKI PROCESI V OKOLJU Učni načrt predmeta/Course syllabus

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| Predmet: | KEMIJSKI PROCESI V OKOLJU |
| Course title: | CHEMICAL PROCESSES IN THE ENVIRONMENT |
| Članica nosilka/UL Member: | UL FKKT |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020654 |
| Koda učne enote na članici/UL Member course code: | 31 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 20 | 40 |  |  |  | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Helena Prosen |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet /Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Slovenščina |
|  | Vaje/Tutorial: |  |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski program. Potrebno predznanje z enega od naštetih področij: kemije, kemijske tehnologije, fizike, metalurgije, hidrotehnike, medicine, biologije, agronomije in podobno. Potrebno je osnovno znanje kemije. | Enrolment in the doctoral study programme. Prerequisite knowledge of at least one of the following: chemistry, chemical technology, physics, metalurgy, hydrotechnics, medicine, biology, agronomy or similar. Basic knowledge of chemistry necessary. |

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| Vsebina: | Content (Syllabus outline): |
| Atmosfera - nastanek in značilnosti atmosfere. Viri in mehanizmi nastanka glavnih onesnažil: žveplov(IV) oksid, NOX, alifatski in poliaromatski ogljikovodiki, halometani, ozon itd.  Kemija troposfere in stratosfere, nastanek smoga in fotosmoga, vzroki za spremembe koncentracij troposferskega in stratosferskega ozona, toplogredni plini, vplivi na sevalno ravnotežje. Zmanjševanje emisij glavnih onesnažil atmosfere.  Emisije, transport, akumulacija in razgradnja organskih snovi v okolju (biološko razgradljive snovi v vodah in v tleh in spremljajoči problemi). Obstojne organske spojine, kot so klorirani pesticidi, klorirane aromatske spojine, višji ogljikovodiki; njihova stabilnost in akumulacija v okolju in kroženje stabilnih onesnažil. Kovine v okolju: viri, porazdeljevanje, kemijske reakcije, ki vplivajo na topnost kovin. Trdni odpadki, kemijski procesi, ki potekajo na odlagališčih in v sežigalnicah odpadkov. | |  | | --- | | **Atmosphere - evolution and properties. Sources and reaction mechanisms of principal pollutants: sulphourous oxide, NOx, aliphatic and polyaromatic hydrocarbons, halomethans, ozone, etc. Chemistry of troposphere and stratosphere, formation of smog and photosmog, reasons for concentration fluctuations of tropospheric and stratospheric ozone, greenhouse gases, influences on the radiative balance. Ways to decrease emissions of principal atmospheric pollutants.**  **Emissions, transport, accumulation and degradation of organic substances in the environment (biodegradable substances in water bodies and soil with the associated problems). Persistent organic compounds, e.g. organochlorine pesticides, chlorinated aromatic compounds, higher hydrocarbons; their stability and accumulation in the environment, cycling of the persistent pollutants.**  **Metals in the environment: sources, partitioning, chemical reactions influencing their solubility. Solid waste, chemical processes in landfills and in waste incinerators.** | |

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| Temeljna literatura in viri/Readings: |
| G. W. vanLoon, S. J. Duffy: Environmental Chemistry, a Global Perspective; Oxford, Oxford University Press (1.-4. izdaja)  Dodatno:  G. Fellenberg: The Chemistry of Pollution, Chichester ,Wiley, ISBN 0-471-61391-6, 2000, 192 str./pages  **Revije: izbrani članki / Journals: selected articles**  Chemosphere , Elsevier, Nizozemska  Environ.Sci.Technol., American Chemical Society, ZDA  Environ. pollut*.* Elsevier, Nizozemska |

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| Cilji in kompetence: | Objectives and competences: |
| Predstaviti študentom glavna onesnažila atmosfere, vod in tal in njihove kemijske spremembe pod vplivom okoljskih dejavnikov. | Present students with the knowledge of the principal pollutants of atmosphere, water bodies and soil, as well as of their chemical transformations influenced by the environmental factors. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Razumevanje kemijskih reakcij in pretvorb glavnih okoljskih onesnažil in posledic teh onesnažil za okolje  Sposobnost predstavitve določenih okoljskih problemov ustno in v pismeni obliki; sposobnost razreševanja konkretnih okoljskih problemov. | Knowledge and understanding:  Understanding of chemical reactions and transformations of principal environmental pollutants, as well as the effects of these pollutants on the environment.  Ability to present certain environmental problems orally and in written form; ability to solve real-life environmental problems. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja, seminarji in konzultacije. | Lectures, seminar coursework, consultations. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Ustno izpraševanje | 60,00 % | Oral exam |
| Seminarska naloga | 40,00 % | Seminar coursework |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| **Helena Prosen**   1. Rok Tomšič, David Heath, Ester Heath, Jernej Markelj, Andreja Kandolf Borovšak and **Helena Prosen**. Determination of neonicotinoid pesticides in propolis with liquid chromatography coupled to tandem mass spectrometry. *Molecules* 2020, 25: 5870. 2. Ida Kraševec, **Helena Prosen**. Determination of polar benzotriazoles in aqueous environmental samples by hollow-fibre microextraction method with LC-MS/MS and its comparison to a conventional solid-phase extraction method. *Microchem. J.* 2021, 166: 106191. 3. Borislav N. Malinović, Jernej Markelj, Andreja Žgajnar Gotvajn, Irena Kralj Cigić, **Helena Prosen**. Electrochemical treatment of wastewater to remove contaminants from the production and disposal of plastics: a review. *Environ. Chem. Lett.* 2022, 20: 3765. |

# KOVINE V OKOLJU Učni načrt predmeta/Course syllabus

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| Predmet: | KOVINE V OKOLJU |
| Course title: | METALS IN THE ENVIRONMENT |
| Članica nosilka/UL Member: | UL FKKT |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski (od študijskega leta 2025/2026 dalje) | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020655 |
| Koda učne enote na članici/UL Member course code: | 32 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 40 | 20 |  |  |  | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Marija Zupančič |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: |  |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij. Predznanje s področja naravoslovja ali tehnike. | Inscription to doctoral programme. University graduation of natural science or natural science technology study. |

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| Vsebina: | Content (Syllabus outline): |
| ***Uvod***  (razporeditev kovin in njihovih spojin v okolju, esencialni in potencialno strupeni elementi, naravni in antropogeni izvori, pomen kovin za žive organizme).  ***Reakcije kovin v okolju*** (topnost spojin, ligandi v okolju, nastanek koordinacijskih spojin, reakcije koordinacijskih spojin, stabilnost koordinacijskih spojin, obarjanje, adsorpcija, kemisorpcija, ionska izmenjava, redoks reakcije, frakcionacija kovin v tleh).  ***Kemijska speciacija in frakcionacija kovin v okolju in njun pomen*** (principi nastanka kemijskih zvrsti, kemijska ravnotežja med kemijskimi zvrstmi v okolju, določevanje kemijskih zvrsti, razporeditev kemijskih zvrsti v okolju).  ***Kroženje kemijskih zvrsti kovin v okolju*** (transport kemijskih zvrsti kovin v okolju, fizikalne in kemijske pretvorbe kovin, redoks reakcije, …).  ***Obremenitev okolja s spojinami*** ***kovin*** (strupenost, mejne vrednosti, zakonodaja)  ***Sanacija tal in vode, stabilizacija odpadkov*** (ocena stanja pri onesnaženju s kovinami, principi sanacije, izbira metode sanacije). | |  | | --- | | ***Introduction*** (distribution of metals and their compounds in the environment, essential and potentially toxic elements, geochemical and anthropogenic source of metals, importance of metals for living beings).  ***Reactions of metals in environment*** (solubility of metal compounds; ligands for metals in the environment; origin, reactions and stability of coordination compounds; precipitation, adsorption, chemisorption, ionic exchange, redox reaction and fractionation of metals in ecosystems).  ***Chemical speciation and fractionation of metals in environment and their significance*** (principles of the origin of chemical species, chemical equilibria between chemical species in the environment, distribution and determination of chemical species in the environment).  ***Cycling of metal chemical species in the environment*** (transportation of metal compounds, physical and chemical transformations of metals, redox reactions…).  ***Pollution of environment with metal compounds*** (toxicity, limit values, legislation)  ***Remediation of soil and water, stabilisation of wastes*** (evaluation of state of contamination with metals, principles and suitable methods of rehabilitation). | |

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| Temeljna literatura in viri/Readings: |
| **Učbeniki / Handbooks:**  Siegel, F. R., *Environmental geochemistry of potentially toxic metals*, Berlin [etc.] : Springer, 2002  Merian E., Anke M., Ihnat M., Stoeppler M., *Elements and Their Compounds in the Environment: Occurrence, Analysis and Biological Relevance*, 2nd completely revised and enlarged ed. , Weinheim : Wiley-VCH, cop., 2004  Kabata-Pendias A., *Trace elements in soils and plants*, 4th ed., Boca Raton ; London ; New York : CRC Press, 2011  **Revije / Periodicals:**  Environmental Science & Technology  Chemosphere  Waste Management  Environmental Pollution  Science of the Total Environment  Water Air and Soil Pollution  Journal of Environmental Monitoring  Journal of Environmental Management |

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| Cilji in kompetence: | Objectives and competences: |
| Poznavanje pojavnosti kovin v okolju, njihove dinamike, problemov onesnaženja in osnovnih remediacijskih tehnik. Razumevanje povezav med dinamiko kovin, njihovo porazdelitev v okolju in biodostopnostjo. Samostojno iskanje literaturnih virov, samostojna obdelava in interpretacija podatkov, predstavitev seminarskih tem in rezultatov pred javnostjo.  Uporaba znanj v nadaljnjem procesu študija, navezava problematike na druge predmete (Gospodarjenje z odpadki, Kemijski procesi v okolju, Tla in okolje...). | The knowledge about the appearance of metals in the environment, their dynamics, pollution problems and basic remediation techniques. Comprehension of connection of metal dynamics, distribution in environment and bioaccessibility. Self-dependence in investigation of literature sources, processing and interpretation of data, presentation of seminar topics and results in public. Use of knowledge in further study process. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| ***Znanje in razumevanje****:*Po končanem izpitu naj bi študent obvladoval in razumel zgoraj naštete vsebine.  ***Uporaba***: Študent naj bi naučeno znanje znal uporabiti za razlago opazovanj in logično reševanje problemov povezanih z vsebinami predmeta. Sposoben naj bi bil uporabljati svoje znanje interdisciplinarno in na praktičnih primerih.  ***Refleksija***: Študent razvija sposobnost za interpretacijo ter kritično analizo rezultatov.  ***Prenosljive spretnosti****:* Poznavanje vsebin iz predmeta pripomore k boljšemu razumevanje osnovnih procesov v naravi kot tudi k boljšemu razumevanje problematike drugih predmetov. | ***Knowledge and understanding****:* The student should understand and master the content listed above.  ***Use***: The student should be able to use the acquired knowledge for observations and logical solving of problems. The student should be able to use his knowledge multidisciplinary.  ***Reflections****:* The student develops skills for critical interpretation and evaluation of results.  ***Transferable skills***: Obtained knowledge enables better understanding of basic natural principles and could be beneficially used at many other subjects of doctoral programme. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predmet se izvaja v obliki predavanj in seminarskih nalog. V okviru predavanj se študentje seznanijo s teoretskimi osnovami. Velik poudarek je na aktualnih aplikacijah remediacije. Študentje pripravijo seminarje o izbranih temah in jih predstavijo pred svojimi kolegi. | Performance of the course includes lectures and seminars. At lectures students are informed with theoretical basics with emphasis on actual remediation applications. Students prepare seminars on particulate topics and represent them in front of their colleagues. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Ustno izpraševanje | 60,00 % | Oral exam |
| Seminarska naloga | 40,00 % | Seminar coursework |

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| Ocenjevalna lestvica: | Grading system: |
| 5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10 | 5 - 10, a student passes the exam if he is graded from 6 to 10 |

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| Reference nosilca/Lecturer's references: |
| 1. ZUPANČIČ, Marija, MILER, Miloš, ŽIBRET, Gorazd. The relationship between the inhalation bioaccessibility of potentially toxic elements in road dust from a heavily polluted industrial area and the source of their pollution. *Environmental pollution*. 2024, 361, 13. DOI: [10.1016/j.envpol.2024.124810](https://dx.doi.org/10.1016/j.envpol.2024.124810)  2. LONCNAR, Mojca, MLADENOVIČ, Ana, ZALAR SERJUN, Vesna, ZUPANČIČ, Marija. Leaching and geochemical modelling of an electric arc furnace (EAF) and ladle slag heap. *Toxics*, 2022, 10(1), 1-21. DOI: 10.3390/toxics10010010.  3. ZUPANČIČ, Marija, ŠUŠTERŠIČ, Mojca, BAVEC, Špela, GOSAR, Mateja. Oral and inhalation bioaccessibility of ptentially toxic elements in household dust from former HG mining district, Idrija, Slovenia. *Environmental geochemistry and health*, 2021, 43(9), 3505-3531. DOI: 10.1007/s10653-021-00835-z. |

# KRAS IN OKOLJE Učni načrt predmeta/Course syllabus

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| Predmet: | KRAS IN OKOLJE |
| Course title: | Karst and Environment |
| Članica nosilka/UL Member: | UL NTF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020664 |
| Koda učne enote na članici/UL Member course code: | 33 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 30 | 30 |  |  |  | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Mihael Brenčič |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet /Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij. | Enrollment in the doctoral study programme. |

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| Vsebina: | Content (Syllabus outline): |
| Definicija krasa in zgodovinski pregled: Fizikalno- geološka in geografska definicija krasa. Drugi načini definiranja. Razvoj misli o krasu. Kras kot naravni pojav, matični Kras in klasični kras. Model čistega krasa. Kras kot življenjsko okolje.  Kraške kamnine: karbonatne kamnine njihova struktura in tektura, minerali karbonatnih kamnin. Poroznost karbonatnih kamnin. Druge kraške kamnine. Vpliv strukture na razvoj krasa.  Raztapljanje kraških kamnin: Raztapljanje karbonatnih kamnin. Kemijsko ravnotežje pri raztapljanju karbonatnih kamnin. Kinetika raztapljanja karbonatnih kamnin.  Denudacija površine kraških kamnin: Globalna porazdelitev denudacije kraških kamnin. Meritve in izračunavanje denudacije kraških kamnin.  Hidrogeologija krasa: Hidrogeološki pristop k razumevanju krasa. Hidrogeološka conacija krasa. Analiza hidrograma kraških vodotokov. Sledilni poizkusi.  Speleogeneza: Hidrogeološka conacija krasa, karakteristične jamske oblike. Fizika nastajanja kraških kanalov, tipi kraških kanalov. Časovna dinamika speleogenetskega prostora. Enciklopedija podzemskih kraških oblik s posebnim poudarkom na povezavo s konkretnimi procesi.  Sedimenti v krasu: Avtohtoni in alohtoni sedimenti v jamah.  Površinska oblikovanost krasa: Kraške in navidezno kraške oblike. Pomen brezstropih jam. Enciklopedija površinskih kraških oblik.  Pomembni kraški sistemi v Sloveniji in po svetu: Dinarski, alpski in osameli kras. Kras Kamniško-Savinjskih Alp. Kras v porečju Save nad Ljubljano. Kras v porečju zgornje Soče. Visoki kras. Kras v porečjih Reke, Ljubljanice, Kolpe in Krke. Osameli kras Posavja in Šavrinov. Pregled najpomembnejših kraških ozemelj in krasa v svetu.  Uporabno krasoslovje: Kraška hidrogeologija. Samočistilnost krasa. Nastajanje in erozija tal na krasu. | Karst deffinition and historical overview: Geological, geographical and physical definition of karst. Other definitions. Ideas development in karst science. Karst as a natural phenomena, classical karst and Karst. Pure karst model. Karst as a human environment.  Karstic rocks: carbonate rocks – their structure and texture, minerals in carbonate rocks. Porosity of carbonate rocks. Other karstic rocks. Geological structure influences on the karst development.  Karstic rocks dissolution: Dissolution of karstic rocks. Chemical equilibrium in karstic rock dissolution. Kinetics of karstic rock dissolution.  Karstic surface denudation: Global disstribution of karstic rock denudation. Measurements and calculations of karstic roc denudation processes.  Karst hydrogeology: Hydrogeological understanding of karst. Hydrogeological conation of karst. Karst hydrograph analyses. Tracing experiments.  Speleogenesis: Characteristic channel shapes of hydrogeological conation of karst. Physical processes in the development of karstic channels. Time component of speleogenesis processes. Encyclopaedia of karstic subsurface forms with the emphasise on the genetically processes.  Sediments in karst: Autochthonous and alochthonous sediments in caves.  Surface forms on karst: Karstic and virtually karstic features. Roofless caves and their meaning for karst development. Encyclopaedia of karstic surface forms.  Important karstic systems in Slovenia and worldwide. Dinaric, Alpine and isolated karst. Karst of Kamnik Savinje Alps, karst in watershed of river Sava, High karst, Karst of rivers Soča, Ljubljanica, Kolpa and Krka. Posavje and Šavrinsko karst. Overview of most important karstic regions in the world.  Applied karstology: Karst hydrogeology. Self‑purification potential on karst. Development and erosion of soil on karst. |

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| Temeljna literatura in viri/Readings: |
| 1. Ford D. C. P.W., Williams. 2007. *Karst Hydrogeology and Geomorphology*. 562 str. John Wiley & Sons.  2. Gams, I. 2004. *Kras v Sloveniji v prostoru in času*. Založba ZRC, Ljubljana.  3. White, B.W. 1989. *Geomorphology and hydrology of karst terrains*. University Press, 464 str., New York.  4. Appelo, C. A. J., Postma, D. *Geochemistry, Groundwater and Pollution. 2nd ed*. Taylor and Francis, 2005. 649 str.  5. National Research Council, 1996: *Rock Fractures and Fluid Flow. Contemporary Understanding and Applications*. National Academy Press.  6. Periodika/Journals: Acta Carsologica, Naše jame, Karst and Cave Science, Water Resources Research, Hydrogeology Journal, Environmental Geology. |

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| Cilji in kompetence: | Objectives and competences: |
| Podati slušatelju geološke osnove krasoslovja in ga seznaniti s tistimi fizikalno-kemičnimi procesi, ki delujejo v krasu. Zlasti bodo poudarjeni tisti kraški procesi in pojavi, zaradi katerih je kras ekološko posebej občutljiv. | Student will become acquainted with geological background of karstology and with physical and chemical processes responsible for karst development. Emphasise will be given on those processes that are responsible for karst ecological vulnerability. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Slušatelji se teoretsko in praktično spoznajo z metodami krasoslovja s pomočjo katerih bodo znali izluščiti kritične parametre in jih prostorsko opredeliti. | Knowledge and understanding:  Students will learn practical and theoretical methods of karstology that will help them understand important parameters and to determine them spatially and temporally. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja (v primeru zadostnega št. študentov) ali individualne konzultacije (v primeru nezadostnega št. študentov), terenske vaje. | Lectures (when number of students is adequate) or individual consultations (when number of students is less than required), seminar work. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Ustno izpraševanje. | 40,00 % | Oral examination. |
| Seminarska naloga. | 60,00 % | Coursework. |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| **BRENČIČ, Mihael**. Hydrogeological conditions of the Kroparica recharge area, Jelovica, Slovenia. *Geologija*, 2003/46, str. 281-306.  **BRENČIČ, Mihael**, POLTNIG, Walter, 2008: Podzemne vode Karavank = Grundwasser der Karawanken. 144 str., monografija.  PAVLIČ, Urša, **BRENČIČ, Mihael**. Application of sequential trend analysis for discharge characterisation of Vipava karstic springs, Slovenia. *Acta carsol.*, 2011, 40/2, 283-291 |

# KRIZNI MANAGEMENT Učni načrt predmeta/Course syllabus

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| Predmet: | KRIZNI MANAGEMENT |
| Course title: | Crisis management |
| Članica nosilka/UL Member: | UL EF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski (od študijskega leta 2025/2026 dalje) | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020622 |
| Koda učne enote na članici/UL Member course code: | 91 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 10 | 30 |  |  | 15 | 195 | 10 |

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| Nosilec predmeta/Lecturer: | Vlado Dimovski |

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| Izvajalci predavanj: | Marjan Malešič, JUDITA PETERLIN, Iztok Prezelj |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Temeljni predmet/Core course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij. | Enrollment in the doctoral studies. |

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| Vsebina: | Content (Syllabus outline): |
| Sodobni pristopi kontingenčnega planiranja:  Graditev scenarijev  Krizno planiranje  Analiza trendov in diskontinuitete  Opredelitev področja kriznega managementa:  Preprečitev  Priprava  Omejitev  Aktivacija kriznega tima in njene specifike.  Odprta komunikacija.  Služnostno vodenje deležnikov.  Splošne značilnosti kriz (nesreč) in odzivanja nanje: endemičnost, neprekinjenost, kompleksnost, transnacionalnost, teorije odzivanja na krizo (funkcionalni pristop, simbolni pristop).  Kognitivno-institucionalni pristop k proučevanju krize (nesreče): večstopenjski pristop, analitične teme.  Sistemski vidiki odzivanja na krize (nesreče): sistemske in organizacijske rešitve na področju kriznega upravljanja in vodenja (upravljanja ob nesrečah), v izbranih državah in mednarodnih organizacijah.  Medorganizacijsko sodelovanje: nujnost in načini medorganizacijskega sodelovanja pri kriznem upravljanju in vodenju, koordinacija, tipični problemi.  Funkcionalni vidiki odzivanja na krizo (nesrečo).  Komuniciranje v krizi: teorije o komuniciranju v krizi, medijizacija kriz, taktike in strategije komuniciranja, pretok informacij v krizi. | Recent extensions of contingency planning:  Building scenarios  Crisis planning  Trend and discontingencies analysis  Analysis of crisis management:  Prevention  Preparation  Containment  Activating the crisis management team.  Crisis team management.  Open communication.  Servant leadership through meeting safety and emotional needs of stakeholders.  General characteristics of crises (disasters) and of crisis response: endemity, continuity, transnationality; crisis response theories (functional approach, symbol approach).  Cognitive-institutional approach to crisis (disater) research: multi-level approach, analytical themes.  System aspects of crisis (disaster) response: system and organizational solutions in the field of crisis (disaster) management in the selected countries and international organizations.  Interorganizational cooperation: necessity and ways of interorganizational cooperation in crisis management, coordination, typical problems.  Functional aspects of crisis (disaster) response.  Crisis communication: crisis communication theories, mediazation of crisis, crisis communication tactics and strategies, crisis (disaster) information flow. |

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| Temeljna literatura in viri/Readings: |
| Brändström, A. & Malešič, M. (ur.). (2004). *Crisis Management in Slovenia: Comparative Perspectives*. Stockholm: CRISMART.  Boin, A., Hart, P., Stern, E., & Sundelius, B. (2017; 2. izdaja). *The Politics of Crisis Management. Public Leadership under Pressure.* Cambridge: Cambridge University Press.  Coombs, W.T & Holaday, S. J. (2023). *The Handbook of Crisis Communication*. John Wiley & Sons Ltd.  Crandall, W. R., Parnell, J. A., & Spillan, J. E. (2014). *Crisis Management: Leading in the New Strategy Landscape*. SAGE Thousand Oaks  Daft, R. L. & Marcic, D. (2013): Management: *The new workplace*. Australia: South-Western Cengage Learning.  Fearn Banks, K. & Kawamoto, K. (2024; 6. izdaja). *Crisis Communications: A Casebook Approach*. Routledge.  Rosenthal, U., Boin, A. R., & Comfort, L. K. (2001). *Managing Crises. Threats, Dilemmas, Opportunities*. Springfield: Charles C Thomas.  Ulmer, R., Sellnow, T.L & Seeger, M.W. (2022). *Effective Crisis Communication: Moving from crisis to opportunity*. Sage College Publishing.  Spletni viri: npr. <https://rib.msb.se/filer/pdf/23992.pdf> |

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| Cilji in kompetence: | Objectives and competences: |
| Po uspešno zaključenem predmetu naj bi bili študenti zmožni:   * razlikovati med managementom in kriznim managementom; * identificirati cilje in udeležence pri razvoju kriznega managementa; * izbrati in uporabiti zahtevne tehnike kriznega managementa; * primerjati in razlikovati med različnimi pristopi kriznega managementa; * predlagati rešitve kompleksnih kriznih dogodkov; * povzeti vzroke in posledice krize v izbranem sektorju; * organizirati program za izobraževanje komunikatorjev v krizi; * ovrednotiti strategije kriznega managementa; * uspešno komunicirati z različnimi deležniki v krizni situaciji.       Študentke in študentje bodo na osnovi teoretičnih znanj in empiričnih podatkov usposobljeni za ravnanje v kriznih situacijah.  Poudarek bo na poučevanju koordinacijskega in komunikacijskega managementa.  Izpostavljeno bo ključno razumevanje različnih vidikov kriznega managementa (ekološki, finančni, sociološki in kulturološki vidiki, učinek na sosesko, transport, situacija na trgu, reakcija konkurentov ipd.) in vključitve deležnikov (lastnikov, investitorjev, prebivalcev, politikov, lobistov ipd.).  Izpostavljena bosta sistemski in funkcionalni vidik kriznega managementa, v katerega se bodo na vajah, glede na svoj izobrazbeni profil ali svojo zaposlitev, aktivno vključevali študentke in študenti.  Izdelati lasten načrt razvoja veščin in kompetenc kriznega managementa – t.i. integrirati teoretična znanja v uporabno vrednost za trajnostni razvoj. | After successfully completing the course, students should be able to:  - distinguish between management and crisis management;  - identify goals and participants in the development of crisis management;  - choose and use demanding crisis management techniques;  - compare and differentiate between different crisis management approaches;  - propose solutions to complex crisis events;  - summarize the causes and consequences of the crisis in the selected sector;  - organize a program for training crisis communicators;  - evaluate crisis management strategies;  - communicate successfully with various stakeholders in a crisis situation.    Students will be equipped with theoretical and practical knowledge of crisis management.  Coordination and communication management skills are essential to manage complex crisis situations.  Understanding aspects of crisis management (ecological aspects, financial issues, social and cultural aspects, neighbourhood effect, infrastructure, transport, market situation, competitors reaction etc.) and stakeholder engagement (owners, investors, citizens, politicians, lobbysts etc.).  Special attention will be paid to the system and functional aspect of crisis management. Students will be actively involved in crisis management study according to their existing educational profile or employment.  Prepare a personal action plan of developing crisis management skills and competencies - integrate theoretical findings into practical added value for sustainable development. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Akcijska priprava raziskovalnega projekta/naloge in delo na znanstvenem članku, veščina komuniciranja z deležniki v kriznih situacijah, sposobnost managerskih veščin za reševanje kriznih dogodkovo na znanstvenem članku. | Knowledge and understanding:  Project action research preparation and work on scientific paper, correct communication with stakeholeders in the situation of crisis, managerial skills for solving crisis situation (technical, human, conceptual. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja z uporabo ppt/prezi.  Diskusije Pro et Contra in Sokratova metoda.  Seminarji (izdelava in predstavitev raziskovalnih nalog).  Konzultacije. | Lectures using ppt/prezi.  Lecture discussion (Pro et Contra and Socrates method).  Seminars (implementation and presentation of small research project).  Consultations. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Pisni izpit | 40,00 % | Written examination |
| Seminarji (izdelava in predstavitev raziskovalnih nalog) | 60,00 % | Written seminary work with final presentation |

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| Ocenjevalna lestvica: | Grading system: |
| 5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10 | 5 - 10, a student passes the exam if he is graded from 6 to 10 |

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| Reference nosilca/Lecturer's references: |
| **DIMOVSKI**, Vlado, PENGER, Sandra, PETERLIN, Judita, UHAN, Miha, ČERNE, Matej, MARIČ, Miha. Napredni management, (Zbirka Maksima). 1. natis. Ljubljana: Ekonomska fakulteta, 2013. 280 str., ilustr. ISBN 978-961-240-259-4. ISBN 978-961-240-266-2. [COBISS.SI-ID 267302400]  ROBLEK, Vasja, **DIMOVSKI**, Vlado, PETERLIN, Judita. Emergence of urban ageing based on technological solutions to ensure smart urban sustainable development : emergence of an urban ageing ecosystem. V: ERTURK, Alper (ur.), et al. Digital transformation and sustainable development in cities and organizations. Hershey: IGI global, 2024. Str. 141-166. Advances in electronic government, digital divide, and regional development book series (Print). ISBN 979-8-369-33567-3. ISSN 2326-9103. DOI: 10.4018/979-8-3693-3567-3\_07. [COBISS.SI-ID 184768003]  ROBLEK, Vasja, **DIMOVSKI**, Vlado, COLNAR, Simon, MEŠKO, Maja, PETERLIN, Judita. The “Great Reset” and its implications on organisational theory. Kybernetes. [in press] 2024. ISSN 0368-492X. DOI: 10.1108/K-06-2024-1453. [COBISS.SI-ID 205824003]  projekt: The paper is part of research program group Program P5-0364, supported by ARIS.  **DIMOVSKI**, Vlado, PENGER, Sandra, GRAH, Barbara, COLNAR, Simon, PETERLIN, Judita. Izzivi in priložnosti družbene odgovornosti organizacij do starejših v Sloveniji. V: MULEJ, Matjaž (ur.), et al. Inovativna trajnostna družbeno odgovorna družba. 3. knjiga, Skrb za starejše. Ljubljana: IRDO - Inštitut za razvoj družbene odgovornosti, 2024. Str. 44-66. Zbirka Družbeno odgovorna družba. ISBN 978-961-7141-09-2. <https://www.irdo.si/wp-content/uploads/2024/07/3.-knjiga-Inovativna-trajnostna-druzbeno-odgovorna-druzba.pdf>. [COBISS.SI-ID 201477379]  ROBLEK, Vasja, **DIMOVSKI**, Vlado, JOVANOV OBLAK, Kristjan, MEŠKO, Maja, PETERLIN, Judita. Leadership and managerial challenges to ensure agile management as a method to enable business success : a Delphi study of the Slovenian health organisations. Measuring business excellence. 2024, vol. 24, iss. 1, str. 39-51. ISSN 1368-3047. Repozitorij Univerze v Ljubljani – RUL, Digitalna knjižnica Univerze v Mariboru – DKUM, DOI: 10.1108/MBE-09-2023-0122. [COBISS.SI-ID 171473923]  projekt: Supported by the Slovenian Research and Innovation Agency; ARIS) Program P5-0364 – The Impact of Corporate Governance, Organizational Learning, and Knowledge Management on Organizations in Ageing Societies and by the Interreg ADRION Program funded under the European Regional Development Fund and IPA II fund (Project Number, 1228). This work was also part of the project “Researching the process of micro-mobility management” in the framework of the project called “Project work for gaining practical experience and knowledge of students in working environment 2022/23” in the Operational Program for conducting European cohesion politics 2014–2020 which was financed by European social fund EU and Ministry of Higher Education, Science and Innovation, Slovenia. |

# MEDICINA V IZREDNIH RAZMERAH Učni načrt predmeta/Course syllabus

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| Predmet: | MEDICINA V IZREDNIH RAZMERAH |
| Course title: | Disaster medicine |
| Članica nosilka/UL Member: | UL MF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020623 |
| Koda učne enote na članici/UL Member course code: | 92 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 20 | 30 |  |  | 20 | 180 | 10 |

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| Nosilec predmeta/Lecturer: | Radko Komadina |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Temeljni predmet /Core course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij. | Enrollment in the doctoral studies. |

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| Vsebina: | Content (Syllabus outline): |
| Medicina v izrednih razmerah (disaster medicine) je nova veja medicine, ki se je razvila v zadnjih dveh desetletjih iz Disaster managementa in Emergency medicine v ZDA ob povečani nevarnosti mednarodnega terorizma in spremenjenega načina vojaškega delovanja. Ima splošni del (definicija medicinskega disastra, družbene krize, vojna, terorizem, množične nesreče), etični, socialni in psihološki vidiki disastra, javnozdravstveni vidiki na prehospitalnem in hospitalnem nivoju, specifična obravnava posebno ogroženih skupin prebivalstva (otroci, nosečnice, starostniki), načrtovanje in izvajanje medicine v izrednih razmerah na nivoju lokalne skupnosti, države in mednarodnih organizacij. Snov predmeta obravnava tudi vojno kirurgijo (kirurgija omejevanja škode – damage control surgery), množične naravne nesreče, množične mirnodobne nesreče in nesreče ob terorističnih napadih. Ob prenosu izkušenj vojne v mirnodobno medicino se izpopolnjuje algoritem ukrepov ob masivni travmatski krvavitvi. Princip odziv medicine pri velikih nesrečah (MRMI - medical response to major incidents ) omogoča pripravo racionalnih načrtov za ukrepanje v zdravstvenih zavodih ob masovnih nesrečah in drugih medicinskih katastrofah. | Disaster medicine developed in past 20 years from coupling of disaster management with emergency medicine. From the US army the principle of damage control surgery was spread around the world in field of war surgery and individual multiple injured patient treatment. The student is familiar with the principles of disaster medicine (definitions of medical disaster, complex emergencies, field surgery, terrorism, mass casualty incidents), ethical, social and psychological aspects of medical disaster, with manmade and natural disasters; special assessment is dedicated to specific groups of population (children, women, and elderly people) on prehospital and hospital level. In special part recent experiences from war surgery transmitted to multiple injured patient treatments with massive internal traumatic bleeding are presented with war surgical practicum. Medical response to major incidents principle and advanced trauma life support principle is presented for preparedness of health providers on individual and institutional level |

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| Temeljna literatura in viri/Readings: |
| G.R. Cittone (ur): Disaster Medicine, 2006, Mosby.  D.E. Hogan, J.L. Burstein: Disaster Medicine, 2002, Lippincott Williams & Wilkins.  International Committee of Red Cross, Surgery for victims of war, spletna literatura [www.icrc.org.](http://www.icrc.org/)  R. Komadina, V. Smrkolj: Osnove medicine v izrednih razmerah s kirurškega vidika. Celje, Splošna bolnišnica, 2009. |

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| Cilji in kompetence: | Objectives and competences: |
| Študent spozna principe disaster managementa, načrtovanja in ukrepanja ob množičnih nesrečah z zdravstvenega vidika in povezano z ukrepi drugih resorjev, povzročenih s človeškim faktorjem in ob naravnih nesrečah, s principi triaže, reševanja problemov pri množičnih ranitvah, z veščinami ATLS, s principi damage control kirurgije, z organizacijo zdravstva v izrednih razmerah in z javno-zdravstvenimi vidiki medicine v izrednih razmerah. | Study of complex interdisciplinary disaster management, emergency medicine, mass casualties in manmade and natural disasters, military surgery with principles of damage control surgery, skills of ATLS, organization of field hospitals and major health problems in complex social emergencies. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  disaster cikel,  medresorno načrtovanje ukrepov ob katastrofah,  damage control kirurške tehnike,  razumevanje ATLS,  stopenjska oskrba v zdravstveni službi.  Prenesljive/ključne spretnosti in drugi atributi:  packing (pakiranje) telesnih votlin,  ATLS – veščine oživljanja,  organizacija stopenjske oskrbe pri množičnih nesrečah,  organizacija poljske bolnišnice. | Knowledge and Understanding:  disaster cycle,  interdisciplinary planning in disaster management,  damage control surgery,  ATLS,  from stage to stage organization of medical field service.  Transferable/Key Skills and other attributes:  packing, external fixation of long bone fractures,  skills of resuscitation,   * triage. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja, konzultacije Individualni študij na daljavo, seminarji. | Lectures, consulting, Individual e-learning, seminars. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Seminarska naloga | 50,00 % | Written seminar |
| Pisni test | 50,00 % | Written examination |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| **1.** SPAHN, Donat R., BOUILLON, Bertil, CERNY, Vladimir, COATS, Timothy J., DURANTEAU, Jacques, FERNANDEZ-MONDEJAR, Enrique, FILIPESCU, Daniela, HUNT, Beverley J., KOMADINA, Radko, NARDI, Giuseppe, NEUGEBAUER, Edmund A., OZIER, Yves, RIDDEZ, Louis, SCHULTZ, Arthur, VINCENT, Jean Louis, ROSSAINT, Rolf. Management of bleeding and coagulopathy following major trauma: an updated European guideline. *Crit. care (Lond., Online)*, 2013, let. 17, št. 2, [1-45] R76. <http://ccforum.com/content/17/2/R76>, doi: [10.1186/cc12685](http://dx.doi.org/10.1186/cc12685). [COBISS.SI-ID [607139](http://cobiss.izum.si/scripts/cobiss?command=DISPLAY&amp;base=COBIB&amp;RID=607139)], [[JCR](http://www.cobiss.si/scripts/cobiss?command=SEARCH&amp;base=jcr&amp;select=(sc=1466-609X+and+PY=2012)), [Scopus](http://www.scopus.com/inward/record.url?partnerID=2dRBettD&amp;eid=2-s2.0-84876280594) do 6. 11. 2013: št. citatov (TC): 16, čistih citatov (CI): 15, normirano št. čistih citatov (NC): 5]  **2.** ROSSAINT, Rolf, BOUILLON, Bertil, CERNY, Vladimir, COATS, Timothy J., DURANTEAU, Jacques, FERNANDEZ-MONDEJAR, Enrique, HUNT, Beverley J., KOMADINA, Radko, NARDI, Giuseppe, NEUGEBAUER, Edmund A., OZIER, Yves, RIDDEZ, Louis, SCHULTZ, Arthur, STAHEL, Philip F., VINCENT, Jean Louis, SPAHN, Donat R. Management of bleeding following major trauma: an updated European guideline. *Crit. care (Lond., Online)*, 2010, let. 14, št. 2, [1-29] R52, doi: [10.1186/cc8943](http://dx.doi.org/10.1186/cc8943). [COBISS.SI-ID [464803](http://cobiss.izum.si/scripts/cobiss?command=DISPLAY&amp;base=COBIB&amp;RID=464803)], [[JCR](http://www.cobiss.si/scripts/cobiss?command=SEARCH&amp;base=jcr&amp;select=(sc=1466-609X+and+PY=2010)), [WoS](http://gateway.isiknowledge.com/gateway/Gateway.cgi?GWVersion=2&amp;SrcAuth=Alerting&amp;SrcApp=Alerting&amp;DestApp=WOS&amp;DestLinkType=FullRecord&amp;UT=000278816800027) do 12. 11. 2013: št. citatov (TC): 212, čistih citatov (CI): 212, normirano št. čistih citatov (NC): 74, [Scopus](http://www.scopus.com/inward/record.url?partnerID=2dRBettD&amp;eid=2-s2.0-77950525508) do 12. 11. 2013: št. citatov (TC): 272, čistih citatov (CI): 270, normirano št. čistih citatov (NC): 94]  **3.** SPAHN, Donat R., CERNY, Vladimir, COATS, Timothy J., DURANTEAU, Jacques, FERNANDEZ-MONDEJAR, Enrique, GORDINI, Giovanni, STAHEL, Philip F., HUNT, Beverley J., KOMADINA, Radko, NEUGEBAUER, Edmund A., OZIER, Yves, RIDDEZ, Louis, SCHULTZ, Arthur, VINCENT, J. L., ROSSAINT, Rolf. Management of bleeding following major trauma: a European guideline. *Crit. care (Lond., Online)*, 2007, let. 11, št. 1, [1-22] R17. [COBISS.SI-ID [332963](http://cobiss.izum.si/scripts/cobiss?command=DISPLAY&amp;base=COBIB&amp;RID=332963)], [[JCR](http://www.cobiss.si/scripts/cobiss?command=SEARCH&amp;base=jcr&amp;select=(sc=1466-609X+and+PY=2007)), [WoS](http://gateway.isiknowledge.com/gateway/Gateway.cgi?GWVersion=2&amp;SrcAuth=Alerting&amp;SrcApp=Alerting&amp;DestApp=WOS&amp;DestLinkType=FullRecord&amp;UT=000247721000017) do 10. 11. 2013: št. citatov (TC): 172, čistih citatov (CI): 171, normirano št. čistih citatov (NC): 63, [Scopus](http://www.scopus.com/inward/record.url?partnerID=2dRBettD&amp;eid=2-s2.0-34248228655) do 7. 10. 2013: št. citatov (TC): 206, čistih citatov (CI): 203, normirano št. čistih citatov (NC): 75] |

# MEDNARODNOPRAVNO VARSTVO OKOLJA Učni načrt predmeta/Course syllabus

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| Predmet: | MEDNARODNOPRAVNO VARSTVO OKOLJA |
| Course title: | International Environmental Law |
| Članica nosilka/UL Member: | UL PF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020657 |
| Koda učne enote na članici/UL Member course code: | 96 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 30 | 30 |  |  | 30 | 160 | 10 |

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| Nosilec predmeta/Lecturer: | Vasilka Sancin |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij. | Enrollment in the doctoral study programme. |

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| Vsebina: | Content (Syllabus outline): |
| 1. Uvod  1.1. Razvoj mednarodnega okoljskega prava  1.2. Viri mednarodnega okoljskega prava  1.3. Nezavezujoče »mehko« mednarodno okoljsko pravo    2. Načela mednarodnega okoljskega prava  2.1. Prepoved povzročanja škode  2.2. Dolžnost opozorila in posvetovanja  2.3. Previdnostno načelo  2.4. Načelo onesnaževalec plača  2.5. Načelo skupnih vendar različnih obveznosti  2.6. Načelo trajnostnega razvoja    3. Mednarodni sistem okoljskega upravljanja  3.1. Države  3.2. Mednarodne organizacije  3.3. Telesa mednarodnih pogodb  3.4. Vloga znanstvenih organizacij  3.5. Vloga nevladnih akterjev  3.6. Oblikovanje mednarodnopravnega okoljskega režima    4. Varovanje okolja na mednarodni in evropski ravni  4.1. Čezmejno varovanje okolja  4.2. Skupna dediščina, skupna ozemlja in skupni interes  4.3. Sladkovodni viri  4.4. Oceani in onesnaževanje morja  4.5. Onesnaževanje zraka  4.6. Ozon in vesolje  4.7. Podnebne spremembe  4.8. Biološka raznolikost  4.9. Nevarni odpadki    5. Mednarodno okoljsko pravo v povezavi z drugimi pravnimi področji  5.1. Varovanje okolja in človekove pravice  5.2. Varovanje okolja in mednarodni mir in varnost  5.3. Varovanje okolja in mednarodno gospodarsko pravo    6. Izpolnjevanje mednarodnih obveznosti in odgovornost držav  6.1. Izpolnjevanje obveznosti iz mednarodnih pogodb in mehanizem izvrševanja  6.2. Pravila o odgovornosti  6.3. Odgovornost držav    7. Reševanje sporov  7.1. Reševanje sporov v okviru mednarodnih pogodb  7.2. Reševanje sporov pred mednarodnimi telesi | 1. Introduction  1.1. Development of international environmental law  1.2. Sources of international environmental law  1.3. International environmental soft law    2. Principles of international environmental law  2.1. No Harm Principle  2.2. Duty to Notify and to Consult  2.3. Precautionary Principle  2.4. Polluter Pays Principle  2.5. Common but Differentiated Responsibility  2.6. Sustainable Development    3. International environmental governance  3.1. States  3.2. International organizations  3.3. Treaty bodies  3.4. The role of scientific organizations  3.5. The role of non-state actors  3.6. International environmental treaty regime-building    4. International and European Environmental Protection  4.1. Transboundary Environmental protection  4.2. Common heritage, common areas and common concern  4.3. Freshwater sources  4.4. Oceans and marine pollution  4.5. Air pollution  4.6. Ozone and outer space  4.7. Climate change  4.8. Biodiversity  4.9. Hazardous Waste    5. International environmental law and other areas of law  5.1. Environmental protection and human rights  5.2. Environmental protection and international peace and security  5.3. Environmental protection and international economic law    6. Compliance and responsibility  6.1. Compliance with treaty law and enforcement mechanisms  6.2. Liability  6.3. State responsibility    7. Dispute settlement  7.1. Under international environmental law treaties  7.2. Judicial dispute settlement |

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| Temeljna literatura in viri/Readings: |
| - BIRNIE, P., BOYLE A. and REDGWELL, C.: International Law and the Environment, 3rd edition, Oxford University Press, Oxford 2009.  - Sands, P., and Peel, J.: Principles of International Environmental Law, 3rd edition, Cambridge University Press, Cambridge 2012.  - BeYERLIN, U. and Marauhn, t.: International Environmental Law, Hart Publishing, Oxford 2011.  - SANCIN, V. (ed.): International Environmental Law: Contemporary Concerns and Challenges, GV Založba, Ljubljana 2012.  - SANCIN, V. and KOVIČ DINE, M.: International Environmental Law: Contemporary Concerns and Challenges in 2014, GV Založba, Ljubljana, 2014  - SANCIN, V.: Mednarodno pravo v hierarhiji pravnih virov EU in njenih članic, Uradni list RS, Ljubljana 2009  - SHAW, M.: International Law, Sixth Edition, Cambridge University Press, 2007  - SANCIN, V.: Nekateri aktualni mednarodnopravni vidiki urejanja kitolova, Pravna praksa, leto 33, št. 19, 15. maj 2014  - SANCIN, V.: Odgovornost državnih organov za kršitve mednarodnega prava, XIII. Dnevi mednarodnega prava in javnega managementa, Portorož 2007  - KOVIC DINE, M., PUCELJ VIDOVIC, T. and SANCIN, V.: Pravne obveznosti glede varstva volkov kot zaščitene vrste v Sloveniji, Dignitas 2014.  - KOVIC DINE, M.: Mednarodne obveznosti držav za zagotavljanje trajnostnega razvoja gozdov. Zbornik znanstvenih razprav, letnik 73, 2013.  - Ustanovna listina Združenih narodov  - Relevantne mednarodne pogodbe |

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| Cilji in kompetence: | Objectives and competences: |
| Cilj predmeta je pregleden študij izbranih temeljnih poglavij mednarodnega okoljskega prava. Študent pridobi poglobljeno teoretično znanje vprašanj mednarodnega okoljskega prava. Na njihovi podlagi pridobi sposobnost znanstvenega analiziranja problemov, vrednotenja različnih teoretičnih izhodišč, uporabe primerjalno pravne metode, kritičnega analiziranja prakse držav in mednarodne judikature ter pisnega oblikovanja zahtevnejše argumentacije. | The objectives of the course are to give the student an overview of the selected elementary issues of international environmental law. The student will gain an indepth teoretical knowledge on the addressed international environmental law issues. On the basis of this knowledge the student will be able to scientifically analize the international environmetnal law problems, evaluate various theoretical and practical views, use comparative legal methods, critically analyze state practice and decisions of international tribunals and arbitration and express though legal argumentation |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Študentje pridobijo znanje s področja mednarodnega okoljskega prava, ki ga lahko uporabijo pri svojem delu v katerikoli disciplini povezani s področjem varovanja okolja. Študentje pri predmetu pridobijo razumevanje mednarodnopravnega urejanja področja, obveznosti držav za varovanje okolja ter odnosov med državami in nedržavnimi akterji. | Knowledge and understanding:  The students will gain the basic knowledge of international environmental law, that they will need in their work in any other discipline concerned also with environmental protection. The students will gain an understanding of the international legal regulation of the field, the obligations and responsibilities of states and the relationship between states and non-state actors. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja – predavajo se izbrane teme  Seminarske vaje – na seminarskih vajah študentje predstavijo vsebino seminarske naloge  Drugo – izdelava seminarske naloge, ki obravnava  zahtevnejši pravni problem z navedenih področij.  Individualni študij za izpit. | Lectures – lectures on selected topics  Seminars – presentation of an extended essay on a topi cof choice  Other – research work and preparation of the extended essay  Individual study for teh exam |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Način (pisni izpit, ustno izpraševanje, naloge, projekt): Ustni izpit. | 75,00 % | Type (examination, oral, coursework, project): Oral exam |
| Seminarska naloga. Za pristop k izpitu se zahteva uspešno izdelana in predstavljena seminarska naloga | 25,00 % | Extended Essay. Successful presentation of the extended essay predisposition for the oral exam. |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| Doc. dr. Vasilka Sancin, univ.dipl.prav  - SANCIN, V.: Položaj mednarodnega prava v hierarhiji pravnih virov Evropske unije in njenih članic, s posebnim ozirom na okoljsko pravo (doktorska disertacija), Pravna fakulteta Univerze v Ljubljani, 2007.)  - SANCIN, V. (ed.): International Environmental Law: Contemporary Concerns and Challenges, GV Založba, Ljubljana 2012.  - SANCIN, V. and KOVIČ DINE, M.: International Environmental Law: Contemporary Concerns and Challenges in 2014, GV Založba, Ljubljana, 2014  - SANCIN, V.: Mednarodno pravo v hierarhiji pravnih virov EU in njenih članic, Uradni list RS, Ljubljana 2009  - SANCIN, V.: Nekateri aktualni mednarodnopravni vidiki urejanja kitolova, Pravna praksa, leto 33, št. 19, 15. maj 2014  - SANCIN, V.: Odgovornost državnih organov za kršitve mednarodnega prava, XIII. Dnevi mednarodnega prava in javnega managementa, Portorož 2007  - SANCIN, V.: Članstvo Slovenije v mednarodnih organizacijah, Dnevi slovenskih pravnikov, Portorož 2011  - KOVIC DINE, M., PUCELJ VIDOVIC, T. and SANCIN, V.: Pravne obveznosti glede varstva volkov kot zaščitene vrste v Sloveniji, Dignitas 2014. |

# MIKROBNA EKOLOGIJA Učni načrt predmeta/Course syllabus

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| Predmet: | MIKROBNA EKOLOGIJA |
| Course title: | Microbial ecology |
| Članica nosilka/UL Member: | UL BF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020658 |
| Koda učne enote na članici/UL Member course code: | 34 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 10 | 50 |  |  |  | 190 | 10 |

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| Nosilec predmeta/Lecturer: | David Stopar |

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| Izvajalci predavanj: | Ines Mandić Mulec |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študijski program. | Enrolment in the doctoral study program. |

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| Vsebina: | Content (Syllabus outline): |
| Temeljna vsebinska področja pri predmetu so:   * različnost mikrobnih habitatov in niš, * ekstremna okolja mikroorganizmov, * mikrobna ekofiziologija, * mikrobne združbe in simbioze, * značilnosti mikrobnega kroženja elementov, * biofilmi, * mikrobiologija odpadnih voda, * mikrobiologija tal, voda in sedimentov, * biorazgradljivost in bioremediacija, * proizvodnja mikrobne biomase in biogoriv. | The following themes will be discussed:   * microbial habitats and niches, * extreme environments and microorganisms, * microbial ecophysiology, * microbial communities and symbioses, * biogeochemical cycling of elements, * biofilms, * wastewater treatment, * soil, aquatic, and sediment microbiology, * biodegradation and bioremediation, * microbial fuel and biomass production. |

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| Temeljna literatura in viri/Readings: |
| Aktualni znanstveni in pregledni članki, ki so javno dostopni preko spleta. |

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| Cilji in kompetence: | Objectives and competences: |
| Predmet je predvsem namenjen študentom, ki niso diplomanti mikrobiologije, vendar bi radi pridobili znanje o razširjenosti, aktivnosti in pomenu mikroorganizmov v okolju. Študent bo na izbranem mikrobno ekološkem problemu pridobil ustrezne kompetence za reševanje okoljskih težav, ki jih povzročajo mikroorganizmi. | This course in Microbial ecology is mainly intended for students that are not masters of Microbiology, but would like to obtain basic knowleadge about the distribution, activity and the role of microbes in the environment. On a selected microbial ecology topic student will learn how to tackle and solve environmental problems related to microorganisms. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Študent spozna glavne interakcije med mikrobi. Pozna vplive fizikalno-kemijskih parametrov na rast in aktivnost mikrobne populacije v naravnem okolju. Pozna glavne mehanizme kroženja in transporta mikrobioloških hranil. Pozna osnovne koncepte pri razgradnji snovi. Pridobljeno znanje zna uporabiti za reševanje problemov v mikrobni ekologiji. | Knowledge and understanding:  Student understands main interactions between microorganisms in the environment. Knows how different physicochemical parameters influence microbial growth, knows major mass and heat transport mechanisms in the environment, understands biogeochemical cycles. Student can apply knowledge to solve microbial ecology problem. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja, konzultacije. | Lectures, consultations. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Ocenjuje se seminarsko delo, ki študent zagovarja pred nosilcem predmeta | 100,00 % | Oral seminar |

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| Ocenjevalna lestvica: | Grading system: |
| 5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10 | 5 - 10, a student passes the exam if he is graded from 6 to 10 |

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| Reference nosilca/Lecturer's references: |
| **Prof. dr. David Stopar**  1. ODIĆ, Duško, BUDIČ, Bojan, MANDIĆ-MULEC, Ines, **STOPAR, David**. Influence of bacterial lysate quality on growth of two bacterioplankton species. *Microb. ecol.*, 2010, issue 2, vol. 59, str. 246-252, doi: [10.1007/s00248-009-9557-1](http://dx.doi.org/10.1007/s00248-009-9557-1). [COBISS.SI-ID [3653496](http://cobiss.izum.si/scripts/cobiss?command=DISPLAY&amp;base=COBIB&amp;RID=3653496)]  2. BORIĆ, Maja, DANEVČIČ, Tjaša, **STOPAR, David**. Prodigiosin from Vibrio sp. DSM 14379 : a new UV-protective pigment. *Microb. ecol.*, 2011, vol. 62, str. 528-536, doi: [10.1007/s00248-011-9857-0](http://dx.doi.org/10.1007/s00248-011-9857-0). [COBISS.SI-ID [3915896](http://cobiss.izum.si/scripts/cobiss?command=DISPLAY&amp;base=COBIB&amp;RID=3915896)]  3. ABEDON, Stephen T., HERSCHLER, Troy D., **STOPAR, David**. Bacteriophage latent-period evolution as a response to resource availability. *Appl. environ. microbiol.*, 2001, vol. 67, no. 9, str. 4233-4241. [COBISS.SI-ID [2524792](http://cobiss.izum.si/scripts/cobiss?command=DISPLAY&amp;base=COBIB&amp;RID=2524792)]  4. TERLEP, Saša, HYMPANOVA, Michaela, DOGŠA, Iztok, PAJK, Franja, STOPAR, David. Photoacoustic removal of Enterococcus faecalis biofilms from titanium surface with an Er:Yag laser using super short pulses. *Lasers in medical science*. 2022, vol. 37, str. 381–390. ISSN 0268-8921. DOI: [10.1007/s10103-021-03265-6](https://dx.doi.org/10.1007/s10103-021-03265-6). [COBISS.SI-ID [50278659](https://plus.cobiss.net/cobiss/si/sl/bib/50278659)]  5. PANDUR, Žiga, DULAR, Matevž, KOSTANJŠEK, Rok, STOPAR, David. Bacterial cell wall material properties determine E. coli resistance to sonolysis. *Ultrasonics Sonochemistry*. Feb. 2022, vol. 83, str. 1-10, art. 105919, ilustr. ISSN 1350-4177. <https://www.sciencedirect.com/science/article/pii/S1350417722000128?via%3Dihub>, <https://repozitorij.uni-lj.si/IzpisGradiva.php?id=135331>, DOI: [10.1016/j.ultsonch.2022.105919](https://dx.doi.org/10.1016/j.ultsonch.2022.105919) |

# MINERALNI MATERIALI V KULTURNI DEDIŠČINI Učni načrt predmeta/Course syllabus

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| Predmet: | MINERALNI MATERIALI V KULTURNI DEDIŠČINI |
| Course title: | Mineral materials in cultural heritage |
| Članica nosilka/UL Member: | UL NTF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020659 |
| Koda učne enote na članici/UL Member course code: | 35 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 25 | 25 | 10 |  |  | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Mirijam Vrabec |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet /elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij. | Enrollment to the doctoral study programme. |

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| Vsebina: | Content (Syllabus outline): |
| Vrste mineralnih materialov kot element kulturne dediščine: naravni kamen, hidravlična veziva (naravna, umetna), ometi, malte, tlaki, agregati, keramični materiali (zidaki, strešniki) in steklo kot gradbeni element. Uporaba (mesto in namen uporabe v objektu), lastnosti, tehnologija priprave in uporabe mineralnih materialov skozi čas. Destruktivne in nedestruktivne metode preiskav mineralnih materialov po vgradnji, kvalitativna in kvantitativna kemična in mineralna sestava, fizikalne lastnosti. Izbira analitske tehnike glede na vrsto mineralnega materiala in dosegljivost vzorca. Propadanje (spremembe fizikalnih lastnosti, kemične in mineraloške spremembe, nastanek sekundarnih mineralov), zaščita in restavriranje mineralnih materialov, ki so bili vgrajeni v objekte kulturne dediščine. | Mineral materials as the elements of cultural heritage: natural stone, hidraulic binders (natural and artificial), plasters, mortars, pavements, aggregats, ceramic materials (brick, tiles) and glass as the construction elements. Use, properties, manufacturing technology and use mineral materials in the past. Destructive and nondestructive investigation methods of mineral materials in situ. Qualitative and quantitative chemical and mineral composition, physical properties. Weathering (changes of physical properties, chemical and mineralogical changes, crystallization of secondary minerals), conservation and restoration of mineral materials, built in the objects of cultural heritage. |

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| Temeljna literatura in viri/Readings: |
| - E.M.Winkler: Stone in architecture, New York 1997, 313 str.  - J.in N.Ashurst: Practical building conservation, vol. 1 (100 str.), vol.3 (126 str.), Hants 1998  - P.Brimblecombe: The effects of air pollution on the built environment, London 2003, 428 str.  - B.Stuart: Analytical techniques in materials conservation, Chichester 2007, 424 str.  - Conservation of historic stone buildings and monuments, Washington 1982, 365 str. (NRCC report)  - C.Groot: Characterisation of old mortars with respect to their repair, Bagneux 2007, 177 str. (RILEM report)  - International RILEM Workshop on historic mortars, Paisley, Scotland 1999, 459 str. (RILEM proceedings, PRO 12)  - W.Vogel: Kemija stakla, Zagreb 1985, 379 str.  - mednarodni članki iz področja študija |

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| Cilji in kompetence: | Objectives and competences: |
| Elementi kulturne dediščine, ki jo predstavljajo mineralne snovi, so naravni kamen, steklo, zračna in hidravlična veziva, keramični materiali. Njihova uporaba odraža odnos človeka do okolja in izraža stopnjo tehnološkega razvoja človeka v kulturni krajini. Obnašanje uporabljenih mineralnih snovi po vgradnji pa kaže na stanje okoljskih parametrov onesnaženosti zraka, vode in vpliv antropogenih dejavnikov.  Študenti se spoznajo z mineralnimi snovmi, ki so uporabljeni v posameznem urbanem okolju (kamen, steklo, keramika, ..), s tehnologijo uporabe in se naučijo prepoznati posledice vplivov okoljskih dejavnikov na njihovo obstojnost. | Elements of cultural heritagewhere nonmetal mineral materials were used are natural stone, glass, air and hydraulic binders, ceramic materilas. Their use express the relation between the mankind and environment and determine the level of technological development in cultural region. The way of weathering and its rate are dependent on parameters of air pollutants, water and other anthropogene factors.  Students acquire knowledge about mineral materials used in the particular geographic region (natural stone, glass and ceramic products), the technology of their use, the concequences of environmental factors on their durability. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Študenti pridobijo znanja o mineralnih snoveh, ki jih potrebujejo za uspešno preprečevanje propadanja, zaščito in /ali obnovo objektov kulturne dediščine, za katere se bile uporabljene nekovinske mineralne snovi. | Knowledge and understanding:  Knowledge about the nonmetal mineral materials, which the students need for successful prevention of weathering and protection or restoration the objects of cultural heritage. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja in laboratorijske vaje, konzultacije, seminarska naloga. | Lectures, tutorial (laboratory), seminar, consulting hours. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Seminar | 50,00 % | Seminar |
| Ustni izpit | 50,00 % | Oral examination |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| KRAMAR, Sabina, LUX, Judita, MLADENOVIČ, Ana, PRISTACZ, Helmut, **MIRTIČ, Breda**, SAGADIN, Milan, ROGAN ŠMUC, Nastja. Mineralogical and geochemical characteristics of Roman pottery from an archaeological site near Mošnje (Slovenia). *Appl. clay sci.*. [Print ed.], 2012, vol. 57, str. 39-48, doi: [10.1016/j.clay.2011.12.00](http://dx.doi.org/10.1016/j.clay.2011.12.00).  KRAMAR, Sabina, **MIRTIČ, Breda**, KNÖLLER, Kay, ROGAN ŠMUC, Nastja. Weathering of the black limestone of historical monuments (Ljubljana, Slovenia): Oxygen and sulfur isotope composition of sulfate salts. *Appl. geochem.*. [Print ed.], 2011, vol. 26, iss. 9-10, str. 1632-1638, doi: [http://dx.doi.org/10.1016/j.apgeochem.2011.04.020](http://dx.doi.org/http:/dx.doi.org/10.1016/j.apgeochem.2011.04.020).  KRAMAR, Sabina, ZALAR, Vesna, UROŠEVIČ, Maja, KÖRNER, Wilfried, MAUKO, Alenka, **MIRTIČ, Breda**, LUX, Judita, MLADENOVIČ, Ana. Mineralogical and microstructural study of mortars from the bath complex of the Roman villa rustica near Mošnje (Slovenia). *Mater. charact.*. [Print ed.], 2011, vol. 62, iss. 11, str. 1042-1057, doi: [10.1016/j.matchar.2011.07.019](http://dx.doi.org/10.1016/j.matchar.2011.07.019).. |

# NAČRTOVANJE OKOLJU PRIJAZNIH PROIZVODOV IN TEHNOLOGIJ Učni načrt predmeta/Course syllabus

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| Predmet: | NAČRTOVANJE OKOLJU PRIJAZNIH PROIZVODOV IN TEHNOLOGIJ |
| Course title: | DESIGNING ENVIRONMENTALLY-FRIENDLY PRODUCTS AND TECHNOLOGIES |
| Članica nosilka/UL Member: | UL NTF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020671 |
| Koda učne enote na članici/UL Member course code: | 36 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 20 | 30 | 30 |  |  | 170 | 10 |

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| Nosilec predmeta/Lecturer: | Borut Kosec |

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| Izvajalci predavanj: | Aleš Nagode, Franci Pušavec |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Pogoj za vključitev v delo oziroma za opravljanje študijskih obveznosti je vpis v 1. letnik doktorskega študija. | The condition to attend in the teaching course and to perform study obligations is an entry in the first year of doctoral study.  Completed and successfully presented project work is required before taking the written and oral exam. |

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| Vsebina: | Content (Syllabus outline): |
| Uvod. Načrtovanje okolju prijaznih proizvodov in tehnologij. Metode in orodja.  Življenjski krog proizvoda in recikliranje. Življenjski krog proizvoda: proizvodnja in distribucija, uporaba. Po uporabi: recikliranje, odlaganje in sežiganje. Recikliranje materiala in recikliranje proizvoda.  Analiza življenskega kroga proizvoda. Okoljsko, ekonomsko in tehnično vrednotenje. Orodja in tehnike.  Metode načrtovanja proizvodov. LCA metoda. Predstavitev metode. Vrednotenje. MET metoda. Tehtanje pomembnosti posameznih vplivov na okolje. LiDS kolo okoljskega načrtovanja proizvoda. Predstavitev metode. Načrtovalne faze: (nov) koncept proizvoda, izbira materialov, zmanjšanje porabe materialov, optimiranje procesa, distribucijski sistem, vpliv proizvoda na okolje, optimiranje življenske dobe, scenarij po izrabi proizvoda. Vrednotenje.  FMEA metoda (analiza možnih napak in posledic). Predstavitev metode in tipi. Analiza in optimiranje življenjskega kroga proizvoda z metodo FMEA. Analiza in optimiranje tehnologije in celotnega tehnološkega procesa z metodo FMEA.  Čiste tehnologije.  Analiza ekološko kritičnih mest v proizvodnih procesih. Monitoring. Modeliranje.  Ekološko označevanje proizvodov, storitev, procesov.  Študij praktičnih problemov.  Projektno delo. Kompleksna analiza in optimiranje izbranega tehnološkega procesa, tehnologije oziroma proizvoda z vidika stroškov, časa in kakovosti z vključitvijo vidikov in zahtev varstva okolja. | Introduction. Designing environmentally-friendly products and technologies. Methods and tools.  Product life cycle and recycling. Product life cycle: production and distribution, mode of application. After application: recycling, dumping and burning. Material recycling and product recycling.  Product life cycle analyses: environmental, economic and technical assessment. Tools and techniques.  Methods of product designing. Method LCA. Introduction of the method. Assessment. MET method.  Weighing of importance of single influences to the environment. LiDS cycle of environmentally designing of the product. Introduction of the method. Designing phases: (new) product concept, materials selection, materials consume reduction, process optimization, distribution system, influence of the product to environment, life period optimization, scenario after exploitation of the product. Assessment.  FMEA method (Failure Mode and Effects Analyses). Introduction of the method and types. Analyses and optimization of product life cycle with FMEA method FMEA. Analyses and optimization of the technology and whole technological process with FMEA method.  Clean technologies.  Analyses of ecological critical points in production processes. Monitoring. Modeling.  Environmental labeling of products, services and processes.  Case studies.  Project work. Complex analyses and optimization of selected technological process, technology or product from the view of costs, time and quality with inclusion of aspects and demands of environmental protection. |

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| Temeljna literatura in viri/Readings: |
| ABELE, E., ANDERL, R. in BIRKHOFER, H. *Environmentally – Friendly Product Development – Methods and Tools.* London: Springer Verlag, 2005.  BUDAK, I., KOSEC, B., HODOLIČ, J., KARPE, B., STEVIĆ, M. in VUKELIĆ, Đ. *Environmental labelling of products.* Novi Sad: Fakultet tehničkih nauka, 2009.  BURKE, G., SINGH, B. in THEODORE, L. *Handbook of Environmental Management and Technology*. New Yersey: John Wiley & Sons, 2005.  HODOLIČ, J., VUKELIĆ, Đ., HADŽISTEVIĆ, M., BUDAK, I., BADIDA, M., ŠOOŠ, L., KOSEC, B., in BOSAK, M*. Recycling and Recycling Technologies*. Novi Sad: Fakultet tehničkih nauka, 2011.  KUTZ, M. *Environmentally Conscious Manufacturing*. New Jersey: John Wiley & Sons, 2007.  KUTZ, M. *Environmentally Conscious Mechanical Design*. New Jersey: John Wiley & Sons, 2007.  LUND, H.F. *The McGraw – Hill Recycling Handbook.* New York: McGraw – Hill, 2001.  McDERMOT, E.R., MIKULAK, J.R. in BEAUERGARD R.M. *The Basics of FMEA.* New York: Productivity, 1996,  *Acta Materialia*, Elsevier, ISSN: 1359-6454  *Basic and Applied Ecology*, Elsevier, ISSN: 1439-1791  *Environmental Modeling and Assessment,* Springer, ISSN: 1420-2026  *Journal of Environmental Management*, Elsevier, ISSN: 0301-4797 |

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| Cilji in kompetence: | Objectives and competences: |
| Študent pri predmetu Načrtovanje okolju prijaznih proizvodov in tehnologij spozna ekološko naravnanost posameznih materialov, proizvodov in tehnoloških procesov ter postopkov.  Nauči se metod in orodij za načrtovanje in analizo okolju prijaznih materialov, izdelkov in tehnologij.  Študent se navaja na samostojno in timsko raziskovalno ter projektno delo, uporabo strokovne literature in sodobnih virov informacij. | In the teaching course Designing environmentally-friendly products and technologies the student acquires knowledge about the ecological orientation of individual products, technological processes and technologies.  Student learns the methods and tools methods and techniques of design and development of environmentally-friendly materials, products, and technologies.  Student gets accustomed to individual and team, project and research work, and expert literature and modern information source applications. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Pri predmetu Načrtovanje okolju prijaznih proizvodov in tehnologij pridobi študent znanja o ekološki naravnanosti posameznih proizvodov, tehnoloških procesov in tehnologij.  Spozna metode in tehnike načrtovanja in razvoja okolju prijaznih proizvodov, procesov in tehnologij.  Študent se navaja na samostojno sprejemanje odločitev, povezuje in vrednoti analitične, eksperimentalno in numerično dobljene rezultate. Navaja se na samostojno in timsko delo, na projektno in raziskovalno delo, uporabo strokovne literature in sodobnih virov informacij.  Pridobi sposobnosti za samostojno znanstveno raziskovalno delo, razvoj, organizacijo in vodenje industrijskih in temeljnih raziskovalnih projektov. | Knowledge and understanding:  In the course Designing environmentally-friendly products and technologies teaching course the student acquires knowledge about the ecological orientation of individual products, technological processes and technologies.  They learn methods and techniques of planning and development of environmentally-friendly products, processes and technologies.  Student will get accustomed to reach decision individually. Link and asses analytical, experimental and numerical acquired results. Students get used to individual and team, project and research work, and expert literature and modern information source applications.  Student will acquire knowledge for individual scientific work, development, organization and conduction of industrial and fundamental scientific activities and research projects. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja, računske vaje in simulacije, reševanje odprtih nalog (problemov), projektno delo. | Lectures. Exercises solving and simulations. Solving case studies. Project work. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Ocena projektnega dela | 30,00 % | The mark of project work |
| Ocena pisnega dela izpita | 30,00 % | The mark of written examination |
| Ocena ustnega dela izpita | 40,00 % | The mark of the oral examination |
| Način opravljanja izpita: ustni /pisni izpit – teorija in naloge, reševanje odprtih nalog (problemov), izdelava in uspešen zagovor projektnega dela . predmet se zaključi z izpitom, ki ga sestavljata pisni in ustni del. |  | Type of examination: oral /written examination – theory and calculation tasks, solving case studies, successfully presented project work . The course ends with passing the examination which is composed of written. |
| Od 6-10 (pozitivno) oz. 1-5 (negativno) oz. opravil / ni opravil; ob upoštevanju Statuta UL in fakultetnih pravil. |  | From 6-10 (positive) and from 1-5 (negative) or; to pass / to fail; regard to Statute of UL faculty rules. |
| Opravljeno in uspešno predstavljeno projektno delo je pogoj za pristop k pisnemu in ustnemu izpitu. |  |  |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| **prof. dr. Borut KOSEC:**  1. **KOSEC, Borut**, SOKOVIĆ, Mirko, KOSEC, Ladislav, BIZJAK, Milan, PUŠAVEC, Franci, KAMPUŠ, Zlatko. Introduction of new ecologically safe material for fusible elements of low voltage fuses. Archives of materials science and engineering. 2007, Vol. 28, No. 4, pp. 211-216.  2. JEVREMOVIĆ, Danimir, PUŠKAR, Tatjana, **KOSEC, Borut**, VUKELIĆ, Djordje, BUDAK, Igor, ALEKSANDROVIĆ, Srbislav, EGBEER, David, WILLIAMS, Robert. The analysis of the mechanical properties of F75 Co-Cr alloy for use in selective laser melting (SLM) manufacturing of removable partial dentures (RPD). Metallurgy, 2012, Vol. 51, No. 2, pp. 171-174.  3. AGARSKI, Boris, BUDAK, Igor, **KOSEC, Borut**, HODOLIČ, Janko. An approach to multi-criteria environmental evaluation with multiple weight assignment. Environmental Modeling and Assessment, 2012, Vol. 17, No. 3, pp. 255-266. |

# NARAVNA TVEGANJA V GORSKEM OKOLJU Učni načrt predmeta/Course syllabus

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| Predmet: | NARAVNA TVEGANJA V GORSKEM OKOLJU |
| Course title: | NATURAL HAZARDS IN MOUNTAINOUS ENVIRONMENT |
| Članica nosilka/UL Member: | UL FGG |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020673 |
| Koda učne enote na članici/UL Member course code: | 37 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 20 | 40 |  |  |  | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Matjaž Mikoš |

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| Izvajalci predavanj: | Marko Polič, Timotej Verbovšek |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis na doktorski študij. | Enrollment to doctoral studies. |

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| Vsebina: | Content (Syllabus outline): |
| Vsebina se deli na 4 enote (študent lahko glede na svoja predznanja in zasnovo doktorskega dela da poudarek le določenim vsebinskim sklopom):  Ocenjevanje nevarnih procesov v gorskem okolju - delitev pobočnih masnih premikov; značilnosti hudourniških poplav, snežnih in zemeljskih plazov; metode določanja intenzitete in verjetnosti nastopa ter dosega delovanja omenjenih pojavov (osnove modeliranja posameznih vrst nevarnih procesov).  Ukrepi za zmanjševanje tveganj ter urejanje hudourniških in nestabilnih območij - pregled metod ukrepanja za zmanjševanje tveganj, predvsem gradbeno-tehničnih in biotehničnih metod urejanja ogroženih območij zaradi naštetih naravnih tveganj, metod dimenzioniranja posameznih varovalnih objektov ter načinov njihovega vzdrževanja.  Upravljanje s tveganji in socio-ekonomski vidiki - analiza celotnega (integralnega) kroga upravljanja s tveganji od kriznega menedžmenta v primeru naravnih nesreč v gorskem svetu preko odprave posledic in sanacije (mitigacije) do preventive in priprave na prevzem novih tveganj (izobraževanje, obveščanje, zgodnje opozarjanje, alarmiranje) v luči modernega obvladovanja tveganj (risk governance).  Zajemanje in priprava relevantnih podatkov o tveganjih in dogodkih - izdelava ustrezne dokumentacije o naravnih katastrofah v gorskem svetu za kasnejšo kakovostno analizo vzrokov in posledic, izvedeno na primerih dobre prakse v alpskem svetu. | The content is divided into 4 units (student may according to his own past experiences and the doctoral thesis give the accent to only selected parts):  Assessment of dangerous processes in mountainous environment – classification of slope mass movements; characteristics of flash floods, avalanches and landslides; methods of determination of intensity, probability of occurrence, and reach-out areas of before mentioned processes (bases of modelling of single classes of dangerous processes).  Measures for risk mitigation, torrent and landslide control – overview of risk mitigation methods, especially structural and bioengineering methods of mitigation in risk areas due to before mentioned natural risks, designing methods of single protection structures, and ways of their maintenance.  Risk management and socio-economic aspects – analysis of the integral risk management cycle from crisis management in the case of natural catastrophes in mountainous environment across removal of consequences and mitigation to prevention and preparations works to new risks (education, notification, early warning, alarming) in the light of modern risk governance.  Gathering and preparation of relevant data on risks and events – preparation of adequate documentation on natural catastrophes in mountainous environment for later qualitative analysis of causes and consequences, done on the cases of good practice in the alpine environment. |

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| Temeljna literatura in viri/Readings: |
| D. Alexander, 2002. Natural Disasters, Routledge.  F.G. Bell, 1999. Geological Hazards – Their Assessment, avoidance and mitigation, E & FN Spon, 648 str.  G.-R. Bezzola, C. Hegg (eds.), 2007. Ereignisanalyse Hochwasser 2005. Teil 1: Prozesse, Schäden und erste Einordnungen, BAFU, Bern & WSL, Birmensdorf, 215 str.  G.-R. Bezzola, C. Hegg (eds.), 2008. Ereignisanalyse Hochwasser 2005. Teil 2: Analyse von Prozessen, Massnahmen und Gefahrengrundlagen, BAFU, Bern & WSL, Birmensdorf, 426 str.  P. Blaikie, T. Cannon, I. Davis, B. Wisner, 2004. At Risk: Natural Hazards, People's Vulnerability and Disasters, 2nd ed., Routledge, 447 str.  E. Bryant, 2005. Natural Hazards, 2nd ed., Cambridge University Press, 312 str.  C. Embleton, C. Embleton-Hamann, 1997. Geomorphological Hazards of Europe, Elsevier, 524 str.  J. Hϋbl, H. Kienholz, A. Loipersberger (eds.), 2002. DOMODIS – Documentation of Mountain Disasters, INTERPRAEVENT, Handbuch 1, Klagenfurt, 40 str.  IRGC, 2005. Risk Governance – Towards an Integrative Approach, White Paper No1, IRGC, Geneva, 24 str.  E.M. Lee, D.K.C.Jones, 2004: Landslide Risk Assessment, Thomas Telford, 454 str.  J. Nott, 2006. Extreme Events – A Physical Reconstruction and Risk Assessment, Cambridge University Press, 297 str.  O. Renn, K. Walker (eds.), 2008. Global Risk Governance – Concept and Practice Using the IRGC Framework, Springer Verlag, 370 str.  K. Smith, 2000. Environmental Hazards: Assessing Risk and Reducing Disaster, 4th ed., Routledge, 432 str.   |  | | --- | |  | |  |   **Revijalni članki s področja, spletne strani** |

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| Cilji in kompetence: | Objectives and competences: |
| Predmet seznanja študenta z nevarnimi naravnimi procesi, ki v gorskem svetu predstavljajo tveganje za človeka in njegovo infrastrukturo. Študent spozna vrste in zakonitosti teh procesov, načine določanja območij njihovega delovanja in pristope k načrtovanju, dimenzioniranju in izvajanju ustreznih varovalnih ukrepov (preventivnih in ob izrednih razmerah). | The course acquaints a student with dangerous natural processes that in mountainous environment represent risks for humans and their infrastructure. A student gets to know classes and characteristics of such processes, ways of determination of areas of their impacts, and approaches to planning, designing, and executing corresponding protection measures (preventive ones and those in emergency conditions). |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Študent spozna krog integralnega upravljanja s tveganji v gorskem svetu ter razume vlogo posameznih subjektov (država, lokalna skupnost, stroka, znanost, javnost) in dokumentiranja ekstremnih dogodkov pri integralnem upravljanju s tveganji.  Študent zna s pridobljenim znanjem zasnovati analizo ekstremnega naravnega dogodka v gorskem okolju (predvsem hudourniških in rečnih poplav ter kamninskih podorov, padanja skal, drobirskih tokov in zemljinskih plazov), ali zasnovati eksperimentalno analizo delovanja izbranega varovalnega ukrepa, ali zasnovati raziskavo prostorske razširjenosti izbrane vrste tveganja ter nato tako zasnovo v okviru doktorskega dela tudi dokončati. | Knowledge and understanding:  A student gets to know the risk management circle for risks in mountainous environment, and understands the role of single subjects (state, local community, professions, science, public), and the role of documenting extreme events in integral risk management.  A student can with the gathered knowledge make a design of an analysis of a extreme natural event in mountainous environment (especially torrential (flash) and river floods, and rock falls, stone falls, debris flows, and landslides), or to make a design of an experimental analysis of the impacts of a selected protection measure, or to make a design of a research on spatial extent of a selected risk and furthermore to finalise such a design within the doctoral dissertation. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Študij izbrane literature s konzultacijami, zbiranje relevantnih podatkov, krajši raziskovalni projekt s pripravo poročila oziroma pisanje seminarske naloge na izbrano temo s področja naravnih tveganj v gorskem okolju s končnim poročilom v obliki raziskovalnega članka. | Studying of selected literature with consultations, collecting of relevant data, a short research project with a short report resp. seminar work on the selected theme from the field of natural risks in mountainous environment with a final report in the form of a research paper. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Izdelava poročila o krajšem raziskovalnem projektu oz. predstavitev seminarske naloge ali objava raziskovalnega članka. | 100,00 % | Report on a short research project resp. presentation of a seminar work or publication of a research paper. |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| **Matjaž Mikoš:**  1. **Mikoš, M.**, Fazarinc, R., Majes, B. 2007: Delineation of risk area in Log pod Mangartom due to debris flows from the Stože landslide, *Acta geographica Slovenica*, 47/2, 171-198.  2. Sodnik, J., **Mikoš, M.** 2006: Estimation of magnitudes of debris flows in selected torrential |

# NEVARNE SNOVI V TEKSTILIJAH Učni načrt predmeta/Course syllabus

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| Predmet: | NEVARNE SNOVI V TEKSTILIJAH |
| Course title: | HAZARDOUS SUBSTANCES IN TEXTILES |
| Članica nosilka/UL Member: | UL NTF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020686 |
| Koda učne enote na članici/UL Member course code: | 38 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 30 | 30 |  |  |  | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Petra Eva Forte Tavčer |

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| Izvajalci predavanj: | Barbara Simončič |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij. | Enrolment in the programme. |

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| Vsebina: | Content (Syllabus outline): |
| Vsebina predmeta se prilagaja študijskemu načrtu in raziskovalnemu delu doktoranda. Poglobljeno se predelajo vsebine izbrane izmed naslednjih poglavij: Vrste tekstilnih vlaken in ploskih tekstilj.  Vpliv procesov proizvodnje in izdelave vlaken, tekstilij in oblačil na ljudi in okolje.  Okolju prijazni postopki pridobivanja naravnih, regeneriranih celuloznih in sintetičnih vlaken. Humana tekstilna ekologija. Vpliv tekstilij in oblačil na počutje in zdravje ljudi. Oporečne substance (formaldehid, težke kovine, pesticidi, biocidi, alergeni…). Toksičnost tekstilij in tekstilnih pomožnih sredstev. Toksičnost barvil in pigmentov. Analitika oporečnih substanc. Ekološke oznake tekstilij (npr. Eko-Tex standard 100). Pridobivanje certifikatov. Okoljska zakonodaja. Tekstilni odpadki; odlaganje in recikliranje. | The content of the course conform to the study plan and research work of particular student. Selected contents out of the following chapters will be studied:  Types of fibers and textiles  Influence of fiber and fabric production on environment and population  Environmetaly friendly production of natural and synthetic fibers  Human textile ecology  Influence of textiles and apparels on well-being and health  Prohibited, hazardous, toxic substances in textiles  Eco-labels and certification  Environmental legislation  Textile waste, disposal and recycling |

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| Temeljna literatura in viri/Readings: |
| - Mirafab M. and Horrocks A.R. Ecotextiles, (Woodhead publishing in textiles). [Manchester]: Textile Institute; Boca Raton [etc.]: CRC Press; Cambridge: Woodhead Publishing, 2007.  - Christie, R. M. Environmental aspects of textile dyeing, (Woodhead publishing in textiles). [Manchester]: Textile Institute; Boca Raton [etc.]: CRC Press; Cambridge: Woodhead Publishing, 2007.  - Wang, Y., Recycling in textiles, (Woodhead publishing in textiles). [Manchester]: Textile Institute; Boca Raton [etc.]: CRC Press; Cambridge: Woodhead Publishing, 2006.  - Slater, K. Environmental impact of textiles, Production, processes and protection, Woodhed Publishing Ltd., Cambridge, 2003.  - Blackburn, R.S. Biodegradable and sustainable fibres, (Woodhead publishing in textiles). [Manchester]: Textile Institute; Boca Raton [etc.]: CRC Press; Cambridge: Woodhead Publishing, 2005.  - Skelly, J. K. Water Recycling in Textile Wet Processing, SDC, Bradford, 2003.  - Cooper, P. Colour in Dyehouse Effluent, SDC, Nottingham, 1995.  - revijalni članki s področja, tekoča periodika, učna gradiva. |

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| Cilji in kompetence: | Objectives and competences: |
| Študenti se pri predmetu seznanijo z osnovami tekstilne tehnologije in vplivom procesov proizvodnje tekstilij na okolje. Spoznajo prednosti in pomanjkljivosti naravnih in sintetičnih vlaken. Spoznajo se z okoljsko zakonodajo in standardi na področju tekstilstva. Spoznajo kemijsko strukturo vlaken ter kemikalije, ki se uporabljajo za plemenitenje tekstilij. Seznanijo se z dovoljenimi in prepovedanimi spojinami pri obdelavi tekstilij. Spoznajo vpliv tekstilij na zdravje ljudi. Seznanijo se z najpomembnejšimi ekološkimi oznakami tekstilij. | Students get information of fundamentals of textile technology and the influence of fiber and textile production on the envirnomnet. They recognize benefits and drawbacks of natural and synthetic fibers. They get information on environmental legislation and standardization in the field of textiles. They acquired knowledge about chemical structure of fibers and chemicals used in the production of textiles. They get information on forbbiden and permitted chemicals for textile processing. They recognize the influence of textiles and apparels on human health. They get to know different environmental labels and their meaning in general and especially for textiles. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Poznavanje in razumevanje:   * vpliva tekstilne industrije na okolje, * okolju prijaznejših tekstilnih surovin, sredstev in postopkov, * vpliva tekstilij na zdravje ljudi, * različnih okoljskih znakov in njihovega pomena, * problemov odlaganja tekstilnih odpadkov in izdelkov, * postopkov predelave in recikliranja tekstilnih odpadkov in tekstilnih izdelkov, * pravilnikov (zakonodaje) in standardov s področja varovanja okolja, * osnov okoljske analitike. | Knowledge and understanding:   * Influence of textile industry on environment * Environmentaly friendly resources, chemicals and processes * Influence of textiles on human health * Different environmental labels and their influence * Problematic of waste textile disposal * Processes of recycling of textile waste * Regulation and standardisation of environment protection * Fundamentals of environmental analysis |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja, konzultacije, seminar,študij po literaturnih virih. | Lecturing, consulting, seminar, individual study. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Izdelava seminarja z zagovorom ali objavo | 60,00 % | Project performance or publication |
| Ustno spraševanje | 40,00 % | Oral exam |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| **Petra Forte-Tavčer**  **1.** FORTE-TAVČER, Petra. Low-temperature bleaching of cotton induced by glucose oxidase enzymes and hydrogen peroxide activators. *Biocatal. biotransform. (Print)*, 2012, vol. 30, no. 1, str. 20-26, doi: [10.3109/10242422.2012.644437](http://dx.doi.org/10.3109/10242422.2012.644437). **2.** GOLJA, Barbara, BOH, Bojana, ŠUMIGA, Boštjan, FORTE-TAVČER, Petra. Printing of antimicrobial microcapsules on textiles. *Color. technol.*, 2012, vol. 128, no. , 8 str. [online, 23 Jan. 2012]. <http://onlinelibrary.wiley.com/doi/10.1111/j.1478-4408.2011.00349.x/pdf>, doi: [10.1111/j.1478-4408.2011.00349.x](http://dx.doi.org/10.1111/j.1478-4408.2011.00349.x). **3.** FORTE-TAVČER, Petra. Biotechnology in textiles - an opportunity of saving water. V: EINSCHLAG, Fernando S. García (ur.). *Waste water - treatment and reutilization*. Rijeka: Intech, 2011, str. [387]-404. <http://www.intechopen.com/articles/show/title/biotechnology-in-textiles-an-opportunity-of-saving-water>. |

# OBNOVLJIVI VIRI ENERGIJE Učni načrt predmeta/Course syllabus

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| Predmet: | OBNOVLJIVI VIRI ENERGIJE |
| Course title: | Renewable energy sources |
| Članica nosilka/UL Member: | UL FS |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski (od študijskega leta 2025/2026 dalje) | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020687 |
| Koda učne enote na članici/UL Member course code: | 39 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 30 | 30 | 60 |  |  | 130 | 10 |

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| Nosilec predmeta/Lecturer: | Ciril Arkar |

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| Izvajalci predavanj: | Marko Hočevar, Marko Topič |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective Course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij. | Admission to the doctoral programme. |

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| Vsebina: | Content (Syllabus outline): |
| *Splošni modul*  - energija in sodobne družbe (človek);  - procesi v okoljskih sferah na katere vplivamo s pretvarjanjem energij;  - uravnoteženje med dobavo in porabo energij, pomen oskrbe in varčevanja z energijami;  - potencial OVE; metode za vrednotenje potenciala;  - naravni in tehnološki procesi pretvarjanja OVE in njihovo modeliranje, teoretične omejitve učinkovitosti pretvarjanja;   - modeliranje sistemov in naprav za pretvarjanje OVE v toploto, električno energijo in goriva;  - okoljski pritiski tehnologij za pretvarjanje OVE;  - ekonomičnost tehnologij pretvarjanja OVE in študije izvedljivosti;  - vloga OVE v energetskih politikah držav EU;  - perspektive oskrbe z energijo v prihodnosti.  *Modul sončne energija*  - modeliranje sončnega sevanja na poljubno orientirano ploskev;  - naravno ogrevanje in hlajenje stavb;  - naravna osvetlitev stavb;  - prenos toplote in modeliranje toplotnega odziva stavb;  - aktivni solarni sistemi za ogrevanje in hlajenje;  - modeliranje sistemov za pretvarjanje sončne energije v toploto in električno energijo.  *Modul fotovoltaike:*  - pregled tehnologij za pridobivanje elektrike iz sonca, ekološki in ekonomski vidiki  *- sončne celice:* principi delovanja, materiali in tehnologije ter značilnosti in napredni trendi celic iz kristalnega silicija, tankoplastnih celic (silicijevih, halkopiritnih in kadmijteluridnih), elektrokemijskih in organskih sončnih celic, tandemskih in večspojnih celic ter celic termofotovoltaike; analiza optičnih in električnih izgub, modeliranje, simulacije in karakterizacija. Sončne celice tretje generacije.  *- fotonapetostni moduli:* značilnosti, tehnološki trendi in standardi kristalnosilicijevih, tankoplastnih in koncentratorskih PV modulov. Vrednotenje zmogljivosti, analiza izgub in energijskega izplena. Modeliranje, simulacije in karakterizacija.  *- Fotonapetostni sistemi:* omrežni in samostojni PV sistemi, načrtovanje, gradnja in vzdrževanje; močnostni regulatorji in razsmerniki, zaščitni elementi; priključevanje na omrežje, ekonomika PV sistemov.  *Modul izkoriščanje energije vode in vetra*  - osnove turbinskih strojev in metode modeliranja vodnih in vetrnih turbin  - energijske pretvorbe v vodnih in vetrnih turbinah ter predstavitev specifičnih pojavov,  - hidroenergetski potencial in metode vrednotenja potencialov  - snovanje in modeliranje hidroenergetskih sistemov  - izkoriščanja energije vetra in metode vrednotenja smotrne izrabe energije vetra  - osnove eksperimentalnih metod - modelna preskušanja turbinskih strojev v laboratorijskih in obratovalnih razmerah  - funkcionalni nadzor in vzdrževanje na hidroenergetskih objektih in vetrnih turbinah. | *General module*  - Energy and modern society;  - Processes in environmental spheres, influenced by the energy conversion;  - Balance between supply and consumption of energy, the importance of power supply and energy saving;  - The potential of renewable energy sources, methods for evaluating the potential;  - Natural and technological processes for converting renewable energy sources and their modelling, theoretical limits of conversion efficiency;  - Modelling of technologies and systems for utilization of renewable energy sources for heat, electricity and fuel production;  - Environmental footprint of technologies for utilization of RES;  - Efficiency of technologies and feasibility studies;  - The role of RES in the EU energy policies;  - Perspective of energy supply in the future.  *Solar energy module*  - Modelling of the solar radiation on an arbitrary oriented surface;  - Natural heating and cooling of buildings;  - Natural lighting of buildings;  - Modelling of heat transfer and thermal response of buildings;  - Active solar systems for heating and cooling;  - Modelling of systems for converting solar energy into heat and electricity.  *PV module:*  - An overview of technologies for electricity generation from the solar energy, ecological and economical aspects;  - Solar cells: operating principles, materials and technologies and advanced features and trends  of (mono/poly)crystalline, thin-film (Si, CIGS, CdTe), dye sentitized and organic solar cells, tandem and multi-junction cells; analysis of optical and electrical losses, modelling, simulations and characterization. Third generation solar cells;  - Photovoltaic modules: types and technological trends, standards of crystalline silicon, thin-film and concentrator PV modules. Evaluation of performance, analysis of losses and energy yield. Modelling, simulation and characterization;  - Photovoltaic systems: grid-connected and autonomous PV systems, design, realization and maintenance; power regulators and inverters, protection devices; connection to the grids, economy of PV systems;  *Water energy and wind power utilisation module*  - Fundamentals of turboengine and modelling of water and wind turbines;  - Energy conversion in wind and water turbines and presentation of specific phenomena;  - Hydropower potential and methods for potential evaluation;  - Design and modelling of hydropower systems;  - Wind-energy exploitation and evaluation methods of efficient utilization of wind energy;  - Fundamentals of experimental methods - model turboengine testing in the laboratory and operating conditions;  - Functional control and maintenance of the hydropower facilities and wind turbines. |

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| Temeljna literatura in viri/Readings: |
| 1. Marko Hočevar in Matevž Dular, Uvod v hidroenergetske sisteme, Fakulteta za strojništvo, učbenik, COBISS.SI-ID – 282771968, 2015  2. Pfleiderer, C., Petermann, N.: Strömungsmaschinen.- 74. Aufl.- Berlin etc.: Springer, 2004 COBISS.SI-ID - 8907525, 1972  3. Raabe, J.: Hydro power: the design, use and function of hydromechanical, hydraulic and electrical equipment.- Düsseldorf: VDI, COBISS.SI-ID – 378907, 1985  4. Duffie, J. A., Beckman, W. A. Solar engineering of thermal processes. 2nd Edition. John Wiley & Sons, Inc., New York, 1991 [COBISS.SI-ID 12237317].  5. Tiwari, G. N., Tiwari, A., Shyam. Handbook of Solar Energy : Theory, Analysis and Applications. Springer Singapore, 2016 [COBISS.SI-ID 136696067].  6. Solar heating systems for houses : a design handbook for solar combisystems. Ed. Werner Weiss. James & James, 2003 [COBISS.SI-ID 7331355].  7. Malamatenios, C., Giakoumelos, L., Mavrou, E. Obnovljivi viri energije. Centre for Renewable Energy Sources and Saving, Athens, 2017 [COBISS.SI-ID 15780635].  8. Medved, S., Domjan, S., Arkar, C. Sustainable technologies for nearly zero energy buildings : design and evaluation methods. Cham : Springer, 2019 [COBISS.SI-ID 16490011]. |

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| Cilji in kompetence: | Objectives and competences: |
| Namen predmeta je kandidata seznaniti z lastnostmi obnovljivih virov energije (OVE) in procesi pretvarjanja teh virov v oblike energij, ki jih potrebujemo v sodobnih družbah. Uvodoma kandidat spozna elemente okolja in procese, ki se v njih dogajajo zaradi antropogenih virov onesnaževanja, ki so posledica oskrbe z energijami. Za posamezni OVE so predstavljene metode za oceno potenciala ter teoretične omejitve pri izkoriščanju. Predstavljeni so fizikalni, kemijski in biološki procesi pretvarjanja OVE v obsegu, ki jih kandidat potrebuje za razumevanje potenciala OVE oziroma pretvarjanja v toploto, električno energijo in goriva. Kandidat spozna metode za modeliranje delovanja sistemov in njihovo optimizacijo in ekonomsko presojo.  Posamezne skupine tehnologij za pretvarjanje OVE so analizirane tudi s stališča vplivov na okolje in tveganja. Spozna kako so OVE v različnih državah umeščeni v energetsko politiko in kako se uporaba OVE s strani držav spodbuja. Predstavljeni so potencialni nosilci energij, ki izvirajo iz OVE, ki se napovedujejo v prihodnosti. Kandidati bodo spoznali tudi temeljne raziskovalne segmente fotovoltaike od materialov preko sončnih celic in fotonapetostnih modulov do fotonapetostnih sistemov ter sodobne razvojne trende pridobivanja elektrike iz sonca. V obliki modulov bodo kandidatom posredovane dodatne vsebine o pretvarjanju sončne energije, energije vetra in vodne energije. | The purpose of the course is to educate the candidate with the characteristics of renewable energy sources (RES) and the process of converting these resources into forms of energy that are needed in modern societies. The candidate is introduced to the elements of the environment and processes that occur in them due to anthropogenic sources of pollution as a result of the energy supply. For each RES methods for assessment of the potential and theoretical limits of exploitation are presented.  The physical, chemical and biological processes for conversion of RES are presented in such an extent, that the candidate is able to understand the potential of RES and conversion into heat, electricity and fuel. The candidate learns methods for modelling operation of systems and their optimization and economic assessment.  Individual groups of technologies for conversion of RES are also analyzed in terms of impact on the environment and environmental risks. They learn how RES are settled in the energy policy in different countries and how these countries promote the use of RES. Potential energy carriers anticipated in the future, derived from RES, are presented. Candidates will also learn about basic research segments of the photovoltaic, covering materials, solar cells, PV modules, PV systems and modern development trends of solar electricity generation.  The additional content on converting solar energy, wind energy and hydropower will be forwarded to candidates in the form of modules. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Razume pomen trajnostne oskrbe in rabe energije, pozna značilnosti neobnovljivih in obnovljivih naravnih virov, spozna povezavo med energetsko in okoljsko politiko, razume fizikalne, kemične in biološke procese, ki se uporabljajo pri pretvarjanju obnovljivih virov energije, spozna in zna uporabiti metode za modeliranje procesov pretvarjanja obnovljivih virov energij, zna uporabiti metode za LCA in LCC presojo energetskih tehnologij. | Knowledge and understanding:  The candidate understands the importance of sustainable energy supply and use, is familiar with features of non-renewable and renewable energy resources, learns about the connection between energy and environmental policy, understands the physical, chemical and biological processes that are used in the conversion of RES, recognizes and knows how to use methods for modelling processes of RES conversion, is able to use methods for LCA and LCC assessment of energy technologies. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Avditorna predavanja, laboratorijske vaje, individualni raziskovalni seminar, osebna komunikacija. | Auditorial lectures, lab experiments, individual research seminar , personal communication. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Pisni izpit | 60,00 % | Examine: written |
| Ustni zagovor | 25,00 % | Examine: oral |
| Javna predstavitev seminarske naloge s področja teme doktorske disertacije | 15,00 % | Public presentation of project report |

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| Ocenjevalna lestvica: | Grading system: |
| 5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10 | 5 - 10, a student passes the exam if he is graded from 6 to 10 |

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| Reference nosilca/Lecturer's references: |
| **izr. prof. dr Ciril Arkar:**  1. ZAVRL, Eva, ŽIŽAK, Tej, POREDOŠ, Primož, ARKAR, Ciril. Thermal modeling of living walls : a review. *Renewable & sustainable energy reviews : an international journal*. [Print ed.]. Feb. 2025, vol. 208, [art. no.] 115009, str. 1-16, ilustr. ISSN 1364-0321. <https://www.sciencedirect.com/science/article/pii/S1364032124007354>, [Repozitorij Univerze v Ljubljani – RUL](https://repozitorij.uni-lj.si/IzpisGradiva.php?id=164522), DOI: [10.1016/j.rser.2024.115009](https://dx.doi.org/10.1016/j.rser.2024.115009). [COBISS.SI-ID [213331971](https://plus.cobiss.net/cobiss/si/sl/bib/213331971)]; 1.02  2. ARKAR, Ciril, ŽIŽAK, Tej, DOMJAN, Suzana, MEDVED, Sašo. Comparative analysis of free cooling of photovoltaics – phase change versus evaporative cooling. *Journal of energy storage*. [Print ed.]. May 2022, vol. 49, str. 1-13, ilustr. ISSN 2352-152X. <https://www.sciencedirect.com/science/article/pii/S2352152X22001967>, <https://repozitorij.uni-lj.si/IzpisGradiva.php?id=135036>, DOI: [10.1016/j.est.2022.104162](https://dx.doi.org/10.1016/j.est.2022.104162). [COBISS.SI-ID [97940227](https://plus.cobiss.net/cobiss/si/sl/bib/97940227)]; 1.01  3. MEDVED, Sašo, BEGELJ, Žiga, DOMJAN, Suzana, ŠUKLJE, Tomaž, ČERNE, Boštjan, ARKAR, Ciril. The dynamic thermal response model and energy performance of multi-layer glass and BIPV facade structures. *Energy and buildings*. [Print ed.]. Apr. 2019, vol. 188/189, str. 239-251, ilustr. ISSN 0378-7788. <https://www.sciencedirect.com/science/article/pii/S0378778818332997?via%3Dihub>, <https://repozitorij.uni-lj.si/IzpisGradiva.php?id=106521>, DOI: [10.1016/j.enbuild.2019.02.017](https://dx.doi.org/10.1016/j.enbuild.2019.02.017). [COBISS.SI-ID [16497179](https://plus.cobiss.net/cobiss/si/sl/bib/16497179)]; 1.01  4. DOMJAN, Suzana, ARKAR, Ciril, BEGELJ, Žiga, MEDVED, Sašo. Evolution of all-glass nearly zero energy buildings with respect to the local climate and free-cooling techniques. *Building and environment*. [Print ed.]. 2019, vol. 160, str. 1-15, ilustr. ISSN 0360-1323. <https://www.sciencedirect.com/science/article/pii/S0360132319303932?via%3Dihub>, <https://repozitorij.uni-lj.si/IzpisGradiva.php?id=108033>, DOI: [10.1016/j.buildenv.2019.106183](https://dx.doi.org/10.1016/j.buildenv.2019.106183). [COBISS.SI-ID [16653339](https://plus.cobiss.net/cobiss/si/sl/bib/16653339)]; 1.01  5. MEDVED, Sašo, DOMJAN, Suzana, ARKAR, Ciril. Passive and free cooling of buildings : chapter 15. V: SHARMA, Atul (ur.), SHUKLA, Amritanshu (ur.), SINGH, Renu (ur.). *Low carbon energy supply technologies and systems*. New York: CRC Press, 2020. Str. 237-270, ilustr. ISBN 978-0-367-37340-5. <https://www.taylorfrancis.com/books/e/9780429353192/chapters/10.1201/9780429353192-15>, DOI: [10.1201/9780429353192-15](https://dx.doi.org/10.1201/9780429353192-15). [COBISS.SI-ID [21695235](https://plus.cobiss.net/cobiss/si/sl/bib/21695235)]; 1.16  **prof. dr. Marko Hočevar**  1. GOSTIŠA, Jurij, DREŠAR, Primož, HOČEVAR, Marko, DULAR, Matevž. Computational analysis of flow conditions in hydrodynamic cavitation generator for water treatment processes. The Canadian journal of chemical engineering. Dec. 2022, vol. 100, iss. 12, str. 3502-3516 [COBISS.SI-ID 117661955]  2. HOČEVAR, Marko, NOVAK, Lovrenc, DREŠAR, Primož, RAK, Gašper. The status quo and future of hydropower in Slovenia. Energies. sept. 2022, vol. 15, iss. 19 [COBISS.SI-ID 123711491]  3. PIPP, Peter, HOČEVAR, Marko, DULAR, Matevž. Numerical insight into the Kelvin-Helmholtz instability appearance in cavitating flow. Applied sciences. Mar. 2021, vol. 11, iss. 6, str. 1-12 [COBISS.SI-ID 56979971]  4. PODNAR, Andrej, HOČEVAR, Marko, NOVAK, Lovrenc, DULAR, Matevž. Analysis of bulb turbine hydrofoil cavitation. Applied sciences. Mar. 2021, vol. 11, iss. 6, str. 1-18 [COBISS.SI-ID 56988419  5. JAŠAREVIĆ, Ajdin, HOČEVAR, Marko, RAK, Gašper. Turbulent flow height measurement with stereo vision. Defense and security studies. 2021, letn. 2, št. okt., str. 96-111 [COBISS.SI-ID 81998339] |

# OHRANITVENO GOZDARSTVO Učni načrt predmeta/Course syllabus

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| Predmet: | OHRANITVENO GOZDARSTVO |
| Course title: | Conservation Forestry |
| Članica nosilka/UL Member: | UL BF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski (od študijskega leta 2025/2026 dalje) | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020688 |
| Koda učne enote na članici/UL Member course code: | 40 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 20 | 35 |  |  | 5 | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Dušan Roženbergar |

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| Izvajalci predavanj: | Dušan Roženbergar |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet /Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij. | Enrollment in doctoral studies. |

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| Vsebina: | Content (Syllabus outline): |
| Naravna izhodišča: Spreminjanje rabe tal v svetovnem merilu in ekološke posledice; Gozdovi sveta: razvoj, raba in ohranjanje; Referenčne krajine za sonaravno, ohranitveno gospodarjenje; Pragozdovi in zavarovani gozdovi; Naravne motnje in obnovitveni cikli gozdnih ekosistemov; Umetni gozdni ekosistemi in primerjava z naravnimi ekosistemi; Vplivi človeka na gozdne ekosisteme; Gozdovi in podnebne spremembe.  Nega gozdnih ekosistemov: Izhodišča in razvoj sonaravnega gospodarjenja z gozdnimi ekosistemi; Nega gozdnega roba, obvodnih gozdnih ekosistemov, gozdnate krajine, primestnih gozdov; Certifikacijske sheme – ekosistemsko gospodarjenje – trajnostno gospodarjenje; Ohranjanje biotske pestrosti pri upravljanju z gozdnimi ekosistemi; Načrtovanje in praktična izpeljava ukrepov nege; Revitalizacija spremenjenih gozdnih ekosistemov; Agrogozdarstvo; Smeri razvoja upravljanja gozdnih ekosistemov. | Natural traits: Global change in the land use patterns and ecological consequences; Worlds’ forests: trends, use and conservation; Reference landscapes for close-to-nature, conservative management; Old-growth and protected forests; Natural disturbances and regeneration dynamics of forest ecosystems; Man-made forest ecosystems and comparison with natural ecosystems; Influence of man on forest ecosystems; Forests and climate change.  Tending and use of forest ecosystems: Origins of close-to-nature forest management; Tending of forest edge, riparian forests, forested landscapes and urban forests; Forest certification – ecosystem management – sustainable management; Conservation of biodiversity and forest management; Planning and practical implementation of forest tending; Gradual conversion and restoration of artificial, man-made forest ecosystems; Agroforestry; Future development of forest ecosystem management. |

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| Temeljna literatura in viri/Readings: |
| Knjige in učbeniki / Textbooks:  Diaci, J. (ur.) 2006. Nature based forestry in Central Europe: alternatives to industrial forestry and strict preservation. Univerza v Ljubljani, 178 s.  FAO - Global forest resources assessment 2020 / http://www.fao.org/forestry/site/fra2010/en/  Kaufmann, M. R. / Graham, R. T. / Boyce, Jr, .A. D. / Moir, W. H. / Perry, L. / Reynolds, R. T. / Bassett, R. L. / Mehlhop, P. / Edminster, C. B. / Block, W. M. / Corn, P.S., 1994. An ecological basis for ecosystem management. - Fort Collins, CO, Gen. Tech. Rep. RM 246, USDA For. Serv., 24 s.  <https://www.fs.usda.gov/research/treesearch/7612>  Kimmins, J. P., 1997. Forest Ecology: A Foundation for Sustainable Management.- Prentice Hall, Upper Saddle River, New Jersey, 596 s.  Peterken, G. F. 1996. Natural woodland: ecology and conservation in northern temperate regions.- Cambridge University Press, Cambridge, 522 s.  Smith, D. M., Larson, B. C., Kelthy, M. J., Ashton, P. M. S., 1997. The practice of silviculture: applied forest ecology.- John Wiley & Sons, inc., New York, 537 s.  Larsen, J.B., Angelstam, P., Bauhus, J., Carvalho, J.F., Diaci, J., Dobrowolska, D., Gazda, A., Gustafsson, L., Krumm, F., Knoke, T., Konczal, A., Kuuluvainen, T., Mason, B., Motta, R., Pötzelsberger, E., Rigling, A., Schuck, A., 2022. Closer-to-Nature Forest Management. European Forest Institute.  Vsi viri so študentu dosegljivi v gozdarski knjižnici ali jih posredujemo na elektronskih medijih. Dodatni viri za izdelavo seminarskih nalog so na voljo na svetovnem spletu.  All sources are accessible to students in the forestry library or they will be distributed as the electronic media. Additional resources for seminar papers are available on the World Wide Web. |

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| Cilji in kompetence: | Objectives and competences: |
| Slušatelj osvoji temeljna znanja o teoretičnih izhodiščih, razvoju in razlikah modelov ohranitvenega gozdarstva v evropskem in svetovnem merilu (npr. sonaravno, trajnostno, ekosistemsko, večnamensko gozdarstvo) ter spoznava in razume razvojne ovire za ohranitveno gospodarjenje. | Students attain basic knowledge on theoretical background, development and differences among diverse approaches to conservation forestry on a global and European level (e.g. close-to-nature, sustainable, ecosystem, multipurpose forestry). They understand developmental constraints for conservation forestry. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Slušatelj je sposoben samostojne presoje in ocene različnih standardov upravljanja gozdnih ekosistemov. Osvoji praktične primere dobrih praks povezovanja ekoloških, varovalnih, ekonomskih ter socialnih vlog in funkcij gozdov. Preko seminarja in terenskega pouka razvije spretnosti samostojnega in skupinskega dela v naravi ter možnosti predstavitve rezultatov javnosti. | Knowledge and understanding:  Students learn to judge and evaluate different standards of forest ecosystem management. They gain knowledge on practical examples of successful combination of ecological, protection, economic and social forest functions and services. Within a seminar and field work they develop skills of individual and group work in nature, as well as possibilities of public presentation of their work. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja s sodelovalnim, refleksivnim učenjem / poučevanjem in diskusijo. Vodeno seminarsko delo v kabinetu in na terenu. Poudarek je na sprotnem učenju in sodelovanju. Končni izpit se opravlja neposredno po opravljenih kontaktnih urah. Sprotno ocenjevanje dosežkov stimulira študenta k rednem delu.  Slušatelj aktivno sodeluje na predavanjih in diskusijah (vsakokratna priprava na tematiko), pripravi seminarsko nalogo s terenskega pouka, izdela obsežnejšo seminarsko nalogo in jo predstavi pred podiplomskimi študenti oz. na dodiplomskem študiju (okvirno 20 min in 10 min diskusije). Možna je predstavitev na terenu. Naloga lahko vključuje gozdno-ekološke ali gozdno-upravljavske vidike doktorske naloge. | Formal lectures with reflexive learning / teaching and discussion. Guided seminar work in classroom, lab and in the field. Stress is on continuous learning and cooperation. Final exam is to be taken directly after accomplished contact hours. Permanent evaluation of study success stimulates students for continuous learning.  Student actively participates in lectures and discussions (obligatory preparing for every lecture and theme), he/she prepares seminar from the field exercises, accomplishes comprehensive seminar, which is presented in front of undergraduate or graduate students (ca. 20 min and 10 min of discussion). Presentation can take place in the field. The seminar may include forest ecological or managerial parts of students’ doctoral dissertation. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Ocene sodelovanja na predavanjih | 20,00 % | Grade for lecture participation |
| Ocene seminarskih nalog s terena | 20,00 % | Grade for field seminar reports |
| Ocene vsebine in predstavitve obsežnejše seminarske naloge | 20,00 % | Grade for the comprehensive final seminar |
| Končna ocena izpita je sestavljena iz: pisnega izpita. | 40,00 % | Final grade will be comprised of: final written exam |

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| Ocenjevalna lestvica: | Grading system: |
| 5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10 | 5 - 10, a student passes the exam if he is graded from 6 to 10 |

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| Reference nosilca/Lecturer's references: |
| **Dušan Roženbergar**  Roženbergar, D., Pavlin, J., Nagel, T., Short-term survival and crown rebuilding of European broadleaf tree species following a severe ice storm. Canadian journal of forest research, 2020, vol. 50, iss. 11, str. 1131-1137.  Aszalós, R., Thom, D., Aakala, T., Angelstam, P., Brūmelis, G., Gálhidy, L., Gratzer, G., Hlásny, T., Katzensteiner, K., Kovács, B., Knoke, T., Larrieu, L., Motta, R., Müller, J., Ódor, P., Roženbergar, D., Paillet, Y., Pitar, D., Standovár, T., Svoboda, M., Szwagrzyk, J., Toscani, P., Keeton, W.S., 2022. Natural disturbance regimes as a guide for sustainable forest management in Europe.,Ecol. Appl. vol. 32, iss. 5.  Nicolescu, V.-N., Rédei, K., Mason, W.L., Vor, T., Pöetzelsberger, E., Bastien, J.-C., Brus, R., Benčať, T., Đodan, M., Cvjetkovic, B., Andrašev, S., La Porta, N., Lavnyy, V., Mandžukovski, D., Petkova, K., Roženbergar, D., Wąsik, R., Mohren, G.M.J., Monteverdi, M.C., Musch, B., Klisz, M., Perić, S., Keça, L., Bartlett, D., Hernea, C., Pástor, M., 2020. Ecology, growth and management of black locust (Robinia pseudoacacia L.), a non-native species integrated into European forests. J. For. Res. 31, 1081–1101. |

# OKOLJE, BIOVARNOST IN ŽIVALSKA PRODUKCIJA Učni načrt predmeta/Course syllabus

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| Predmet: | OKOLJE, BIOVARNOST IN ŽIVALSKA PRODUKCIJA |
| Course title: | Environment, Biosecurity and Animal Production |
| Članica nosilka/UL Member: | UL VF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020689 |
| Koda učne enote na članici/UL Member course code: | 41 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 20 | 40 |  |  |  | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Štefan Pintarič |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective Course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študijski program. | Enrollment in the Interdiciplinary Doctoral Programme. |

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| Vsebina: | Content (Syllabus outline): |
| definicija biovarnosti kot strateški in integrirani pristop k analizi in ukrepom glede zdravstvenih in okoljskih tveganj  razvoj, vsebina in posebnosti ukrepov biovarnosti.  posebnosti sistema biovarnosti kot harmoniziranega in integriranega medsektorskega sistema v okviru vzdrževanja javnega zdravja, varne hrane, veterinarstva, kmetijstva, gozdarstva, ribištva in zaščite okolja.  management in preventivnost ukrepov biovarnosti na nivoju mednarodnih političnih in administrativnih teles v zvezi s komplementarnimi ukrepi.  obvladovanje sistema biovarnosti kot politike in regulatornih mehanizmov na področjih varne hrane, zoonoz, bolezni živali in rastlin, tujerodnih organizmov, gensko spremenjenih organizmov in njihovih proizvodov.  interdisciplinaren pristop k urejanju mikro- in makroambienta, s stališča manipulacije, higienizacije in distribucije odpadkov in živalskih stranskih proizvodov.  zaščita zraka v smislu zniževanja razvoja emisij in imisij toplogrednih plinov, neugodnih vonjav in NH3  specialna mikrobiologija in higiena živinorejskih objektov in objektov za predelavo živalskih surovin in živalskih stranskih proizvodov  Gospodarna zreja glede na zdravstveno varstvo, biološko varnost in sistem kakovosti  Vplivi različnih tehnik zreje na obremenitev okolja in možne rešitve  Precizna živinoreja (tehnike, tveganja, prednosti)  Trajnostna živinoreja in Ekološko kmetovanje, agro-biodiverziteta, učinkovito in alternativno gospodarjenje  Biovarnost kot harmonizirani in integrirani medsektorski sistem v okviru vzdrževanja javnega zdravja, varne hrane, veterinarstva, kmetijstva, gozdarstva, ribištva in zaščite okolja  Mikrobiološko upravljanje kakovosti, nadzor higiene, DDD dejavnost in možne alternative | * - microbiological quality of management, hygiene control, DDD activity and possible alternatives   - definition of biosecurity as a strategic and integrated approach to the analysis and evaluation of health and environmental risks  - the development, content and special issues of biosecurity measures.  - special issues of biosecurity as a harmonized and integrated cross-sectoral system in the maintenance of public health, food safety, veterinary medicine, agriculture, forestry, fishery and in environmental protection.  - biosecurity management and its preventive on international policy and administrative level, based on complementary measures.  - Management of biosecurity as a policy and regulatory mechanisms in the areas of food safety, zoonoses, animal and plant diseases, non-native organisms, genetically modified organisms and their products.  - interdisciplinary approach to regulation of micro- and macroambient, in terms of handling, sanitation and distribution of wastes and animal by-products.  - protection of air in terms of greenhouse gases, odours and NH3 emission and imission reducing.  - special microbiology and hygiene of livestock facilities, facilities for animal products processing and the processing of animal by-products  - economical animal production in terms of health, biosecurity and quality systems  - the impacts of different techniques of animal production on the environment and possible solutions  - precision animal husbandry (techniques, risks, benefits)  - sustainable livestock farming and organic farming, agro-biodiversity, efficient and alternative management  - biosecurity as a harmonized and integrated cross-sector system in the context of the maintenance of public health, food safety, veterinary medicine, agriculture, forestry, fisheries and environmental protection |

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| Temeljna literatura in viri/Readings: |
| OIE. Animal Production Food Safety Challenges in Global markets. OIE Vol. 25 (2), 2006  OIE.Animal Welfare: Global Issues, Trends and Challenges. OIE Vol. 25 (2), 2006  Kelley J. D., Thelin A. Agricultural medicine – Ocucupational and Environmental Health for the Health Professions. Ames, Iowa: Blackwell Publishing, 2006.  Axford, I Fayez M. Marai, H Omed. Pollution in Livestock Production Systems, Edit. I. Ap Dewi, R.F.E, AB International, 1994  FAO. FAO Biosecurity toolkit. Food and Agric.Org.UN, Rome, 2007.  DEFRA. Biosecurity guidance. [http://www.defra.gov.uk/animalh/diseases/control/biosecurity/index.htm. 2008](http://www.defra.gov.uk/animalh/diseases/control/biosecurity/index.htm.%202008)  Thomas Banhazi, Andres Aland, Jörg Hartung. Air Quality and Livestock Farming. CRC Press, 2018. 372 str.  Frank Flanders, James R. Gillespie. Modern Livestock & Poultry Production: 9 th Edition. Cengage learning, 2016, 1152 str.  Jordening J, Winter J. Environmental Biotechnology. Wiley-VCH, 2005. (Izbrana poglavja).  Donham, J.K. Thelin, A. Agricultural Medicine. Occupational and Environmental Health for the Health proffesions. Blackwell Publishing, 2006.  Hugh-Jones, M. Biological Disasters of Animal Origin. The role of preparedness of veterinary and public health services. OIE, Vol. 25 (1), 2006.  Slorach, SA. Animal Production food safety challengesin global markets. OIE, Vol. 25 (2), 2006.  A. Aland and F. Madec. Sustainable animal production: The challenges and potential developments for professional farming. Wageningen Academic Publishers, 2009. 496 str.  A. Aland and T. Banhazi. Livestock housing: Modern management to ensure optimal health and welfare of farm animals. Wageningen Academic Publishers, 2013. 496 str.  W. G. Pond, F. W. Bazer, B. E. Rollin. Animal Welfare in Animal Agriculture: Husbandry, Stewardship, and Sustainability in Animal Production. CRC Press, 2011. 333 str.  J. Webster. Management and Welfare of Farm Animals: The UFAW Farm Handbook, 5th Edition. Wiley-Blackwell, 2011. 614 str.  Donham, J.K. Thelin, A. Agricultural Medicine. Occupational and Environmental Health for the Health proffesions. Blackwell Publishing, 2006.  Hugh-Jones, M. Biological Disasters of Animal Origin. The role of preparedness of veterinary and public health services. OIE, Vol. 25 (1), 2006.  Slorach, SA. Animal Production food safety challengesin global markets. OIE, Vol. 25 (2), 2006. |

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| Cilji in kompetence: | Objectives and competences: |
| Cilji in kompetence izobraževanja so, da udeleženci:   * dosežejo poglobljeno razumevanje glede ciljev biovarnosti v ohranjanju človekovega zdravja, zdravja živali, rastlin in zaščite okolja. * razumejo principe za zmanjševanje tveganja dejavnikov rizika, učinkov in za oblikovanje profila skladnosti sistema biovarnosti * razvijejo sposobnost za harmoniziran ter integriran pristop k analizi tveganja, * pridobijo poglobljena znanja s področja zdravstvenih pravil za različne stranske proizvode. | Goals and specific competencies of training base on the objectives that participants have to:   * achieve the profound understanding of the biosecurity objectives in maintaining of the human and animal health, plant and environment protection. * understand the principles of the risk factors diminishing and to create a profile of biosecurity compliance * the ability to develop a harmonized and integrated approach to risk analysis, * acquire knowledge in the field of health rules concerning different by-products. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Udeleženci bodo:   * pridobili znanja glede strateških in integriranih pristopov k analizi, presojam ter ukrepom glede tveganj na področjih zaščite okolja, javnega zdravja in zdravja živali, * ­razumeli načine in postopke presoje glede ocene kapacitet za uvajanje sistema biovarnosti, * razumeli problematiko živalske reje v odnosu do okolja in javnega zdravja. | Knowledge and understanding:  Participants will:   * gain knowledge of strategic and integrated approaches to the analysis, assessments and measures of risk on the areas of environmental protection, public and animal health, * understand the different ways of procedures on estimation of the capacity for the bio-security system implementation, * understand the problematics on the issue of animal husbandry in relation to the environment and public health. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Učenje se izvede s predavanji, skupinskimi (diskusijske ure) in individualnimi konzultacijami, seminarskimi nalogami in praktičnimi vajami. | Teaching is conducted through lectures, small-group (discussion hours) and individual consultations, seminar papers, and practical exercises. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Ustni izpit | 50,00 % | Oral examination |
| Seminarska naloga | 50,00 % | Seminar exercise |
| Ocenjevalna lestvica: 6-10 pozitivno, 1-5 negativno, skladno z določili statuta UL |  | Marking scale: 6-10 positive, 1-5 negative, harmoniously with UL statute regulation. |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| 1. PINTARIČ, Robert ; MATELA, Jožef ; PINTARIČ, Štefan ; NOVAK, Matjaž ; FILIPIČ, Metka. Evaluation of potential toxicity of Steriplant©N aerosolization toward human alveolar cells A459 in vitro. Toxicology and industrial health. - ISSN 1477-0393. (2021)- Vol. 37, iss. 9, str. 520-527.  2. PINTARIČ, Štefan. Decontamination of the population with new generation biocides. Jedan svet jedno zdravlje : zbornik radova; 34. savetovanje dezinfekcija, dezinsekcija i deratizacija, Vrnjačka Banja, 8 - 11. jun 2023. - Str. 12-18.  3. PINTARIČ, Štefan. Using electro-oxygenated water for extending the shelf life of food. Jedan svet jedno zdravlje : zbornik radova; 34. savetovanje dezinfekcija, dezinsekcija i deratizacija, Vrnjačka Banja, 8 - 11. jun 2023. - Str. 88-93.  **4.** KOKLIČ, Tilen, PINTARIČ, Štefan, ZDOVC, Irena, GOLOB, Majda, UMEK, Polona, MEHLE, Alma, DOBEIC, Martin, ŠTRANCAR, Janez. Photocatalytic disinfection of surfaces with copper doped Ti0 2 nanotube coatings illuminated by ceiling mounted fluorescent light. *PloS one*, ISSN 1932-6203, 2018, vol. 13, no. 5, e0197308, str. 1-17.  **5.** KOKLIČ, Tilen, URBANČIČ, Iztok, ZDOVC, Irena, GOLOB, Majda, UMEK, Polona, ARSOV, Zoran, DRAŽIĆ, Goran, PINTARIČ, Štefan, DOBEIC, Martin, ŠTRANCAR, Janez. Surface deposited one-dimensional copper-doped TiO(2) nanomaterials for prevention of health care acquired infections. *PloS one*, ISSN 1932-6203, 2018, vol. 13, issue 7, str. e0201490 (1-20).  **6.** DOBEIC, Martin, GREBENC, Stanka, BAJC, Zlatka, UMEK, Polona, PINTARIČ, Štefan, URANJEK, Irena, ŠINIGOJ-GAČNIK, Ksenija. Antibacterial properties of non-thermal, atmospheric, Openair(R), plasma jet in surface decontamination of eggs in shell. *Slovenian veterinary research*, ISSN 1580-4003. [English print ed.], 2016, vol. 53, no. 1, str. 29-41  **7.** ŽIŽEK, Suzana, DOBEIC, Martin, PINTARIČ, Štefan, ZIDAR, Primož, KOBAL, Silvestra, VIDRIH, Matej. Degradation and dissipation of the veterinary ionophore lasalocid in manure and soil. *Chemosphere*, ISSN 0045-6535. [Print ed.], Nov. 2015, vol. 138, 947-951 str., |

# OKOLJE, ZDRAVJE IN BLAGOSTANJE Učni načrt predmeta/Course syllabus

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| Predmet: | OKOLJE, ZDRAVJE IN BLAGOSTANJE |
| Course title: | ENVIRONMENT, HEALTH, AND WELLBEING |
| Članica nosilka/UL Member: | UL MF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020624 |
| Koda učne enote na članici/UL Member course code: | 2 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 30 | 30 | 15 |  |  | 175 | 10 |

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| Nosilec predmeta/Lecturer: | Ivan Eržen |

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| Izvajalci predavanj: | Marjan Bilban, Štefan Pintarič, Jurij Prezelj, Matija Svetina |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Temeljni predmet /Core course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Študenti doktorskega študija. | PhD students. |

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| Vsebina: | Content (Syllabus outline): |
| Metodološki pristopi pri raziskovanju vplivov okolja na zdravje in blagostanje. Toksikologija in povezava med toksikologijo in epidemiologijo. Ocenjevanje tveganja za zdravje. Odnos doza-učinek.  Škodljivi dejavniki in njihova narava ter vrste (mikrobiološki, kemijski, fizikalni). Možne zdravstvene zaradi izpostavljenost škodljivim dejavnikom.  Pomen ravnovesja med okoljem, ljudmi in posameznimi dejavniki, ki vplivajo na zdravje in blagostanje.  Medsebojni vplivi človeka, živali in okolja v smislu zdravja in varovanja okolja  Ekološko epidemiološki vidiki kmetijstva s posledično uporabo in varnostjo biogenih odpadkov in odpadnih zdravil ter vplivi na človeka in okolje z vidikov onesnaževanja zraka, tal in talnice.  Elementi sistemov biovarnosti na lokalnih področjih in v globalnem prostoru.  Trajnostni razvoj kot socialni precep; dejavniki trajnostno usmerjenega vedenja; upravljanje s kompleksnimi sistemi; previdnostno načelo .  Dojemanje okolja in odnos do njega; miselni modeli procesov v okolju; odzivi na okoljske spremembe; družbeni procesi v okolju; socialno načrtovanje; izkušnja narave in dejavniki odnosa do narave; psihologija vrednotenja okolja.  Ovire za okolju prijazno vedenje; vplivanje; ozaveščanje o trajnostnem razvoju okolja; okoljsko izobraževanje.  Ovire za okolju prijazno vedenje; vplivanje; ozaveščanje o trajnostnem razvoju okolja; okoljsko izobraževanje.  Definicija zvoka in hrupa. Spektralna analiza hrupa. Definicije ravni, decibel in dB(A) skala. Viri hrupa, definicija in pojavne oblike. Mehanizmi nastajanja hrupa in širjenje hrupa v zraku, vodi in strukturi. Komunalni hrup.  Meritev in analiza hrupa. Merjenje zvočnega tlaka, zvočne intenzivnosti in zvočne moči vira hrupa. Metode in tehnike za zmanjševanje hrupa: na mestu vira, na poti širjenja in na mestu sprejema.  Vpliv hrupa na ljudi (in živali). | Methodological approaches in the research of environmental impact on health and wellbeing. Toxicological and epidemiological approaches in assessing the health impact. Dose –effect relationship.  Hazardous factors and their nature (biological, chemical and physical). Possible health effects coused due the environmental factors.  The importance of the balance between environment, environmental factors and human being.  Interactions between humans, animals and the environment in terms of health and environmental protection.  Eco-epidemiological aspects of agriculture due to subsequent application and security of biogenic wastes and waste products, and to impactions on human health and environment in the aspect of the air, soil and ground water pollution.  The elements of biosecurity systems in local areas and in the global arena.  Sustainable development as social dillema; factors of sustainable behaviour; managing complex system; precautionary principle.  Perception of environment and attitudes toward it;mental models of environmental processess; reactions to environmental changes; social processess in the environment; social planning; nature experience and factor influencing attitudes toward it; psychology of environmental impact assessment.  The obstacles to environmentally friendly behavior, influence, awareness on sustainable development of the environment, environmental education.  Definition of sound and noise. Spectral analysis of the noise. Definitions of levels and decibel dB (A) scale. Noise sources, definitions and forms. Mechanisms of noise generation and propagation in air, water and structure. Communal noise.  The measurement and analysis of noise. Measurement of sound pressure, sound intensity and sound power of noise source. Methods and techniques for noise reduction: on-site source, the spread on the road and at the receive site.  The impact of noise on humans (and animals). |

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| Temeljna literatura in viri/Readings: |
| Eržen in sod. Zdravje in okolje. Medicinska fakulteta Maribor 2010, 1-208.  Bazerman M.H., Messick D.M., Tenbrunsel A.E., Wade-Benzoni K.A. (Eds.) (1997). Environment, Ethics, and Behavior, San Francisco: The New Lexington Press  Bennett P, Calman K. (Eds.) 2005). Risk Communication and Public Health, Oxford: Oxford University Press.  Kasperson J.X., Kasperson R.E.(2005). The Social Contours of Risk, vol. I. & II., London: EARTHSCAN.  Kahn P.H. (1999). The Human Relationship with Nature, Cambridge: The MIT Press.  Kaplan R., Kaplan S. (1989). The Experience of Nature:A Psychological Perspective. Cambridge: Cambridge University Press.  Kline M., Polič M., Zabukovec V. (1998). Javnost in nesreče, Ljubljana: ZIFF.  Kazimir Tarman. Osnove ekologije in ekologija živali, DZS, Ljubljana 1992.  Harold F. Hemond, Elizabeth J. Fechner. Chemical Fate and Transport in the Environment, Academic, Presss, inc., 1994.  Kelley J. D., Thelin A. Agricultural medicine – Ocucupational and Environmental Health for the Health Professions. Ames, Iowa: Blackwell Publishing, 2006.  Jordening H.J., Winter J. Environmental Biotechnology. Weinheim: Wiley-VCH Verlag GmbH, 2005.  Ford David E. Scientific method for Ecological researc. Cambridge: Cambridge University Press, 2000.  Wackett P.L., Hershberger C.D. Biocatalysis and Biodegradadtion. Washington, d.c.: ASM Press, 2001.  OIE. Animal Production Food Safety Challenges in Global markets. OIE Vol. 25 (2), 2006.  Axford, I Fayez M. Marai, H Omed. Pollution in Livestock Production Systems, Edit. I. Ap Dewi, R.F.E, AB International, 1994.  Čudina, M.: Tehnična akustika, Fakulteta za strojništvo, Ljubljana, 2001.  Crocker, M.J., Čudina, M. et al: Handbook of noise and vibration control. Hoboken, New Jersey, USA: John Wiley & Sons, cop. 2007.  Beranek, L.L.: Noise and Vibration Control, Institute of Noise Control Engineering, Washington, DC, 1999.  Bilban, M. Medicina dela. Ljubljana: ZVD - Zavod za varstvo pri delu, 1999. 605 str., ilustr., tabele. ISBN 961-90350-4-6.  - Donham, J.K. Thelin, A.  Agricultural Medicine. Occupational and Environmental Health for the Health proffesions. Blackwell Publishing, 2006.  - Aland A., F. Madec. Sustainable animal production: The challenges and potential developments for professional farming. Wageningen Academic Publishers, 2009. 496 str. |

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| Cilji in kompetence: | Objectives and competences: |
| Udeleženci bodo:  razumeli pomen zdravega naravnega in družbenega okolja za blagostanje posameznika in prebivalstva v celoti,  obvladali uporabo ustreznih raziskovalnih metod in pristopov pri ugotavljanju vplivov okolja,  obvladali pristope, probleme in rešitve pri pridobivanju podatkov za raziskave v okviru zdravstvene in veterinarske ekologije ter okoljske psihologije  znali razpoznavati, meriti in vrednotiti vire hrupa in zvočne signale v časovni in frekvenčni domeni. | Participants will:  understand importance of healthy natural and social environment for the wellbeing of individual and whole population,  learn use of relevant research methods and approaches in environmental impact assessment,  mastering of approach to resolve the problems and solutions how to collect the data for experimental work in the medical and veterinary ecology and in the environmental psychology,  know how to recognize, measure and assess sources of noise and sound signals in temporal and frequency domain. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Udeleženci:  dosežejo poglobljeno razumevanje medsebojnih vplivov posameznikov, družbe in okolja predvsem z ozirom na zagotavljanje uravnoteženega družbenega in okoljskega razvoja,  razumejo človeško dojemanje okolja in njegovih tveganj ter dejavnike, ki vplivajo na okoljsko ozaveščenost,  spoznajo načela in metode presoje različnih vplivov na okolje in ljudi,  spoznajo fizikalne lastnosti zvoka in hrupa ter njune pojavne oblike, mehanizme nastajanja hrupa in metode za zmanjšanje hrupa ter učinke hrupa na zdravje ljudi. | Knowledge and understanding:  The participants will:  achieve in deep understanding of mutual influences of individuals, society and environment mainly regarding assurance of balanced social and environmental development,  understand human environmental cognition and its risks, as well as the factors influencing environmental consciousness,  get acquainted with principles and methods of assessment of different impact on environment and people,  get acquainted with physical properties of sound and noise and their forms of appearance, mechanisms of noise generation and methods for noise decreasing as well as noise influences on people's health. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja, seminarji, študij primerov, diskusije, nastopi, delo v manjših skupinah, reševanje konkretnih problemov, individualne naloge. | Lectures, seminars, case study, student’s presentations, small group work, consultations, team work, individual work. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Pisni izpit (več kot 5 kandidatov | 100,00 % | Written exam (more than 5 kandidates) |
| Ustni izpit (manj kot 5 kandidatov | 100,00 % | Oral exam (les than 5 kandidates) |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| **Ivan Eržen**   1. JEREB, Gregor, POLJŠAK, Borut, ERŽEN, Ivan. Contribution of drinking water softeners to daily phosphate intake in Slovenia. International journal of environmental research and public health, ISSN 1660-4601, 2017, vol. 14, iss. 10, str. 1-10. 2. KUKEC, Andreja, BOŽNAR, Marija, MLAKAR, Primož, GRAŠIČ, Boštjan, HERAKOVIČ, Andrej, ZADNIK, Vesna, ZALETEL-KRAGELJ, Lijana, FARKAŠ-LAINŠČAK, Jerneja, ERŽEN, Ivan. Methodological approach in determination of small spatial units in a highly complex terrain in atmospheric pollution research : the case of Zasavje region in Slovenia. Geospatial Health, ISSN 1827-1987, 2014, vol. 8, no. 2, str. 527-535. 3. LANZINGER, Stefanie, SCHNEIDER, Alexandra, BREITNER, Susanne, STAFOGGIA, Massimo, ERŽEN, Ivan, DOSTÁL, Miroslav, PASTORKOVA, Anna, BASTIAN, Susanne, CYRYS, Josef, ZSCHEPPANG, Anja, KOLODNITSKA, Tetiana, PETERS, Annette. Associations between ultrafine and fine particles and mortality in five central European cities - results from the UFIREG study. Environment international, ISSN 0160-4120. [Print ed.], 2016, letn. 88, št. march, str. 44-52 4. ERŽEN, Ivan, KUKEC, Andreja, ZALETEL-KRAGELJ, Lijana. Air pollution as a potential risk factor for chronic respiratory diseases in children: a prevalence study in Koper municipality. HealthMed, ISSN 1840-2291, 2010, vol. 4, no. 4, suppl. 1, str. 945-954 5. KOKLIČ, Tilen, PINTARIČ, Štefan, ZDOVC, Irena, GOLOB, Majda, UMEK, Polona, MEHLE, Alma, DOBEIC, Martin, ŠTRANCAR, Janez. Photocatalytic disinfection of surfaces with copper doped Ti0 2 nanotube coatings illuminated by ceiling mounted fluorescent light. PloS one, ISSN 1932-6203, 2018, vol. 13, no. 5, str. 1-17. 6. KOKLIČ, Tilen, URBANČIČ, Iztok, ZDOVC, Irena, GOLOB, Majda, UMEK, Polona, ARSOV, Zoran, DRAŽIĆ, Goran, PINTARIČ, Štefan, DOBEIC, Martin, ŠTRANCAR, Janez. Surface deposited one-dimensional copper-doped TiO(2) nanomaterials for prevention of health care acquired infections. PloS one, ISSN 1932-6203, 2018, vol. 13, issue 7, str. 1-20. 7. ŽIŽEK, Suzana, DOBEIC, Martin, PINTARIČ, Štefan, ZIDAR, Primož, KOBAL, Silvestra, VIDRIH, Matej. Degradation and dissipation of the veterinary ionophore lasalocid in manure and soil. Chemosphere, ISSN 0045-6535. [Print ed.], Nov. 2015, vol. 138, 947-951 |

# OKOLJSKA EPIDEMIOLOGIJA Učni načrt predmeta/Course syllabus

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| Predmet: | OKOLJSKA EPIDEMIOLOGIJA |
| Course title: | ENVIRONMETAL EPIDEMIOLOGY |
| Članica nosilka/UL Member: | UL MF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020690 |
| Koda učne enote na članici/UL Member course code: | 42 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 30 | 30 | 15 |  |  | 175 | 10 |

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| Nosilec predmeta/Lecturer: | Ivan Eržen |

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| Izvajalci predavanj: | Borut Poljšak |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Slovenščina |
|  | Vaje/Tutorial: | Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Študenti doktorskega študija. | PhD students. |

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| Vsebina: | Content (Syllabus outline): |
| Predstavitev dejavnikov okolja ter njihovega pomena za zdravje  Razvoj pristopov v okoljski epidemiologiji  Predmet proučevanja – odkrivanje in proučevanje posledic delovanja okolja na zdravje- metodološki pristopi za opredelitev škodljivosti  Oblikovanje osnovnih kriterijev za oceno nevarnosti dejavnikov okolja  Pregled glavnih metod dela ter tipov posameznih študij – opis metod. Predstavitev prednosti in slabosti posameznih tipov študij  Napake in prostranosti v epidemiologiji okolja ter tehnik za njihovo zmanjševanje  Obravnava posameznih primerov okoljskih škodljivosti ter analiza pristopov, ki so bili uporabljeni v okviru proučevanja razmer  Načrtovanje okoljskih raziskav ter priprava metode dela. | Introduction to environmental factors and their importance for health  Approach development in environmental epidemiology  Object of study - discovering and studying environment impact on health-methodological approaches for hazard identification  Design of basic criteria for risk assessment of environmental factors  Overview of the main working methods and the types of individual studies. Description of methods. Presentation of the advantages and disadvantages of each type of the study  Errors and bias in environmental epidemiology and techniques to reduce  Presentation of particular cases of environmental harm and analysis of approaches that were used in the study  Planning of environmental research and preparation methods. |

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| Temeljna literatura in viri/Readings: |
| Eržen in sod. Zdravje in okolje. Medicinska fakulteta Maribor 2010, 1-208  Lijana Zaletel-Kragelj, Ivan Eržen. Ecological Studies: Basic Principles  http://www.snz.unizg.hr/ph-see/Documents/Publications/PH-SEE\_Book6\_Full\_MethodsAndToolsInPH.pdf,  stran 289 do 309  R. Beaglehole, R. Bonita, T. Kjelldstrom Basic Epidemiology. World Health Organisation (WHO). 1994  Lilienfeld AM, Lilienfeld ED. Foundations of Epidemiogy, Oxford, New York: Oxford University Press, 1980.http://themes.eea.eu.int/ |

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| Cilji in kompetence: | Objectives and competences: |
| Cilj izobraževanja je, da udeleženci:  dosežejo poglobljeno razumevanje metodoloških pristopov pri proučevanju vpliva okoljskih dejavnikov na zdravje  razumejo možnosti ter prednosti in slabost metodoloških pristopov v okoljski epidemiologiji  poznajo praktično uporabo metod v okviru okoljske epidemiologije ter njihove omejitve  razvijejo kritičen odnos do možnosti, ki jih imamo na področju okoljskega raziskovanja v sodobnem času. | The goal of training is that students:  achieve in-depth understanding of methodological approaches for studying the impact of environmental factors on health  understand the options and the pros and cons of methodological approaches in environmental epidemiology  know the practical application of methods in environmental epidemiology, and their limitations  develop a critical attitude towards the opportunities that we have in the field of environmental research at present. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Študentke in študenti bodo:  poznali definicije, vlogo in značilnosti epidemiologije okolja ter razvoj tega področja,  poznali osnovne interakcije med okoljem (socialno in biološko) in človekom ter njihov vpliv na zdravje,  poznali pomen proučevanja populacije kot prispevek k zdravju posameznika,  razumeli in obvladali pristope, probleme in rešitve na področju epidemiologije okolja,  poznali pravne in etične okvire na področju epidemiologije okolja,  s pridobljenim znanjem razumeli principe na dokazih temelječega ukrepanja na področju zmanjševanja škodljivih vplivov okolja na zdravje. | Knowledge and Understanding:  On the completition of this course the student will:  be acquainted with the definitions, role and characteristic of environmental epidemiology and its development,  be familiar with the importance of interdependency of health determinants in social and physical environment for health status of the population,  understand the importance of measurement of health and diseases,  be able to recognize and understand approaches, problems and soulutions in environmental epidemiology,  will know legal and ethical frames in public health,  will understand the principles of evidence based environmental epidemiology. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja, seminarji, študij primerov, diskusije, nastopi, delo v manjših skupinah, reševanje konkretnih problemov, individualne naloge. | Lectures, seminars, case study, student’s presentations, small group work, consultations, team work, individual work. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Ustni izpit | 100,00 % | Oral examination |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| Ivan Eržen  ERŽEN, Ivan. Ocena izpostavljenosti otrok svincu v celjskih vrtcih = An assessment of lead exposure among children attending kindergartens in Celje. Zdravstveno varstvo. [Tiskana izd.], 2011, letn. 50, št. 2, str. 113-120  ERŽEN, Ivan, KUKEC, Andreja, ZALETEL-KRAGELJ, Lijana. Air pollution as a potential risk factor for chronic respiratory diseases in children: a prevalence study in Koper municipality. HealthMed, 2010, vol. 4, no. 4, suppl. 1, str. 945-954  ŠTUPAR, Janez, DOLINŠEK, Franci, ERŽEN, Ivan. Hair-Pb longitudinal profiles and blood-Pb in the population of young Slovenian males. Ecotoxicol. environ. saf., 2007, letn. 68, št. 1, str. 134-143 |

# OKOLJSKE POLITIKE MED MORALNIM UPRAVIČENJEM, EKONOMSKO ANALIZO IN POLITIČNO URESNIČLJIVOSTJO Učni načrt predmeta/Course syllabus

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| Predmet: | OKOLJSKE POLITIKE MED MORALNIM UPRAVIČENJEM, EKONOMSKO ANALIZO IN POLITIČNO URESNIČLJIVOSTJO |
| Course title: | ENVIRONMENTAL POLICIES BETWEEN MORAL JUSTIFICATION, ECONOMIC ANALYSIS AND POLITICAL FEASABILITY |
| Članica nosilka/UL Member: | UL FF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020691 |
| Koda učne enote na članici/UL Member course code: | 43 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 30 | 30 |  |  |  | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Simon Hajdini |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: |  |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij. | Enrolment in the doctoral study. |

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| Vsebina: | Content (Syllabus outline): |
| Predmet bo po uvodnem delu, posvečenem seznanjanju z temeljnimi pojmi in problemi odnosa med moralno in ekonomsko teorijo (instrumentalna racionalnost, interes, moralna norma, analiza stroškov in koristi itd. ) ter relevantnimi koncepti in stališči najpomembnejših tokov sodobne praktične etike in normativne politične filozofije, s pomočjo pridobljenega znanja problematiziral razmerja med moralnimi normami, pravom, političnim odločanjem in ekonomskim delovanjem v zvezi z okoljem. Temu se bo posvečal prek analize argumentacij v zvezi s posameznimi okoljskimi izzivi (globalno segrevanje, ohranitev divjine, genski inženiring, moralni status nečloveških živali, biotska raznovrstnost itd.) ter – realnih in možnih – okoljskih ukrepov in politik, (emisijska, energetska, demografska, davčna politika, trajnostni razvoj). V ospredju bo preučevanje njihove upravičenosti (npr. individualna in kolektoivna odgovornost; bogati in revni; lokalno in globalno; mesto in podeželje; medgeneracijska pravičnost; okoljski aktivizem; poslovna etika in korporativna odgovornost; okoljska civilna neposlušnost), pozornosti pa bo deležna tudi njihova politična uresničljivost. | After an introduction, dedicated to basic concepts and problems concerning the relation between moral and economic theory (instrumental rationality, interest, moral norm, cost benefit analysis) and the relevant concepts and positions of the most important strains in contemporary practical ethics and normative political philosophy, the subject will focus on the relationships between moral norms, law, political decisions and profitability based acting concerning the environment. The topic will be dealt with analyzing the argumentations proposed concerning peculiar environmental challenges (global warming, preserving the wilderness, genetic engineering, moral status of non-human animals, biodiversity etc.) and real or potential environmental measures and politics (regarding pollution, energy, demography, tax policy, sustainable development). In the forefront there will be the study of their justification (for example: individual and collective responsibility; rich and poor; local and global; city and countryside; intergenerational justice; environmental activism; business ethics and corporate responsibility; environmental citizens' disobedience), some attention will be paid also to their political feasibility. |

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| Temeljna literatura in viri/Readings: |
| Donald VanDeVeer, Christine Pierce (2003): The Environmental Ethics & Policy Book, Wadsworth, 2003.  Daniel M. Hausman, Michael S. McPherson: Economic analysis and moral philosophy, Cambridge University Press,  Paola Cavalieri: Živalsko vprašanje, Krtina, 2006  Andrew Dobson: Green Political Thought, Routledge, 2003.  Jeremy Rifkin: Stoletje biotehnologije, Krtina, 2001.  George Monbiot: Vroče, Krtina, 2010 |

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| Cilji in kompetence: | Objectives and competences: |
| Študentje bodo pridobili temeljna znanja o prepletu moralnih, pravnih, političnih in ekonomskih argumentacij, ki se v sodobnih družbah pojavljajo v zvezi z okoljem.  Cilj predmeta je usposobiti študente za samostojno analizo in presojo moralne upravičenosti praks, institucij, ukrepov in politik, ki zadevajo okolje, ter za samostojno oblikovanje argumentov za ali proti uvedbi posameznih ukrepov na področju okoljskih politik.  Predmetnospecifične kompetence, ki jih bodo pridobili študetje so:  - sposobnost smotrne uporabe osnovnega instrumentarija normativne moralne, politične in ekonomske filozofije,  - sposoblnost odkrivanja, prepoznavanja, analize in presoje moralnih stališč ter argumentacij v javnih diskurzih, ki zadevajo status okolja,  - sposobnost oblikovanja in zagovarjanja lastnih moralnih in političnih stališč o upravičljivosti okoljskih praks, ukrepov in politik. | Students will gain basic knowledge on the interconnectedness of moral, legal, political and economic argumentations, which appears in contemporary societies regarding the environment. The aim of the subject is to enable the student to undertake independent analysis and form judgments about moral justifications of praxis regarding the environment, as well as for an independent formulation of arguments for or against the implementation of proposed measures of environmental policies.  The competences specific to the subject that the students will gain, are:  The competence to make sensible use of the basic tools pertinent to normative moral and political philosophy and economy.  The competence to discover, recognize, analyse and judge moral standpoints as well as argumentation which appears in public discurse, related to the status of the environment.  The competence to form and argue for her own moral and political standpoints about the justifications of environmental praxis, measures and policies. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Študenti bodo spoznali in razumeli oblikovanje okoljskih politik kot iskanje ravnovesja med moralnim upravičenjem ekonomsko učinkovitostjo in politično uresničljivostjo. | Knowledge and understanding:  Students will get the knowledge and understanding of environmental policies as a trade- off between moral justification, economic profitability and political feasibility. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Uvodni, konceptualni del bo podan prek predavanj, aplikativni del pa pretežno v seminarski obliki, ki bo vključevala tudi individualne konzultacije. | The introductory conceptual part will be delivered through lessons; the applied part will take mainly in seminar form, including individual consultations. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Ustno izpraševanje | 50,00 % | Oral examination |
| Seminarska naloga. | 50,00 % | Seminar work |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| 1. HAJDINI, Simon. Živel antispiecizem? : primer mrtvega psa (in mačk). *Problemi : revija za kulturo in družbena vprašanja*. 2022, letn. 60, št. 9/10, str. 199-239, 243-244, 247-248, ilustr. ISSN 0555-2419. [COBISS.SI-ID [137222915](https://plus.cobiss.net/cobiss/si/sl/bib/137222915)], [[SNIP](https://plus.si.cobiss.net/opac7/snip?c=sc=0555-2419+and+PY=2021&amp;r1=true&amp;lang=sl)] financer: ARRS, P6-0252, Filozofske raziskave; ARRS, J6-2590, Heglova politična metafizika kategorija: 1A1 (Z, A'', A', A1/2); uvrstitev: Scopus (h), Scopus (d), MBP (PHIN); tip dela še ni verificiran točke: 121.56, št. avtorjev: 1  2. HAJDINI, Simon. Prepozno za prihodnost. V: MODER, Gregor (ur.), RUDA, Frank. *Ukinimo svobodo : zagovor sodobne rabe fatalizma*. Ljubljana: Maska, 2020. Str. 207-224. Zbirka Mediakcije, knj. 19. ISBN 978-961-6572-57-6. [COBISS.SI-ID [18222339](https://plus.cobiss.net/cobiss/si/sl/bib/18222339)] kategorija: 3B (Z, A1/2); tip dela je verificiral OSICH točke: 40, št. avtorjev: 1  3. HAJDINI, Simon. Ne splača se : spremna študija. V: PFALLER, Robert. *Za kaj se splača živeti : elementi materialistične filozofije*. Ljubljana: Studia humanitatis, 2020. Str. 267-281. Studia humanitatis. ISBN 978-961-6798-98-3. [COBISS.SI-ID [63151619](https://plus.cobiss.net/cobiss/si/sl/bib/63151619)] financer: ARRS, J6-1812, Teatralnost oblasti: Hegel in Shakespeare o sodobnih strukturah oblasti kategorija: 3B (Z, A1/2); tip dela je verificiral OSICH točke: 40, št. avtorjev: 1  4. HAJDINI, Simon. Ste slišali tistega o Benjaminu?. *Problemi : revija za kulturo in družbena vprašanja*. 2021, letn. 59, št. 9-10, str. 135-158, 238-239, 242. ISSN 0555-2419. [COBISS.SI-ID [97798659](https://plus.cobiss.net/cobiss/si/sl/bib/97798659)], [[SNIP](https://plus.si.cobiss.net/opac7/snip?c=sc=0555-2419+and+PY=2021&amp;r1=true&amp;lang=sl)] financer: ARRS, P6-0252, Filozofske raziskave; ARRS, J6-2590, Heglova politična metafizika kategorija: 1A1 (Z, A'', A', A1/2); uvrstitev: Scopus (h), Scopus (d), MBP (PHIN); tip dela je verificiral OSICH točke: 121.56, št. avtorjev: 1 |

# OKOLJSKI IN SOCIOLOŠKI VIDIKI TRAJNOSTNEGA RAZVOJA Učni načrt predmeta/Course syllabus

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| Predmet: | OKOLJSKI IN SOCIOLOŠKI VIDIKI TRAJNOSTNEGA RAZVOJA |
| Course title: | ENVIRONMENTAL AND SOCIOLOGICAL ASPECTS OF SUSTAINABLE DEVELOPMENT |
| Članica nosilka/UL Member: | UL FF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020625 |
| Koda učne enote na članici/UL Member course code: | 4 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 45 | 15 |  |  |  | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Katja Vintar Mally, Marjan Hočevar |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Temeljni predmet /Core course |

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| Jeziki/Languages: | Predavanja/Lectures: | Slovenščina |
|  | Vaje/Tutorial: |  |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij. | Enrolment in the doctoral study programme. |

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| Vsebina: | Content (Syllabus outline): |
| Raziskovanje okoljskih dilem in problemov v radikalni varianti uvaja paradigmatski obrat v razumevanju sodobnih družb. Okoljski problemi presegajo operativni repertoar modernih družbenih sistemov. Pritiski na okolje so v številnih območjih sveta presegli zmogljivosti okolja, okoljska globalizacija je prinesla izčrpavanje naravnih virov, podnebne spremembe in zmanjševanje pokrajinske in biotske raznovrstnosti. Kot alternativa sedanjemu načinu materialne in prostorske organizacije družbe se postopoma oblikuje trajnostni, sonaravni razvojni model, zasnovan na upoštevanju nosilne zmogljivosti okolja. Obravnavani bodo primeri trajnostnega načina reorganizacije družbe v smeri materialne zmernosti, socialne pravičnosti in okoljske odgovornosti. Predstavljene bodo potrebne razvojne strategije, ki bi omogočile trajnostno, sonaravno organizacijo materialnega življenja Slovenije in njenih regij.  Očitno postaja, da v obstoječem sistemskem okviru ni mogoče zastaviti niti pravih vprašanj, kaj šele ponuditi delujoče odgovore nanje. Takšna situacija poglablja razpon med benignimi površinskimi pristopi in globinskimi radikalnimi zastavitvami problematike. Temeljno izhodišče sociologije okolja je razvijanje sistemsko integrativnih pristopov, t.j. načina, ki celotno družbeno prakso opazuje in interpretira z vidika varovanja in ohranjanja okolja. Takšen integrativen pristop se povsem prilega zasnovi interdisciplinarnega univerzitetnega študija varstva okolja. Kritična obravnava koncepta trajnostnega razvoja je ključna predmetna tematika. Trajnostni razvoj je integrativni deklarativni cilj večine razvitih sodobnih družb. Navkljub temu refleksija tega radikalnega koncepta močno zaostaja za implementacijskimi potrebami. Predmet predstavi temeljne konceptualne zamisli trajnostnega razvoja in najbolj aktualne dileme njegovega praktičnega uvajanja. Nato se posveti trodelni obravnavi trajnostnega razvoja – analitski, normativni in strateški ravni. Tak pristop vnaša pregledno refleksijo ter radikalne zamisli, kar je bila in je še vedno ključna pomanjkljivost dosedanjih obravnav. Analitično bodo obravnavani »trajnostno« naravnani razvojni projekti. Družbena konstrukcija okolja, dojemanje tveganj, ne/pripravljenost na spreminjanje uveljavljenih družbenih praks, problem kolektivnega delovanja pri varovanju okolja, paradoksi preseganja antropocentrizma , vrednotni preskoki oz. trdovratnost modernih vrednotnih usmeritev, komunikativno delovanje kot možna oblika preseganja disciplinarne zamejenosti pri varovanju okolja ipd. so nekatere izbrane teme, ki bodo podrobneje predstavljene. Glede na širok disciplinarni razpon predvidnih študentov, bo obravnavana vsebina prilagojena interesom in predznanjem študentov. | Exploring environmental dilemmas and problems in a radical form introduces a paradigmatic turn to our understanding of modern societies. Environmental issues transcend the operative repertoire of modern social systems. In many areas of the world the pressures on the environment have exceeded its capacities, environmental globalisation has led to the depletion of natural resources, climate change, and a reduction of landscape and bio diversity. As an alternative to the present way our society is materially and spatially organised, a sustainable development model is gradually taking shape, based on consideration of the environment's carrying capacity. The course will look into examples of sustainable ways of reorganising society towards material restraint, social justice, and environmental responsibility. It will present the required development strategies that will facilitate a sustainable organisation of material life in Slovenia and its regions. It is increasingly obvious that the framework of the present system does not even enable us to ask the right questions, let alone provide working answers to them. This situation deepens the gap between benign superficial approaches and in-depth, radical exposure of the issues. The fundamental starting-point of the sociology of the environment is to develop systemic integrative approaches, i.e. ways to observe the entire social practice and interpret it from the viewpoint of environment protection and preservation. Such an integrative approach is perfectly adapted to the concept of interdisciplinary university study of environment protection. Critical discussion of the concept of sustainable development is the course's key theme. Sustainable development is the declared integrative objective of most developed modern societies. Nevertheless, reflection on this radical concept lags far behind its implementation requirements. The course presents the basic conceptual ideas of sustainable development and the most current dilemmas of its practical introduction. It then turns to a three-part discussion of sustainable development – at the analytical, normative, and strategic levels. Such an approach provides for clear reflection and radical ideas – the key deficiency of the discussions on the theme in the past and present. The analysis will address „sustainably“ designed development projects. The social construction of the environment, the perception of risk, the (un)willingness to change established social practices, the problem of collective operation in environment protection, the paradoxes of moving beyond anthropocentrism, value leaps or the obstinacy of modern value orientations, communicative operation as a possible form of surpassing the delimitations of individual disciplines in environment protection, and the like, are some selected themes that will be presented in greater detail. In view of the widely diverse disciplines from which the expected students come, the contents will be adapted to their interests and pre-knowledge. |

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| Temeljna literatura in viri/Readings: |
| * Beck, U., 2009. Družba tveganja. Ljubljana: Krtina. COBISS.SIID – 246065152 * Brown, L., 2006. Plan B 2.0. New York, London: W. W. Norton & Co. COBISS.SIID – 16701926 * Hočevar, M., 2023. Mapping the dualism of nature/society and nature/culture in environmental sciences in view of the anthropocene. Social Science Forum (Družboslovne razprave), 39, 104, str. 21–47. COBISS.SIID – 186548227 * Jerolmack, C., 2012. Toward A Sociology of Nature. The Sociological Quarterly, 53, 4, str. 501–505. DOI: <https://doi.org/10.1111/j.1533-8525.2012.01250.x> * Kos, D., 2004. Tri ravni trajnostnega razvoja. Teorija in praksa, 41, 1–2. COBISS.SIID – 53075201 * Plut, D., 2010. Geografija sonaravnega razvoja. Ljubljana: Znanstvena založba Filozofske fakultete. COBISS.SIID – 253053184 * Transforming our world: the 2030 Agenda for Sustainable Development. 2015. United Nations. <https://sdgs.un.org/2030agenda> * Vintar Mally, K., 2020. Sustainable development. V: Rogelj, B. (ur.). Geography of Slovenia. Ljubljana: Znanstvena založba Filozofske fakultete, str. 225–234. COBISS.SI-ID – 71678306 |

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| Cilji in kompetence: | Objectives and competences: |
| Cilj predmeta je seznaniti študente s temeljnimi dilemami okoljskih in socioloških razsežnosti trajnostnega razvoja, t.j. z dilemami vseh sodobnih družb, ki deklarativno razglašajo trajnostno razvojno usmeritev. Študenti se bodo seznanili s potrebnimi, večplastnimi spremembami v prostorski in materialni organizaciji družbe, ki bi bila zasnovana na trajnostnih, sonaravnih principih.  Zaradi kopičenja in globalnega širjenja okoljsko neprilagojenih družbenih praks so legitimizacijski problemi sodobnih družb že dosegli stopnjo, ki ogroža zmožnost refleksije in smiselnega strukturiranja problematike. Temeljni cilj predmeta je usposabljanje slušateljev za teoretsko konsistentno analizo nevzdržnih trendov ter uporabno aplikacijo motivacij za spreminjanje uveljavljenih netrajnostnih družbenh praks. Študentje bodo sposobni simulirati učinke okoljskih in prostorskih projektov na družbeno okolje, presojati legitimizacijske potenciale preventivnih in kurativnih posegov na lokalni, regionalni, nacionalni in nadnacionalni – globalni ravni. | The objective of the course is to introduce the students to the basic dilemmas of the environmental and sociological dimensions of sustainable development, i.e the dilemmas of all modern societies which declare themselves to be oriented towards sustainable development. The students will be introduced to the necessary, multilayered changes in the spatial and material organisation of society, which would be based on sustainable principles. Because of the accumulation and global spread of environmentally detrimental social practices, the legitimation problems of modern societies have reached a level that threatens their ability to reflect on and sensibly structure the issues. The basic objective of the course is to train the students to theoretically and consistently analyse unsustainable trends and the practical application of motivations for changing unsustainable social practices. The students will be capable of simulating the effects of environmental and spatial projects on the social environment, assess the legitimation potentials of preventive and curative interventions at the local, regional, national, and supranational, i.e. global, levels. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Študenti bodo seznanjeni z interdisciplinarno problematiko antropogenega preseganja nosilnih zmogljivosti okolja in modeli trajnostne reorganizacije družbe. Obenem bodo sposobni razumeti okoljsko in sociološko razsežnost trajnostnega razvoja in s tem povezano večplastnost razmerja človek – okolje /narava. | Knowledge and understanding:  The students will be introduced to the interdisciplinary issues of anthropogenic exceeding of the carrying capacities of the environment and to models of a sustainable reorganisation of society. They will also be able to understand the environmentral and sociological dimensions of sustainable development and the related multi-layered relationships between man and the environment/nature. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Tri četrtine kontaktnih ur se bodo izvajale kot klasična predavanja, ena četrtina ur pa bo namenjena seminarjem, v katerih bodo z aktivno udeležbo v naprej pripravljenih slušateljev obravnavane izbrane teme iz učnega načrta. | Three-quarters of the contact hours will be delivered as lectures and one quarter will be dedicated to seminars, in which selected topics from the course syllabus will be addressed with the active participation of students prepared in advance. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Seminarska naloga | 60,00 % | Seminar paper. |
| Ustni zagovor seminarske naloge in izpit. | 40,00 % | Oral presentation of seminar paper and examination. |

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| Ocenjevalna lestvica: | Grading system: |
| 5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10 | 5 - 10, a student passes the exam if he is graded from 6 to 10 |

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| Reference nosilca/Lecturer's references: |
| **prof. dr. Marjan Hočevar:**  Hočevar, Marjan (2023). Mapping the dualism of nature/society and nature/culture in environmental sciences in view of the anthropocene; Social science forum (Družboslovne razprave); l. 39, št. 104, str. 21-47.  Hočevar, Marjan, Bartol Tomaž (2021). Cities as places and topics of studies: mapping research clusters across disciplines; Urbani izziv; l. 32, št. 1, str.123-137.  Hočevar, Marjan (2017). Konceptualni okvir sonaravne mobilnostne strukturacije v razmerah nadnacionalnega povezovanja, Teorija in praksa; l. 54, št. 5, str. 831-856, 91  Hočevar, Marjan (2012). Dispersed settlement in detached houses: attitudes over the residential space consumption in Slovenia ; Sociologija; l. 54, št. 1, str. 123-152.    **prof. dr. Katja Vintar Mally:**  Vintar Mally, K., Bobovnik, N., Kimovec, L., Lampič, B., 2022. Changes in (sustainable) development of Slovenian small towns. *European Countryside*, 14, 1, str. 87–103. DOI: [10.2478/euco-2022-0005](https://dx.doi.org/10.2478/euco-2022-0005)  Bobovnik, N., Vintar Mally, K., 2022. Awareness of planetary boundaries as a starting point for sustainable development. An example of the use of the ecological footprint in education. *Sodobna pedagogika*, 73, 1, str. 196–212.  Vintar Mally, K., 2021. Trends in regional development in Slovenia in the light of the goals of sustainable development. *European journal of geography*, 12, 2, str. 36–51. DOI: [10.48088/ejg.k.mal.12.2.36.51](https://dx.doi.org/10.48088/ejg.k.mal.12.2.36.51)  Vintar Mally, K., 2020. The environmental price of socio-economic development. Worldwide trends from 1990 to 2016. *European journal of geography*, 11, 2, str. 137–153. DOI: [10.48088/ejg.k.mal.11.2.137.153](https://dx.doi.org/10.48088/ejg.k.mal.11.2.137.153) |

# PODZEMNE VODE Učni načrt predmeta/Course syllabus

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| Predmet: | PODZEMNE VODE |
| Course title: | Ground Water |
| Članica nosilka/UL Member: | UL NTF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020692 |
| Koda učne enote na članici/UL Member course code: | 44 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 30 | 30 |  |  |  | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Mihael Brenčič |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet /Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Zaključen študijski program druge stopnje s področja naravoslovno matematičnih ali tehničnih usmeritev. | Master degree in mathematics, natural or technical sciences. |

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| Vsebina: | Content (Syllabus outline): |
| Študent se seznani s pojavljenjem podzemne vode v prostoru, njenim nastopanjem v tleh, sedimentih in kamninah, konceptom poroznega medija in pojavljanjem poroznosti v različnih geoloških okoljih, vlogo podzemne vode in njenim vplivom na ostale podsisteme v hidrološkem krogu ter njenimi bilančnimi parametri (na globalni in na regionalni ravni), vplivom podzemne vode na ekosisteme, osnovami dinamike toka podzemne vode skozi sedimente, definicijo vodonosnika in različnimi hidrodinamskimi modeli vodonosnikov, osnovnimi tehnikami raziskav podzemnih vod (hidrogeološko kartiranje, meritve gladin podzemne vode, črpalni in nalivalni poizkusi, sledilni poizkusi, geofizikalne metode, izhodišči za modeliranje toka podzemne vode), vplivi točkovnih in ploskovnih onesnaževanj in onesnaževanja na kemijsko stanje podzemne vode in osnovami širjenja in transporta onesnaževal skozi vodonosnike, osnovami razvoja podzemnih vodnih virov (izvedba zajetij na izvirih, izvedba vodnjakov in opazovalnih vrtin), osnovami zaščite podzemne vode na medzrnskih in kraških vodonosnikih in osnovami varstva pred podzemnimi vodami (pri globokih gradbenih jamah, pri gradnji avtocest in železnic). Podane bodo tudi osnovne informacije o pojavljanju mineralnih, in termalnih vod. | Students will learn basic concepts of groundwater appearance in space, its appearance in soil, sediments and rocks, porous media concept in different geological environments. They will learn about the role of groundwater in relation to other hydrological subsystems and their balance characteristics on local, regional and global scale, influences of groundwater on ecological systems. It is intended to present also basic knowledge of groundwater dynamics through sediments, aquifer definition and various conceptual hydrodynamic models of aquifer types. Basic groundwater investigation techniques (hydrogeological mapping, groundwater level measurements, pumping test, inflow tests, tracing tests, geophysical methods, basics of groundwater numerical modelling) will be presented. Basics of contaminant hydrogeology will be presented in relation to point and spatial pollution sources and basic knowledge about mass transport in porous media will be given. In the frame of applied hydrogeology construction of wells and water capture facilities will be presented as well as groundwater protection in intergranular and karstic aquifers. Protection from groundwater influences in larger infrastructural projects (railway and highway construction) will be also illustrated. |

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| Temeljna literatura in viri/Readings: |
| Izbrana poglavja iz knjig in člankov iz revij (v okviru izbranega št. kreditov)/ Selected chapters from books and papers in journals (in the frame of ECTS):  Brenčič, M. Splošna hidrogeologija (general hydrogeology) – študijsko gradivo / lecture materials.  Hiscock, K., 2005: Hydrogeology - principles and practice. Blackwell Publishing, 389 pp.  Todt, D.K. & Mays, L.W, 2005: Groundwater Hydrology. John Wiley & Sons., Inc., 636 pp.  Younger, P.L., 2007: Groundwater in the Environment. Blackwell Publishing, 318 pp.  Periodika/Journals: Water Resources Research, Journal of Hydrology, Ground Water, Hydrogeology Journal. |

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| Cilji in kompetence: | Objectives and competences: |
| Študent bo osvojil osnovno znanje o pojavljanju podzemne vode v sedimentih in kamninah ter osnovno znanje o pomenu podzemne vode za oskrbo prebivalstva s pitno vodo, pomenu podzemne vode v hidrološkem krogu in njenem vplivu na ekosisteme ter vlogi podzemne vode pri širjenju antropogenih onesnaževal v prostoru. | Student will learn basic knowledge about groundwater appearance in sediments and rocks. They will gain basic understanding of groundwater hydrology needed for drinking water supply form aquifers and about the role of groundwater in hydrological systems and their influence on the ecosystems. They will learn also about anthropogenic influences on the aquifer pollutant transport. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Predvideni študijski rezultati: usposobljenost študenta za opredelitev pojavljanja podzemne vode v kamninah in sedimentih, usposobljenost za sodelovanje pri zajemih podzemne vode za potrebe vodooskrbe in pri zaščiti virov pitne vode v vodonosnikih. | Knowledgeandunderstanding:  Capacity for determination of groundwater in rocks and sediment and skills for cooperation in groundwater drinking water supply projects and safe guard protection zones determination in aquifers. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja (v primeru zadostnega št. študentov) ali individualne konzultacije (v primeru nezadostnega št. študentov), terenske vaje. | Lectures (when number of students is adequate) or individual consultations (when number of students is less than required), seminar work. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Ustno izpraševanje | 40,00 % | Oral examination |
| Seminarska naloga | 60,00 % | Coursework. |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| **BRENČIČ, Mihael,** VREČA, Polona. Identification of sources and production processes of bottled waters by stable hydrogen and oxygen isotope ratios. *Rapid commun. mass spectrom.*, 2006, vol. 20, vol. 20, iss. 21, str. 3205-3212.  VREČA, Polona, **BRENČIČ, Mihael,** LEIS, Albrecht. Comparison of monthly and daily isotopic composition of precipitation in the coastal area of Slovenia. *Isot. environ. health stud.*, 2007, vol. 43, no. 4, str. 307-321.  **BRENČIČ, Mihael**. Groundwater and highways interaction: past and present experiences of highway construction in Slovenia. *Environ. geol.* 2006, vol. 49 |

# POLITIČNA EKOLOGIJA Učni načrt predmeta/Course syllabus

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| Predmet: | POLITIČNA EKOLOGIJA |
| Course title: | Political Ecology |
| Članica nosilka/UL Member: | UL FDV |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020693 |
| Koda učne enote na članici/UL Member course code: | 45 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 25 | 35 |  |  |  | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Andrej A. Lukšič |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Slovenščina |
|  | Vaje/Tutorial: |  |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študijski program. | Doctoral programme enrolment. |

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| Vsebina: | Content (Syllabus outline): |
| - Osnovni koncepti države (predstavitev osnovnih konceptov liberalne, socialne, korporativne, policijske, totalitarne, ekološke države, itd.)  - Osnovni koncepti politik za področje narave in okolja (običajno poslovanje, ekološko ugajanje, ekološka modernizacija, ekološki razvoj, ekološka pravičnost, ekološka družba, politike in subpolitike, redefiniranje političnega in nepolitičnega)  - Koncepti policy aren (vrste, značilnosti, tipologije, zakonitosti, politični akterji in odločevalci, načini oblikovanja politik)  - Komunikacijske in odločevalne forme (zgodovina, vloga in pomen, participativne ideje, zakonitosti delovanja in vzpostavljanje, nacionalna in internacionalna raven)  - Komunikacijski in odločevalni procesi (struktura akterjev, pravila komuniciranja, sistemska in strukturna moč, lobiranje, moč javnega pritiska, vloga javnih medijev, nove tehnološke možnosti za povezovanje akterjev)  - Koncept “konfliktnih” interesov (percepcija problemov, artikulacija, viri konfliktov, vodenje konfliktnega procesa)  - Koncept dekonflikcije (načini razumevanja, argumentativni način mišljenja, lateralno mišljenje, dizajn mišljenje)  - Koncept komunikacije v trikotniku stroka – politika – javnost (decizionistični, tehnokratski, pragmatični model, odpiranje političnega, nezmožnost komuniciranja, kolektivne identitete in pripadnosti). | - Basic concepts of state (introduction to the basic concepts of liberal, welfare, corporate, police, totalitarian, ecological state, etc.).  - Basic concepts of policies in the field of nature and environment (business as usual, pleasing organic, ecological modernization, environmental development, environmental justice, ecological society, politics and subpolitike, redefining the political and non-political)  - Concepts of policy arenas (the nature, characteristics, typology, legality, political actors and decision-makers, policy-making methods)  - Communication and the decision-making forms (history, role and importance of participatory ideas, and the legality of the establishment, national and international level)  -- Communication and decision-making processes (structure of actors, rules of communication, systemic and structural power, lobbying power of public pressure, the role of public media, new technological options for connecting players)  - The concept of "conflict" of interest (perception problems, articulation, sources of conflict, conflict management process)  -The concept of »deconfliction« (ways of understanding, argumentative way of thinking, lateral thinking, design thinking)  - The concept of communication in the triangle science - politics - public (decisional, technocratic, pragmatic model, opening of political, inability to communicate, collective identity and belonging). |

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| Temeljna literatura in viri/Readings: |
| * Beck Ulrich (2001): Družba tveganja. Na poti v neko novo moderno. Krtina, Ljubljana. * Lukšic A. Andrej (1998): Rizična tehnologija: izziv demokraciji (k politicni ekologiji),CKZ, ŠOU, Študentska založba, Ljubljana. * Dobson Andrew (2003): Green Political Thought (Third Edition), Routledge, London, New York. * Forsyth Tim (2003): Critical Political Ecology. The Politics of Environmental Science. Routlage. London, New York. * Lukšic A. Andrej, M. Bahor (2008): eZbornik znanstvenih člankov s področja politične ekologije, Center za kritično politologijo, FDV, Ljubljana. * Dryzek, John (2018): Politika Zemlje, Okoljski diskurzi. IČKZ, Ljubljana * Hajer, Maarten (2020): Politika okoljskega diskurza. IČKZ, zbirka OIKOS, Ljubljana. * Eckersley, Robyn (2019): Zelena država. Premišljanje demokracije in suverenosti. IČKZ, zbirka OIKOS, Ljubljana. * Mednarodna poletna šola politične ekologije 2018 (predavanja vabljenih profesorjev iz tujine): https://www.politicalecology-ljubljana.si/2018-2/ |

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| Cilji in kompetence: | Objectives and competences: |
| Študent/-ka bo s predmetom osvojil temeljne in posodobljene poglede politične ekologije, s katerimi bo sposoben umestiti sebe v komunikacijski in odločevalski sistem kot okoljskega strokovnjaka s specifičnim znanjem, (zavest o omejenosti lastnega strokovnega znanja po eni strani in po drugi o pomembnosti vključevanja svojega znanja, kar nujno vodi k interdisciplinarnemu sodelovanju). | Students will acquire basic and updated views of political ecology, which will be able to place yourself in communication and decision-making system as an environmental expert with specific knowledge; awareness of the limitations of our own knowledge on the one hand and the other on the importance of integrating their knowledge, which necessarily leads to interdisciplinary collaboration. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  - poznavanje osnovnih razmerij med stroko politiko in javnostjo/civilnodružbenimi akterji  - razumeti potrebo po vključevanju javnosti in civilnodružbenih akterjev v presojanje alternativnih strokovnih rešitev;  - razumeti odnos javnih oblasti do znanja  - razumeti komunikacijskih in odločevalskih form, v katere bo kot strokovnjak vključen. | Knowledge and understanding:  - Knowledge of the basic relationships between science, policy and public / civil society actors,  - Understand the need to involve the public and civil society actors to analyze alternative technical solutions;  -  Understand the attitude of the public authorities to knowledge  -  Understand communication and decision-making form, in which will be included as an expert. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja z aktivno komunikacijo s študenti. | Lectures with active communication with students. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Naloga v obsegu 30.000 znakov in zagovor | 100,00 % | Text to the extent of 30,000 characters and defense |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| |  | | --- | | 1. LUKŠIČ, Andrej*. Rizična tehnologija: izziv demokraciji : k politični ekologiji*, (Časopis za kritiko znanosti, Let. 27, št. 193). Ljubljana: Študentska organizacija Univerze v Ljubljani: Inštitut za ekologijo, 1999. 335 str. 2. LUKŠIČ, Andrej, BAHOR, Maja. Koncepti demokracije u Europskoj uniji. *Anali Hrvat. politol. društva*, 2006, god. 3, str. 149-176, ilustr.  3. LUKŠIČ, Andrej, BAHOR, Maja. Trajnostni razvoj v luči Lizbonske strategije in njene revizije. V: LUKŠIČ, Andrej (ur.), PLUT, Dušan (ur.). *Zbornik Okoljske akademske mreže, številka 1, letnik 2007 : zbornik člankov in prispevkov prvega srečanja Okoljske akademske mreže*. Ljubljana: Fakulteta za družbene vede, 2007, str. 27-42.  4. LUKŠIČ, Andrej. Ecology, low-carbon society and politics. Teorija in praksa : revija za družbena vprašanja, ISSN 0040-3598, sep.-okt. 2014, letn. 51  ISSN 1338-1385. [Online ed.], Jul. 2010, vol. 3, no. 2, str. 85-103,   5. ŠOBOT, Aleksandar, LUKŠIČ, Andrej. The impact of Europeanization on the nature protection system of Bosnia and Herzegovina : example of the establishment of multi-level governance of Natura 2000 protected areas. Socijalna ekologija : časopis za ekološku misao i sociologijska istraživanja okoline, ISSN 1330-0113, 2019, vol. 28, no. 1, str. 27-48.  6. ŠOBOT, Aleksandar, LUKŠIČ, Andrej. The impact of europeanisation on nature protection system of Croatia : example of the establishment of multi-level governance system of protected areas Natura 2000. Socijalna ekologija : časopis za ekološku misao i sociologijska istraživanja okoline, ISSN 1330-0113, 2016, vol. 25, no. 3, str. 235-270.  7. LUKŠIČ, Andrej, BAHOR, Maja. Green political theory and citizenship. V: LUKŠIČ, Andrej (ur.). Exploration of political ecology in Slovenia, (Zbirka Znanstvena produkcija). Ljubljana: Fakulteta za družbene vede, Center za politično teorijo. 2017, str. 3-21. http://dk.fdv.unilj. si/ek/pdfs/Exploration\_of\_political\_ecology\_in\_Slovenia.pdf. | |

# POŽARI IN VPLIV NA OKOLJE Učni načrt predmeta/Course syllabus

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| Predmet: | POŽARI IN VPLIV NA OKOLJE |
| Course title: | Fires and Their Environmental Impacts |
| Članica nosilka/UL Member: | UL FPP |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020694 |
| Koda učne enote na članici/UL Member course code: | 46 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 20 | 60 | 60 |  |  | 110 | 10 |

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| Nosilec predmeta/Lecturer: | Stojan Petelin |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective Course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij. | Enrollment in doctoral studies. |

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| Vsebina: | Content (Syllabus outline): |
| Požarna znanost in zgorevanje, požarna varnost, prenos toplote, razvoj plamena, gorljivost, difuzija plamena in ognjeni oblak, stacionarno gorenje tekočih in trdnih snovi, vžig, razširjanje plamena, tvorba in gibanje dima.  Modeli požara: empirični, področni in CFD.  Verjetnostne in deterministične analize požarov.  Puščanja, razlitja, odpovedi posod v povezavi s požari.  Tveganje za širitev požara in odziv služb za zaščito in reševanje.  Ocene posledic požarov in eksplozij. | Fire Science and combustion, fire safety, heat transfer, development of flame, burning, diffusion flames and fiery cloud, stationary combustion of liquid and solid materials, ignition, flame spread, smoke formation and movement.  Fire models: empirical, area and CFD. Probabilistic and deterministic analyzes of fires. Leaks, spills, failure of vessels in connection with the fires.  Risk of fire Spread and Fire Service Response.  Assessment of the consequences of fires and explosions. |

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| Temeljna literatura in viri/Readings: |
| *Dougal Drysdale*: An Introduction to Fire Dynamics, John Wiley&Sons, 1999.  *G.Cox:* Combustion Fundamentals of Fire, Academic Press, 1996.  *Karlsson B.: Quintiere J.G.*, Enclosure Fire Dynamics, CRC Press LLC, 2000.  *Baulak C.E.:* Heat transfer in Industrial combustion, CRC Press LCC, 2000.  *Cowley J.:* Fire Safety at Sea, Institute of Marine Science and Technology, 2002.  *Di Nenno, P.J., et al*.: SEPE Handbook of Fire Protection Engineering, Society of Fire Protection Engineering, Boston, 1995.  *Cote A.E. ed*.: NFPA Handbook, National Fire Protection Association, Quiney, MA,1997.  *Schrol R.C.:* Industrial Fire Protection Handbook, CRC Press LLC, 2002.  Guidelines for Chemical Process Quantitative Risk Analysis, Second Ed., Center for Chemical Process Safety, American Institute of Chemical Engineers, 2000.  *Melhem G.A.:* Advanced Consequence Analysis: Fluid Flow, Emergency Relief Systems Design, Thermal Hazards Assessment, Emission, Dispersion, Fire, and Explosion Dynamics, ioMosaic Corporation, Copyright ioMosaic Corporation 2006, 878 pages.  *James G. Quintiere*, Fundamentals of Fire Phenomena, University of Maryland, USA, 2006 John Wiley & Sons, Ltd ISBN: 0-470-09113-4.  *Andrew Furness, Martin Muckett*, Introduction to Fire Safety Management, 2007, Elsevier Ltd., ISBN: 978 0 7506 8068 4.  *J. Wang, V. Trbojevic*, Design for Safety of Marine and Offshore Systems, IMAREST, 2007, 403 pages.  *J. Reason*, Managing the Risks of Organizational Accidents, ASGATE, 2011, 252 pages.  *Turns S.R.,* An Introduction to Combustion Concepts and Application, Third Edition, McGrawHill 2012, ISBN 978-007-108687-5, 732 pages.  *James A. Milke, Francine Amon, Jonatan Gehandler, Selim Stahl, Mai Tomida Brian Meacham*, Development of an Environmental and Economic Assessment Tool (Enveco Tool) for Fire Events, 2016, Springer.  *M Green,* Guide to the advanced fire safety engineering of structures, 2007 The Institution of Structural Engineers.  *Charles A. Harper*, *Handbook of Building Materials for Fire Protection, 2004,* The McGraw-Hill Companies.  *Guan Heng Yeoh, Kwok Kit Yuen* , Computational Fluid Dynamics in Fire Engineering, 2009, Elsevier Inc.  *G. Perona, C.A. Brebbia*, Modelling, Monitoring and Management of Forest Fires II, 2010, WIT Press. |

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| Cilji in kompetence: | Objectives and competences: |
| Požarno inženirstvo in požarna znanost sta kompleksni področji, ki obsegata obravnavo širokega spektra fizikalnih pojavov kot so: hidrodinamika, prenos toplote s prevodom, konvekcijo in sevanjem, prenos snovi, kemija zgorevanja, toksičnost, odziv konstrukcij pri visokih temperaturah itd.  Obstajajo predvsem tri računske tehnike za modeliranje širjenja požara:  empirični modeli so v bistvu najenostavnejši. So dobro zasnovani, ker slonijo na eksperimentalnih podatkih in so zanesljivi za tisto, kar so namenjeni.  področni modeli slonijo na čistem fizikalnem popisu dogodkov, kot so zgorevanje, prenos toplote in snovi itd.  "Computational Fluid Dynamics" CFD modeli so računalniško bistveno bolj zahtevni, vendar omogočajo veliko bolj nazorne rezultate.  Na primer modeliranje gašenja požara, ali iskanje novih metod gašenja lahko predstavlja izjemno zahtevno nalogo, ker je povezano z obravnavo kompliciranih večfaznih tokov z istočasnim prenosom toplote in snovi, ki niti v svetu še niso ustrezno rešeni. | Fire engineering and fire science are complex areas that cover the treatment of a wide spectrum of physical phenomena such as fluid dynamics, heat transfer by conduction, convection and radiation, mass transfer, combustion chemistry, toxicity, response structures to high temperatures, etc.  There are mainly three computational techniques for modeling fire spread:  Empirical models are basically the simplest. They are well designed, because are based on experimental data and are reliable for what they are intended.  Zone models are based on physical description of events such as combustion, heat and mass transfer, etc.  "Computational Fluid Dynamics" CFD computer models are much more complex, but are capable of much more vivid results.  For example, modeling of fire-fighting, or search for new methods of extinguish can be an extremely challenging task, as it is linked to the treatment of complicated multiphase flows with simultaneous heat and mass transfer, which even in the world have not yet been adequately resolved. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Analize posledic namernih ali slučajnih izrednih dogodkov na okolje.  Vpliv požarov oz. eksplozij na okolje.  Vpliv posredovanja in gašenja na okolje.  Identifikacija izvorov onesnaževanja v primeru požara z namenom minimiziranja posledic. | Knowledge and understanding:  Analyses of the consequences of deliberate or accidental incidents on the environment.  The effect of fires or. explosions on the environment.  The impact of intervention and extinguish a fire on the environment.  Identification of sources of pollution in the event of a fire in order to minimize the consequences. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Na predavanjih pridobi študent temeljna teoretična znanja. S seminarsko nalogo samostojno pod mentorstvom visokošolskega učitelja rešuje problematiko požarov v obliki projektne oz. laboratorijske naloge. | In the lectures the student gains the basic theoretical knowledge. The seminar work independently under the guidance of a university teacher solves the problem of fires in the form of project or laboratory tasks. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Pisni izpit | 50,00 % | Written exam |
| Ustni zagovor | 30,00 % | Oral exam |
| Seminar - projekt | 20,00 % | Seminar - project |
| Ocena seminarske-projektne naloge, ustnega znanja in vseh vaj se oceni ločeno od pisnega dela izpita. |  | Rating seminar, project work, oral skills and all work is assessed separately from the written part of the exam. |
| Pogoj za pristop k ustnemu izpitu so opravljene vaje, seminarska-projektna naloga in pozitivna ocena pisnega dela izpita. Znanje se vrednoti s sistemom; od 6-10 (pozitivno) oz. 1-5 (negativno). |  | The condition for the oral examination is carried out exercises, seminar, project work and a positive evaluation of the written part of the exam. Knowledge is valued from the system; 6-10 (positive) or. 1-5 (negative). |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| **1.** STANKOVIĆ, Goran, PETELIN, Stojan, VIDMAR, Peter, PERKOVIČ, Marko. Impact of LNG Vapor Dispersion on Evacuation Routes inside LNG Terminals. *Strojniški vestnik*, ISSN 0039-2480, Mar. 2018, vol. 64, no. 3, str. 176-184, ilustr.<http://www.sv-jme.eu/sl/article/impact-of-lng-vapor-dispersion-on-evacuation-routes-inside-lng-terminals/>.  **2.**JUG, Aleš, PETELIN, Stojan, BUKOVEC, Peter. Designing an underground car park fire scenarios on a probabilistic basis. *Acta chim. slov.*. [Tiskana izd.], 2010, vol. 57, no. 1, str. 136-143. <http://acta.chem-soc.si/57/57-1-136.pdf>.  **3.** PETELIN, Stojan, LUIN, Blaž, VIDMAR, Peter. Risk analysis methodology for road tunnels and alternative routes. *Stroj. vestn.*, 2010, vol. 56, no. 1, str. 41-51. <http://www.sv-jme.eu/current-volume/sv-jme-56-1-2010/>.  **4.** PETELIN, Stojan, MAVKO, Borut, KONČAR, Boštjan, HASSAN, Yassin A. Scaling of small-scale thermal-hydraulic transient to the real nuclear power plant. *Nucl. technol.*, 2007, vol. 158, no. 1, str. 56-68. |

# PRESOJE OKOLJSKIH POSEGOV IN POKRAJINSKA RANLJIVOST Učni načrt predmeta/Course syllabus

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| Predmet: | PRESOJE OKOLJSKIH POSEGOV IN POKRAJINSKA RANLJIVOST |
| Course title: | ASSESSING ENVIRONMENTAL IMPACTS AND LANDSCAPE VULNERABILITY |
| Članica nosilka/UL Member: | UL FF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020695 |
| Koda učne enote na članici/UL Member course code: | 47 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 30 | 15 |  |  |  | 205 | 10 |

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| Nosilec predmeta/Lecturer: | Matej Ogrin |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet /Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Slovenščina |
|  | Vaje/Tutorial: |  |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Izpolnjeni pogoji za vpis v doktorski študij. | The student must meet the criteria for enrolment in the Ph.D. programme. |

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| Vsebina: | Content (Syllabus outline): |
| • vzdrževanje dinamičnega ravnovesja kot temeljna zahteva pri pokrajinskoekološki presoji posegov;  • možnosti in oblike prenosa ekosistemskih mehanizmov ravnovesja v pokrajinskoekološke presoje;  • občutljivost posameznih pokrajinotvornih sestavin na antropogeno obremenjevanje in posege;  • kvantitativni in kvalitativni kazalci za njihovo vrednotenje;  • pomen različne ranljivosti okolja v specifičnih mikrogeografskih okoljih in prepoznavanje vzrokov za zmanjšan naravni potencial posameznih sestavin okolja;  • nabor kazalcev raznovrstnih okoljskih vplivov, ki izvirajo iz različnih človekovih dejavnosti tako tistih, ki sodijo v skupino okoljsko bolj agresivnih (poselitev gradnja infrastrukture, industrija, proizvodna obrt….), kot pasivnih (kmetijstvo, nekatere oblike turizma in rekreacije, gozdarstvo, uslužnostne dejavnosti…);  • vzroki za ranljivost pokrajinotvornih sestavin in pokrajinskoekoloških enot in njen pomen za načrtovanje trajnostnega razvoja;  • trajnostno gospodarjenje z občutljivimi ekosistemi. | • maintaining a dynamic equilibrium as the primary requirement in assessing the landscape ecological effect of impacts;  • possibilities and forms for the transfer of ecosystem equilibrium mechanisms to landscape ecological assessments;  • sensitivity of particular landscape-forming components to anthropogenic pressure and impacts;  • quantitative and qualitative indicators for their evaluation;  • the significance of different environmental vulnerabilities in specific microgeographic environments and identification of causes for the reduction of the natural potential of particular environmental components;  • set of indicators of diverse types of environmental impacts originating from various human activities, including those ranked among the environmentally most aggressive (settlement, construction of infrastructure, industry, manufacturing, etc.) as well as more passive forms (agriculture, certain forms of tourism and recreation, forestry, services, etc.);  • causes of the vulnerability of landscape-forming components and landscape ecological units and significance in planning sustainable development;  • sustainable management of sensitive ecosystems. |

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| Temeljna literatura in viri/Readings: |
| • Plut, 1998, Varstvo geografskega okolja-učbenik, Filozofska fakulteta, Ljubljana  • Park, 1997, The Environment: Principles and Application. Routledge, London  • Goudie 1987, The Nature of the Environment, Basil Blackwell, Oxford  • A.P.A. Vink, Landscape Ecology and Land Use, Longman, London 1983  • M. G. Turner, R.H. Gardner, R. V. O´Neal, 2001, Landscape Ecology in Theory and Practice, Pattern and Process, Springer,London  • A.R.W.Jackson, J.M. Jackson, 1996, Environmental Science. The natural environment and human impact, Longman, London  • Z. Naveh, A. S. Lieberman, Landscape Ecology, Springer-Verlag, New York 1994  • M.Špes, D.Cigale, B. Lampič, K.Natek, D. Plut, A. Smrekar, Študija ranljivosti okolja (Metodologija in aplikacija)-Environmental Vulnerability Study (Methodology and Application), Geographica Slovenica 35/1-2, Založba ZRC, Ljubljana 2002  • Pokrajinsko ranljiva območja v Sloveniji (The Landscape Vulnerable Areas in Slovenia), Geographica Slovenica33/I, Inštitut za geografijo, Ljubljana 2000  • Plut, 2002, Okoljevarstveni vidiki prostorskega razvoja Slovenije, Razprave Filozofske fakultet, Ljubljana  • M. Špes, 1998, Degradacija okolja kot dejavnik diferenciacije urbane pokrajine, Geographica Slovenica 30, Ljubljana  • F. Vester, 1991, Kriza prenaseljenih območij, DZS, Ljubljana  • R. G. Bailey, 1996, Geosystem Geography, Springer, New York  • C.J.Barrow, 1995, Developing the Environment Problems & Management, Longman Scientific & Technical, London  • F. Sandbach, 1982, Principles of Pollution Control, Longman, London  Spletna učilnica |

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| Cilji in kompetence: | Objectives and competences: |
| Cilj predmeta je poglobiti znanje za razumevanje, spremljanje in vrednotenje raznovrstnih okoljskih posegov, ki se odražajo v paleti negativnih in ponekod tudi pozitivnih sprememb v posameznih pokrajinotvornih sestavinah oziroma različnih ekosistemih. Gre predvsem za prepoznavanje in posledično preprečevanje onesnaževanja okolja v območjih s specifičnimi pokrajinskimi značilnostmi. Z razumevanjem mrežne povezanosti vseh sestavin okolja t.im. vertikalni pogled na pokrajino jo razumemo kot rezultat součinkovanja vseh sestavin, ne pa zgolj kot seštevek njihovih individualnih značilnosti. Tovrstno celostno- ekosistemsko razumevanje pokrajine se prenaša v izdelavo metodoloških izhodišč za presojo načrtovanih posegov.  Pokrajinskoekološke presoje zahtevajo poznavanje in razumevanje naravnih in družbenih dejavnikov, predvsem pa pokrajinskim značilnostim prilagojene metodološke pristope, kar je temeljni cilj predmetno specifične kompetence. | The objective of the subject is to deepen knowledge for the understanding, monitoring, and evaluation of different types of environmental impacts reflected in a range of negative and in some cases also positive changes in particular landscape-forming components or ecosystems. It is concerned primarily with the identification and consequent prevention of environmental pollution in areas with specific landscape characteristics. Through an understanding of the web of interconnections among all environmental components, the landscape is understood as the result of the interaction of all its components, not just as the sum of its individual characteristics. This kind of holistic ecosystemic understanding of the landscape is transferred to the development of methodological bases for assessing planned impacts.  Landscape-ecological assessments require a knowledge and understanding of natural and social factors, and especially methodological approaches which are adapted to landscape properties, which is the fundamental objective of subject-specific competences. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje: pomena presoj posegov v luči preventivnega varovanja okolja in trajnostnega razvoja, pri čemer je ključno prepoznavanje vloge pokrajinske ranljivosti (pokrajine kot ekosistema in njegovih sestavin) oziroma odzivnost na posege, ki se razlikujejo po intenzivnosti in obsegu. | Knowledge and understanding: importance of evaluating impacts in light of preventive environmental protection and sustainable development, in which the recognition of the role of landscape vulnerability (landscapes as ecosystems and their components) and reaction to impacts of differing intensity and extent is crucial. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanje, projektno delo, individualne seminarske naloge, sodelovanje v raziskovalnih projektih. | Lectures, project work, individual seminar papers, participation in research projects. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Pozitivno ocenjena poročila o opravljenih seminarskih delih in raziskovalnih projektih | 60,00 % | Reports with passing grades for seminar work and research projects |
| Preizkusi znanja ob reševanju konkretnih raziskovalnih problemov | 40,00 % | Testing of knowledge through solving of specific research problems |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| HARMEL, Matjaž, STRITIH, Jernej, PRAŠNIKAR, Dušan, OGRIN, Matej. Analiza možnosti za ustanovitev regijskega parka Kamniško-Savinjske Alpe. V: ŠALEJ, Matjaž (ur.). *Šaleška in Zgornja Savinjska dolina : [zbornik]*. Velenje: Erico, Inštitut za ekološke raziskave, 2006, str. 172-183.  CIGALE, Dejan, LAMPIČ, Barbara, OGRIN, Matej, PLUT, Dušan, REBERNIK, Dejan, ŠPES, Metka, VINTAR MALLY, Katja, CETKOVSKÝ, Stanislav, KALLABOVÁ, Eva, MIKULÍK, Oldřich, VAISHAR, Antonín, ZAPLETALOVÁ, Jana. Sustainable development of small towns a Slovenian-Moravian comparative methodological approach. *Moravian geographical reports*, ISSN 1210-8812, 2006, vol. 14, no. 1, str. 17-28.  OGRIN, Matej*. Prometno onesnaževanje ozračja z dušikovim dioksidom v Ljubljani*, (GeograFF, 1). Ljubljana: Znanstvena založba Filozofske fakultete, Oddelek za geografijo, 2008. 87 str.  OGRIN, Matej. Prometno obremenjevanje ozračja. V: CIGALE, Dejan. *Okoljski učinki prometa in turizma v Sloveniji*, (GeograFF, 5). Ljubljana: Znanstvena založba Filozofske fakultete, 2009, str. 62-72.  OGRIN, Matej. Je trajnosten razvoj zavarovanih območij mogoč brez trajnostne mobilnosti?. V: NARED, Janez (ur.), PERKO, Drago (ur.), RAZPOTNIK VISKOVIĆ, Nika (ur.). *Razvoj zavarovanih območij v Sloveniji*, (Regionalni razvoj, ISSN 1855-5780, 3). Ljubljana: Založba ZRC, 2011, str. 127-137.  VINTAR MALLY, Katja, OGRIN, Matej. Spatial variations in nitrogen dioxide concentrations in urban Ljubljana, Slovenia. *Moravian geographical reports*, ISSN 1210-8812, 2015, vol. 23, no. 3, str. 27-35. |

# PROSTOR IN OKOLJE Učni načrt predmeta/Course syllabus

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| Predmet: | PROSTOR IN OKOLJE |
| Course title: | Spatial planning and environment |
| Članica nosilka/UL Member: | UL FGG |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020696 |
| Koda učne enote na članici/UL Member course code: | 48 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 30 | 60 |  |  | 20 | 140 | 10 |

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| Nosilec predmeta/Lecturer: | Alma Zavodnik Lamovšek, Gregor Čok |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Temeljna znanja iz prostorskih ved, ki jih na 2. bolonjski ali univerzitetni ravni nudijo študijske smeri prostorskega načrtovanja, geografije, geodezije, gradbeništva, arhitekture, krajinske arhitekture, varstva okolja, geoinformatike in sorodnih ved. | Basic knowledge in the fields of spatial sciences, which are offered by curricula on the master level or universitv degree level of following sudies: spatial planning, geography, surveying, civil engineering, architecture, landscape planning, environmental protection, geoinformatics and others. |

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| Vsebina: | Content (Syllabus outline): |
| Raziskovalno delo na področju trajnostnega prostorskega razvoja. Metode usklajevanja razvojnega in varstvenega načrtovanja. Omilitveni ukrepi. Usklajevanje interesov med različnimi rabami prsotora kot so urbanizacija, kmetijstvm, gozdarstvo, promet, vodno gospodarstvo, energetika, rudarstvo, turizem idr. . Metode raziskovanja ranljivosti, nosilnosti in privlačnosti prostora.. Zakonodaja na področjih urejanja prostora in varstva okolja, podprto s primeri iz prakse. Trajnostni razvoj na ravneh lokalne skupnosti, regije, države, EU in sveta. Oblikovanje in vrednotenje alternativ. Primeri dobrih praks. Seminar z obdelavo konkretne prostorske naloge in prezentacija. | Research in the field of sustainable spatial development. Coordination between development and protective approach. Mitigating as a method of environmental problem solving. Synthesis of diferent kinds of land use, such as urbanisation, agriculture, forestry, producion of energy, traffic, water management, mining, turism and and others. Vulnerability capacity and attraciveness of space. Legal foundations of planning and environmental protection supported by practical examples. Sustainable spatial development on the levels of local community, region, state, EU and world- wide. Planning the alternatives and its evaluation. Cases of good practice. In seminar a planning task is worked out and presented. |

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| Temeljna literatura in viri/Readings: |
| European Spatial Development Perspecives (1999/2000), European Commission, Potsdam.  POLICY BRIEF: Quality of Life for territorial and citizen-centric policies – how to empower people as actors of chang (2021), https://www.espon.eu/territorial-quality-life  European Environmental Agency (2021), Urban sustainability in Europe - Learning from nexus analysis, EEA report no. 7 Urban sustainability in Europe, Learning from nexus analysis  European Environmental Agency (2021), Urban sustainability in Europe – opportunities for challenging times, https://www.eea.europa.eu/publications/urban-sustainability-in-europe/urban-sustainability-in-europe  Mander, Ü., Wiggering, H., Helming, K. 2007. Multifunctional Land Use – Meeting Future Demands for Landscape Goods and Services. Springer: str. 424  Aktualne raziskave na spletnih straneh www.espon.eu ter druge aktualne raziskave na ravni EU in OECD ter drugih evropskih in svetovnih institucij. |

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| Cilji in kompetence: | Objectives and competences: |
| Spoznati metode raziskovanja v prostorskih vedah.  Razumevati konfliktnost ciljev razvojnega in varovalnega načrtovanja in pridobiti znanja za usklajevanje obeh vidikov.  Usposobiti se za timsko in interdisciplinarno delo na področju varstva okolja. | Knowledge of the research methods in spatial sciences.  Understanding the conflicts of development and protecitve approach. Obtain the capability to balance and coordinate various interests in space.  Capabilities for Team and Interdisciplinary work in the fields of environmental protection. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Samostojno vodenje raziskav na področjih umeščanja dejavnosti v prostor. Sposobnost za vodilne funkcije v raziskovalnih institucijah, upravi ali v gospodarstvu na področjih varstva okolja. Komuniciranje z javnostjo.  Znanstveno raziskovalno delo:  Razumeti prostorske in okoljske izzive. Poznati različne raziskovalne metode za raziskovanje prepoznanih izzivov ter predlagati ustrezne rešitve. | Knowledge and understanding:  Leading the research teams in the fields of spatial planning and protection. Ability for top jobs in public or private sector . Knowledges for communication with different publics.  Scientific research:  Understanding spatial and environmental challenges. Understand different research methods to study the identified challenges and propose appropriate solutions. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja in individualne konzultacije.  Terensko delo ob spoznavanju konkretne naloge.  Individualna izdelava seminarske naloge z obveznimi konzultacijami in končno prezentacijo. | Lectures and individual consultations.  Field work related to practical seminary task.  Individual seminary work with obligatory consultations. Final presentation is compulsory. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Izdelava in zagovor seminarske naloge | 100,00 % | Written seminary work with final oral presentation |

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| Ocenjevalna lestvica: | Grading system: |
| 5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10 | 5 - 10, a student passes the exam if he is graded from 6 to 10 |

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| Reference nosilca/Lecturer's references: |
| LAMOVŠEK, Alma. Monitoring land-use change using selected indices. Acta geographica Slovenica, ISSN 1581-6613. [Tiskana izd.], 2019, 59, no. 2, str. 161-175, fotogr., zvd., tabele. https://ojs.zrcsazu.si/ags/article/view/5276, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=114117&lang=slv,doi: 10.3986/AGS.5276.  ČOK, Gregor, MRAK, Gašper, BREZNIK, Jana, FOŠKI, Mojca, ZAVODNIK LAMOVŠEK, Alma. Spatial regulation instruments of work at home: the case of Slovenia as a post-transition country. Sustainability. apr. 2022, vol. 14, iss. 7, art. 4254, [27] f., ilustr. ISSN 2071-1050. <https://www.mdpi.com/2071-1050/14/7/4254>, <https://repozitorij.uni-lj.si/IzpisGradiva.php?id=136045>, <https://repozitorij.uni-lj.si/IzpisGradiva.php?id=136045>, DOI: [10.3390/su14074254](https://dx.doi.org/10.3390/su14074254). [COBISS.SI-ID [104058883](https://plus.cobiss.net/cobiss/si/sl/bib/104058883)]  ČOK, Gregor, MEZEK, Slavko, URH, Vane, REPE, Blaž. Contribution of international projects to the development of maritime spatial planning structural elements in the Northern Adriatic : the experience of Slovenia. Water. 2021, vol. 13, iss. 16, art. 754, [24] str., ilustr. ISSN 2073-4441. <https://www.mdpi.com/2073-4441/13/6/754>, <https://repozitorij.uni-lj.si/IzpisGradiva.php?id=127414>, <https://repozitorij.uni-lj.si/IzpisGradiva.php?id=127414>, DOI: [10.3390/w13060754](https://dx.doi.org/10.3390/w13060754). [COBISS.SI-ID [55112963](https://plus.cobiss.net/cobiss/si/sl/bib/55112963)] |

# RECIKLIRANJE KOVINSKIH MATERIALOV Učni načrt predmeta/Course syllabus

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| Predmet: | RECIKLIRANJE KOVINSKIH MATERIALOV |
| Course title: | RECYCLING OF METAL MATERIALS |
| Članica nosilka/UL Member: | UL NTF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020697 |
| Koda učne enote na članici/UL Member course code: | 90 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 30 | 30 | 20 |  |  | 170 | 10 |

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| Nosilec predmeta/Lecturer: | Boštjan Markoli |

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| Izvajalci predavanj: | Borut Kosec, Jožef Medved, Primož Mrvar |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Pogoj za vključitev v delo oziroma za opravljanje študijskih obveznosti je vpis v 1. letnik doktorskega študija.  Opravljeno in uspešno predstavljeno projektno delo je pogoj za pristop k pisnemu in ustnemu izpitu. | The condition to attend in the teaching course and to perform study obligations is an entry in the first year of doctoral study.  Completed and successfully presented project work is required before taking the written and oral exam. |

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| Vsebina: | Content (Syllabus outline): |
| Uvod.  Osnove recikliranja kovinskih materialov.  Pregled področja recikliranja in naraščanje njegovega pomena ter obsega. Zakonodaja s področja reciklaže, razvrščanje, določanje in vrednotenje odpadnih snovi.  Karakterizacija ali opredelitev odpadnih snovi.  Postavljanje ciljev in prednostnih nalog in ciljev recikliranja.  Sistemi za zbiranje in postopki ločevanja odpadnih snovi.  Obrati in procesi za predelavo sekundarnih surovin. Demontaža večjih odpadnih industrijskih kompleksov.  Recikliranje glavnih kovinskih materialov, kot so: jeklo, aluminij, baker, nikelj, titan, magnezij, zlato, svinec, težke kovine, redke zemlje ter njihove zlitine. Primeri: aluminijske pločevinke, odpadna elektronska in električna oprema, avtomobili in avtomobilski deli, letala in letalski deli, odpadne avtomobilske baterije oz. akumulatorji.  Sistemi in standardi za zagotavljanje kakovosti sekundarnih surovin.  Analiza življenskega kroga proizvoda. Načrtovanje življenjskega kroga izdelka in njegovo recikliranje.  Načrtovanje programov recikliranja in uvajanje v prozvodnjo.  Pregled postopkov in zakonodaje sosednjih sdržav s področja recikliranja odpadnih snovi.  Študij praktičnih problemov.  Projektno delo. | Introduction.  Basics of recycling of metallic materials.  Overview of the field of recycling and increase of its importance and scope. Legislation in the field of recycling, sorting, identification and evaluation of waste materials.  Characterization and identification of waste.  Setting goals and priorities and recycling targets.  Systems for the collection and separation processes waste materials.  Installations and processes for the recovery of secondary raw materials. Disassembly of the major waste industrial complexes.  Recycling main metallic materials, such as steel, aluminum, copper, nickel, titanium, magnesium, gold, lead, heavy metals, rare earths, and alloys thereof. Examples: aluminum cans, waste electronic and electrical equipment, automobiles and automotive parts, aircraft and aircraft parts, waste automotive batteries.  Systems and standards for quality assurance of secondary raw materials.  Analysis of the life cycle of the product. Planning life cycle of the product and its recycling.  Planning and implementation of recycling programs in production.  Review of procedures and the laws of neighboring countries in the field of recycling waste materials.  Study of practical problems.  Project work. |

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| Temeljna literatura in viri/Readings: |
| LUND, H.F. *The McGraw – Hill Recycling Handbook.* New York: McGraw – Hill, 2001.  SCHMITZ, C. *Handbook of Aluminium Recycling*. Essen: Vulkan Verlag, 2006.  HODOLIČ, J., VUKELIĆ, Đ., HADŽISTEVIĆ, M., BUDAK, I., BADIDA, M., ŠOOŠ, L., KOSEC, B., in BOSAK, M*. Recycling and Recycling Technologies*. Novi Sad: Faculty of Technical Sciences, 2011.  ČOSIĆ, I., LAZAREVIĆ, M., ŠOOŠ, L., ONDEROVA, I., in KRIŽAN, P*. End-of-Life Products, Disassembly and Recycling*. Novi Sad: Faculty of Technical Sciences, 2009.  *RAMACHANDRA RAO, S .Resource Recovery and Recycling From Metallurgical Wastes, Waste Management Seriec Vol. 7.* New York: Elsevier, 2006.  *Ecological Engineering,* ISSN: 0925-8574  *Acta Materialia*, Elsevier, ISSN: 1359-6454  *Ecological Modelling,* ISSN: 0304-3800  *Environmental Modeling and Assessment,* Springer, ISSN: 1420-2026 |

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| Cilji in kompetence: | Objectives and competences: |
| Študent pri predmetu Načrtovanje okolju prijaznih proizvodov in tehnologij najprej spozna potencialno obremenitev okolja, ki ga predstavljajo posamezne skupine sodobnih materialov ter smernice in težnje industrije k ekološki naravnanosti posameznih materialov, proizvodov in tehnoloških procesov ter postopkov.  Spozna se z metodami in orodji potrebnimi za zanesljivo, moderno načrtovanje in analizo okolju prijaznih materialov, izdelkov in tehnologij. Pri tem se naslanja na tradicionalno poznavanje značilnosti kovinskih materialov, njihovega vpliva na okolje in sodobnih proizvodnih procesov kovinskih materialov v Sloveniji in svetu.  Študent se navaja tako na samostojno kot na skupinsko raziskovalno ter projektno delo, uporabo ažurne strokovne literature in sodobnih virov informacij. | Students are during the subject Design of environmentally friendly products and technologies firstly acquainted with the potential environmental burden posed by certain groups of modern materials and guidelines or industry trends to the ecological orientation of individual materials, products and technological processes and procedures.  Student is familiarized with the methods and tools necessary for a reliable, modern design and analysis of environmentally friendly materials, products and technologies. In doing so, relying on traditional knowledge of the characteristics of metallic materials, and their impact on the environment and modern manufacturing processes of metallic materials in Slovenia and around the world.  The student states both independently and in team research and project work, the use of up to date literature and contemporary sources of information. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Pri predmetu Načrtovanje okolju prijaznih proizvodov in tehnologij pridobi študent znanja o škodljivosti posameznih kemijskih elementov in skupin materialov ter v zvezi s tem ekološko naravnanost posameznih proizvodov, tehnoloških procesov in tehnologij.  Spozna metode in tehnike načrtovanja ter modernega razvoja okolju prijaznih proizvodov, procesov in tehnologij.  Študent se navaja na samostojno sprejemanje odločitev, povezuje in vrednoti analitične, eksperimentalno in numerično dobljene rezultate. Navaja se na samostojno in skupinsko delo, na projektno in raziskovalno delo, uporabo strokovne literature in sodobnih virov informacij.  Pridobi sposobnosti za samostojno znanstveno raziskovalno delo, razvoj, organizacijo in vodenje industrijskih in temeljnih raziskovalnih projektov. | Knowledge and understanding:  In the course Designing environmentally-friendly products and technologies teaching course the student acquires knowledge about the ecological burden of individual chemical elements and groups of materials and in relation with that the orientation of individual products, technological processes and technologies.  They learn methods and techniques of planning and modern development of environmentally-friendly products, processes and technologies.  Student will get accustomed to reach decision individually and link and asses analytical, experimental and numerical acquired results. Students get used to individual and team, project and research work, and expert literature and modern information source applications.  Student will acquire knowledge for individual scientific work, development, organization and conduction of industrial and fundamental scientific activities and research projects. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja, računske vaje in simulacije, reševanje odprtih nalog (problemov), projektno delo. | Lectures. Exercises solving and simulations. Solving case studies. Project work. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Končno oceno predmeta sestavljajo: Ocena ustnega dela izpita | 40,00 % | The mark is composed of: the mark of the oral examination |
| Ocena projektnega dela | 30,00 % | The mark of project work |
| Ocena pisnega dela izpita | 30,00 % | The mark of written examination |
| Način opravljanja izpita: 1. Ustni /pisni izpit – teorija in naloge, reševanje odprtih nalog (problemov), izdelava in uspešen zagovor projektnega dela . 2. Predmet se zaključi z izpitom, ki ga sestavljata pisni in ustni del. |  | Type of examination: 1. Oral /written examination – theory and calculation tasks, solving case studies, successfully presented project work. 2. The course ends with passing the examination which is composed of written and oral examination |
| Od 6-10 (pozitivno) oz. 1-5 (negativno) oz. opravil / ni opravil; ob upoštevanju Statuta UL in fakultetnih pravil. |  | From 6-10 (positive) and from 1-5 (negative) or; to pass / to fail; regard to Statute of UL faculty rules. |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| **prof. dr. Boštjan MARKOLI:**  1. ZUPANIČ, Franc, **MARKOLI, Boštjan**, NAGLIČ, Iztok, BONČINA, Tonica. The experimental investigation of phase equilibria in the Al-rich corner within the ternary Al-Mn-Be system. J. alloys compd.., 2013, vol. 570, pp. 125-132  2. **MARKOLI, Boštjan**, BONČINA, Tonica, ZUPANIČ, Franc. Behaviour of a quasicrystalline strengthened Al-alloy during compression testing. Mater.wiss. Werkst.tech., Apr. 2012, vol. 43, no. 4, pp. 340-344.  3. PODMILJŠAK, Benjamin, ŠKULJ, Iztok, **MARKOLI, Boštjan**, ŽUŽEK ROŽMAN, Kristina, MCGUINESS, Paul J., KOBE, Spomenka. Microstructural changes in Fe-doped Gd[sub]5Si[sub]2G[sub]2. J. magn. magn. mater., 2009, vol. 321, no. 4, pp. 300-304. |

# REMEDIACIJA TAL Učni načrt predmeta/Course syllabus

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| Predmet: | REMEDIACIJA TAL |
| Course title: | Soil Remediation |
| Članica nosilka/UL Member: | UL BF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020698 |
| Koda učne enote na članici/UL Member course code: | 49 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 25 | 35 |  |  |  | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Domen Leštan |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| - Študent mora biti vpisan na doktorski študij.  - Za razumevanje in spremljanje vsebin predmeta so nujna osnovna znanja iz matematike, kemije, (mikro)biologije, in biokemije.  Obvezna udeležba pri seminarjih. | - Student has to be enrolled in the doctoral study.  - Basic knowledge of mathematics, chemistry, (micro)biology and biochemistry.  Mandatory presence at seminars. |

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| Vsebina: | Content (Syllabus outline): |
| Kemizacija tal in podtalnice: organska in anorganska onesnažila, usoda in transport onesnažil v tleh, bio-dostopnost/ dosegljivost onesnažil.  Ocena tveganja onesnaženja in upravljanje z onesnaženimi zemljišči.  Izbor metode remediacije tal/ podtalnice.  Naravno zmanjševanje onesnaženja.  Termične metode in situ in ex situ: sežig tal, piroliza, vitrifikacija.  Fizikalno-kemijske metode in situ in ex situ: pranje tal, separacijske metode, termična desorpcija, vakuumska ekstrakcija, solidifikacija/ stabilizacija, elektroremediacija, oksidacija/ redukcija onesnažil.  Bioremediacija in situ in ex situ: bio-prezračevanje, biostimulacija, fitoremediacija, bioaugmentacija, obdelovanje tal, nadzorovana bioremediacija, kompostiranje tal, bioremediacija v pol-trdi fazi. bio-izpiranje tal.  Remediacija podtalnice: "pump and treat" metode, razprševanje zraka, in situ izpiranje, odstranjevanje hlapov v vrtini, pasivne in reaktivne pregrade.  Metode spremljanja učinkovitosti remediacije, postopki po remediaciji tal in vpliv remediacije na kakovost in funkcioniranje tal. | Pollution in soil and vandose zone: organic and inorganic pollutants, fate and transport of pollutants, bio-accessibility / availability of pollutants.  Risk assessment and risk management of soil pollution.  Factors in selection of soil/groundwater remediation technology.  Natural attenuation of pollution.  Thermal methods in situ and ex situ: soil combustion, pyrolysis and vitrification.  Physical-chemical method in situ and ex situ: soil washing, separation of soil fractions, thermal desorption, vacuum desorption, solidification/stabilization, electro-remediation, oxidation / reduction of pollutants. Bioremediation in situ and ex situ: bio-venting, bio-stimulation, phyto-remediation, bio-augmentation, soil-farming, enhanced bioremediation, soil composting, slurry-phase remediation, bio-leaching.  Groundwater remediation: pump and treat methods, air sparging, in situ flushing, well vapor extraction, passive and reactive barriers.  Methods of remediation efficiency evaluation, post-remedial measures, quality and functioning of remediated soils. |

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| Temeljna literatura in viri/Readings: |
| Pichtel, J. 2000. Fundamentals of Site Remediation. Governoment Institutes, Rockville, Maryland. ISBN 0-86587-689-4 (izbrana poglavja/ selected chapters).  Nathanial, C.P., Bardos, R.P. 2004. Reclamation of Contaminated Land. Wiley, Chichester. ISBN 0-471-98560-0 (izbrana poglavja / selected chapters).  Suthersan, S.S. 2002. Natural and Enhanced Remediation Systems.Lewis Publishers, Boca Raton. ISBN 1-56670-282-8 (izbrana poglavja / selected chapters).  Revije / Journals:  • Environmental Science and Technology, ACS.  • Chemosphere, Elsevier.  • Environmental Pollution, Elsevier.  • Journal of Hazardous Materials, Elsevier.  • Water, Soil and Air Pollution, Springer.  • Plant and soil, Kluwer.  • Journal of Environmental Engineering, ASCE.  • Soil and Sediment Contamination, AEHS.  • Journal of Environmental Quality, ASA**.** |

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| Cilji in kompetence: | Objectives and competences: |
| **Cilji:** Poznavanje postopkov, procesov in tehnologij remediacije tal za sonaravno ohranjanje okolja, odpravljanje onesnaženosti tal ter trajnostno rabo tal kot ne-obnovljivega naravnega vira.  **Predmetno specifične kompetence:** Slušatelji se seznanjajo z fizikalno-kemijskimi, mikrobiološkimi, biološkimi in biokemijskimi procesi, ki so temeljni za tehnologije sanacije in remedicaije tal. Spoznajo metode določevanja komcentracije in (bio)dostopnosti / dosegljivosti onesnažil v tleh, metode ocenjevanja tveganja onesnaženja ter metode obvladovanja tveganja onesnaženja. | **Aims:** Student gains the information on processes and technologies of soil remediation for sustainable environment and use of soil as a non-renewable natural resource.  **Specific competences:** Understanding of physical-chemical, microbiological, biological and biochemical processes that are essential for development of soil remediation /reclamation technologies. Knowledge of methods of assessment of pollutant concentration and (bio)availability / accessibility, risk assessment and risk management of pollution. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| **Znanje in razumevanje:**  Študent osvoji osnovne fizikalno-kemijske in biološke koncepte tehnologij remediacije tal, obvladuje obstoječe in lahko sodeluje pri razvoju novih tehnologij, pridobi znanje, da najde in razume informacije vezane na tehnologije remediacije tal. | **Knowledge and understanding:**  Understanding of basic physico-chemical and biological concepts and principles of soil remediation technologies, knowledge and skills to actively participate in the development of novel technologies, skill to find and comprehend information related to remediation technologies. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja, seminarji, skupinsko ali individualno delo. | Lectures, seminars, team or individual work. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Ocena izpita: Pisni izpit | 60,00 % | Lectures assessment: written exam |
| Ocena projekta/seminarja | 30,00 % | Seminar |
| Aktivna udeležba | 10,00 % | Active participation |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| VOGLAR, David, **LEŠTAN, Domen**. Pilot-scale washing of Pb, Zn and Cd contaminated soil using EDTA and process water recycling. Chemosphere (Oxford). [Print ed.], 2013, vol. 91, str. 76-82.  JELUŠIČ, Maša, GRČMAN, Helena, VODNIK, Dominik, SUHADOLC, Marjetka, **LEŠTAN, Domen**. Functioning of metal contaminated garden soil after remediation. Environ. pollut. [Print ed.], 2013, vol. 174, str. 63-70.  VOGLAR, Grega E**., LEŠTAN, Domen**. Equilibrium leaching of toxic elements from cement stabilized soil. J. hazard. mater.. [Print ed.], 2013, vol. 246-247, str. 246-247 |

# SEIZMOLOGIJA IN POTRESNO INŽENIRSTVO Učni načrt predmeta/Course syllabus

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| Predmet: | SEIZMOLOGIJA IN POTRESNO INŽENIRSTVO |
| Course title: | SEISMOLOGY AND EARTHQUAKE ENGINEERING |
| Članica nosilka/UL Member: | UL NTF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020626 |
| Koda učne enote na članici/UL Member course code: | 93 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 10 | 40 | 30 |  |  | 170 | 10 |

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| Nosilec predmeta/Lecturer: | Andrej Gosar |

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| Izvajalci predavanj: | Matjaž Dolšek, Peter Fajfar |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Temeljni predmet/Core course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij. | Enrollment in the doctoral studies. |

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| Vsebina: | Content (Syllabus outline): |
| SEIZMOLOGIJA  Uvod: vrste potresov, teorija elastične povratne zveze, zgodovina seizmologije.  Merjenje in opazovanje potresov: potresni valovi (prostorski in površinski valovi), seizmometer, akcelerometer, seizmograf, potresna opazovalnica, seizmogram, moč potresa, magnituda, intenziteta, evropska potresna lestvica, učinki potresov, lociranje potresov.  Potresi v prostoru in času: prostorska porazdelitev potresov, seizmičnost in tektonika plošč, časovna porazdelitev potresov, logaritmična odvisnost frekvence potresov od magnitude, frekvenca pojavljanja popotresov.  Potresi in tektonika: seizmotektonika, dolžina pretrga, premik ob prelomu, žariščni mehanizmi - opredeljevanje in njihov pomen.  Ocenjevanje potresne nevarnosti: karte potresne nevarnosti, verjetnostno ocenjevanje potresne nevarnosti, vpliv lokalne geološke zgradbe na potresne valove (metoda referenčne točke, metoda spektralnega razmerja, metoda mikrotremorjev, numerično modeliranje), potresna mikrorajonizacija, krivulje potresne nevarnosti.  Potresi in notranja zgradba Zemlje: analize oddaljenih potresov, seizmična tomografija, analiza disperznih krivulj površinskih valov, model lupinaste zgradbe notranjosti Zemlje, seizmične hitrosti v notranjosti Zemlje, glavne hitrostne diskontinuitete.  Potresi v Sloveniji: karte seizmičnosti, tektonika plošč in ozemlje Slovenije, močnejši potresi v Sloveniji, opazovanje potresov v Sloveniji, slovenska mreža potresnih opazovalnic, potresna nevarnost v Sloveniji, karta projektnega pospeška tal, karta intenzitete po MSK lestvici.  POTRESNO INŽENIRSTVO  **Učinki potresov na objekte:** osnovni mehanizmi za porušitev elementov konstrukcije in sistema, opečne in kamnite zidane stavbe, armiranobetonske stavbe (okviri, okviri s polnili, stenasti objekti, stene z odprtinami, mešani sistemi), jeklene stavbe, mostovi, hidrotehnični in geotehnični objekti, učinki minulih potresov v Sloveniji in po svetu.  **Načela za projektiranje objektov na potresno obtežbo: osnovni pojmi (togost, nosilnost, duktilnost, nihajni čas, dušenje), projektiranje objektov skozi čas, projektni potres, varnost pri projektiranju, princip redukcije potresnih sil, projektiranja po standardu Evrokod 8.**  **Simulacija potresnih zahtev na objektih:**  **Enačba gibanja, spekter pospeškov, metode za določitev potresnih zahtev, vrednotenje vplivov negotovosti, verjetnostna ocena potresnih zahtev.**  **Vrednotenje poškodovanosti v odvisnosti od potresnih zahtev:** mejna stanja (razpoke, velike poškodbe, blizu porušitve, porušitev), krivulje ranljivosti za konstrukcijske in nekonstrukcijske elemente, krivulje ranljivosti za komponente občutljive na deformacije in za komponente občutljive na pospeške.  **Potresno tveganje na osnovi verjetnostnih metod:** metrika za vrednotenje potresnega tveganja, enačba tveganja, vpliv negotovosti, verjetnost porušitve objekta, pričakovane letne izgube, verjetnost prekoračitve izgub za izbrano časovno obdobje. | SEISMOLOGY  Introduction: earthquake types, elastic rebound theory, history of seismology  Measurements and monitoring of earthquakes: seismic waves (body and surface), seismometer, accelerometer, seismograph, seismic station, seismogram, size of an earthquake, magnitude, intensity, European Macroseismic Scale, effects of earthquakes, locating earthquakes.  Spatial and temporal distribution of earthquakes: spatial distribution of earthquakes, seismicity and plate tectonics, temporal distribution of earthquakes, logaritmic frequency-magnitude relation, frequency distribution of aftershocks.  Earthquakes and tectonics: seismotectonics, rupture length, fault slip, focal mechanisms – methods of determination and their meaning.  Seismic hazard assessment: seismic hazard maps, probabilistic seismic hazard assessment, influence of local geological structure on seismic ground motion – site effects (reference point method, spectral ratio method, microtremor method, numerical modelling), seismic microzonation, seismic hazard curves.  Earthquakes and internal structure of the Earth: analyses of teleseisms, seismic tomography, analysis of surface waves dispersion curves, the models of the Earth's interior, seismic velocities in the Earth, main seismic discontinuities.   * Earthquakes in Slovenia: seismicity maps, plate tectonics and geological setting of Slovenia, larger earthquakes in Slovenia, Slovenian seismological network, seismic hazard in Slovenia, design ground acceleration seismic hazard map, seismic intensity (MSK) hazard map.   EARTHQUAKE ENGINEERING   * **The effects of earthquakes on structures:** basic failure modes of structural elements and systems, brick and stone masonry buildings, reinforced concrete buildings (frames, frames with masonry infills, wall systems, walls with openings, dual systems), steel buildings, bridges, hydrotechnical and geotechnical facilities, effects of past earthquakes in Slovenia and worldwide.   **Basic principles for the seismic design of structures:** basic concepts (stiffness, load bearing capacity, ductility, vibration period, damping), the design of buildings over time, the design earthquake, safety in the design, concept of reduction of seismic forces, the design according to Eurocode 8.  **Simulation of seismic demands on structures:** Equation of motion, ground-motion intensity measures, acceleration spectrum, methods for determining seismic demand, evaluation of the impact of uncertainty, probabilistic assessment of seismic demands.  **Evaluation of damage depending on the seismic requirements:** limit states (cracking, significant damage, near collapse, collapse), fragility curves for structural and non-structural elements, fragility curves for deformation-sensitive and acceleration-sensitive components.  **Seismic risk based on probabilistic methods:** metrics for the evaluation of seismic risk, the risk equation, the impact of uncertainty, the probability of collapse, the expected annual losses, probability of losses for the selected time period. |

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| Temeljna literatura in viri/Readings: |
| Gosar, A. 2011: Osnove seizmologije. Skripta NTF, 70 str.  Fowler, C.M.R. 2005: The solid earth. An intruduction to global geophysics. Cambridge University Press, 2nd ed., 685 pp.  Stein, S., Wysession, M. 2003: An introduction to seismology, earthquakes, and earth structure. Blackwell, 498 pp.  Doyle, H. 1995: Seismology. John Wiley & Sons, 218 pp.  Yeats, R.S., Sieh, K., Allen, C.R. 1997: The geology of earthquakes. Oxford university press, 568 pp.  Fajfar P. 1995. Osnove potresnega inženirstva, FGG, 83 pp.  Villaverde R. 2009. Fundamental Concepts of Earthquake Engineering, CRC Press, 939 pp.  Dolšek M. (Ed.). Protection of Built Environment Against Earthquakes, Springer, 331 pp.  Chopra A.K. 1995. Dynamics of Structures – Theory and Applications to Earthquake Engineering, Prentice Hall, 729 pp.  Fajfar P. 1984. Dinamika gradbenih konstrukcij, FAGG, 550 pp.  Fajfar P., Fischinger M., Beg D., Dolšek M., Isaković T., Kreslin M., Rozman M., Vidrih Z., Čermelj B. (2009). Evrokod 8: Projektiranje potresnoodpornih konstrukcij. V: Priročnik za projektiranje gradbenih konstrukcij po Evrokod standardih (Beg D. (ur.), Pogačnik A. (ur.)). Inženirska zbornica Slovenije, 241 pp.  FEMA 2012a. Seismic Performance Assessment of Buildings – Methodology, FEMA P-58-1, Federal Emergency Management Agency, 319 pp.  FEMA 2012a. Seismic Performance Assessment of Buildings – Implementation Guide, FEMA P-58-2, Federal Emergency Management Agency, 365 pp. |

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| Cilji in kompetence: | Objectives and competences: |
| Cilji:  seznanitev z izbranimi poglavji seizmologije, geologije potresov in notranje zgradbe Zemlje, poznavanje opredeljevanja osnovnih potresnih parametrov,  povezovanje znanja o potresih s strukturno geologijo, tektoniko in regionalno geologijo,  poznavanje metod potresne mikrorajonizacije in povezava z inženirsko geologijo,   * seznanitev s potresnimi obremenitvami in njihovimi učinki na objekte, * seznanitev z principi potresnoodpornega projektiranja objektov, * seznanitev s potresnim tveganjem,   Kompetence:  razumevanje nastajanja in pojavljanja potresov,  razumevanje seizmoloških metod opredeljevanja potresnih parametrov,  razumevanje metod raziskav potresov,   * razumevanje vzrokov za poškodbe, * razumevanje postopkov za projektiranje objektov, * komuniciranje v zvezi s potresnih tveganjem na osnovi različne metrike, vključno na osnovi verjetnostnega pristopa. | Objectives:  knowledge of principles of seismology, geology of earthquakes and internal structure of the Earth, and determination ob basic earthquake parameters,  to link the knowledge on earthquakes with structural geology, tectonics and regional geology,  knowledge of seismic microzonation methods and link with engineering geology,  introducing the concepts of seismic actions and their effects on structures,  introducing the principles of earthquake-resistant design,  introducing the seismic risk.  Competences:  comprehension of earthquake occurence,  comprehension of methods for earthquake parameters determination,  understanding the seismological investigation methods,  understanding of the seismic impact on structures,  understanding of the procedures for the design of structures,  communication of seismic risk based on various metrics, including on the basis of a probabilistic approach. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  osnovnih zakonitosti pojavljanja potresov,  geoloških metod raziskav potresov.  Uporaba:  metod raziskav v seizmologiji,  osnovnih metod raziskav za potresno mikrorajonizacijo.  Refleksija:  razumevanje osnovnih fizikalnih zakonov na primeru potresov.  Prenosljive spretnosti:  sposobnost fizikalnega obravnavanja geoloških problemov,  sinteze seizmoloških podatkov z tektonskimi in inženirskogeološkimi podatki.  Poznavanje učinkov potresov na gradbene objekte.  Razumevanje osnovnih fizikalnih zakonov za določitev potresnih zahtev.  Razumevanje osnov verjetnostnega pristopa k ocenjevanju posledic potresov.  Sposobnost komuniciranja z različnimi deležniki, vključenimi v zmanjševanje potresnega tveganja | Knowledge and understanding:  basic principles of earthquake occurence,  geological investigations of earthquakes.  Application:  research methods used in seismology,  methods for seismic microzonation.  Reflection:  understanding basic physical principles related to earthquakes.  Transferable skills:  capability of physical approach to geological problems,  capability of synthesis of seismological data with tectonic and engineering geology data.  Knowledge about the seismic effects on structures.  Understanding the basic laws of physics for the determination of seismic demands.  Understanding the basics of the probabilistic approach for the assessment of the impact of earthquakes  Ability to communicate with various stakeholders involved in the mitigation of seismic risk |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja, laboratorijske vaje, računalniške vaje, konzultacije. | Lectures, laboratory and computer excercises, consultations. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Način (pisni izpit, ustno izpraševanje, naloge, projekt) |  | Type (examination, oral, coursework, project): |
| Seminarska naloga | 35,00 % | Seminar report |
| Pisni ali ustni izpit | 65,00 % | Writen or oral examination |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| Gosar, A. 2007: Microtremor HVSR study for assessing site effects in the Bovec basin (NW Slovenia) related to 1998 Mw5.6 and 2004 Mw5.2 earthquakes. *Engineering geology*, 91, 178-193.  Ganas, A., Gosar, A., Drakatos, G., 2008: Static stress changes due to the 1998 and 2004 Krn Mountain (Slovenia) earthquakes and implications for future seismicity. *Nat. hazards earth syst. sci.*,8/1, 59-66.  Gosar, A. 2010: Site effects and soil-structure resonance study in the Kobarid basin (NW Slovenia) using microtremors. *Nat. hazards earth syst. sci.*, 10/4, 761-772.  Gosar, A. 2012: Application of Environmental Seismic Intensity scale (ESI 2007) to Krn Mountains 1998 Mw = 5.6 earthquake (NW Slovenia) with emphasis on rockfalls. *Nat. hazards earth syst. sci.*, 12/5, 1659-1670. |

# SPREMEMBE OKOLJA IN RASTLINE Učni načrt predmeta/Course syllabus

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| Predmet: | SPREMEMBE OKOLJA IN RASTLINE |
| Course title: | Environmental Changes and Plants |
| Članica nosilka/UL Member: | UL BF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020699 |
| Koda učne enote na članici/UL Member course code: | 50 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 20 | 20 | 10 |  | 10 | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Mateja Germ |

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| Izvajalci predavanj: | Alenka Gaberščik |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet /Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij Varstvo okolja. | Enrolment in the doctoral study Environment protection. |

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| Vsebina: | Content (Syllabus outline): |
| Pogled v zgodovino (spremembe okolja in rastline v preteklosti). Rastline in njihova vloga pri oblikovanju okolja (vplivi na atmosfero, hidrosfero, tla, energijsko bilanco pokrajine). Zaščitna vloga rastlin (vloga vegetacije kot zaščite vodnega ekosistema, pomen gozdnega roba). Rastline kot nosilci ekosistemskih storitev. Rastline kot indikatorji sprememb v okolju (indikatorji in monitoring organizmi, indikatorji klimatskih sprememb). Rastline vezane na posebna rastišča (kisla ali bazična tla, tla revna z minerali, apnenčasta tla, tla z veliko vsebnostjo težkih kovin, slana tla). Vpliv globalnih sprememb na rastline (ekosistemski sindromi, tanjšanje ozonske plasti, topla greda). Zračni polutanti in rastline (vpliv na rastline in mehanizmi odpornosti). Pesticidi, težke kovine, radionukleidi (vplivi na rastline in mehanizmi odpornosti). Tujerodne in gensko spremenjene rastline ter biološka varnost. | View into history (environmental changes in the past). Plants and their role in development of environment (influences on atmosphere, hydrosphere, soil, energy balance in landscape).  Protection role of plants (the role of vegetation in protection of aquatic ecosystems, the importance of forest edge). Plants and ecosystem services. Plants as indicators of changes (bioindicators and monitors, indicators of climate changes). Plants of special habitats (acid and alkaline soil, oligotrophic habitats, limestone, soil with increased amounts of toxic metals, saline soil). The influence of global changes on plants (ecosystem syndromes, ozone layer, greenhouse effect). Air pollutants and plants (influence on plants and mechanisms of resistance). Pesticides, toxic metals, radionuclides (influence on plants and mechanisms of resistance). Alien and genetically modified plants and biological safety. |

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| Temeljna literatura in viri/Readings: |
| **Priporočena literatura:**  **Knjige / Books**  Schulze, D.E., Beck, E., Hohenstein, K. M. Plant Ecology, 702 pages, Springer Verlag, 2005. <https://www.esalq.usp.br/lepse/imgs/conteudo_thumb/Plant-Ecology-by-Ernst-Detlef-Schulze--2005-.pdf> (UL, BF, Biološka knjižnica/Biological library)  Gurevitch J., Scheiner S.M., Fox G..The Ecology of Plants. 523 pages, Sinauer Associates, 2002 (UL, BF, Biološka knjižnica/Biological library)  Larcher, W. Physiological Plant Ecology. 513 pages, Springer, 4 edition, 2003 (UL, BF, Biološka knjižnica/Biological library)  **Izbrani članki iz revij na primer/ Selected articles**  Costanza, R., Fisher, B., Mulder, K., Liu, S., Christopher, T. 2007. Biodiversity and ecosystem services: A multi-scale empirical study of the relationship between species richness and net primary production, Ecological Economics, Volume 61, Issues 2-3, 1, Pages 478-49.  Kruijt, B., Witte, J.-P. M., Jacobs, C. M.J., Kroon, T., 2008. Effects of rising atmospheric CO2 on evapotranspiration and soil moisture: A practical approach for the Netherlands Journal of Hydrology, Volume 349, Issues 3-4, 1, Pages 257-267.  **Drugi revijalni članki s področja, tekoča periodika ter druga učna gradiva** |

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| Cilji in kompetence: | Objectives and competences: |
| Razumevanje delovanja abiotskih in biotskih dejavnikov na rastline in vloge rastlin pri preoblikovanju okolja ter ekosistemskih storitvah. Razumevanje antropogenih vplivov in globalnih sprememb na rastline. | Objectives: The understanding of the relation between plants and their biotic and abiotic environment, the role of plants in environment development and ecosystem services. The understanding of anthropogenic influences and global changes on plants. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje. Študenti spoznajo osnovne vlogo rastlin pri oblikovanju atmosfere, pedosferein biosphere, ter grožnje rastlinam zaradi sprememb ter ohranitvene in omilitvene ukrepe ter načine izboljšanja stanja.  Uporaba. Razumevanje pomena rastlin za vzdrževanje ugodnih razmer ter njihovo priilagojenost na dane razmere.  Refleksija. Aplikacija znanj pri delovanju in odločanju o naravi.  Prenosljive spretnosti. Uporaba domače in tuje literature in drugih virov, zbiranje in razlaga podatkov, kritična analiza podatkov pridobljenih z meritvami, njihova sinteza in pisanje poročil, delo v skupini. | Knowledge and understanding: Students get acquainted with role of plants in development of atmosphere, pedosphere and biosphere as well as threats to plants due to changes and conservation and mitigation measures.  Application: The understanding of the importance of plants in maintenance of favourable conditions and their adaptation to different conditions.  Reflection: The applications of the knowledge in decision-making.  Transferable skills: The use of literature and other scientific and professional sources, gathering the results, critical analysis of data, writing and presenting results, work in a group. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja, seminarji, laboratorijske vaje, projektna naloga in terensko delo. | Lectures, seminar, coursework, laboratory exercises, field work. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Izdelava in zagovor seminarja | 35,00 % | Seminar |
| Laboratorijske vaje | 15,00 % | Coursework |
| Projektna naloga in/ali poročilo o terenskem delu | 15,00 % | Project /report on field work |
| Pisni izpit | 35,00 % | Written exam |
| Od 6-10 (pozitivno), 1-5 (negativno |  |  |

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| Ocenjevalna lestvica: | Grading system: |
| 5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10 | 5 - 10, a student passes the exam if he is graded from 6 to 10 |

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| Reference nosilca/Lecturer's references: |
| **Mateja Germ**  1 **GERM, Mateja**, GOLOB, Aleksandra, ZELNIK, Igor, KLINK, Agnieszka, POLECHOŃSKA, Ludmiła. Contents of metals in sediments and macrophytes differed between the locations in an Alpine lake revealing human impacts : a case study of Lake Bohinj (Slovenia). *Water*. Apr. 2023, vol. 15, iss. 7, str. [1]-14  2 ZELNIK, Igor, **GERM, Mateja,** KUHAR, Urška, GABERŠČIK, Alenka. Waterbodies in the floodplain of the Drava River host species-rich macrophyte communities despite *Elodea* invasions. *Diversity*. Oct. 2022, vol. 14, iss. 10, str.  3 MAVRIČ ČERMELJ, Anja, FIDERŠEK, Eva, GOLOB, Aleksandra, KACJAN-MARŠIĆ, Nina, VOGEL-MIKUŠ, Katarina, **GERM, Mateja**. Different concentrations of potassium silicate in nutrient solution affects selected growth characteristics and mineral composition of barley (*Hordeum vulgare* L.). *Plants*. Jun. 2022, vol. 11, iss. 11, str.  **Alenka Gaberščik:**  1.ZELNIK, Igor, MAVRIČ KLENOVŠEK, Valentina, **GABERŠČIK, Alenka**. Complex undisturbed riparian zones are resistant to colonisation by invasive alien plant species. Water, ISSN 2073-4441, 2020, vol. 12, no. 2, str. 1-14. https://www.mdpi.com/2073-4441/12/2/345, doi: 10.3390/w12020345.  2. GRAŠIČ, Mateja, DOBRAVC, Maja, GOLOB, Aleksandra, VOGEL-MIKUŠ, Katarina, **GABERŠČIK, Alenka**. Water shortage reduces silicon uptake in barley leaves. Agricultural water management, ISSN 0378-3774. [Print ed.], 2019, vol. 217, str. 47-56, doi: 10.1016/j.agwat.2019.02.030  3. GRAŠIČ, Mateja, MALOVRH, Urša, GOLOB, Aleksandra, VOGEL-MIKUŠ, Katarina, **GABERŠČIK, Alenka**. Effects of water availability and UV radiation on silicon accumulation in the C4 crop proso millet. Photochemical & photobiological sciences, ISSN 1474-905X, 2019, vol. 18, no. 2, str. 375-386, ilustr., doi: 10.1039/C8PP00517F. |

# Temeljni predmet 1 Učni načrt predmeta/Course syllabus

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| Predmet: | Temeljni predmet 1 |
| Course title: | Core course 1 |
| Članica nosilka/UL Member: |  |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) | 1. letnik |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020661 |
| Koda učne enote na članici/UL Member course code: | 100 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
|  |  |  |  | 250 |  | 10 |

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| Nosilec predmeta/Lecturer: |  |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: |  |

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| Jeziki/Languages: | Predavanja/Lectures: |  |
|  | Vaje/Tutorial: |  |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
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| Vsebina: | Content (Syllabus outline): |
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| Temeljna literatura in viri/Readings: |
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| Cilji in kompetence: | Objectives and competences: |
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| Predvideni študijski rezultati: | Intended learning outcomes: |
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| Metode poučevanja in učenja: | Learning and teaching methods: |
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| Načini ocenjevanja: | Delež/Weight | Assessment: |
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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
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# Temeljni predmet 2 Učni načrt predmeta/Course syllabus

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| Predmet: | Temeljni predmet 2 |
| Course title: | Core course 2 |
| Članica nosilka/UL Member: |  |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) | 1. letnik |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020662 |
| Koda učne enote na članici/UL Member course code: | 101 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
|  |  |  |  | 250 |  | 10 |

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| Nosilec predmeta/Lecturer: |  |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: |  |

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| Jeziki/Languages: | Predavanja/Lectures: |  |
|  | Vaje/Tutorial: |  |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
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| Vsebina: | Content (Syllabus outline): |
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| Temeljna literatura in viri/Readings: |
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| Cilji in kompetence: | Objectives and competences: |
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| Predvideni študijski rezultati: | Intended learning outcomes: |
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| Metode poučevanja in učenja: | Learning and teaching methods: |
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| Načini ocenjevanja: | Delež/Weight | Assessment: |
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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
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# TLA IN GEOLOGIJA OKOLJA Učni načrt predmeta/Course syllabus

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| Predmet: | TLA IN GEOLOGIJA OKOLJA |
| Course title: | Soils and Environmental Geology |
| Članica nosilka/UL Member: | UL BF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020627 |
| Koda učne enote na članici/UL Member course code: | 3 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 40 | 20 |  |  |  | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Marjetka Suhadolc |

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| Izvajalci predavanj: | Helena Grčman, Franc Lobnik, Andrej Šmuc, Nina Zupančič |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Temeljni predmet /Core Course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij. | Enrolment in the doctoral study programme. |

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| Vsebina: | Content (Syllabus outline): |
| Geologija (osnovni pojmi, pomen za okolje: geološka podlaga kot njegov materialni nosilec, in kot vir za napovedovanje njegovih bodočih sprememb). Zemljina zgradba in sestava (zgradba planeta, Zemljine lupine: litosfera, pedosfera, hidrosfera, atmosfera in biosfera). Geološko dogajanje (endogeni in eksogeni procesi, magmatizem s poudarkom na vulkanizmu, erozija in transport, sedimentacija, metamorfoza, tektonika in potresi, tektonika plošč). Zemljin razvoj (geološka zgodovina, razvoj življenja, razvoj ekosistemov, pomen načela aktualizma za napoved prihodnjega razvoja). Geokemično modeliranje (naravni in antropogeno vplivni sistemi, matematični modeli, modeliranje več komponentnih sistemov). Naravne nevarnosti (geološke osnove vulkanizma, potresov, erozije, preperevanja rudišč, poplav, zavarovanje in napovedovanje). Geološke danosti pri oceni stanja okolja (strukturno-geološka, geokemična, inženirsko-geološka, seizmološka, hidrogeološka in ekonomsko-geološka merila).  Tlotvorni dejavniki in procesi. Klasifikacija tal glede na samoočiščevalno sposobnost in degradacijske procese. Parametri in indikatorji kakovosti tal. Fizikalnomorfološke lastnosti tal. Gibanje vode, zraka, toplote in raztopin skozi tla. Interakcije med organskimi in anorganskimi komponentami tal. Interakcije med trdno, tekočo in plinasto fazo v tleh: talni koloidi, ionska izmenjava, sorptivne lastnosti tal in njihova vloga v transportnih procesih, mehanizmi izmenjave plinov v tleh. Ekologija tal s poudarkom na kroženju ogljika in toku energije v ekosistemu tal. Vpliv klimatski razmer na procese mineralizacije in humifikacije organske snovi. Talni organizmi kot indikatorji kakovosti in zdravja tal. Biogeokemijski procesi, ciklusi in kroženje hranil v ekosistemu tal.  Definicije, izvori in načini onesnaževanja. Razvrščanja onesnažil. Usoda potencialno nevarnih snovi v sistemu tla-rastlina-podtalnica: mehanizmi vezave, transformacij, razgradnje ter prenosa v tleh. Učinki onesnažil na organizme. Interpretacija podatkov o okolju na podlagi okoljskih standardov in normativov. Osnove ekotoksikologije in bioindikacije onesnaženih tal.  Zgradba Slovenije (poglavitne kamnine in vrste tal v Sloveniji s posebnim poudarkom na krasu, okoljsko pomembne lastnosti geološke in pedološke zgradbe, mineralni viri, geološke in pedološke karte, karte onesnaženosti tal, geografski informacijski sistemi v geologiji in pedologiji in pomen informacije za smotrno rabo prostora, ugotavljanje, oceno in saniranje stanja okolja, za napovedovanje sprememb okolja, za zagotavljanje trajnostnega razvoja. | Geology (basic concepts, importance for the environment: geological basis as its material carrier, and as a source of prediction of its future changes). Earth's structure and composition (Planet composition, Earth layers: the lithosphere, pedosphere, hydrosphere, atmosphere and biosphere). Geological processes (endogenous and exogenous processes, magmatism with emphasis on volcanic activity, erosion and transportation, sedimentation, metamorphosis, tectonics and earthquakes, plate tectonics). Earth development (geological history, development of life and ecosystems, importance of the principle of actualism to predict future development). Geochemical modelling (natural and anthropogenic influenced systems, mathematical models, modelling of multi-component systems). Natural hazards (geological basis of volcanism, earthquakes, erosion, weathering of ore deposits, flooding, protection and forecasting). Geological conditions in the evaluation of environmental status (structural-geological, geochemical, engineering-geological, seismic, hydrogeological and geo-economic criteria).  Soil forming factors and processes. Soil classification according to the filtering capability and degradation processes. Parameters and indicators of soil quality. Physical and morphological soil properties. The movement of water, solutes, air and heat trough the soil. Interactions between organic and mineral soil components. Interactions between soil solid, liquid and gaseous phase: soil colloids, ion exchange, sorption properties and their role in transport processes, mechanisms of gas exchange in the soil. Soil ecology with an emphasis on the carbon cycle and energy flow in the soil ecosystem. Climate effects on soil organic matter mineralisation and humification. Soil organisms as indicators of soil quality and health. Biogeochemical processes, cycles and nutrient cycling in the soil ecosystem. Definitions, sources and means of pollution. Classification of pollutants. Fate of pollutant in the plant-soil-groundwater system: mechanisms of adsorption, transformation, degradation and transport in soil. The effect of pollutants on soil organisms. The interpretation of environmental data using environmental standards and norms. Fundamentals of ecotoxicology and bioindication of contaminated soil.  Geological setting of Slovenia (main rock and soil types in Slovenia, with special emphasis on Karst, environmentally relevant properties of geological and soil composition, mineral resources, geological and soil maps, maps of soil pollution, geographic information systems in geology and soil science and importance of the information for the rational space use , for identification, assessment and remediation of the environment, to predict the changes in the environment, to ensure sustainable development. |

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| Temeljna literatura in viri/Readings: |
| Brady N. C., Weil R. R., 2014. The nature and properties of soils. Harlow, Pearson education limited: 1046 str. (knjižnica BF)owel,D.,R. 1996. Soil Science. Longman  **- Digitalna pedološka karta** *v merilu 1: 25 000.*  **- Digitalna pedološka karta** *v merilu 1: 250.000.* |

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| Cilji in kompetence: | Objectives and competences: |
| Človekovo življenjsko okolje je proizvod razvoja Zemljine skorje, ki je z njim tesno  povezana. Naravne nevarnosti in človekovi posegi v okolje imajo geološko podlago.  Geologija kot historična veda tudi omogoča znanstveno napovedovati prihodnje  spremembe okolja iz preteklih geoloških dogodkov ter pomaga znanstveno utemeljeno  načrtovati sonaravni razvoj okolja.  Iz kamnin nastanejo tla, kot glavno križišče živega in mrtvega sveta, ki poleg preperevanja kamnin omogočajo tudi razgradnjo organskih ostankov in kroženja snovi na tem planetu. Zato je cilj prikazati tla kot naravni vir in kot element varstva okolja.  Študentje pridobijo znanja osnov geologije in biogeokemijskih ter fizikalnih procesov v tleh, posebno tistih, ki vplivajo na transport, vezavo na talne delce, bio-, kemo- in foto-transformacije in bioakumulacijo snovi v sistemu tla, rastlina, podtalnica. Študentje spoznajo procese degradacije okolja, seznanijo se z definicijami in pojmi onesnaževanja, potencialno nevarnimi snovmi in njihovimi škodljivimi učinki, geogenimi in antropogenimi viri teh snovi, procesi transporta in transformacij snovi v sistemu tla-rastlina podtalnica. Nadalje študentje znajo pridobiti, uporabljati in interpretirati javno dostopne geološke in pedološke podatkovne zbirke (geološka, pedološka karta RS, podatki monitoringa kakovosti/onesnaženosti tal…). | Human living environment is a product of Earth's crust development, which is closely connected to it. Natural hazards and human interventions in the environment are geologically based. Geology as historical science enables scientifically prediction of the future changes in the environment on the basis of the past geological events, and help science-based planning of the sustainable development of the environment.  From rocks soil is formed, as the main crossroads of the living and the dead world, in addition to the weathering of rocks allow the decomposition of organic residues and cycling of elements on the planet. Therefore, the objective is to evaluate soil as a natural resource and an element of environmental protection.  Students get knowledge of basic geology and soil biogeochemical and physical processes, especially those that affect the transport, adsorption to soil particles, bio-, chemo-and photo-transformations and bioaccumulation of substances in the soil, plant and groundwater system.  Students get an insight in processes of environment degradation and environmental pollution. They receive information on pollutants and their harmful effects, geogenic and anthropogenic sources, transport and transformations in the plant-soil-groundwater system. Further students get an insight how to obtain, use and interpret the publicly available databases (national geology and soil maps, soil quality/pollution monitoring data…). |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Študentje pridobijo teoretična in praktična znanja.  Prenos znanj v prakso, kreacija razvoja in raziskav. | Knowledge and understanding:  The students obtain theoretical and practical knowledge.  Transfer the knowledge into practice, creation of new development and research. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Poleg predavanj, ki vključujejo multimedijske pripomočke (ppt, video, spletne strani, izvedeni projekti) so sestavni del tudi seminarji in vaje, ki od študenta zahtevajo individualno delo in skupinsko diskusijo. | Lectures with multimedia support and seminars, exercises which require individual work and group discussion. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Seminar | 50,00 % | Seminar |
| Izpit | 50,00 % | Exam |

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| Ocenjevalna lestvica: | Grading system: |
| 5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10 | 5 - 10, a student passes the exam if he is graded from 6 to 10 |

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| Reference nosilca/Lecturer's references: |
| **Marjetka Suhadolc**  GOVEDNIK, Anton, POTOČNIK, Živa, ELER, Klemen, MIHELIČ, Rok, SUHADOLC, Marjetka. Combined effects of long-term tillage and fertilisation regimes on soil organic carbon, microbial biomass, and abundance of the total microbial communities and N-functional guilds. *Applied soil ecology*. 2023, vol. 188, str. 1-13, ilustr. ISSN 0929-1393. <https://www.sciencedirect.com/science/article/pii/S0929139323000744>, DOI: [10.1016/j.apsoil.2023.104876](https://dx.doi.org/10.1016/j.apsoil.2023.104876). [COBISS.SI-ID [146728963](https://plus.cobiss.net/cobiss/si/sl/bib/146728963)  GRČMAN, Helena, TURNIŠKI, Rok, SUHADOLC, Marjetka. Evtrična rjava tla – najboljša kmetijska tla v Sloveniji = Eutric cambisols – Slovenia’s best agricultural soils. *Geodetski vestnik : glasilo Zveze geodetov Slovenije*. [Tiskana izd.]. 2023, letn. 67, št. 3, str. 297-324, ilustr. ISSN 0351-0271. <https://www.geodetski-vestnik.com/arhiv/67/3/297_Grcman_at_al.pdf>, <https://repozitorij.uni-lj.si/IzpisGradiva.php?id=151731>, DOI: [10.15292/geodetski-vestnik.2023.03.297-324](https://dx.doi.org/10.15292/geodetski-vestnik.2023.03.297-324). [COBISS.SI-ID [168861955](https://plus.cobiss.net/cobiss/si/sl/bib/168861955)]  PINTARIČ, Sara, SUHADOLC, Marjetka, ELER, Klemen. Straw management and slurry application affect the soil microbial community composition and its activity. *Agronomy*. 2022, vol. 12, iss. 11, art. 2781, 19 str., ilustr. ISSN 2073-4395. <https://www.mdpi.com/2073-4395/12/11/2781>, <https://repozitorij.uni-lj.si/IzpisGradiva.php?id=143398>, DOI: [10.3390/ agronomy12112781](https://dx.doi.org/10.3390/%20agronomy12112781). [COBISS.SI-ID [134456067](https://plus.cobiss.net/cobiss/si/sl/bib/134456067)]  MAČEK, Irena, PINTARIČ, Sara, ŠIBANC, Nataša, RAJNIŠ, Tatjana, KASTELEC, Damjana, LEŠTAN, Domen, SUHADOLC, Marjetka. Plants play a crucial role in the development of soil fungal communities in the remediated substrate after EDTA washing of metal-contaminated soils. *Frontiers in environmental science*. 2022, vol. 10, art. :978850, 11 str. ISSN 2296-665X. <https://doi.org/10.3389/fenvs.2022.978850>, [https://www.frontiersin.org/articles/10.3389/fenvs.2022.978850/full?&utm\_source=Email\_to\_authors\_&utm\_medium=Email&utm\_content=T1\_11.5e1\_author&utm\_campaign=Email\_publication&field=&journalName=Frontiers\_in\_Environmental\_Science&id=978850](https://www.frontiersin.org/articles/10.3389/fenvs.2022.978850/full?&amp;utm_source=Email_to_authors_&amp;utm_medium=Email&amp;utm_content=T1_11.5e1_author&amp;utm_campaign=Email_publication&amp;field=&amp;journalName=Frontiers_in_Environmental_Science&amp;id=978850), <https://dirros.openscience.si/IzpisGradiva.php?id=15562>, <https://dirros.openscience.si/IzpisGradiva.php?id=15562>, DOI: [10.3389/fenvs.2022.978850](https://dx.doi.org/10.3389/fenvs.2022.978850). [COBISS.SI-ID [121915395](https://plus.cobiss.net/cobiss/si/sl/bib/121915395)]  POJE, Anton, ZORE, Primož, SUHADOLC, Marjetka. Ocena ranljivosti gozdnih tal na zbijanje zaradi mehanizacije - preizkus in nadgradnja terenske metode blatne kepe = Assessment of the vulnerability of forest soils to compaction due to mechanization - testing and improving the field soil clump method. *Acta Silvae et Ligni*. [Tiskana izd.]. 2020, [št.] 123, str. 43-52, ilustr. ISSN 2335-3112. <https://doi.org/10.20315/ASetL.123.4>, <http://dirros.openscience.si/IzpisGradiva.php?id=12774>, <https://repozitorij.uni-lj.si/IzpisGradiva.php?id=122204>, <https://repozitorij.uni-lj.si/IzpisGradiva.php?id=122204>, <http://www.dlib.si/details/URN:NBN:SI:doc-FJ1OZL6R>, <https://dirros.openscience.si/IzpisGradiva.php?id=12774>, DOI: [10.20315/ASetL.123.4](https://dx.doi.org/10.20315/ASetL.123.4). [COBISS.SI-ID [39512323](https://plus.cobiss.net/cobiss/si/sl/bib/39512323) |

# TOKSIKOKINETIKA ZDRAVIL ZA UPORABO V VETERINARSKI MEDICINI, V ŽIVALSKEM ORGANIZMU IN OKOLJU Učni načrt predmeta/Course syllabus

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| Predmet: | TOKSIKOKINETIKA ZDRAVIL ZA UPORABO V VETERINARSKI MEDICINI, V ŽIVALSKEM ORGANIZMU IN OKOLJU |
| Course title: | Toxicokinetics of Medicinal Products for Use in Veterinary Medicine in an Animal’s Organism and the Environment |
| Članica nosilka/UL Member: | UL VF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020700 |
| Koda učne enote na članici/UL Member course code: | 51 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 40 |  | 20 |  |  | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Tomaž Snoj |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Slovenščina |
|  | Vaje/Tutorial: | Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Splošni pogoji za vpis na doktorski študij. Predznanje temeljev kemije, farmakologije, mikrobiologije, biologije in geologije. | General requirements for admission to PhD study with knowledge of the foundations of chemistry, pharmacology, microbiology, biology and geology. |

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| Vsebina: | Content (Syllabus outline): |
| Splošno o problemu onesnaževanja okolja z zdravili za uporabo v veterinarski medicini, pesticidi (insekticidi in rodenticidi) ter nekaterimi drugimi pomembnimi onesnaževalci okolja (PCB, P in dr.), njihovi mobilnosti in porazdelitvi v okolju. Načini vnosa navedenih onasneževalcev v živalski organizem ter biološki mehanizmi, ki so vključeni v toksikokinetiko le teh v živalskem organizmu in v okolju.  Predstavitev problema onesnaženosti okolja s ostanki neuporabljenih zdravil za uporabo v veterinarski medicini, zlasti iz skupine protiparazitarnih, protimikrobnih in hormonskih zdravil ter onesnaženosti okolja s preostanki le teh, ki se v nespemenjeni obliki ali v obliki njihovih metabolitov z različnimi živalskimi izločki vračajo v naravo, po njihovi uporabi pri živalih.  Možnosti pretvorbe bolj toksičnih v manj toksične učinkovine, njihove popolne detoksikacije, uporabe specifičnih antidotov in doktrina zdravljenja zastrupitev živali. | General of the problem of environmental pollution by drugs for use in veterinary medicine, pesticides (insecticides and rodenticides), and some other important environmental pollutants (PCBs, P et al.), Their distribution and mobility in the environment. Input methods listed contaminants in animal organism and biological mechanisms involved in the toxicokinetics of these in the animal body and in the environment.  Introduction to the problem of environmental pollution remains unused medicines for use in veterinary medicine, and in particular from the group antiparasitic, antimicrobial drugs, and hormonal and environmental contamination with residues of these, which are unchanged form or in the form of its metabolites with various animal secretions back into the wild after their use in animals.  Conversion Options more toxic to less toxic substances, their full detoxification, the use of specific antidotes and treatment doctrine poisoning animals. |

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| Temeljna literatura in viri/Readings: |
| * Plumlee K. *Clinical Veterinary Toxicology*. Mosby, 2004. (izbrana poglavja).   Chapman M. *Veterinary Toxicology*. Blackwell Publishing, 2006. (izbrana poglavja).  Walker CH, Hopkin SP, Sibly RM, Peakall DB. 2001. *Principles of Ecotoxicology*. Taylor & Francis, New York, New York. (izbrana poglavja).  Rang HP, Dale MM, Ritter JM. Pharmacology. 4th international student edition, Churchill, Livingstone, Edinburgh, 2003. (izbrana poglavja).  Oberdisse E, Hackenthal E, Kuschinsky K. Pharmakologie und Toxikologie. Springer, Berlin, 1997. (izbrana poglavja).  Gilman AG, Nies AS, Rall TW, Taylor P. Goodman & Gilman’s The pharmacological basis of therapeutics. Mc Millan, New York, 2006. (izbrana poglavja).  Timbrell J. *Introduction to Toxicology.* CRC Press, 2002. (izbrana poglavja).  Derelanko M.J., Mannfred A.H. 1995. Handbook of Toxicology. CRC. Press, USA.  Lah A. 1997. Kemizacija okolja in življenja-do katere meje? Narodna in univerzitetna knjižnica, Ljubljana.  Lokke H., van Gestel C. A. M. 1998. Handbook of Soil Invertebrate Toxicity Tests. John Wiley & Sons, Canada.  **Vsa znanstveno raziskovalna in strokovna dogajanja z navedenega področja (relevantni članki).** **All scientific research and professional developments in that area (relevant articles).** |

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| Cilji in kompetence: | Objectives and competences: |
| Seznaniti slušatelje z uvodom v toksikokinetiko zdravil za uporabo v veterinarski medicini in najpogostejših onesnaževalcev okolja z močno izraženim toksičnim učinkom na domače in ljubiteljske (hišne) živali, metodami dela, z znanstvenimi in strokovnimi problemi, ki jih toksikokinetika obravnava, interdisciplinarnostjo, s toksikokinetiko različnih učinkovin na različnih nivojih biološke organizranosti in na različnih organizmih, uporabo znanja s področja toksikokinetičnih lastnosti zdravil za uporabo v veterinarski medicini in nekaterih drugih pomembnih kontaminantov okolja v praksi.  Cilj je seznaniti slušatelje s toksikokinetičnimi mehanizmi, z osnovami klinične toksikologije s poudarkom na najpogostejših zastrupitvah z zdravili za uporabo v veterinarski medicini in nekaterimi drugih pomembnimi kontaminanti.  Predmet nudi študentom razumevanje definicij in strokovnih izrazov iz področja toksikokinetike. Nudi razumevanje različnih procesov toksikokinetike. Slušatelji se bodo seznanili s temelji živalske in okoljske toksikokinetike, spoznali bodo kje se prepletata in dopolnjujeta. | To acquaint students with an introduction to toxicokinetics of medicines for use in veterinary medicine and the most common environmental pollutants with strong expressed toxicity in domestic and hobby animals, methods of work, the scientific and technical problems which toxicokinetics deals, interdisciplinarity, toxicokinetics different substances at different levels of biological organizranosti and different organisms, using knowledge of toxicokinetic properties of medicines for use in veterinary medicine and some other important environmental contaminants in practice.  The aim is to acquaint students with toxicokinetic mechanisms, with the basics of clinical toxicology with a focus on the most common poisonings by drugs for use in veterinary medicine and some other major contaminants.  The course offers students an understanding of definitions and terminology in the field of toxicokinetics. It offers an understanding of the different processes toxicokinetics. Students will become acquainted with the fundamentals of animal and environmental toxicokinetics, know where they are intertwined and complementary. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Pri predmetu študent usvoji znanje s področja toksikodinamike zdravil in drugih onasnaževalcev in njihov učinek na okolje. | Knowledge and understanding:  In this course students learn about the toxicodynamics medicines and other onasnaževalcev and their impact on the environment. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja, konzultacije, raziskovalni seminarji. | Lectures, consultations, research seminars. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Ustni izpit | 60,00 % | Oral examination |
| Raziskovalne seminarske naloge | 40,00 % | Research paper |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| Tomaž Snoj 1. Snoj T, Dolenc J, Kobal S. Sex steroid levels in urine of cattle of different ages - evaluation of abuse control procedures. Food additives & contaminants. Part A 2014, 31: 614-620. 2. Premrov Bajuk B, Babnik K, Snoj T et al. Coumaphos residues in honey, bee brood, and beeswax after varroa treatment. Apidologie 2017; 48: 588-598. 3. Nedić S, Kirovski D, Vujanac I, Prodanović R, Jovanovič L, Kobal S, Snoj T. Preventing ectoparasite infestation reduces glucocorticoid concentrations in the hair of cows. Acta Vet Hun 2018; 66: 390-393. 4. Snoj T, Blažič K, Šehič N, Vake T, Majdič G. Calves management conditions affect sperm count in adult bulls. Acta Vet Scan 2020; 62: 1-6. 5. Simsek I, Kuzukiran O, Yurdakok-Dikmen B, Snoj T, Filazi A. Determination of persistent organic pollutants (POPs) in propolis by solid-phase extraction (SPE) and gas chromatography - mass spectrometry (GC-MS). Analytical letters 2020; doi: 10.1080/00032719.2020.1821208 |

# TRAJNOSTNO RAZVOJNO USMERJENE TEHNOLOGIJE IZRABE PODZEMNEGA PROSTORA Učni načrt predmeta/Course syllabus

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| Predmet: | TRAJNOSTNO RAZVOJNO USMERJENE TEHNOLOGIJE IZRABE PODZEMNEGA PROSTORA |
| Course title: | SUSTAINABLE DEVELOPMENT ORIENTED TECHNOLOGIES OF UNDERGROUND SPACE USED |
| Članica nosilka/UL Member: | UL NTF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020701 |
| Koda učne enote na članici/UL Member course code: | 85 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 30 | 45 | 20 | 10 |  | 145 | 10 |

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| Nosilec predmeta/Lecturer: | Željko Vukelić |

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| Izvajalci predavanj: | Jože Kortnik, Goran Vižintin |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Predznanje s področja matematike, fizike, mehanike, inženirske geologije, mehanike tal in mehanike kamnin. | Good knowledge of mathematics, physics, mechanics, engineering geology, soil mechanics and rock mechanics. |

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| Vsebina: | Content (Syllabus outline): |
| Osvežitev in ponovitev osnov načrtovanja gradnje podzemnih prostorov ob upoštevanju funkcionalnosti podzemnih prostorov in sodobnih principov načrtovanja, skladno s trajnostnim razvojem območij ter ohranjanja naravne in kulturne dediščine naravnega in urbanega okolja. V sklopu navedenih ciljev bodo posebej izpostavljeni pogoji rabe podzemnih prostorov v okviru trajnostnega razvoja večjih mest v luči razvoja infrastrukture in energetske oskrbe urbanih območij.  Poudarek navedenih osnov je na tematskih sklopih, ki upoštevajo:  - prilagajanje možnosti izrabe podzemnega prostora v cilju ohranjanja okolja in krajine;  - umeščanje podzemnih prostorov v prostor v okviru celovitega reševanja infrastrukturnih rešitev v smislu trajnostnega razvoja posameznih območij;  - preverjanje možnosti izrabe podzemnega prostora z namenom prilagajanja prihajajočim klimatskim spremembam s poudarkom na iskanju racionalnih in okolju primernih tehničnih  rešitvah.  Tehnično tehnološki del področja, ki pokriva rabo podzemnega prostora pa vsebuje:  - sodobne metode gradnje podzemnih prostorov v nosilnih in stabilnih kamninah,  - sodobne metode gradnje podzemnih prostorov v nizko nosilnih kamninah in stabilnih zemljinah,  - sodobne metode gradnje podzemnih prostorov v nestabilnih zemljinah.  V nadaljevanje so vključena naslednja poglavja:  - uporaba sodobnih in strokovno uveljavljenih numeričnih metod s poudarkom na analizi delovanja hribina - podporje z vključevanjem reoloških zakonitosti za posamezne vrste hribin;  - armiranje in utrjevanje hribinskih zlogov z injektirnimi postopki, vgradnja nosilnih jeklenih in drugih materialov, kemičnimi postopki izboljšanja nosilnih sposobnosti geomaterialov;  - analize delovanja aktivnih in pasivnih sidrnih sistemov z vključevanjem časovnih sovisnosti za posamezne vrste hribin;  - postopke zagotavljanja dolgoročne stabilnosti podzemnih prostorov;  - kriterije ekonomičnosti načrtovanja gradnje podzemnih prostorov ob znanih geotehničnih in tehnoloških pogojev izvedbe del z upoštevanjem okoljevarstvenih zahtev;  - specialne geotehnične meritve in spremljava izdelave podzemnih prostorov, vključno s povratnimi parametričnimi analizami v času gradnje in obratovanja tovrstnih objektov;  - načrtovanje prezračevalnih ukrepov v času gradnje in obratovanja podzemnih prostorov. | Revising the basics of planning the construction of underground structures with regarding to their functionality and modern principles of designing accordance to sustainable development large areas and in the case of development infrastructure and energy supply urban parts of the country.  The emphasis of described fundamentals is on following topics:  - adjustment possibility underground space use in the name of preservation environment and region;  - placement of underground spaces in the integrity frame to find infrastructure solution in the aim of country parts of sustainable development;  - verification possibilities of underground space use regarding adaptation to arriving climate changing with emphasis on research rational and environmental suitable technical solutions.  Technical and technological part of topics which include underground space use are:  - modern methods of construction of underground structures in bearing and stable rocks;  - modern methods of construction of underground structures in weak rocks and soils;  - modern methods of construction of underground structures in unstable soils;  - application of modern and professionally established numeric methods with emphasis on the analysis of interaction between the ground and the support by considering rheological laws for individual types of ground;  - grouting and reinforcement of ground layers by injecting, installation of bearing steel structures and other materials, chemical procedures for optimizing the bearing capacity of geological materials;  - performance analyses of active and passive anchoring systems by considering time interdependence of individual types of ground;  - procedures for ensuring long-term stability of underground structures;  - economic criteria in planning of the construction of underground structures in known geotechnical and technological conditions for the implementation of works and by considering the environmental requirements;  - special geotechnical measurements and monitoring the construction of underground structures with feedback parameter analyses during the construction and operation of such structures;  - designing ventilation measures during the construction and operation of such underground structures. |

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| Temeljna literatura in viri/Readings: |
| - B.H.G. Brady, E.T. Brown: ROCK MECHANICS FOR UNDERGROUND MINING, George Allen  & Unwin; London, 2004, 626 p.p.;  - E. Hoek: ROCK ENGINEERING FOR TUNNELS, Rockscience, 1998, 313 p.p.;  - R. Goodman: INTRODUCTION TO ROCK MECHANICS, John Willey, 1989, 562 p.p.;  - B. Singh, R. K. Goel: Tunneling in weak rocks, Elsevier Geo-Engineering Book Series,  Volume 5, 2006; 489 p.p.;  - D. Kolymbas: Tunnelling and Tunnel Mechanics, Springer, 2005, 437 p.p.;  - B. Maidl: Handbuch des Tunnel – und Stollenbaues, BAND I in BAND II, 3. Auflage,  Verlag Glueckauf, 2004, 422 p.p. and 356 p.p.  - revijalni članki s področja gradnje predorov, tekoča periodika, učna gradiva/ Appropriate articles from the field of tunnelling, current periodicals, teaching materials; |

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| Cilji in kompetence: | Objectives and competences: |
| Usposobitev za uporabo znanj s področja izrabe podzemnega prostora s posebnim poudarkom na racionalnem načrtovanju podzemnih prostorov v spremenljivih geotehničnih razmerah gradnje v urbanih in neurbanih območjih v smislu trajnostnega razvoja posameznih območij in ohranjanja naravne dediščine in kulturne krajine. | The ability to use knowledge from underground space use, with particular emphasis on the rational design of underground facilities in varying geotechnical conditions relating to construction in urban and other non-urban areas particularly through sustainable development. Special attention will be paid on conservation of natural heritage and cultural landscapes for future periods. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Pridobljena bodo znanja o načrtovanju podzemnih prostorov ob upoštevanju specifičnih lastnosti hribinskih območij ter principov trajnostnega razvoja posameznih območij na osnovi razumevanja sodobnih tehničnih postopkov gradnje podzemnih objektov. | Knowledge and understanding:  The knowledge of the planning of underground facilities will be obtained as a subject of the specific properties of rock environments. Similar, the sustainable development principles of individual sites based on modern technical understanding of the building underground facilities will be obtained, too. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Poučevanje poteka v okviru predavanj, seminarjev in laboratorijskih vaj ter terenskih vaj, ki vključujejo oglede gradbišč podzemnih objektov. Učenje je sprotno s poudarkom na učni predelavi podane snovi, sodelovanju pri analizi seminarskh nalog, aktivni izvedbi laboratorijskih vaj, ter aktivni udeležbi na terenskih vajah. | Teaching methods include lectures, seminars and laboratory exercises and field work (visiting construction sites). Students are required to study the contents throughout the course of lectures, and must participate in preparing and analysing seminar works. Active implementation of laboratory exercises, and active participation in field work activities are required. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Ob sprotnem preverjanju znanja s kolokviji, ki so načrtovani po predelanem posameznem sklopu poglavij, je obvezna izdelava vsaj ene seminarske naloge ter izdelava pisnega poročila o rezultatih laboratorijskih in terenskih vaj. |  | Student knowledge is tested by colloquia after every course module. Students are required to prepare at least one seminar work and submit a written report on the results of laboratory exercises and field work. |
| Pisni izpit | 35,00 % | Written exam |
| Ustni izpit | 35,00 % | Oral exam |
| Naloge | 15,00 % | Course work |
| Seminarska naloga | 15,00 % | Seminar |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| **Željko Vukelić**     1. VUKELIČ, Željko, VULIĆ, Milivoj. Concept of underground gas storage in the limestone rocks in Slovenia. *Advances in Sciences and Technology,2018* 2. VUKELIČ, Željko. Thermal conductivity of rocks and geothermal water = Toplotna prevodnost kamnin in geotermalne vode. *RMZ - Materials and geoenvironment : periodical for mining, metallurgy and geology,2018* 3. VUKELIČ, Željko, DERVARIČ, Evgen, ŠPORIN, Jurij, VIŽINTIN, Goran. The development of dewatering predictions of the Velenje coalmine. *Energies*, ISSN 1996-1073, 2016, vol. 9, no.9, 2020 4. JANC, Blaž, JOVIČIĆ, Vojkan, VUKELIČ, Željko. Laboratory test methods for assessing the abrasivity of rocks and soils in geotechnology and mining applications = laboratorijske preiskave abrazivnosti kamnin in zemljin na področju geotehnologije in rudarstva. *RMZ - Materials and geoenvironment : periodical for mining, metallurgy and geology*, ISSN 1408-7073, 2020   **Goran Vižintin (soizvajalec)**   1. VIŽINTIN, Goran, RAVBAR, Nataša, JANEŽ, Jože, KOREN, Eva, JANEŽ, Naško, ZINI, Luca, TREU, Francesco, PETRIČ, Metka. Integration of models of various types of aquifers for water quality management in the transboundary area of the Soča/Isonzo river basin (Slovenia/Italy). *Science of the total environment*, ISSN 0048-9697, 1. Apr. 2018, vol. 619/620, str. 1214-1225. <https://doi.org/10.1016/j.scitotenv.2017.11.017>, 2. VIŽINTIN, Goran, MAYER, Janez, LAJLAR, Bojan, VUKELIČ, Željko. Rock burst dependency on the type of steel arch support in the Velenje mine = Hribinski udari v odvisnosti od vrste jeklenih podpornih lokov v premogovniku Velenje. *Materiali in tehnologije*, ISSN 1580-2949. [Tiskana izd.], jan.-feb. 2017, letn. 51, št. 1, str. 11-18, ilustr. <http://mit.imt.si/Revija/izvodi/mit171/vizintin.pdf>, 3. VIŽINTIN, Goran, KOCJANČIČ, Maja, VULIĆ, Milivoj. Study of coal burst source locations in the Velenje colliery. *Energies*, ISSN 1996-1073, 2016, vol. 9, no.7, 15 str. <http://www.mdpi.com/1996-1073/9/7/507>, 4. VUKELIČ, Željko, DERVARIČ, Evgen, ŠPORIN, Jurij, VIŽINTIN, Goran. The development of dewatering predictions of the Velenje coalmine. *Energies*, ISSN 1996-1073, 2016, vol. 9, no.9, 9 str. <http://www.mdpi.com/1996-1073/9/9/702>. 5. LAZAR, Aleš, VIŽINTIN, Goran, BEGUŠ, Tomaž, VULIĆ, Milivoj. The use of precise survey techniques to find the connection between discontinuities and surface morphologic features in the Laže quarry in Slovenia. *Minerals*, ISSN 2075-163X, 2020, vol. 10, iss. 4, str. 1-14,   **Jože Kortnik (soizvajalec)**   1. KORTNIK, Jože. Stability assessment of the high safety pillars in Slovenian natural stone mines = Ocena stabilności wysokich filarów bezpieczeństwa w kopalniach kamieni naturalnych w Slowenii. *Archives of Mining Sciences*, ISSN 0860-7001, 2015, vol. 60, no. 1, str. 403-417. [http://mining.archives.pl](http://mining.archives.pl/),] 2. KORTNIK, Jože. Optimization of the high safety pillars for the underground excavation of natural stone blocks. *Acta geotechnica Slovenica*, ISSN 1854-0171. [Tiskana izd.], 2009, vol. 6, 1, str. 34-48. 3. KORTNIK, Jože. Backfilling waste material composites environmental impact assessment. *Journal of the Southern African Institute of Mining and Metallurgy*, ISSN 0038-223X, 2003, vol. 103, no. 6, str.: 391-396. 4. KORTNIK, Jože. Underground "Green" mining of dimension stone - limestone in Slovenia = Abbau von Kalksteinblöcken in Slowenien: Durchführung und Vorteile einer untertägigen Gewinnung von Natursteinen. *Mining report : Fachzeitschrift für Bergbau, Rohstoffe und Energie*, ISSN 2195-6529. [Print ed.], 2017, jhg. 153, ausg. 5, str. 480-489. |

# UMEŠČANJE RIZIČNIH/TVEGANIH OBJEKTOV V SOCIALNO OKOLJE Učni načrt predmeta/Course syllabus

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| --- | --- |
| Predmet: | UMEŠČANJE RIZIČNIH/TVEGANIH OBJEKTOV V SOCIALNO OKOLJE |
| Course title: | Course title: PLACEMENT RISKY BUILDINGS IN SOCIAL ENVIRONMENT |
| Članica nosilka/UL Member: | UL FDV |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| --- | --- |
| Univerzitetna koda predmeta/University course code: | 0020702 |
| Koda učne enote na članici/UL Member course code: | 52 |

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| --- | --- | --- | --- | --- | --- | --- |
| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 30 | 30 |  |  |  | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Marjan Hočevar |

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| Izvajalci predavanj: | Mitja Brilly, Marko Polič |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij. Opravljene obveznosti pri temeljnih predmetih. | Enrolment in doctoral studies. Completed requirements for core subjects. |

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| Vsebina: | Content (Syllabus outline): |
| Želeno in neželeno: pot do navzkrižij. Socialna konstrukcija stvarnosti in raznovrstnost družbenih interakcij. Odnos do okolja. Zaznava tveganja in njene razsežnosti. Stigmatizacija. NIMBY in podobni pojavi. Laiki in strokovnjaki. Vloga strokovnjakov različnih strok. Odnosi med interesnimi skupinami. Dejavniki sodelovanja med njimi. Vloga in pomen zaupanja. Vloga in sodelovanje javnosti. Načini komuniciranja pri predstavitvi okoljskih problemov in posegov. Obstoječe zakonske in tehnične rešitve varstva okolja in možnosti ustreznejšega razreševanja navzkrižij. | Desired and undesired: the path to conflict. Social construction of reality and diversity of social interactions. Attitude towards the environment. The perception of risk and its magnitude. Stigma. NIMBY and related events. Laymen and professionals. The role of experts in various disciplines. Relations between stakeholders. Factors cooperation between them. The role and importance of trust. The role and participation of the public. Communication methods to present environmental problems and interventions. Existing legal and technical solutions to environmental protection and the most appropriate management of conflicts. |

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| Temeljna literatura in viri/Readings: |
| |  | | --- | | 1. Guy, S., & Shove, E. (2014). *The sociology of energy, buildings and the environment: Constructing knowledge, designing practice*. Routledge. 2. Cox R. (2006). Environmental Communication and the Public Sphere, London: SAGE. 3. Löw, M., & Steets, S. (2014). The spatial turn and the sociology of built environment. *Routledge handbook of european sociology*, 211-224.Gutteling J.M. & Wiegman O. (1996), Exploring Risk Communication, Dordrecht: Kluwer. 4. Kasperson J. X., Kasperson R. E. (Eds.) (2005). The Social Contours of Risk, vol. I. and II., London: Earthscan. 5. Bazerman, M.H., Messick D.M., Tenbrunsel A., Wade-Benzoni K.A. (Eds.)(1997). Environment, Ethics, and Behavior. San Francisco: The new Lexington Press. 6. Boström, M., Lidskog, R., & Uggla, Y. (2017). A reflexive look at reflexivity in environmental sociology. *Environmental Sociology*, *3*(1), 6-16. | |

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| Cilji in kompetence: | Objectives and competences: |
| Varovanje okolja zahteva tudi ustrezno umeščanje kritičnih, v javnosti iz različnih razlogov nepriljubljenih posegov (npr. Odlagališča odpadkov, tovarne, prometnice) ter preprečevanje izgradnje škodljivih objektov. Študenti se bodo seznanili z razlogi za vključevanje javnosti oz. Interesnih skupin in z načini komuniciranja in sodelovanja z njimi. | Protecting of the environment requires an appropriate placement critical, in public for various reasons unpopular interventions (eg, landfills, factories, roads), and prevent building of harmful objects. Students will learn about the reasons for public involvement or stakeholders and way of communication and cooperation with them. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Spoznali bodo dejavnike in vzroke nastanka navzkrižij med posameznimi interesnimi skupinami ter možnosti njihovega razreševanja ter spoznali potrebo po interdisciplinarnem sodelovanju družboslovnih, tehničnih in naravoslovnih strok. Znali bodo poiskati nove inovativne politične, administrativne in tehnične rešitve. | Knowledge and understanding:  They will learn the factors and causes of conflicts between stakeholders and options to resolve them, and see the need for interdisciplinary cooperation social, technical and scientific disciplines. They will be able to find new innovative political, administrative and technical solutions. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja in seminarske vaje. | Lectures and tutorials. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Naloge | 50,00 % | Coursework |
| Projekt | 50,00 % | Project |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| 1.  Hočevar, Marjan, et al. *Prostorske in okoljske vrednote 2004\_2018*. Fakulteta za družbene vede, Arhiv družboslovnih podatkov, 2018.  2. Hočevar, M. (2012). Dispersed settlement in detached houses: Attitudes over the residential space consumption in Slovenia. *Sociologija*, *54*(1), 123-152..  3.  Juvancic, M., Hocevar, M., & Zupancic, T. (2014). Improving communication and changing attitudes in architectural practices: digital architectural education tools for non-experts. *Open House International*, *39*(4), 91-100. |

# UPORABA DALJINSKEGA ZAZNAVANJA Učni načrt predmeta/Course syllabus

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| Predmet: | UPORABA DALJINSKEGA ZAZNAVANJA |
| Course title: | Application of Remote Sensing |
| Članica nosilka/UL Member: | UL FGG |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020703 |
| Koda učne enote na članici/UL Member course code: | 53 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 25 | 35 | 10 |  |  | 180 | 10 |

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| Nosilec predmeta/Lecturer: | Krištof Oštir |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Doktorski študentje katerekoli usmeritve. | Doctoral students of any field. |

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| Vsebina: | Content (Syllabus outline): |
| Uvod v daljinsko zaznavanje – definicija in terminologija, zgodovinski razvoj  Fizikalne osnove daljinskega zaznavanja – elektromagnetno valovanje, elektromagnetni spekter, interakcija z atmosfero, interakcija s površjem  Sistemi daljinskega zaznavanja in njihove značilnosti – platforme, tirnice, prostorska, spektralna, radiometrična in časovna ločljivost  Senzorji – optični, radarski, laserski  Sistemi za opazovanje Zemlje – značilnosti, delovanje, pridobivanj podatkov  Interpretacija podob daljinskega zaznavanja – digitalna obdelava podob, vizualna interpretacija  Predobdelava podob – odprava napak v delovanju senzorjev, geometrijski popravki, atmosferski popravki, popravki osvetlitve in topografska normalizacija, kalibracija senzorja  Izboljšanje podob – človeški vid in barvni prostori, izboljšanje kontrasta, psevdobarvni prikazi, filtriranje  Transformacije podob – aritmetične operacije, vegetacijski indeks, analiza osnovnih komponent, Kauth-Thomasova transformacija, transformacija HSI  Klasifikacija podob – spektralni prostor, nenadzorovana klasifikacija, nadzorovana klasifikacija, objektna klasifikacija, ovrednotenje klasifikacije  Primeri uporabe – varstvo okolja, naravne nesreče, ekologija, upravljanje prostora, gozdarstvo, agronomija, arheologija, …  Izvedba praktičnega primera uporabe daljinskega zaznavanja – od izbire snemalnega sistema (satelit, letalo, letalnik), prek pridobivanja podatkov, odbdelave in interpretacije do priprave izdelkov (kart, poročil) | Introduction to remote sensing – definitions and terminology, historical development  Physical principles of remote sensing – electromagnetic radiation, electromagnetic spectrum, interaction with the atmosphere, interaction with the surface  Remote sensing systems and their characteristics – platforms, orbits, spatial, spectral, radiometric and temporal resolution  Sensors – optical, radar, laser  Earth observation systems – features, operation, data acquisition  Interpretation of remote sensing images – digital image processing, visual interpretation  Image pre-processing – the elimination of sensors malfunctioning, geometric corrections, atmospheric corrections, exposure and topographic normalization, sensor calibration  Image enhancement – human vision and colour spaces, contrast enhancement, pseudo-colour display, filtering  Image transformation – arithmetic operations, vegetation index, principal components analysis, Kauth-Thomas transformation, HSI transformation  Image classification – spectral space, unsupervised classification, supervised classification, object-based classification, evaluation of classification  Examples of use – environmental protection, natural disasters, ecology, land management, forestry, agronomy, archaeology, ...  Application of a practical example of the use of remote sensing – the choice of the imaging system (satellite, airplane, UAV), obtaining, processing and interpretation of data, to preparation of products (maps, reports) |

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| Temeljna literatura in viri/Readings: |
| Canty, Morton John (2019): Image analysis, classification and change detection in remote sensing. With algorithms for Python. Fourth edition. Boca Raton FL: CRC Press/Taylor & Francis Group.  Lawhead, Joel (2015): Learning geospatial analysis with Python. An effective guide to geographic information system and remote sensing analysis using Python 3. Second edition. Birmingham, UK: Packt Publishing (Community experience distilled).  Lillesand, Thomas M.; Kiefer, Ralph W.; Chipman, Jonathan W. (2015): Remote sensing and image interpretation. Seventh edition /  Thomas M. Lillesand, Ralph W. Kiefer, Jonathan W. Chipman. Hoboken: Wiley.  Campbell, James B.; Wynne, Randolph H. (2011): Introduction to remote sensing. 5th ed. New York, London: Guilford.  Mather, Paul M.; Koch, Magaly (2011): Computer processing of remotely-sensed images. An introduction /  Paul M. Mather and Magaly Koch. 4th ed. Chichester, West Sussex, UK, Hoboken, NJ: Wiley-Blackwell.  Oštir, Krištof (2006): Daljinsko zaznavanje. Ljubljana: Založba ZRC. |

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| Cilji in kompetence: | Objectives and competences: |
| Študenti pridobijo znanje o uporabi daljinskega zaznavanja pri varstvu okolja. Spoznajo postopke obdelave digitalnih podob in se usposobijo za samostojno aplikacijo tehnologije. | Students will acquire knowledge on the use of remote sensing in environmental issues. They learn about the processing of digital images and gain the ability for stand-alone application of the technology. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Študenti pridobijo naslednja znanja in sposobnosti: spoznajo načine iskanja in naročanja satelitskih in letalskih posnetkov, spoznajo postopek obdelave in njegove korake, znajo samostojno uporabiti daljinsko zaznavanje v konkretni aplikaciji. Vsa teoretična podlaga se tesno povezujejo s praktičnimi primeri, zato se študenti naučijo uporabljati teorijo v praksi, so se sposobni odločati in izbirati primerne metode in podatkovne vire za določeno uporabo. | Students will acquire the following knowledge and skills: learn ways of finding and ordering satellite and aerial images, learn about the various steps of image processing, learn to independently use remote sensing in practical application. All theoretical knowledge is closely linked with practical examples, so students learn to apply theory in practice, they are able to decide and choose the appropriate methods and data sources for a particular use. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja: v predavalnici, uporaba sodobnih metod poučevanja (predstavitve z računalnikom, grafične ponazoritve in animacije, demonstracije, primeri iz prakse).  Praktične vaje: izvedba v predavalnici in računalniški učilnici. Vaje se praviloma izvajajo individualno oziroma v manjših skupinah na ustrezni opremi. | Lectures: in the classroom, the use of modern teaching methods (presentations with computer, graphic illustrations and animations, demonstrations, case studies).  Practical exercises: implementation in the classroom and computer lab. Exercises are performed individually or in small groups with the appropriate equipment. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Pogoj za opravljen predmet je pozitivno ocenjena seminarska naloga, ki predstavlja primer uporabe daljinskega zaznavanja s področja študentovega dela. | 100,00 % | For successful completion of the course the student has a seminar paper. The seminar is an example of the use of remote sensing in the field of student research work. |
| Naloga mora biti predstavljena v okviru seminarskih vaj in izdelana v obliki znanstvenega oziroma strokovnega članka. |  | The paper should be presented in the class and prepared in the form of a scientific or technical paper. |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| Valjavec, Mateja Breg; Ciglič, Rok; Oštir, Krištof; Ribeiro, Daniela (2018): Modelling habitats in karst landscape by integrating remote sensing and topography data. In *Open Geosciences* 10 (1), pp. 137–156. DOI: 10.1515/geo-2018-0011.  Pehani, Peter; Čotar, Klemen; Marsetič, Aleš; Zaletelj, Janez; Oštir, Krištof (2016): Automatic Geometric Processing for Very High Resolution Optical Satellite Data Based on Vector Roads and Orthophotos. In *Remote Sensing* 8 (4), p. 343. DOI: 10.3390/rs8040343.  Švab Lenarčič, Andreja; Mesner, Nika; Oštir, Krištof (2015): Overview of segmentation algorithms and software for optical remote sensing imagery. In *Geod. vestn.* 59 (04), pp. 709–722. DOI: 10.15292/geodetski-vestnik.2015.04.709-722.  Zakšek, Klemen; Oštir, Krištof (2012): Downscaling land surface temperature for urban heat island diurnal cycle analysis. In *Remote Sensing of Environment* 117, pp. 114–124. DOI: 10.1016/j.rse.2011.05.027.  Veljanovski, Tatjana; Kanjir, Urša; Oštir, Krištof (2011): Object-based image analysis of remote sensing data. In *Geod. vestn.* 55 (04), pp. 641–664. DOI: 10.15292/geodetski-vestnik.2011.04.641-664. |

# UPRAVLJANJE S TVEGANJI Učni načrt predmeta/Course syllabus

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| Predmet: | UPRAVLJANJE S TVEGANJI |
| Course title: | Risk Management |
| Članica nosilka/UL Member: | UL FKKT |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020628 |
| Koda učne enote na članici/UL Member course code: | 94 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 60 | 30 | 30 |  |  | 130 | 10 |

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| Nosilec predmeta/Lecturer: | Sabina Huč |

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| Izvajalci predavanj: | Mihael Perman |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Temeljni predmet/Core course |

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| Jeziki/Languages: | Predavanja/Lectures: | Slovenščina |
|  | Vaje/Tutorial: |  |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Zaključen študijski program 2. stopnje | Completed undergraduate education of the second level. |

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| Vsebina: | Content (Syllabus outline): |
| 1. Sistemi vodenja tveganja  Osnovni elementi vodenja tveganja.  Značilnosti visoko zanesljivih organizacij.  2. Odgovornost: Nameni in cilji  Elementi odgovornosti: Avtoriteta, odgovornost, podpora, informacije.  3. Vedenje o procesu in dokumentacija  Definicija procesa, projektni kriteriji, Načrtovanje procesa in opreme, varnostni sistemi.  4. Navodila za varnostni pregled velikih projektov  Varnostni pregled, pregled projekta in varnostnih navodil.  5. Vodenje tveganja:  Identifikacija nevarnosti: Kvalitativne metode.  Kvantitativne metode: Statistične in verjetnostne metode za kvantitativno ocenjevanje tveganj, dogodki, pogojna verjetnost, neodvisnost, porazdelitve, večrazsežne porazdelitve, pričakovane vrednosti, mere raztrosa, korelacija.  Dogodki z majhno verjetnostjo in velikimi posledicami.  Analiza tveganja: Metode Hazop, Lopa, Drevesa odpovedi/Drevesa dogodkov, Aramis, STAMP.  Modeliranje posledic človeško povzročenih nezgod.  Upravljanje z ostalimi tveganji.  Vodenje procesa med nezgodami.  6. Vodenje sprememb v procesu  Sprememba naprave, sprememba organizacije, sprememba navodil, stalne spremembe, začasne spremembe.  7. Integriteta procesa in opreme  Zanesljivostno inženirstvo.  Navodila za vzdrževanje.  Navodila za testiranje.  8. Človeški faktor  Analiza človeških napak.  9. Usposabljanje in izvrševanje  Izbira in razvoj programov za usposabljanje.  10. Preiskava nezgod  Velike nezgode, vključevanje zunanjih ekspertov, komunikacija, zbiranje podatkov in analiza.  11. Pregledi in popravne akcije  Pregledi, ugotavljanje spoštovanja obveznosti, notranji in zunanji pregledovalci. | Systems of risk management.  Basic elements of risk management.  Features of high relliability organizations.  Accountability: objectives and goals.  Elements of accountability: authorithy, responsibility, support and information.  Process Knowledge and documentation  Definiton of process, process criteria.  Process and equipment design, safety systems.  Risk management  Hazard identification: kvalitatitve methods.  Quantitative methods: Statistical and probabilistic methods for quatitative assessment of risk, events, probabilities, conditional probabilities, independence, joint distributions, expected values, dispersion measures, correlation. Small probability and large consequence events.  Risk assessment methods: HAZOP, LOPA, Fault tree/Event tree method, ARAMIS, STAMP.  Consequence modelling of man made accidents.  Risk Management.  Management of residual risks.  Process management during accidents.  Management of change  Change of technlogy, change of organization, change of procedures, permanent changes, temporary changes.  Process and Equipment integrity  Reliability engineering.  Maintenance procedures.  Testing procedures.  Human factors  Human error analisys.  Training and Performance  Selection and development of training programs.  Accident investigation  Major accidents, inclusion of third party experts, communication, data aquisition and analysis.  Audits and Corrective Actions  Compliance reviews.  Internal /External Auditors. |

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| Temeljna literatura in viri/Readings: |
| Glavna literatura:   * Ian Sutton: Process Reliability and Risk Mangement, Van Nostrand New York, 1992. * Nancy Leveson: Engineering Safer World, Systems Thinking Applied to Safety, Massachusetts Institute of Technology, 2011. * J. Reason: Managing the Risks of Organizational Accidents, Ashgate, Aldershot 1997. * K. Weick, K. Sutcliffe: Managing the Unaspected, Resilient Performance in an Age of Uncertainty, Willey and Sons, Second Edition, 2007. * J. Rice, Mathematical Statistics & Data Analysis, 3rd edition, Thompson Brooks/Cole, 2007.   Pomožna literatura:   * AIChE: Guidelines for Tecnical Management of Chemical Process Safety, New York 1989. * E. Van der Heide: Disaster Response, Principles of Preparation and Coordination, E. Van der Heide Atlanta, 1989. * VROM: CPR 16 E Green Book. * VROM: CPR 12 E Red Book. * VROM: CPR 14 E Yellow Book. * VROM: CPR 18 E Purple Book. * J.X.Wang, M.L.Roush: What Every Engineer should know about Risk Engineering and Management, Marcel Decker INC. , New York 2000. * ACSNI: Organizing For Safety, Health and Safety Commission, April 1993, * Lloyd’s Register The Engineering Council: Guidelines on Risk Issues, UK 1993. * Perrow C.: Normal Accidents, Living with High-Risk Technologies, Basic Books, New York, 1985. * Arendt et al:Evaluating Process Safety in the Chemical Industry, A Manager’s Guide to Quantitative Risk Assessment, Chemical Manufacturers Association, Washington, USA, 1989. * Clemen, Reilly: Making Hard Decisions, PWS- Kent Publishing Company, 1991. |

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| Cilji in kompetence: | Objectives and competences: |
| Študentje bodo spoznali, kako informacije o tveganju lahko koristijo pri načrtovanju ukrepov za zagotavljanje varnosti in razumeli, kako s pomočjo vedenja o tveganju optimiramo dejavnosti, da bodo varne in da bodo tudi prijazne do okolja. | Students will learn how the knowledge of risk can help in planning measures to ensure safety and how all the methods and knowledge can be integrated into optimal risk managements procedures that are safe and environmentalz sound. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Študentje naj bi pridobili osnovna teoretska in praktična znanja, ki so potrebna za vodenje tveganj. Spoznali bodo uporabo statističnih in verjetnostnih metod v analizah tveganja, vse elemente vodenja tveganja ter kako se ti vključujejo v odločanje v pogojih negotovosti.  Spoznali bodo tudi uporabnost rezultatov za različne stroke, kot so urgentna medicina, načrtovanje zaščite in reševanja kot tudi za pomembno komunikacijo tveganj ter komunikacijo v kriznih razmerah. | Students will acquire the basec theoretical and practical skills to manage risk. Some statistical and probabilistic methods in risk analysis will be presented and integrated with all other elements of risk assessment under uncertainty. The methods are applicable to other fields like emergency medical care, planning protection and rescue operations as well as the important aspect of communication about risks in crisis situations |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja, vaje in seminar. | Lectures, tutorial and seminar. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Ustni izpit | 70,00 % | Oral exam |
| Seminar | 30,00 % | Seminar |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| 1. HUČ, Sabina, PEČENKO, Robert, HOZJAN, Tomaž. Predicting the thickness of zero-strength layer in timber beam exposed to parametric fires. Engineering structures, ISSN 0141-0296.  [Print ed.], 2021, št. feb., art. 111608, letn. 229, [11] str., ilust. https://doi.org/10.1016/j.engstruct.2020.111608, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=125118, doi: 10.1016/j.engustruct.2020.111608.  [COBISS.SI-ID 42650371]  2. HUČ, Sabina, SVENSSON, Staffan, HOZJAN, Tomaž. Numerical analysis of moisture induces strains and stresses in glues-laminated timber. Holzforschung, ISSN 0018-3830, 2019, str. 1-13, ilustr. https://www.degruyter.com/view/j/hfsg.ahead-of-print/fh-2019-0025/hf-2019-0025.xml?format=INT, doi: 10.1515/hf-2019-0025. [COBISS.SI-ID 8965217]  3. HUČ, Sabina, HOZJAN, Tomaž, PLANINC, Igor. An analytical solution of the elastic concrete ring under restrained shrinkage, considering an interlayer slip. Acta mechanica, ISSN 1619-6937, 2021, vol. XX, iss. avg., str. 1-20, ilsut. https://repozitorij.uni-lj.si/IzpisGradiva.php?id=131837, https://link.springer.com/content/pdf/10.1007/s00707-021-03041-1.pdf, doi: 10.1007/s00707-021-03041-1.  [COBISS.SI-ID 73484547] |

# UPRAVLJANJE Z NARAVNIMI IN ENERGIJSKIMI VIRI Učni načrt predmeta/Course syllabus

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| Predmet: | UPRAVLJANJE Z NARAVNIMI IN ENERGIJSKIMI VIRI |
| Course title: | Energy and Natural Resource Management |
| Članica nosilka/UL Member: | UL FS |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020629 |
| Koda učne enote na članici/UL Member course code: | 7 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 40 | 10 | 10 |  |  | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Sašo Medved |

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| Izvajalci predavanj: | Andrej Bončina, Andrej Udovč |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Temeljni predmet/Core Course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij. | Enrolment in the doctoral study programme. |

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| Vsebina: | Content (Syllabus outline): |
| - naravni viri: opredelitev in pregled,  - obnovljivi in neobnovljivi naravni viri;  - ekološke osnove upravljanja obnovljivih naravnih virov;  - trajnostno gospodarjenje z naravnimi viri;  - gospodarski, ekološki in socialni vidiki upravljanja obnovljivih naravnih virov;  - javne politike na področju upravljanja obnovljivih naravnih virov (prostorsko načrtovanje, varstvo okolja...);  - primeri upravljanja naravnih virov (gozdovi, kmetijska zemljišča, populacije živalskih in rastlinskih vrst..);  - zasnova adaptivnega upravljanja: načrtovanje in monitoring;  - raba naravnih virov, varstvo okolja in ohranjanje narave;  - razvoj in scenarij prihodnje rabe obnovljivih naravnih virov;  - vrste energij in njihovo vrednotenje;  - pomen zanesljive oskrbe z energijo, kazalniki rabe energij;  - energija in trajnostni razvoj;  - uravnoteženje med dobavo in porabo enerije;  - neobnovljivi in obnovljivi viri energije - vrste, lastnosti, modeliranje zalog, modeliranje potencilov;  - procesi, tehnologije in učinkovitost za pretvarjanja neobnovljivih in obnovljivih virov energije;  - vplivi na okolje pri pretvarjanju energij;  - načela in tehnologije varčne rabe energije v različnih segmentih potrošnikov. | - natural resources: definition and review;  - renewable and non-renewable natural resources;  - methods of ecological management of renewable natural resources;  - sustainable management of natural resources;  - economic, ecological and social aspects of renewable natural resources management;  - public policy in the field of renewable natural resources management (spatial planning, environmental protection ...);  - case studies of natural resources management (forests, agricultural land, population of fauna and flora...);  - design of adaptive management: planning and monitoring;  - use of natural resources, environmental protection and nature conservation;  - development and future scenario of renewable natural resources utilization;  - energy sources;  - the importance of reliable energy supply, indicators of energy consumption;  - energy and sustainable development;  - balance between supply and consumption of energy;  - non-renewable and renewable energy sources - types, properties, modeling of stock, modeling of potentials;  - processes, technologies and efficiency for the conversion of non-renewable and renewable energy sources;  - environmental impacts of energy conversion;  - principles and technologies of rational energy use. |

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| Temeljna literatura in viri/Readings: |
| 1. Danny Harvey, L. D. A handbook on low-energy buildings and district-energy systems : Fundamentals, techniques and examples. Earthscan, London, 2006 [COBISS.SI-ID 28146181].  2. Sorensen, B. Renewable energy conversion, transmission and storage. Elsevier, 2007 [COBISS.SI-ID 29233925].  3. Eastop, T. D., Croft, D. R. Energy efficiency for engineers and technologists. Longman Scientific & Technical, UK, 1990 [COBISS.SI-ID 206619].  4. Johansson, T. B., et al. (Ed.) Renewable energy : Sources for fuels and electricity. Island Press, Washinton, 1993 [COBISS.SI-ID 14756101]. |

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| Cilji in kompetence: | Objectives and competences: |
| Študent dobi pregled o naravnih virih. Spozna osnovne značilnosti gospodarjenja z obnovljivimi naravnimi viri, ki je zasnovano na načelu trajnosti. Seznani se z načini presoje trajnostnega gospodarjenje ter spozna gospodarske, ekološke in socialne vidike trajnostnega gospodarjenja. Seznani se z zasnovo gospodarjenja s posameznimi naravnimi viri (gozd, kmetijska zemljišča, itd).  Spozna zasnovo adaptivnega upravljanja in načrtovanja. Seznani se z javnimi politikami na področju upravljanja z obnovljivimi naravnimi viri. Kandidat spozna zgodovinski razvoj oskrbe človeštva z energijo in pomen zanesljive oskrbe v sodobni družbi. Spozna naravne obnovljive in neobnovljive vire energij. Predstavljen mu je odnos med proizvodnjo in porabo energentov.  Seznani se s principi, teoretičnimi in realnimi učinkovitostmi tehnologij za pretvarjanje energijskih virov v oblike energij, ki jih potrebujejo sodobne družbe. Spozna metode modeliranja procesov pretvarjanja energij.  Za posamezne energetske tehnologije spozna, kako vplivajo na okolje in kako te vplive zmanjšamo. Seznani se z modeliranjem širjenja emisij energetskih sistemov v okolju. Spozna ukrepe za varčno rabo energije in energetskimi perspektivami. | Student obtains an overview of natural resources. Learns basic characteristics of the renewable natural resources management, based on the principle of sustainability. Student is acquainted with assessment methods of the sustainable management and obtains the economic, ecological and social aspects of the sustainable management. Student is introduced in the management of specific natural resources (forest, agricultural land, etc.).  Learns the concept of the adaptive management and planning. Student also learns about public policies related to the management of renewable natural resources. Candidate learns about the historical development of energy supply of mankind and the importance of the reliable supply in modern society. Learn about natural renewable and non-renewable sources of energy. The relationship between the production and the consumption of energy is presented.  Learns about the principles, theoretical and technical efficiencies of technologies for the energy resources conversion in the form of energy needed by modern society. Student is acquainted with methods of the modeling of processes for energy conversion.  Learns how energy technologies effect environment and how can these impacts be reduced. Is introduced to modeling of emission spreading of energy systems. Learns measures of rational use of energy and with energy perspectives. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Razume pomen trajnostnega ravnanja z naravnimi in energijskimi viri, pridobi znanje za vrednotenje potencialov naravnih in energijskih virov, osvoji metode presoje trajnostnega ravnanja z naravnimi viri, razume fizikalne, kemijske in biološke procese, ki se pojavljajo pri pretvarjanju in uporabi energijskih virov, osvoji metode preverjanja energijske učinkovitosti izbranih sistemov, zna vrednotiti procese in tehnologije ravnanja z naravnimi in energijskimi viri z LCA in LCC metodami, zna uporabiti metode modeliranja. | Knowledge and understanding:  Student understands the importance of sustainable management of natural and energy resources, acquires the knowledge to evaluate the potential of natural and energy resources, learns assessment methods of sustainable management of natural resources, understands the physical, chemical and biological processes that occur during conversion and use of energy resources, gains knowledge of methods for validation of energy performance of arbitrary systems, is able to evaluate process and technologies of management of natural and energy resources with LCA and LCC methods, student has the knowledge to implement those methods. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Avditorna predavanja, individualni seminar, osebna komunikacija. | Auditorial lectures, individual seminar , personal communication. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Pisni izpit | 60,00 % | Examen writen |
| Ustni zagovor | 25,00 % | Oral |
| Javna predstavitev seminarske naloge s področja teme doktorske disertacije | 15,00 % | Public presentation of project report |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| **prof. dr. Sašo Medved:**  1. ŽIŽAK, Tej, DOMJAN, Suzana, MEDVED, Sašo, ARKAR, Ciril. Efficiency and sustainability assessment of evaporative cooling of photovoltaics. *Energy*. Sep. 2022, vol. 254, pt. a, str. 1-12, ilustr. ISSN 0360-5442. <https://www.sciencedirect.com/science/article/pii/S036054422201163X>, <https://repozitorij.uni-lj.si/IzpisGradiva.php?id=136907>, DOI: [10.1016/j.energy.2022.124260](https://dx.doi.org/10.1016/j.energy.2022.124260). [COBISS.SI-ID [108992259](https://plus.cobiss.net/cobiss/si/sl/bib/108992259)]; 1.01  2. MEDVED, Sašo, DOMJAN, Suzana, ARKAR, Ciril. Contribution of energy storage to the transition from net zero to zero energy buildings. *Energy and buildings*. [Print ed.]. Apr. 2021, vol. 236, str. 1-13, ilustr. ISSN 0378-7788. <https://www.sciencedirect.com/science/article/pii/S0378778821000359?via%3Dihub>, <https://repozitorij.uni-lj.si/IzpisGradiva.php?id=124722>, DOI: [10.1016/j.enbuild.2021.110751](https://dx.doi.org/10.1016/j.enbuild.2021.110751). [COBISS.SI-ID [51396355](https://plus.cobiss.net/cobiss/si/sl/bib/51396355)]; 1.01  3. DOMJAN, Suzana, MEDVED, Sašo, ČERNE, Boštjan, ARKAR, Ciril. Fast modelling of nZEB metrics of office buildings built with advanced glass and BIPV facade structures. *Energies*. Aug. 2019, vol. 12, iss. 16, f. 1-18, ilustr. ISSN 1996-1073. <https://www.mdpi.com/1996-1073/12/16/3194>, <https://repozitorij.uni-lj.si/IzpisGradiva.php?id=109095>, DOI: [10.3390/en12163194](https://dx.doi.org/10.3390/en12163194). [COBISS.SI-ID [16752155](https://plus.cobiss.net/cobiss/si/sl/bib/16752155)]; 1.01  4. ŠUKLJE, Tomaž, HAMDY, Mohamed, ARKAR, Ciril, HENSEN, Jan, MEDVED, Sašo. An inverse modeling approach for the thermal response modeling of green façades. *Applied energy*. Feb. 2019, vol. 235, str. 1447-1456, ilustr. ISSN 0306-2619. <https://www.sciencedirect.com/science/article/pii/S0306261918317720?via%3Dihub>, <https://repozitorij.uni-lj.si/IzpisGradiva.php?id=105462>, DOI: [10.1016/j.apenergy.2018.11.066](https://dx.doi.org/10.1016/j.apenergy.2018.11.066). [COBISS.SI-ID [16368155](https://plus.cobiss.net/cobiss/si/sl/bib/16368155)]; 1.01  5. DOMJAN, Suzana, ARKAR, Ciril, FINK, Rok, MEDVED, Sašo. Evaluation of energy efficiency of buildings based on LCA and LCC assessment – method, computer tool and case studies : chapter 7. V: BIENVENIDO-HUERTAS, David (ur.). *Nearly zero energy building (NZEB) : materials, design and new approaches*. London: IntechOpen, 2022. Str. 125-151, ilustr. ISBN 978-1-80355-312-2, ISBN 978-1-80355-314-6. <https://www.intechopen.com/chapters/80014%205>, DOI: [10.5772/intechopen.101820](https://dx.doi.org/10.5772/intechopen.101820). [COBISS.SI-ID [116411395](https://plus.cobiss.net/cobiss/si/sl/bib/116411395)]; 1.16 |

# VARNOST IN ZANESLJIVOST V PROCESNI TEHNIKI Učni načrt predmeta/Course syllabus

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| Predmet: | VARNOST IN ZANESLJIVOST V PROCESNI TEHNIKI |
| Course title: | SAFETY AND RELIABILITY IN PROCESS ENGINEERING |
| Članica nosilka/UL Member: | UL FMF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020704 |
| Koda učne enote na članici/UL Member course code: | 55 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 30 | 30 |  |  |  | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Ivo Kljenak |

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| Izvajalci predavanj: | Ivo Kljenak |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet /Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij.  Predznanje s področja tehnike ali naravoslovja. | Enrollment in doctoral studies.  Prior knowledge in subjects from technical or natural sciences. |

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| Vsebina: | Content (Syllabus outline): |
| * Zanesljivost v procesni industriji * Varnost in tveganje * Matematične osnove in analitična orodja * Identifikacija in kvantifikacija nevarnosti * Verjetnostne varnostne analize * Drevesa okvar in drevesa dogodkov * Deterministične varnostne analize * Simulacije in industrijske aplikacije | * Reliability in process engineering * Safety and risk * Mathematical fundamentals and analytical tools * Identification and quantification of threats * Probabilistic safety assessment * Fault trees and event trees * Deterministic safety analyses * Simulations and industrial applications |

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| Temeljna literatura in viri/Readings: |
| - A. Kuhlman, Introduction to Safety Science, Springer Verlag, 1985.  - I.S. Sutton, Process Reliability Risk Management, Van Nostrand Reinhold, 1991.  - N.P. Cheremisinnoff, Practical Guide to Industrial Safety, Marcel Dekker, Inc. NY 2001.  - W. Vesely, J. Dugan, J. Fragola, J. Minarick, J. Railsback, Fault Tree Handbook with Aerospace Applications, National Aeronautics and Space Administration, NASA, 2002.  - B.R. Sehgal, Nuclear Safety in Light Water Reactors, Elsevier, 2012.  - Revijalni članki s področja, tekoča periodika, učna gradiva. / Journal papers, current periodical publications, course materials. |

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| Cilji in kompetence: | Objectives and competences: |
| Seznanitev s teoretskimi osnovami, zahtevnimi verjetnostnimi in determinističnimi metodami in orodji za ocenjevanje zanesljivosti in varnosti v procesni industriji, s poudarkom na vplivu procesne industrije na okolje. | To become acquainted with theoretical bases, advanced probabilistic and deterministic methods and tools for assessing reliability and safety in process industries, with emphasis on the influence of the process industries on the environment. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Sposobnost identifikacije in analize tveganja specifičnih industrijskih postrojev za okolje ter ocene eventuelnih posledic hipotetične nesreče. | Ability to identify and analyse the risk of specific industrial plants for the environment and to assess the eventual consequences of a hypothetical accident. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| * Predavanja s teoretično vsebino * Raziskovalni seminarji * Projektno delo * Individualne naloge * Vodeni individualni študij | * Theoretical lectures * Research term papers * Project works * Individual assignments * Individual studies with tutoring |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Seminarska naloga | 40,00 % | Term paper |
| Pisni izpit | 40,00 % | Written examination |
| Zagovor pisnega izpita | 20,00 % | Oral hearing of written examination |

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| Ocenjevalna lestvica: | Grading system: |
| 5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10 | 5 - 10, a student passes the exam if he is graded from 6 to 10 |

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| Reference nosilca/Lecturer's references: |
| **Ivo Kljenak**   * R.Jordan, B.Mavko, **I.Kljenak**, Component reliability assessment using quantitative and qualitative data, *Reliability Engineering & Systems Safety,* 2001, vol. 71, 81-95. * **I.Kljenak**, A.Bentaib, T.Jordan, Hydrogen behavior and control in severe accidents, v: B.R.Sehgal (ur.), Nuclear Safety in Light Water Reactors: Severe Accident Phenomenology, Elsevier, 2012, 186-227. * T.Holler, E.M.J.Komen, **I.Kljenak**, The role of CFD combustion modelling in hydrogen safety management – VIII: use of eddy break-up combustion models for simulation of large-scale hydrogen deflagration experiments, *Nuclear Engineering and Design*, 2022, vol. 388, 111627, 1-16. * M.Kunšek, L.Cizelj, **I.Kljenak**, New multi-fluid model of pool scrubbing in bubble rise region, *Nuclear Engineering and Design*, 2022, vol. 395, 111873, 1-13. * R.Krpan, I.Tiselj, **I.Kljenak**, Atmosphere homogenization induced by vertical jets in large enclosures, *Annals of Nuclear Energy,* 2023, vol. 180, 109476, 1-21. |

# VARSTVO KRAJINE Učni načrt predmeta/Course syllabus

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| Predmet: | VARSTVO KRAJINE |
| Course title: | Landscape conservation |
| Članica nosilka/UL Member: | UL BF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020705 |
| Koda učne enote na članici/UL Member course code: | 56 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 20 | 40 |  |  |  | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Mojca Golobič |

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| Izvajalci predavanj: | Nadja Penko Seidl |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Slovenščina |
|  | Vaje/Tutorial: |  |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij. | Inscription in the PhD programme. |

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| Vsebina: | Content (Syllabus outline): |
| Definicije in pojmi krajine v različnih strokovnih kontekstih: krajinskem oblikovanju, krajinskem-varovalnem planiranju, krajinski ekologiji, kulturološki (antropološki) in politični obravnavi.  Tipologije krajine in tipološka ureditev slovenskih krajin. Varstvo izjemnih krajin.  Varstvo in upravljanje krajine v okviru sektorskih politik (varstvo kulturne dediščine, ohranjanje narave, kmetijstvo…)  Varstvo in načrtovanje krajine v okviru prostorskega načrtovanja; analize ranljivosti, presoje vplivov na okolje,.  Varstvo in načrtovanje mestne krajine – zeleni sistemi. | Definitions and concepts of landscape in different contexts: landscape design, landscape planning, anthropology and cultural studies, policy making.  Processes of landscape change  Landscape typology – focus on classification of Slovenian landscapes and guidelines for landscape management  Landscape conservation instruments in different policies: nature conservation, protection of cultural heritage, agriculture, forestry, water management.  Landscape protection within spatial planning processes and methods: vulnerability analysis, strategic environmental impact assessment.  Conservation and planning of urban landscapes. |

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| Temeljna literatura in viri/Readings: |
| Marušič, J. 2020. O krajini : ustvarjalno varstvo sveta, Ljubljana : Biotehniška fakulteta, Oddelek za krajinsko arhitekturo,  Marušič, J. et al., 1998. Regionalna razdelitev krajinskih tipov v Sloveniji, Uvodni zvezek: Metodološke osnove in zvezki 1-5. Ljubljana: Ministrstvo za okolje in prostor RS, Urad RS za prostorsko planiranje  Ogrin D., 1989. Slovenske krajine. Državna založba Slovenije, Ljubljana  Ogrin, D. (Ur.), 1996, Varstvo narave zunaj zavarovanih območij, Ministrstvo za okolje in prostor, Urad RS za prostorsko planiranje in Biotehniška fakulteta, Inštitut za krajinsko arhitekturo, Ljubljana  McHarg I., 1969, Design with nature. Garden City, New York: Natural History Press  Kučan, A. 1998, Krajina kot nacionalni simbol, Ljubljana: Znanstveno in publicistično središče |

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| Cilji in kompetence: | Objectives and competences: |
| Omogočiti bodočim strokovnjakom na področju varstva okolja boljše poznavanje pojmov, vrednot in metod, ki izhajajo iz koncepta varstva krajine, ter s tem izboljšati vključenost krajine v prizadevanja za varstvo okolja. | To ensure the future professionals in the field of environment protection have adequate knowledge and understanding of landscape concepts, values and methods for landscape conservation, management and planning, and thus improvement of landscape protection and cross sector coordination. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  pojmov in pristopov, ki izhajajo iz koncepta krajine  tipoloških značilnosti krajin ter procesov njihovega spreminjanja  izhodišč za vrednotenje krajine  pristopov in metod varstva krajine v okviru različnih postopkov varstva, upravljanja in načrtovanja,  pravnega in administrativnega okvira za varstvo krajin.  sposobnost interdisciplinarnega pristopa k analizi in reševanju problemov v krajini | Knowledge and understanding:  of concepts and approaches related to landscape  typological characteristics of landscape and processes of landscape change  framework for landscape evaluation  approaches and methods for landscape conservation in different frameworks of conservation, management and planning policies  legal and administrative framework for landscape conservation  capability of interdisciplinary approach to landscape analysis and problem solving |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja s prosojnicami (ppt)  Samostojno delo – priprava seminarske naloge na osnovi virov, konzultacij in terenskih ogledov  Predstavitve seminarskih nalog z razpravo. | Lectures supported with ppt prsentations  Inddividual work: project on a chosen topic, with support of literature, consultations and field work  Presentations of projects with discussion. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Seminarska naloga | 70,00 % | Project (written) |
| Zagovor seminarske naloge | 30,00 % | Presentation and defense of the project |

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| Ocenjevalna lestvica: | Grading system: |
| 5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10 | 5 - 10, a student passes the exam if he is graded from 6 to 10 |

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| Reference nosilca/Lecturer's references: |
| **Mojca Golobič**  PENKO SEIDL, Nadja, ŠMID HRIBAR, Mateja, HUDOKLIN, Jelka, PIPAN, Tomaž, GOLOBIČ, Mojca. Defining landscapes, and their importance for national identity : A case study from Slovenia. Sustainability, ISSN 2071-1050, 2021, vol. 13, no. 11 (6475), str. 1-18. https://doi.org/10.3390/su13116475, doi: 10.3390/su13116475. [COBISS.SI-ID 66838275]  PENKO SEIDL, Nadja, GOLOBIČ, Mojca. Quantitative assessment of agricultural landscape heterogeneity. Ecological indicators : integrating monitoring, assessment and management, ISSN 1470-160X, 2020, vol. 112, art. no. 106115, str. 1-7, doi: 10.1016/j.ecolind.2020.106115. [COBISS.SI-ID 9429369]  BEVK, Tadej, GOLOBIČ, Mojca. Contentious eye-catchers : Perceptions of landscapes changed by solar power plants in Slovenia. Renewable energy, ISSN 0960-1481. [Print ed.], 2020, vol. 152, str. 999-1010, doi: 10.1016/j.renene.2020.01.108. [COBISS.SI-ID 9424249] |

# VARSTVO LESENIH OBJEKTOV KULTURNE DEDIŠČINE Učni načrt predmeta/Course syllabus

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| Predmet: | VARSTVO LESENIH OBJEKTOV KULTURNE DEDIŠČINE |
| Course title: | Protection of Wooden Objects of Cultural Heritage |
| Članica nosilka/UL Member: | UL BF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020706 |
| Koda učne enote na članici/UL Member course code: | 57 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 40 | 5 | 15 |  |  | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Davor Kržišnik |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Slovenščina |
|  | Vaje/Tutorial: | Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis na doktorski študij, drugih pogojev ni. | Registration to doctoral studies; no other conditions are necessary. |

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| Vsebina: | Content (Syllabus outline): |
| Abiotski in biotski dejavniki razkroja lesa. Kemične spremembe v lesu ob razgradnji z lesnimi glivami.  Lesni škodljivci: lesne glive in insekti ter vloga biotskih dejavnikov pri razkroju lesa.  Poškodbe kulturno-zgodovinskih in umetniških predmetov iz lesa z lesnimi škodljivci (alge, glive in insekti).  Različni postopki za ugotavljanje prisotnosti škodljivcev v lesu.  Naravni pogoji, ki preprečujejo biotski razkroj (naravna zaščita) lesa s posebnim poudarkom na konstrukcijski zaščiti kulturno-zgodovinskih lesenih objektov.  Biotehnološki in fizikalni (temperatura, sušenje, zaščita z zaduševanjem) postopki za preventivno in kurativno zaščito.  Biocidni pripravki in postopki zaščite lesa ter negativni vplivi kemične zaščite na okolje in človeka.  Novejša, okolju prijaznejša alternativna sredstva za zaščito lesa.  Konserviranje in restavriranje objektov kulturne dediščine.  Varnostni ukrepi pri izvajanju zaščite lesa z biocidnimi proizvodi. | Abiotic and biotic agents of wood decomposition.  Chemical changes in wood caused by wood decayed fungi.  Wood pests: wood decay fungi and insects and the role of biotic factors in the decomposition of wood.  Damage of wooden cultural, historical and art objects caused by wood pest (algae, fungi and insects).  Various techniques for determining the presence of pests in wood.  Natural conditions for the control of biological decomposition (natural protection) of wood with special emphasis on structural protection of cultural and historical wooden buildings.  Biotechnological and physical (temperature, drying, asphyxiation) methods for preventive and curative protection.  Biocidal products and methods of wood protection and negative effects of chemical preservation to the environment and humans.  Novel environmentally friendly alternative products for wood preservation.  Preservation and restoration of cultural heritage structures.  Safety measures in wood protection using biocidal products. |

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| Temeljna literatura in viri/Readings: |
| Townsend T.G., Solo-Gabriele H. 2006: Environmental Impacts of Treated Wood. CRC Press, Taylor & Francis, Boca Raton, ISBN 0-8493-6495-7, 501 str.  Unger A., Schniewind A.P., Unger W. 2001: Conservation of wood artefacts. Berlin, New York : Springer. ISBN: 3-540-41580-7, 578 str.  Ciferri O., Tiano P., Mastromei G. 2000: Of microbes and art : the role of microbial communities in the degradation and protection of cultural heritage. Kluwer Academic/Plenum Publishers, New York. ISBN: 0-306-46377-6, 250 str.  Aktualni pregledni in znanstveni članki s področja konservatorstva./Current review and scientific articles in the field of the conservation. |

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| Cilji in kompetence: | Objectives and competences: |
| Pridobitev znanja o lesnih škodljivcih in usposobljenost za optimalne presoje in odločitve za izvajanje preventivne ali represivne zaščite lesenih objektov kulturne dediščine pred škodljivci. | To gain knowledge in wood pests and skills for optimal estimations and decisions in implementation of preventive or repressive protection of cultural heritage wooden structures against pests. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| **Znanje in razumevanje:**  Študentje se seznanijo z najpogostejšimi lesnimi škodljivci (glivami in insekti) ter poškodbami, ki jih povzročajo na izdelkih. Naučijo se prepoznati škodljivce ter se seznanijo z ukrepi, ki preprečijo njihovo delovanje. Pridobijo si znanja za presojo, kdaj in kako zaščititi objekte glede na njihovo izpostavitev oziroma način rabe. Študentom nato posredujemo vedenja o okolju prijaznejši zaščiti lesa s sodobnimi postopki in biocidnimi pripravki, ki v primerjavi s klasičnimi načini predstavljajo okolju sprejemljivejšo alternativo. Pri tem je poudarek na konstrukcijski zaščiti lesnih izdelkov in objektov. | **Knowledge and understanding:**  Students learn about the most common wood pests (insects and fungi) and damages caused on wooden products. They learn how to identify pests and get familiar with measures that prevent their activity. They also acquire knowledge to estimate when and how to protect the objects based on their method of use or exposure. Students get skills in environmentally friendly wood preservation using modern procedures and biocidal products, which compared to traditional methods represent environmentally more friendly alternative. These lectures are mainly focused on structural protection of wood products and objects. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Na študenta osredinjena predavanja podprta z IKT orodji, uporaba obrnjenega učenja, konzultacije in uporaba povratne informacije, praktične demonstracije, seminarji, individualno projektno delo, uporaba vrstniških podpornih skupin za razvoj kompetenc. | Student-centered lectures supported by ICT tools, use of flipped learning, consultations and use of feedback, practical demonstrations, seminars, individual project work, use of peer support groups for competence development. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Seminar | 30,00 % | Seminar |
| Pisni izpit | 20,00 % | Written exam |
| Ustni izpit | 50,00 % | Oral exam |

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| Ocenjevalna lestvica: | Grading system: |
| 5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10 | 5 - 10, a student passes the exam if he is graded from 6 to 10 |

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| Reference nosilca/Lecturer's references: |
| **Kržišnik Davor:**  SIDOTI, Giancarlo, ANTONELLI, Federica, GALOTTA, Giulia, MOSCATELLI, Maria Cristina, **KRŽIŠNIK, Davor**, VINCIGUERRA, Vittorio, TAMANTINI, Swati, MARABOTTINI, Rosita, MACRO, Natalia, ROMAGNOLI, Manuela. Inorganic component in oak waterlogged archaeological wood and volcanic lake compartments. Biogeosciences. 2023, vol. 20, iss 15, str. 3137-3149. ISSN 1726-4189. https://bg.copernicus.org/articles/20/3137/2023/, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=148210, DOI: 10.5194/bg-20-3137-2023.  HUMAR, Miha, LESAR, Boštjan, **KRŽIŠNIK, Davor**. Ocena stanja lesenega kipa Japonski festival Tanake Eisakuja = Assessment of the condition of Japanese Festival, a wooden sculpture by Tanaka Eisaku. Acta Silvae et Ligni. [Tiskana izd.]. 2022, [št.] 127, str. 1-12, ilustr. ISSN 2335-3112. https://doi.org/10.20315/ASetL.127.1, https://dirros.openscience.si/IzpisGradiva.php?id=15125, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=137093, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=137093, https://dirros.openscience.si/IzpisGradiva.php?id=15125, http://www.dlib.si/details/URN:NBN:SI:doc-EE3VE7CG, DOI: 10.20315/ASetL.127.1.  KAVKLER, Katja, HUMAR, Miha, **KRŽIŠNIK, Davor**, TURK, Martina, TAVZES, Črtomir, GOSTINČAR, Cene, DŽEROSKI, Sašo, POPOVIC, Stefan, PENKO, Ana, GUNDE-CIMERMAN, Nina, ZALAR, Polona. A multidisciplinary study of biodeteriorated Celje Ceiling, a tempera painting on canvas. International Biodeterioration & Biodegradation. [Online ed.]. 2022, vol. 170, [article no.] 105389, str. 1-14, ilustr. ISSN 1879-0208. https://www.sciencedirect.com/science/article/pii/S0964830522000178, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=138235, DOI: 10.1016/j.ibiod.2022.105389.  HUMAR, Miha, BALZANO, Angela, **KRŽIŠNIK, Davor**, LESAR, Boštjan. Assessment of wooden foundation piles after 125 years of service. Forests. [Online ed.]. 2021, vol. 12, iss. 2, 1-14 str. ISSN 1999-4907. https://www.mdpi.com/1999-4907/12/2/143, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=127808, DOI: 10.3390/f12020143.  ROMAGNOLI, Manuela, GALOTTA, Giulia, ANTONELLI, Federica, SIDOTI, Giancarlo, HUMAR, Miha, **KRŽIŠNIK, Davor**, ČUFAR, Katarina, PETRIAGGI DAVIDDE, Barbara. Micro-morphological, physical and thermogravimetric analyses of waterlogged archaeological wood from the prehistoric village of Gran Carro (Lake Bolsena-Italy). Journal of cultural heritage. 2018, vol. 33, iss. sep.-oct., str. 30-38, ilustr. ISSN 1296-2074. https://www.sciencedirect.com/science/article/pii/S1296207417306623, DOI: 10.1016/j.culher.2018.03.012.  **KRŽIŠNIK, Davor**, LESAR, Boštjan, THALER, Nejc, HUMAR, Miha. Micro and material climate monitoring in wooden buildings in sub-Alpine environments. Construction & building materials. [Print ed.]. 2018, vol. 166, str. 188-195. ISSN 0950-0618. https://www.sciencedirect.com/science/article/pii/S0950061818301417, DOI: 10.1016/j.conbuildmat.2018.01.118.  HUMAR, Miha, LESAR, Boštjan, ŽAGAR, Andreja, BALZANO, Angela, **KRŽIŠNIK, Davor**. Ocena razkrojenosti lesa v Podzemni slemenski utrdbi Goli vrh = Evaluation of the wood degradation in the underground fort Goli vrh. Les. [Tiskana izd.]. jun. 2019, letn. 68, št. 1, str. 61-70, ilustr. ISSN 0024-1067. http://www.les-wood.si/index.php/leswood/article/view/45/38, http://www.dlib.si/details/URN:NBN:SI:doc-5532RC32, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=126662. |

# VREDNOTENJE ZEMLJIŠČ IN GOSPODARJENJE Učni načrt predmeta/Course syllabus

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| Predmet: | VREDNOTENJE ZEMLJIŠČ IN GOSPODARJENJE |
| Course title: | Land Evaluation and Management |
| Članica nosilka/UL Member: | UL BF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020707 |
| Koda učne enote na članici/UL Member course code: | 58 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 30 | 20 | 10 |  |  | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Helena Grčman |

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| Izvajalci predavanj: | Anka Lisec, Marko Zupan |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij.  Predznanje iz biotehniških, naravoslovnih in tehniških ved. | Enrolment in doctoral study.  Knowledge from the field of biotechnical, natural and technical sciences |

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| Vsebina: | Content (Syllabus outline): |
| Zahteva po trajnostnem upravljanju z zemljišči in po zaščiti tal postaja vse pomembnejša po vsem svetu. Poseg človeka v podeželski prostor bi moral biti v skladu s tremi osnovnimi stebri trajnostnega razvoja, ki vključujejo družbeno, gospodarsko in okoljsko komponento. Cilj predmeta je predstaviti povezavo med človekom in naravo v prostoru, ki jo pomembno odločajo parametri biotopa: geolitološka podlaga, relief, klima in hidrosfera, ki preko flore in favne, naravne in koristne, omogočajo človeku preživetje.  Vsebine:  Tla kot naravni vir-definicije. Nastanek tal. Tlotvorni dejavniki in procesi, tla kot trifazni sistem. Kategorizacija zemljišč na osnovi potencialne rabe in naravnih danosti. Degradacijski procesi v tleh (erozija, zmanjšanje organske snovi, onesnaževanje, pozidava, zbitost tal, zmanjšanje biodiverzitete, zaslanjevanje). Principi in metode gospodarjenja na zemljiščih različnih tipov tal. Principi, tehnike in metode vračanja (rekultivacije) zemljišč v naravne oblike in temu prilagojenega gospodarjenja. Zaraščanje kmetijskih zemljišč, principi, tehnike in metode nove sonaravne rabe. Spreminjanje rabe kmetijskih zemljišč kot posledica procesa urbanizacije v Sloveniji. Vplivi različnih dejavnikov (stvarne pravice in drugi pravni vplivi; naravni dejavniki, kot so lastnosti tal, klima, relief; oddaljenost od večjih središč in naselij, infrastrukture ipd.) na trg in tržno vrednost kmetijskih zemljišč. Ekonomski in okoljevarstveni učinki izkoriščanja naravnih virov (glinokopi, peskokopi kamnolomi) in koncepti njihove sanacije (rekultivacije). Uporaba zemljišč v rekreacijske namene. Vrednotenje zemljišč ob posegih v prostor za različne uporabnike. Presoja vplivov na okolje; elementi, tehnike, napovedi in vrednotenje (rangiranje vplivov). Principi,tehnike in metode varovanja najboljših kmetijskih zemljišč. Uporaba talnega informacijskega sistema za vrednotenje tal kot naravnega vira, rabo v kmetijstvu in gozdarstvu ter pri prostorskem planiranju na ravni države, regije, občine, in projektnih odločitev. Interpretacija laboratorijskih podatkov (fizikalnih, kemijskih, biotičnih), dobljenih iz vzorcev terenskih preiskav. Sistem zemljiške administracije in zemljiškega informacijskega sistema, njuna vloga pri upravljanju zemljišč; metode spremljanja spremembe rabe zemljišč. EU in slovenska zakonodaja na področju varovanja in rabe tal, okoljski standardi in normativi. | The need for sustainable land management and soil protection is becoming more and more important all over the world. Human intervention in the rural areas should be in compliance with the basic three pillars of sustainable development, which includes social, economic and environmental components. The objective of the course is to interpret the connection between a human and nature in the space, which is importantly determined by the elements of biotope: geolithological base, relief, climate and hydrosphere, which through the florae and fauna, natural and advantageous, enable the survival of human.  Contents: Soil as natural source. Soil formation. Factors and processes of soil formation, soil as three-phased system. Land categorisation based on the land use potential and natural characteristics. Soil degradation processes (erosion, decline in organic matter, local and diffuse contamination, sealing, compaction, decline in bio-diversity and salinisation.). Management principles and methods of different soil types. Principles, techniques and methods of land re-cultivation in natural forms, the adjusted land management. Overgrowing of agricultural land, principles, techniques and methods of new sustainable use. Agricultural land use change as the consequence of urbanisation in Slovenia. The influence of different factors (material rights and other legal factors, natural factors, such as soil characteristics, climate, relief, distance to bigger centres, settlements and infrastructure etc.) on land market and market value of agricultural land. Economic and environmental effects of natural sources (clay pits, sand pits, stone pits) and concepts of their sanitation (re-cultivation). Land use for the purpose of recreation. Land evaluation for the purpose of intervention in the space for different users. Environmental assessment; elements, techniques, predictions and assessment (ranging of influences). Principles, techniques and methods for protection of qualitative agricultural land. The use of soil information system for the purpose of soil evaluation as the natural source, on the fields of agriculture and forestry and spatial planning at the state, regional and municipal levels, and project decisions. Interpretation of laboratory data (physical, chemical and biotical) based on the samples acquired in the terrain work. Land administration system and land information system, their role for land management; methods for monitoring land use change. European and Slovenian legislation in the fields of soil protection and land use, environmental standards and norms. |

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| Temeljna literatura in viri/Readings: |
| Brady N. C., Weil R. R., 2014. The nature and properties of soils. Harlow, Pearson education limited: 1046 str. (knjižnica BF)owel,D.,R. 1996. *Soil Science*. Longman.  VIDIC, Nataša J. (avtor, urednik, prevajalec), PRUS, Tomaž, GRČMAN, Helena (avtor, urednik), ZUPAN, Marko (avtor, urednik), LISEC, Anka (avtor, urednik), KRALJ, Tomaž, VRŠČAJ, Borut, RUPREHT, Janez, ŠPORAR, Marjan, SUHADOLC, Marjetka, MIHELIČ, Rok, LOBNIK, Franc (avtor, urednik), JONES, Arwyn (urednik), MONTANARELLA, Luca (urednik). Tla Slovenije s pedološko karto v merilu 1:250000 = Soils of Slovenia with soil map 1:250000. Luxembourg: Evropska komisija, Skupni raziskovalni center (JRC): = European Commission Joint Reaearch Centre (JRC): Publications Office of the European Union, 2015. 152 str., 13 str. pril. zvd., [13] str. pril. plastificiranih zvd., [3] str. zganj. pril., ilustr. [EUR Scientific and Technical Research Series], no. 25212 EN. ISBN 978-92-79-23063-9. ISSN 1018-5593. http://soil.bf.uni-lj.si/projekti/pdf/atlas\_final\_2015.pdf, http://soil.bf.uni-lj.si/projekti/pdf/atlas\_final\_2015\_reduced.pdf, DOI: 10.2788/88750.  Drugi viri:  Lobnik. F, *sodelavci, Študijski pripomocki za študente na CD-ju.*  Digitalna pedološka karta *v merilu 1: 25 000*  Digitalna pedološka karta *v merilu 1: 250.000* |

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| Cilji in kompetence: | Objectives and competences: |
| Razumevanje lastnosti tal v povezavi s tlotvornimi dejavniki in omejitvami za različne rabe prostora. Poznavanje sistemov vrednotenja tal in prostorskih podatkovnih baz pri podpori odločanja in načrtovanja v prostoru.  Študent spozna sistem presoje vplivov na okolje, metode upravljanja in nadzora rabe zemljišč. Spozna podatkovne baze o tleh (TIS-talni informacijski sistem) in zemljiščih ter njihovo uporabo v kombinaciji z drugimi bazami (GIS) za vrednotenje prostora in gospodarjenja z zemljišči. | Understanding of soil properties in relation to soil forming factors and constraints for different land uses. Knowledge of land evaluation systems and spatial databases to support decision making and spatial planning.  Student becomes familiar with the environmental assessment techniques, land management methods and land use control. He/she gets insight into soil databases (soil information system) and land databases, their use in combination with other databases (GIS) for evaluation of the space and land management. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Študentje pridobijo teoretična in praktična znanja.  Prenos znanj v prakso, kreacija razvoja in raziskav. | Knowledge and understanding:  The students obtain theoretical and practical knowledge.  Transfer the knowledge into practice, creation of new development and research. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Poleg predavanj, ki vključujejo multimedijske pripomočke (ppt, video, spletne strani, izvedeni projekti) so sestavni del tudi seminarji in vaje, ki od študenta zahtevajo individualno delo in skupinsko diskusijo. | Lectures with multimedia support and seminars, exercises which require individual work and group discussion. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Seminar | 50,00 % | Seminar |
| Izpit | 50,00 % | Exam |

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| Ocenjevalna lestvica: | Grading system: |
| 5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10 | 5 - 10, a student passes the exam if he is graded from 6 to 10 |

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| Reference nosilca/Lecturer's references: |
| **Helena Grčman**  GRČMAN, Helena, TURNIŠKI, Rok, SUHADOLC, Marjetka. Evtrična rjava tla – najboljša kmetijska tla v Sloveniji = Eutric cambisols – Slovenia’s best agricultural soils. *Geodetski vestnik : glasilo Zveze geodetov Slovenije*. [Tiskana izd.]. 2023, letn. 67, št. 3, str. 297-324, ilustr. ISSN 0351-0271. <https://www.geodetski-vestnik.com/arhiv/67/3/297_Grcman_at_al.pdf>, <https://repozitorij.uni-lj.si/IzpisGradiva.php?id=151731>, DOI: [10.15292/geodetski-vestnik.2023.03.297-324](https://dx.doi.org/10.15292/geodetski-vestnik.2023.03.297-324). [COBISS.SI-ID [168861955](https://plus.cobiss.net/cobiss/si/sl/bib/168861955)]  ZUPAN, Marko, ZUPANC, Vesna, GRČMAN, Helena. The effects of temporary occupation of agricultural land by gravel deposits and construction on selected soil properties. *Acta agriculturae Slovenica*. [Spletna izd.]. 2022, vol. 118, no. 1, 9 str. ISSN 1854-1941. <http://ojs.aas.bf.uni-lj.si/index.php/AAS/article/view/2415/582>, <https://repozitorij.uni-lj.si/IzpisGradiva.php?id=135954>, <http://www.dlib.si/details/URN:NBN:SI:doc-UO22ZX0G>, DOI: [10.14720/aas.2022.118.1.2415](https://dx.doi.org/10.14720/aas.2022.118.1.2415). [COBISS.SI-ID [103353603](https://plus.cobiss.net/cobiss/si/sl/bib/103353603)]  TURNIŠKI, Rok, ZUPANČIČ, Nina, GRČMAN, Helena. Geochemical evidence of illuvial processes in clay-rich soils on limestones in a humid temperate climate. Geoderma. [Print ed.]. 2023, vol. 429, art. 116266, 15 str. ISSN 0016-7061. https://www.sciencedirect.com/science/article/pii/S0016706122005730, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=142890, DOI: 10.1016/j.geoderma.2022.116266.  [COBISS.SI-ID 131422467]  TURNIŠKI, Rok, GRČMAN, Helena, ZUPAN, Marko. Understanding the “acric” Illuvial soils in Slovenian soil classification in relation to Acrisols. *Geoderma regional*. 2022, vol. 29, art. e00522, 8 str., ilustr. ISSN 2352-0094. <https://www.sciencedirect.com/science/article/pii/S2352009422000426?via%3Dihub>, <https://repozitorij.uni-lj.si/IzpisGradiva.php?id=136763>, DOI: [10.1016/j.geodrs.2022.e00522](https://dx.doi.org/10.1016/j.geodrs.2022.e00522). [COBISS.SI-ID [108420099](https://plus.cobiss.net/cobiss/si/sl/bib/108420099)]  GRČMAN, Helena, ZUPANC, Vesna. Odmerjanje odškodnin za poškodbe kmetijskih zemljišč ob njihovi začasni zasedenosti = Compensation for soil degradation after easement of agricultural land for a fixed period. Geodetski vestnik : glasilo Zveze geodetov Slovenije. [Tiskana izd.]. 2018, letn. 62, št. 2, str. 235-248, ilustr. ISSN 0351-0271. http://www.dlib.si/details/URN:NBN:SI:doc-72Q1OGOX, DOI: 10.15292/geodetski-vestnik.2018.02.235-248. [COBISS.SI-ID 9000057] |

# ZAŠČITA HIDROSFERE Učni načrt predmeta/Course syllabus

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| Predmet: | ZAŠČITA HIDROSFERE |
| Course title: | Protection of Hydrosphere |
| Članica nosilka/UL Member: | UL FGG |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020708 |
| Koda učne enote na članici/UL Member course code: | 59 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 30 | 10 |  |  |  | 210 | 10 |

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| Nosilec predmeta/Lecturer: | Nataša Atanasova |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Slovenščina |
|  | Vaje/Tutorial: |  |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij.  Predznanje matematike, fizike ter drugih naravoslovnih in tehniških predmetov. | Enrollment in the doctoral study programme.  Knowledge of mathematics, physics and other natural sciences and technology subjects |

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| Vsebina: | Content (Syllabus outline): |
| * Procesi (samo)čiščenja v naravi, na čistilnih napravah in kanalskih sistemih in njihova inženirska obravnava. * Masna bilanca snovi in osnove inženirske limnologije * Kriteriji za zaščito voda (količina vode, kakovost, kisik, hranila…) * Osnove modeliranja kakovosti rek, jezer, morja, bilanca kisika, hranil, evtrofnost. * Inženirske metode povezovanja naravnih procesov (samočistilne sposobnosti narave) z umetno vodenimi procesi v čistilnih napravah in drugih umetno ustvarjenih sistemih. * Metode zaščite in umetnega bogatenja potalnice * Vplivi antropogenih aktivnosti (urbanizacija, kmetijstvo, industrija) na kakovost vodnih teles: ocena in upravljanje * Vpliv različnih konceptov upravljanja z vodo na kakovost vodnih ekosistemov | * Biochemical processes in aquatic environment and in wastewater treatment plants, * Mass balance and basics of engineering limnology * Criteria for water protection (water quantity, quality, oxygen content…) * Basic modelling for quality of rivers, lakes, seas, oxygen balance, eutrophication. * Engineering methods for connecting natural processes (natural self purification ability) with artificial conducted processes in wastewater treatment plants and other artificially created systems * Protection methods and artificial groundwater recharge * Anthropogenic impacts (urbanization, agriculture, industry) to the quality of water bodies: assessment and management * Impacts of different water management concepts on water ecosystems |

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| Temeljna literatura in viri/Readings: |
| * Steven C. Chapra, 1996. Surface Water Quality Modeling * Jerald L. Schnoor, 1996. Environmental Modeling: Fate and Transport of Pollutants in Water, Air, and Soil. John Wiley & Sons, Inc. * ATANASOVA, Nataša, KOMPARE, Boris. Data Mining and EDSS. In: GARRIDO BASERBA, Manel (Ed.). Environmental Decision Support Systems (EDSSs) : a tool for wastewater management in the XXI century, (Novedar\_Consolider, Vol. 8). [Gerona]: Universitat de Girona, 2011, str. 117-144, ilustr. [COBISS.SI-ID 6055009] * Takashi Asano & all, Water Reuse (2007), Metaclf&EDDY/AECOM, * Lee, C., C, (2007), Handbook of environmental engineering calculations, McGraw Hill, New York, 1770 strani (izbrane vsebine) |

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| Cilji in kompetence: | Objectives and competences: |
| * seznanitev s temeljnimi načeli, osnovnimi metodami, modeli in tehnikami zaščite hidrosfere * spoznavanje metode ekološkega modeliranja in prognoziranja kakovostnih sprememb v rekah, jezerih, morju in podtalnici zaradi antropogenih in naravnih vplivov. * optimiziranje ekološke odločitve in rešitve. | * Learning the basic principles, methods, techniques and models for protection of hydrosphere * Learning the method of ecological modelling and forecast of quality changes in rivers, lakes, sea and groundwater due to anthropogenic and natural influences * Optimizing ecological decisions and solutions |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| * da študent razume pogoje in zakonitosti in zna zasnovati rešitve in predlagati najboljše variante. * zna izdelati in uporabljati matematične modele, pripraviti osnutek rešitev in jih zna komentirati in inženirsko ovrednotiti. | - design solutions and propose the best option  - creating and using mathematical models to evaluate environmental solutions  - capable of interpretation of different solutions by using modeling results |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Uvodn(o)a predavanja, seminarske vaje za utrditev vsebine predavanj in s praktičnimi primeri dela, ter izdelava individualne seminarske naloge na izbrano temo. | Lectures, exercises with practical examples. Preparation of seminar with selected topic. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Zagovor seminarske naloge na izbrano temo, ki je pogoj za pristop k ustnemu izpitu | 60,00 % | Defence of the seminary work on the selected subject |
| Ustni izpit | 40,00 % | Oral exam right after the defence of the seminary work. |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| (1) NIKA, Elisa, GUSMAROLI, Lucia, GHAFOURIAN, Matia, **ATANASOVA**, Nataša, BUTTIGLIERI, Gianluigi, KATSOU, Evina. Nature-based solutions as enablers of circularity in water systems - a review on assessment methodologies, tools and indicators. Water research. 2020, letn. 183, št. sept. 115988, str. 1-19, ilustr. ISSN 0043-1354. https://doi.org/10.1080/15376494.2020.1786755, DOI: 10.1016/j.watres.2020.115988. [COBISS.SI-ID 23012099]  (2) RADINJA, Matej, COMAS, Joaquim, COROMINAS, Lluis, **ATANASOVA**, Nataša. Assessing stormwater control measures using modelling and a multi-criteria approach. Journal of environmental management. 2019, letn. 243, št. avg., str. 257-268, ilustr. ISSN 0301-4797. https://www.sciencedirect.com/science/article/pii/S0301479719305699, DOI: 10.1016/j.jenvman.2019.04.102. [COBISS.SI-ID 8801889]  (3) VOLF, Goran, **ATANASOVA**, Nataša, ŠKERJANEC, Mateja, OŽANIĆ, Nevenka. Hybrid modeling approach for the northern Adriatic watershed management. Science of the total environment. sept. 2018, letn. 635, str. 353-363, ilustr. ISSN 0048-9697. https://doi.org/10.1016/j.scitotenv.2018.04.094, DOI: 10.1016/j.scitotenv.2018.04.094. [COBISS.SI-ID 8411233]  (4) **ATANASOVA**, Nataša, DALMAU, Montserrat, COMAS, Joaquim, POCH ESPALLARGAS, Manel, RODRIGUEZ-RODA, Ignasi, BUTTIGLIERI, Gianluiggi. Optimized MBR for greywater reuse systems in hotel facilities. Journal of environmental management, ISSN 0301-4797, 2017, letn. 193, št. maj, str. 503-511, ilustr., doi: 10.1016/j.jenvman.2017.02.041. [COBISS.SI-ID 8125793]  (5) ŠKERJANEC, Mateja, **ATANASOVA**, Nataša, ČEREPNALKOSKI, Darko, DŽEROSKI, Sašo, KOMPARE, Boris. Development of a knowledge library for automated watershed modelingM. Environmental Modelling & Software, ISSN 1364-8152. [Print ed.], 2014, letn. 54, str. 60-72. http://www.sciencedirect.com/science/article/pii/S1364815213003204. [COBISS.SI-ID 6485601] |

# ZDRAVSTVENA EKOLOGIJA Učni načrt predmeta/Course syllabus

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| Predmet: | ZDRAVSTVENA EKOLOGIJA |
| Course title: | Health ecology |
| Članica nosilka/UL Member: | UL MF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020709 |
| Koda učne enote na članici/UL Member course code: | 60 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 20 | 40 |  |  |  | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Marjan Bilban |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet /Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Slovenščina |
|  | Vaje/Tutorial: |  |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij. | Enrolment in the doctoral programme. |

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| Vsebina: | Content (Syllabus outline): |
| Zdravje in okolje.  Interakcija človeka in okolja – zgodovinska in sodobna perspektiva.  Dejavniki tveganja v naravnem in delovnem okolju: biološki, fizikalni, kemični in biomehanični dejavniki in njihov vpliv na zdravje prebivalstva.  Osnovne zahteve za zdravo okolje: zrak, voda, živila,bivalno okolje.  Spremljanje indikatorjev razmer v okolju.  Opredelitev specifičnih vplivov na zdravje: ocena tveganja za zdravje, obvladovanje okoljskega tveganja za zdravje.  Javno zdravje.  Zdravstvene ekologija v izrednih razmerah.  Zdravstveno varstvo posebnih skupin prebivalstva.  Pomembnejši dejavniki delovnega okolja in vpliv na zdravje populacije.  Kazalci negativnega zdravja.  Veliki javno zdravstvenim problemi.  Etika v javnem zdravju.  Seminarji: predstavitev specifičnih tem zdravstvene ekologije, na katerih je slušatelj opravljal dosedanje delo oz. raziskave s pokritjem najpomembnejše problematike zdravstvene ekologije slovenskega prostora (zrak, voda, delovno in bivalno okolje, sevanje, ergonomija…).  Seminarji: predstavitev specifičnih tem zdravstvene ekologije, na katerih je slušatelj opravljal dosedanje delo oz. raziskave s pokritjem najpomembnejše problematike zdravstvene ekologije slovenskega prostora (zrak, voda, delovno in bivalno okolje, sevanje, ergonomija…). | Health and the environment.  Interaction of man and environment – historical and contemporary perspectives.  Risk factors in the natural and occupational environments: biological, physical, chemical, and biomechanical factors and their impact on general public health.  Essentials of a healthy environment: air, water, foodstuffs, living environment.  Tracking the indicators of environmental conditions.  Determination of specific health effects: environmental health risk assessment and management.  Public health.  Health ecologies in emergency situations.  Healthcare for special population groups.  Important factors of the occupational environment and their influence on general public health.  Negative health indicators.  Major public health issues.  Ethics in public health.  Seminars: presentation of specific areas of health ecology in which the candidate had been working in the past or carried out research covering the most pressing issues of health ecology of Slovenia (air, water, occupational and residential environment, radiation, ergonomics ...). |

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| Temeljna literatura in viri/Readings: |
| * 1. Bilban, M.: *Medicina dela za študente tehniške varnosti*. ZVD, Ljubljana 2005. * 2. Valić, F.: *Zdravstvena ekologija*. Medicinska naklada, Zagreb 2001. * 3. Yassi, A., et al.: *Basic Environmental Health*. Oxford University Press 2001. * 4. Eržen, I. (ur.): *Zdravje in okolje* – izbrana poglavja. MF UM, Maribor 2010. * 5. Čakš, T., et al.: *Priročnik iz higiene*. Inštitut za higieno, MF UL, Ljubljana 2002. * 6. Zaletel Kragelj, L., I. Eržen, M. Premik: *Uvod v javno zdravje*. Katedra za javno zdravje, MF UL, Ljubljana, 2007. * 7. Bilban, M.: *Medicina dela*. ZVD, Ljubljana 1999. * 8. Bilban, M.: *Medicina dela za zdravnike družinske medicine*. SZD – ZMDPŠ, Ljubljana 2002. * 9. Sušnik, J.: *Ergonomska fiziologija*, Didakta, 1992. * 10. Šarić, M., E. Žuškin: *Medicina rada i okoliša*, Medicinska naklada, Zagreb 2002. * 11. Vidaković, A.: *Medicina rada*. KCS – Institut za medicinu rada i radiološku zaštitu, Udruženje za medicinu rada Jugoslavije, Beograd 1996 in 1997. |

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| Cilji in kompetence: | Objectives and competences: |
| Študentke in študenti bodo spoznali vplive širšega in ožjega bivalnega okolja ter delovnega okolja na človekovo zdravje, bodisi v dobrem-pozitivnem, bodisi v slabem-negativnem smislu.  Cilj predmeta je približati razumevanje pomena zagotavljanja osnovnih predpogojev za zdravo življenjsko in delovno okolje. | Students will learn about the positive and negative impacts of immediate and general residential and occupational environment on human health.  The course aims to familiarize the student with the importance of essential prerequisites for a healthy residential and occupational environment. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Namen predmeta je tudi študentom pomagati razumeti specifične metode dela pri odkrivanju in obvladovanju škodljivosti v delovnem in bivalnem okolju. | Knowledge and understanding:  The course aims to help students understand the methods involved in the discovery and management of harmful factors in the occupational and residential environment. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja, seminarji, študij primerov, diskusije, nastopi, delo v manjših skupinah – reševanje konkretnih problemov, individualne naloge, spoznavanje realnih razmer. | Lectures, seminars, case studies, discussions, presentations, group work – solving real-life problems, individual assignments, familiarization with actual situations. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Izdelava in zagovor projekta | 100,00 % | Elaboration and presentation of a project |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| **BILBAN, Marjan**, BILBAN-JAKOPIN, Cvetka. Incidence of cytogenetic damage in lead-zinc mine workers exposed to radon. *Mutagenesis*, 2005, let. 20, št. 3, str. 187–191.  **BILBAN, Marjan**. Mutagenetic Testing of Workers Exposed to Toulene-Diisocyanates During Plastics Production Process. *American Journal of Industrial Medicine* 2004, 45: str. 468–474.  **BILBAN, Marjan**, BILBAN-JAKOPIN, Cvetka, OGRINC, D. Cytogenetic tests performed on operating room personnel: the use of anaesthetic gases. *Int. arch. occup. environ. health*, 2005, let. 78, št. 1, str. 60–64. |

# ZGOREVANJE IN PRENOS TOPLOTE V METALURŠKIH REAKTORJIH Učni načrt predmeta/Course syllabus

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| Predmet: | ZGOREVANJE IN PRENOS TOPLOTE V METALURŠKIH REAKTORJIH |
| Course title: | COMBUSTION AND HEAT TRANSFER IN METALLURGICAL REACTORS |
| Članica nosilka/UL Member: | UL NTF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020710 |
| Koda učne enote na članici/UL Member course code: | 61 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 25 | 30 | 35 |  |  | 160 | 10 |

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| Nosilec predmeta/Lecturer: | Borut Kosec |

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| Izvajalci predavanj: | Blaž Karpe, Jakob Lamut |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet /Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Pogoj za vključitev v delo oziroma za opravljanje študijskih obveznosti je vpis v 1. letnik doktorskega študija. | The condition to attend in the teaching course and to perform study obligations is an entry in the first year of doctoral study. |

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| Vsebina: | Content (Syllabus outline): |
| Spoznavanje vrste goriv in njihovih lastnosti. Glede na potrebe procesa določiti ustrezno razmerje goriva in zraka ali zraka z dodanim kisikom. Zgorevanje s čistim kisikom ter njegove prednosti in slabosti. Ugotavljanje količine toplote v plinih na izhodu iz reaktorja in ureditev ukrepov za izkoriščanje te toplote, ki se jo lahko vrača v proces ali pa porabi za druge namene.  Ugotavljanje količine toplote odpadnih plinov iz sestave in temperature. Smotrnost več stopenjskega zgorevanja.  Možnosti in načini izkoriščanja odpadne toplote. Študij prenosa toplote v izmenjalnikih toplote, ki je nato podlaga za izbiro in izračun izmenjalnikov toplote za ogrevanje zraka za zgorevanje. | Understanding the types of fuels and their properties. Depending on the needs of the process to determine the appropriate ratio of fuel and air or air with added oxygen. Special cases with pure oxygen combustion and its advantages and disadvantages. Determination of the amount of heat in the gas at the outlet of the reactor and regulation measures to exploit this heat, which can be returned to the process or for other purposes.  Determination of the amount of heat from the waste gas composition and temperature. Functionality of multi-step combustion.  Possibilities of waste heat exploitation. Study of heat transfer in heat exchangers, which form the basis for the selection and calculation of the heat exchanger for heating air for combustion. |

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| Temeljna literatura in viri/Readings: |
| DESHMUKH, Y.V. *Industrial Heating – Principles, Techniques, Materials, Applications and Design.* London: Taylor & Francis, 2005.  GWYTHER, D.N. *Worked Examples: Heat Transfer, Fuels & Refractories, Fluid Flow and Furnace Technology, The Institution of Metallurgists, Monograph No. 12.* London: The Chameleon Press, 1985.  LINDON, C.T. *Heat Transfer*. New Jersey: Prentice-Hall, 1992.  KAMINSKI, D.A. in JENSEN, M.K. Introduction to Thermal and Fluid Engineering. New York: Wiley International Edition, 2005.  KAVIANY, M. *Principles of Heat Transfer.* New York: John Wiley & Sons, 2002.  LAZIĆ, L. *Numeričke metode u toplinskoj analizi.* Sisak: Sveučilište u Zagrebu, Metalurški fakultet, 2007.  MULLINGER, P. in JENKINS, B. *Industrial and Process Furnaces: Principles, Design and Operation*. Amsterdam: Butterworth-Heinemann, 2008.  OLOMAN, C. *Material and Energy Balances*. London: Imperial College Press, 2009.  *Advances in Heat Transfer,* Elsevier, ISSN: 9780-1237  *Combustion and Flame, Elsevier*, ISSN: 0010-2180  *Gas, Wärme International*, Vulkan Verlag, ISSN: 0368-0932  *International Journal of Heat and Fluid Flow*, Elsevier, ISSN: 0142-727x  *International Communications in Heat and Mass Transfer*, Elsevier, ISSN: 0735-1953  *Progress in Energy and Combustion Science*, Elsevier, ISSN 0360-1285 |

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| Cilji in kompetence: | Objectives and competences: |
| Cilj predmeta Zgorevanje in prenos toplote v metalurških reaktorjih je nadgraditi znanje študentov na področju zgorevanja in mehanizmov prenosa toplote, s poudarkom na aplikaciji znanj na področje metalurških reaktorjev.  Študent se v okviru predmeta usposobi za kompleksno analizo pojavov s področja zgorevanja, prenosa toplote in snovi, metalurških reaktorjev ter njihovega vpliva okolje. Navaja se na samostojno in timsko raziskovalno in projektno delo ter uporabo strokovne literature in drugih - sodobnih virov informacij. | The aim of the course Combustion and heat transfer in metallurgical reactors is to build students' knowledge in the field of combustion and heat transfer mechanisms, with an emphasis on application of knowledge in the field of metallurgical reactors. Students in this course qualifies for analyzing complex phenomena in the field of combustion, heat and mass transfer, metallurgical reactors and their impact environment. Student gets used to independent and team research and project work and the use of literature and other - contemporary sources of information. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Pri predmetu Zgorevanje in prenos toplote v metalurških reaktorjih študent pridobi znanja za kompleksno analizo pojavov s področja zgorevanja, prenosa toplote in snovi, metalurških reaktorjev ter njihovega vpliva okolje.  Študent pridobi znanja o ekološki naravnanosti posameznih tehnoloških procesov in postopkov.  Nauči se pravilnega ravnanja z odpadki, njihovim vplivom na obremenitev okolja ter se seznani z zakonskimi predpisi in standardi.  Študent pri predmetu nadgradi pridobljena znanja s področja prenosa toplote in snovi, toplotne tehnike in industrijskih peči z uporabo eksperimentalnih in numeričnih modelov in simulacij.  Študent se navaja na samostojno sprejemanje odločitev, povezuje in vrednoti analitične, eksperimentalno in numerično dobljene rezultate. Navaja se na samostojno in timsko delo, na projektno in raziskovalno delo, uporabo strokovne literature in sodobnih virov informacij.  Pridobi sposobnosti za samostojno znanstveno raziskovalno delo, razvoj, organizacijo in vodenje industrijskih in temeljnih raziskovalnih projektov. | Knowledge and understanding:  In the course Combustion and heat transfer in metallurgical reactors the student acquires knowledge useful for complex analyses of phenomenon from the fields of combustion, heat and mass transfer, metallurgical reactors, and their impact on the environment.  Student acquires knowledge about the ecological orientation of individual technological processes and procedures. Learn the proper handling of waste, their impact on the environment and become acquainted with the legislative regulations and standards.  Student will deepen the acquired knowledge on the field of Heat and Mass transfer, Thermal engineering, and Industrial Furnaces through the use of experimental methods and numerical simulations.  Student will get accustomed to reach decision individually. Link and asses analytical, experimental and numerical acquired results. Gets accustomed to individual and team, project and research work, and expert literature and modern information sources application.  Student will acquire knowledge for individual scientific work, development, organization and conduction of industrial and fundamental scientific and research projects. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja, računske vaje in simulacije.  Računalniške simulacije in eksperimentalno delo.  Samostojno reševanje postavljenih problemov.  Individualno raziskovalno in projektno delo. | Lectures. Exercises solving and simulations.  Computer simulations and experimental work.  Team and individual problem solving.  Project work. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Končno oceno predmeta sestavljajo: ocena projektnega dela | 35,00 % | The mark is composed of: the mark of project work |
| Ocena ustnega dela izpita | 35,00 % | The mark of the oral examination |
| Ocena pisnega dela izpita | 30,00 % | The mark of written examination |
| Način opravljanja izpita: 1. ustni /pisni izpit – teorija in naloge, reševanje odprtih nalog (problemov), izdelava in uspešen zagovor projektnega dela. 2. Predmet se zaključi z izpitom, ki ga sestavljata pisni in ustni del. |  | Type of examination: 1. Oral /written examination – theory and calculation tasks, solving case studies, successfully presented project work. 2. The course ends with passing the examination which is composed of written and oral examination |
| Opravljen ustni del izpita velja 3,5 ECTS kredita, opravljen pisni del 3 ECTS kredita ter opravljeno projektno delo 3,5 ECTS kredita. |  | Passed oral exam: 3.5 ECTS credit, Passed written exam: 3 ECTS credit and successfully presented project work: 3.5 ECTS credit. |
| Opravljeno in uspešno predstavljeno projektno delo je pogoj za pristop k pisnemu in ustnemu izpitu. |  | Completed and successfully presented project work is required before taking the written and oral exam. |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| **Borut KOSEC**  **KOSEC, Borut**, BREZIGAR, Matjaž, KOSEC, Gorazd, BERNETIČ, Jure, BIZJAK, Milan. Heat treatment of cold formed steel forgings for the automotive industry. Journal of Achievements in Materials and Manufacturing Engineering, 2007, vol. 22, issue 2, pp. 87-90.  **KOSEC, Borut**, KARPE, Blaž, BUDAK, Igor, LIČEN, Metod, ĐORĐEVIĆ, Miroslav, NAGODE, Aleš, KOSEC, Gorazd. Efficiency and quality of inductive heating and quenching of planetary shafts. Metallurgy, 2012, vol. 51, no. 1, pp. 71-74.  ZORC, Borut, **KOSEC, Borut**, KOSEC, Ladislav, NAGODE, Aleš. Analysis of hot water pipeline system leakage. Engineering Failure Analysis, 2013, vol. 28, pp. 78-81. |

# ZNANOST V DRUŽBENEM IN OKOLJSKEM KONTEKSTU Učni načrt predmeta/Course syllabus

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| Predmet: | ZNANOST V DRUŽBENEM IN OKOLJSKEM KONTEKSTU |
| Course title: | Science in the social and in the environmental context |
| Članica nosilka/UL Member: | UL FF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020711 |
| Koda učne enote na članici/UL Member course code: | 62 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 30 | 30 |  |  |  | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Olga Markič |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Slovenščina |
|  | Vaje/Tutorial: |  |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis na doktorski študij. | Registration in the doctoral study. |

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| Vsebina: | Content (Syllabus outline): |
| Predmet podaja osnovna znanja o medsebojnim prežemanjem znanosti in družbe, o etični in okoljski problematiki znanosti. Glavne teme so:  - družbeni značaj znanstvenega znanja,  - znanost kot norma racionalnosti, kot produktivna sila, kot družbeni kapital,  - kritična razmerja med znanostjo/tehniko, demokracijo in civilno družbo,  - okoljska tveganja, znanost in družba,  - etične dileme razvoja znanosti in tehnike v kontekstu trajnostnega razvoja.  Posamezni problemski sklopi bodo po uvodni razlagi obravnavani skozi analizo izbranih besedil. | The subject gives the basic knowledge on the mutual pervasion of science and society, on ethical and ecological problems of science. The main themes are:  Social nature of scientific knowledge,  Science as the norm of rationality, as a productive force, and as a social capital,  Critical relationships between science/technology, democracy and civil society,  Ecological risks, science and society,  Ethical dilemmas of the development of science and technology in the context of sustainable development.  Some individual problem topics will be discussed after the introductive explanation, by the analysis of the selected texts. |

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| Temeljna literatura in viri/Readings: |
| Beck, Ulrich (1992): Risk Society. Towards a New Modernity. Sage: London.  Fuller, Steve (1999): The Governance of Science: Ideology and the Future of Open Society. Open  Univ. Press: Buckingham/Phil.  Kitcher, Philip (2001): Science, Truth and Democracy. Oxford Univ. Press: Oxford.  Lacey, Hugh (1999): Is Science Value-Free? Values and Scientific Understanding. Routledge: London.  Strydom, Piet (2002): Risk, Environment and Society Ongoing Debates,Current Issues and Future  Prospects. Open University Press: Buckingham. |

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| Cilji in kompetence: | Objectives and competences: |
| Prepoznavanje družbene pomenljivosti znanstvenih spoznanj ter odgovornosti načrtovalcev za:   * posege v naravno, družbeno in kulturno okolje, * razumevanje družbene, kulturne in etične problematike sodobnih znanosti, * prevpraševanje vloge znanosti v rizični družbi. | Reconsideration of the social relevance of scientific knowledge and the responsibility of the planners for the   * Interventions in natural, societal and cultural environment, * Understanding of societal, cultural and ethical problems of modern science, * Request of the role of science in the risk society. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  razumevanje problematike, povezane z družbeno, kulturno in etično relevantnostjo znanstvenih in tehničnih dosežkov,  poznavanje povezav med epistemološko, socialno in etično problematike sodobnih znanosti,  sistemsko razumevanje dinamičnih procesov v naravi in družbi,  poznavanje medsebojnih razmerij med civilno družbo, znanostjo in tehniko. | Knowledge and understanding:  Understanding of problems, connected with social, cultural and ethical relevance of scientific and technical achievements,  Knowledge of links between epistemological, social and ethical problems of modern science,  Systemic understanding of dynamical processes in nature and society,  Knowledge of the interrelationships between civil society, knowledge and technology. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja in seminarji. | Lectures and seminars. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Ustni izpit | 70,00 % | Oral examination |
| Naloge | 30,00 % | Coursework |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| MARKIČ, Olga. The philosophical framework for understanding neuroscientific research. *Interdisciplinary description of complex systems*, ISSN 1334-4684, 2013, vol. 11, iss. 4, str. 351-362, doi: [10.7906/indecs.11.4.1](http://dx.doi.org/10.7906/indecs.11.4.1). [COBISS.SI-ID [53514594](http://cobiss.izum.si/scripts/cobiss?command=DISPLAY&amp;base=COBIB&amp;RID=53514594)]  URŠIČ, Marko, MARKIČ, Olga, ULE, Andrej*. Mind in nature : from science to philosophy*, (World Philosophy Series). New York: Nova Science Publishers, cop. 2012. 226 str., ilustr. ISBN 978-1-62081-267-9. ISBN 1-62081-267-3. [COBISS.SI-ID [49263714](http://cobiss.izum.si/scripts/cobiss?command=DISPLAY&amp;base=COBIB&amp;RID=49263714)]  MARKIČ, Olga. Ethical implications of mechanistic approach. V: MARKIČ, Olga (ur.), et al. *Kognitivna znanost : zbornik 17. mednarodne multikonference - IS 2014, 9-10 oktober 2014, [Ljubljana, Slovenia] : zvezek C = Cognitive sciences* Ljubljana: Institut Jožef Stefan, 2014, str. 117-120. [COBISS.SI-ID [56830818](http://cobiss.izum.si/scripts/cobiss?command=DISPLAY&amp;base=COBIB&amp;RID=56830818)] |

# ZRAK, KLIMA IN VODE Učni načrt predmeta/Course syllabus

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| Predmet: | ZRAK, KLIMA IN VODE |
| Course title: | AIR, WATER AND CLIMATE |
| Članica nosilka/UL Member: | UL FGG |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020630 |
| Koda učne enote na članici/UL Member course code: | 6 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 40 | 20 |  |  |  | 190 | 10 |

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| Nosilec predmeta/Lecturer: | Matjaž Mikoš |

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| Izvajalci predavanj: | Mitja Brilly, Lučka Kajfež Bogataj, Matjaž Mikoš, Gregor Skok |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Temeljni predmet/core course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Angleščina, Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij. | Enrolment in doctoral studies. |

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| Vsebina: | Content (Syllabus outline): |
| Dinamika in termodinamika ozračja:  Sestava atmosfere, osnovne meteorološke količine, polje zračnega pritiska in njegove spremembe, kvazistacionarna polja vetrov v višinah in vetrovi pri tleh, sinoptične meteorološke tvorbe. Diabatne in adiabatne spremembe, hidrostatična stabilnost, konvekcija, vlaga v zraku, fazne spremembe za vodo v ozračju, nastanek oblakov, megle in padavin. Energijska bilanca tal. Sinoptični pojavi in tvorbe (cikloni, anticikloni, fronte, frontogeneza) in mezo meteorološki pojavi (nevihte). Analiza in prognoza, osnove vremenske napovedi, numerična napoved vremena.  Sevanje v ozračju:  EM spekter, zakoni sevanja, prehod sevanja skozi medij. Sončno sevanje pri jasnem nebu, solarna konstanta, oslabitev pri prehodu skozi ozračje. Aerosol in sipanje ter absorpcija sončnega sevanja. Planetarni albedo. Dolgovalovno sevanje, absorptivnost ozračja, emisivnostza pretok, divergenca toka sevanja in segrevanje oz. ohlajanje plasti zraka ter tal. Povečevanje absorptivnosti ozračja zaradi emisij “plinov tople grede”, delež vodne pare, aerosolov in antropogenih plinov pri tem. Sevalna bilanca Zemlje danes, v preteklih geoloških obdobjih in izgledi za bodočnost.  Onesnaženost zraka:  Viri, trajektorije in disperzija, lokalno gibanje zraka pod temperaturno inverzijo. Modeliranje polja vetra; razne interpolacije meteoroloških polj, variacijska analiza in masno konsistentni modeli vetra, splošna zgradba numeričnega modela za ozračje. Vertikalna stabilnost ozračja, kapacitete konkavnih reliefnih oblik in plasti zraka pri tleh pod stabilnimi plastmi ozračja za onesnaževanje. Difuzijska enačba - analitične in numerične rešitve, poenostavitve pri tem in uporabnost enačbe. Spoznavanje modeliranja vetrovnih polj v prostem ozračju in pri tleh ter s turbulentno disperzijo. Pridobitev zmožnosti za kritično oceno kdaj je primerna uporabo različnih modelov transporta in disperzije primesi v zraku.  Klima:  Fizikalni dejavniki, ki oblikujejo klimo. Klimatski sistem in njegovo modeliranje: principi in problemi, vrste modelov. Modeli energijske bilance, enodimenzionalni sevalno-konvekcijski modeli in modeli splošne cirkulacije ozračja. Vzroki variabilnosti klime, fluktuacije klime, klimatske spremembe. Antropogeni vplivi na klimo, emisije plinov tople grede. Opazovana klimatska nihanja v 19. in 20. stoletju, prognoze klime 21. stoletja. Rezultati GCM in prognoze regionalnih ter lokalnih klimatskih sprememb.  Hidrologija (definicije, pomen in zgodovinski razvoj), Kroženje vode in energije v naravi (energijska in vodna bilanca, hidrološki krog, porazdelitev vode v prostoru, izkoriščanje vodnih virov, podnebna spremenljivost), Lastnosti vode (fizikalne in kemične lastnosti vode ter njihov pomen za pojave v naravi). Površinski odtok (osnovne zakonitosti površinskega toka vode, koeficient odtoka, hidrogram odtoka). Erozija in transport sedimentov (izvori plavin, rečna erozija, prodonosnost in kalnost, človekovi vplivi). Podpovršinske vode (oblike vode v tleh, lastnosti poroznega prostora, dinamika vode in snovi v topljivih v vodi). Hidrometrija (Meritve gladin, hitrosti, pretokov in kakovosti vode, meritve vodne erozije, meritve kalnosti in prodonosnosti, metode in točnost meritev). Uporaba statistike v hidrologiji (povratna doba, testiranje hidroloških hipotez, analize vzorcev). Hidrološki modeli (klasifikacija, uporaba, osnove teorije sistemov, regionalizacija, HEC modeli, Modflow, eksperimentalana povodja, napovedi hidroloških pojavov, vodna bilanca). Vplivi na vodni režim (vplivi na količine in kakovost voda in njihovo vrednotenje). Informacijski sistemi voda (hidrografski šifrant, registri in katastri objektov in pojavov, kategorizacije vodotokov). Dejavnosti na vodah (izkoriščanje vodnih sil, zaščita pred škodljivim delovanjem voda, ribištvo, rekreacija, melioracije, oskrba z vodo, čiščenje voda, plovba). Vodna infrastruktura (vodne zgradbe, kataster, vzdrževanje). Vodarstvo (izhodišča za politiko na vodah, doktrine vodnega prava, vodne pravice in soglasja, standardi, načrti, reševanje problemov). | Dynamics and thermodynamics of the atmosphere:  Composition of the atmosphere, basic meteorological quantities, air pressure fieldand its changes,quasistationarywind fields at upper levels and at close to the ground, synoptic meteorological phenomena. Diabatic and adiabatic processes, hydrostatic stability, convection, moisture in the air, phase change of water in the atmosphere, formation of clouds, fog and precipitation. Energy balance of the soil. Synoptic phenomena and processes (cyclones, anticyclones, fronts, frontogenesys) and meso-meteorological phenomena (storms). Weather analysis and forecast, concept of weather forecast, numerical weather prediction.  Radiation in the atmosphere:  EM spectrum, radiation laws, transferof radiation through a medium. Solar constantsolarradiation at clear sky, attenuation through the atmosphere. Aerosol and scattering, absorption of solar radiation. Planetary albedo. Long-wave radiation, atmospheric absorptivity, emissivity for radiation flux, flux divergence and heating/cooling of air layers and of soil by radiation. The increase in absorptivity/emissivity atmosphere due to increased emissions of "greenhouse gases", the share of water vapour, aerosols and anthropogenic gases at it. Radiation balance of the Earth today, in past geological periods and outlook for the future.  Air pollution:  Sources, trajectories and dispersion, local air movement below temperature inversion. Modelling of wind fields, various interpolation of meteorological fields, variational analysis and mass-consistent wind models, the general structure of the numerical model of the atmosphere. Vertical stability of the atmosphere, pollution potentials of concave relief forms and of the air below stable layers. Diffusion equation - analytical and numerical solutions to simplify this equation and its use. Understanding the modelling of wind fields in the free atmosphere and of the turbulent dispersion. Acquisition of the ability to critically evaluate which models of transport and dispersion of pollutants are appropriate for a particular case.  Climate:  Physicalfactorsthatshapeclimate. Theairconditioningsystemanditsmodeling: principlesandproblems, typesofmodels. Energybalancemodels, one-dimensionalradiation-convectionmodelsandatmospheric general circulationmodels. Thecausesofclimatevariability, climatefluctuations, climatechange. Anthropogenicinfluences on climate, emissionsofgreenhousegases. Theobservedclimateoscillations in the 19th and 20 century, climateforecasts 21st century. GCM resultsandprognosisofregionalandlocalclimatechange.  Hydrology (definition, importance and historical development), water cycle and energy in nature (energy and water balance, hydrological cycle, water distribution in space, the exploitation of water resources, climate variability), water characteristics (physical and chemical properties of water and their significance for phenomena in nature). Surface runoff (basic laws of overland flow, runoff coefficient, runoff hydrograph). Erosion and sediment transport (sources of sediments, river erosion, bedload transport and turbidity, human impacts). Subsurface water (water forms in the soil pore space properties, the dynamics of water and substances in water - solubles). Hydrometry (measurements of water level, velocity, flowrate and water quality, water erosion measurements, measurements of turbidity and bedload transport, methods and accuracy of the measurements). The use of statistics in hydrology (return period, hydrologic testing hypotheses, analysis of samples). Hydrological models (classification, application, and systems theory, regionalization, HEC models, MODFLOW, experimental river basins, hydrologic phenomena predictions, water balance). Impacts on the water regime (effects on quantity and quality of water and heir evaluation). Information systems water (hydrographic coding, registers and inventories of objects and phenomena, the categorization of rivers). Activities on waters (use water forces, protection against harmful effects of water, fisheries, recreation, land drainage, water supply, water treatment, navigation). Water infrastructure (water building cadastre maintenance). Hydrology (baseline for policy on water, the doctrine of water law, water rights and approvals, standards, plans, problem solving). |

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| Temeljna literatura in viri/Readings: |
| - Rakovec J., Vrhovec T.: Osnove Meteorologije za naravoslovce in tehnike. Ljubljana, DMFA-založništvo, 2007, 313 str., ISBN978-961-212-111-2.  - S. Gaberšek, G. Skok, R. Žabkar: Rešene naloge iz osnov meteorologije, DMFA-založništvo, 2007, 85 str. ISBN 978-961-212-199-0.  - Kajfež-Bogataj, L.: Vaje iz meteorologije. Ljubljana: Oddelek za agronomijo Biotehniškefakultete, 1996. 98 str., ISBN.961-90148-6-3.  - C. D. Ahrens, Essentials ofMeteorology (withMeteorologyNowandInfoTrac). 2004. ISBN-10 0534422640 ISBN-13 9780534422646.  - J. Houghton: ThePhysicsofAtmospheres, Cambridge Univ. Press, 2002, ISBN 0-512-80456-6.  - J. Houghton: Globalwarming : thecompletebriefing. Cambridge UniversityPress, 1997, XV+251 str ISBN 0-521-62089-9.  - Warneck P.: ChemistryoftheNaturalAtmosphere. San Diego [etc.], AcademicPress,1988. – XIII, 757 str., ISBN 0-12-735630-4.  - M. Z. Jacobson: Atmosphericpollution : history, science, andregulation, Cambridge UniversityPress, 2002.  - XI +399 str. ISBN 0-521-81171-6.  - MIKOŠ, Matjaž, MASTNAK, Martin. Navodila za program HEC-RAS : verzija 2.1. Ljubljana: FGG, Katedra za splošno hidrotehniko, 1998. 97 f., ilustr.  - Gardiner J.L.: 1991 River Projects and Conservation - A Manual for Holistic Appraisal, John Wiley&Sons, N.Y.  - Grigg N.S., 1996, Water resources management, , McGraw-Hill, Inc.,  - McCuen, R W.:. 1986, Hydrologic Modeling, Snyder.  - Maidment D. R., 1993, Handbook of Hydrology, McGraw-Hill, Inc.,  - UNESCO: 1994, Applied Hydrology for Technicians. |

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| Cilji in kompetence: | Objectives and competences: |
| Spoznavanje tistih fizikalnih procesov v ozračju, ki opredeljejo vreme in vremenske tvorbe, gibanje zraka in disperzijo v ozračju. Spoznavanje procesov sevanja v ozračju. Spoznavanje fizikalnih dejavnikov klime. Razumevanje celovitosti vodnega režima, spoznavanje značilnosti posameznih vrst dejavnosti na vodah, razumevanje načel in metod urejanja. Seznanjanje s hidrološkimi modeli, modeliranje vodne bilance in onesnaženja voda. Ugotavljanje vplivov na vodni režim vključno s podnebno spremenljivostjo. | Getting to know those physical processes in the atmosphere, defined weather and weather formations, air movement and dispersion in the atmosphere. Understanding the processes of radiation in the atmosphere. Understanding the physical factors of climate. Understanding the integrity of the water regime, getting to know the characteristics of certain types of activities in waters understanding of the principles and methods of regulation. Pair with hydrological models, modeling the water balance and water pollution. To determine the impact on the water regime including climate variability. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Pridobivanje znanja o dinamiki v ozračju in klimatskih spremembah, režimu voda v okolju in delovanju naravnih in antropoloških vplivov.  Meritve hidroloških pojavov. | Knowledge and understanding:  The acquisition of knowledge about the dynamics of the atmosphere and climate change, water regime in the environment and operation of natural and anthropological impact.  Measurements of hydrological phenomena. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| Predavanja inseminarske vaje. | Lectures and tutorials. |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Pisni izpit | 50,00 % | Examination |
| Seminarska naloga | 50,00 % | Coursework |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| 1. BEZAK, Nejc, MIKOŠ, Matjaž. Changes in the rainfall event characteristics above the empirical global rainfall thresholds for landslide inititation at the pan-European  level. *Landslides: Journal of the international consortium on landslides.*2021, vol. 18, Nr. 5, str. 1959-1873.  2. BEZAK, Nejc, MIKOŠ, Matjaž. Changes in the compound drought and extreme heat occurrence in the 1961-2018 period at the European scale. *Water:* 2020, vol. 12, Nr. 12/3543, str. 1-13.  3. PETEK, Manca, MIKOŠ, Matjaž, BEZAK, Nejc. Rainfall erosivity in Slovenia: sensitivity estimation and trend detection. *Environmental research: multidisciplinary journl of environmental sciences, ecology, and public health.*2018, vol. 167, Nr. 11, str. 528-535. |

# ŽIVALSKE KUŽNE BOLEZNI IN OKOLJE Učni načrt predmeta/Course syllabus

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| Predmet: | ŽIVALSKE KUŽNE BOLEZNI IN OKOLJE |
| Course title: | INFECTIOUS ANIMAL DISEASES AND THE ENVIRONMENT |
| Članica nosilka/UL Member: | UL VF |

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| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
| Varstvo okolja, tretja stopnja, doktorski | Ni členitve (študijski program) |  |  | izbirni |

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| Univerzitetna koda predmeta/University course code: | 0020712 |
| Koda učne enote na članici/UL Member course code: | 63 |

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| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
| 50 |  |  |  |  | 200 | 10 |

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| Nosilec predmeta/Lecturer: | Peter Hostnik |

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| Izvajalci predavanj: |  |
| Izvajalci seminarjev: |  |
| Izvajalci vaj: |  |
| Izvajalci kliničnih vaj: |  |
| Izvajalci drugih oblik: |  |
| Izvajalci praktičnega usposabljanja: |  |

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| Vrsta predmeta/Course type: | Izbirni predmet/Elective course |

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| Jeziki/Languages: | Predavanja/Lectures: | Angleščina, Slovenščina |
|  | Vaje/Tutorial: | Slovenščina |

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| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
| Vpis v doktorski študij. | Enrollement in the doctoral programme. |

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| Vsebina: | Content (Syllabus outline): |
| Živalske kužne bolezni so vsekakor eden od pomembnejših faktorjev, ki ne vpliva samo na ekonomiko živinorejske proizvodnje, ampak na celotno družbeno dogajanje. Poznane so številne živalske kužne bolezni, nekatere med njimi, ki so nevarne tudi za človeka uvrščamo med zoonoze. V pogojih modernega življenja se zaradi uporabe hitrih vrst transporta in številnih migracij živali in ljudi povečujejo možnosti za širjenje živalskih kužnih bolezni. Opažamo pa tudi, da imajo klimatske spremembe izredno pomemben vpliv na pojavljanje kužnih bolezni, saj se v Evropi v zadnjih letih srečujemo z boleznimi, ki smo jih pred nekaj leti uvrščali v skupino eksotičnih bolezni. Nekatere med njimi so izrazito vezane na določene pogoje v okolju, ki lahko pogojujejo in omogočajo njihovo širjenje. Povzročitelji bolezni se iz okuženih živali na zdrave ne prenašajo samo z neposrednim kontaktom, ampak lahko v naravi nastopajo različni živi in neživi vektorji prenosa. Poznavanje tovrstnih vsebin je pomembno pri urejevanju razmerij v okolju in preprečevanju možnosti širjenja živalskih kužnih bolezni po teh poteh. Moderni principi epidemiologije obravnavajo sisteme dejavnikov tveganja, s pomočjo katerih lahko predvidimo poti širjenja živalskih kužnih bolezni in ocenimo stopnjo tveganja za posamezne primere. Slušatelji bi z vsebino tega predmeta pridobili osnovno znanje o pogojih v okolju, ki vplivajo na način in hitrost širjenja živalskih kužnih bolezni. Podana bo temeljna informacija o nekaterih najpomembnejših živalskih kužnih boleznih in zoonozah, predstavitev mehanizmov delovanja živalskih kužnih bolezni in njihove poti širjenja in prenašanja, pomen pogojev v okolju za širjenje živalskih kužnih bolezni in zoonoz (tla, zrak, voda, veter, vektorji). Prikazana bo epidemiologija nekaterih najpomembnejših živalskih kužnih bolezni (steklina, slinavka in parkljevka, BSE, bolezen modrikastega jezika, bolezen zahodnega Nila) in metode preprečevanja širjenja teh živalskih kužnih bolezni z ukrepi v okolju. Širjenje nekaterih bolezni je vezano na posamezne vektorje, kot so insekti , ptice, netopirji. Nekatere spremembe nastale zaradi posegov človeka v okolje lahko bistveno vplivajo na pojav teh bolezni. | Infectious animal diseases are certainly one of the more important factors influencing not only the economics of animal husbandry but also the society as a whole. We know several infectious animal diseases, some of which (zoonoses) pose a threat to humans as well. Modern living conditions that include fast transportation of animals and numerous migrations of animals and people increase the probability of the spread of infectious animal diseases. It has also been observed that climate change is a very important factor in the incidence of diseases: we are currently noticing diseases in Europe that were considered exotic a few years ago. Some are directly linked to certain factors in the environment that enable and influence their spreading. Pathogens are spread from animal to animal not only with direct contact, but also via living and non-living vectors in nature. Knowing these problems is imperative for successful regulation of environmental interactions and prevention of the spread of these diseases. The modern principles of epidemiology employ a system of risk factors that enables us to predict the spread of infectious animal diseases and assess the level of risk for individual cases. Students attending this course will obtain basic knowledge on the environmental conditions that impact the way and rate of the spread of infectious animal diseases. They will obtain basic information on the most important infectious diseases and zoonoses, their mechanisms of action, spread and transmission, as well as the importance of environmental factors for the spread of infectious animal diseases and zoonoses (soil, air, water, wind, vectors). Epidemiology of the most important infectious animal diseases will be shown (rabies, foot and mouth disease, BSE, bluetongue, West Nile virus) and the methods for the prevention of their spread with measures taken in the environment. Spreading of some diseases is linked to vectors such as insects, birds, bats, etc. Some human-induced changes of the environment can significantly impact the occurrence of these diseases. |

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| Temeljna literatura in viri/Readings: |
| - Bauerfeind R and Graevenitz A. (2017): Zoonoses: Infectious diseases transmisible from animals to humans. ASM Press  Swayne DE (2016): Animal influenza, 2nd edition. Wiley Online Library  - Costa T, Akdeniz N. [A **review** of the animal disease outbreaks and biosecure animal mortality composting systems](https://www.ncbi.nlm.nih.gov/pubmed/31088667) Waste Manag. 2019 May 1;90:121-131.  - Alexander DJ (2000). A rewiev of avian influenza in different bird species. Vet Microbiol 74: 3-13.  - Jackson AC (2013): Rabies Scientific Basisi of the Disease and its management. Amsterdam, Elsevier, Academic Press.  - MacLachlan JN., Dubovi EL. (2016): Fenner’s Veterinary Virology. Amsterdam, Elsevier science publishers  - Shipley R, Wright E, Selden D, Wu G, Aegerter J, Fooks AR, Banyard AC. [Bats and Viruses: Emergence of Novel Lyssaviruses and Association of Bats with Viral Zoonoses in the EU.](https://www.ncbi.nlm.nih.gov/pubmed/30736432) Trop Med Infect Dis. 2019 Feb 7;4(1)  - [Head JR](https://www.ncbi.nlm.nih.gov/pubmed/?term=Head%20JR%5BAuthor%5D&amp;cauthor=true&amp;cauthor_uid=31043646)1,2, [Vos A](https://www.ncbi.nlm.nih.gov/pubmed/?term=Vos%20A%5BAuthor%5D&amp;cauthor=true&amp;cauthor_uid=31043646)3, [Blanton J](https://www.ncbi.nlm.nih.gov/pubmed/?term=Blanton%20J%5BAuthor%5D&amp;cauthor=true&amp;cauthor_uid=31043646)4, [Müller T](https://www.ncbi.nlm.nih.gov/pubmed/?term=M%C3%BCller%20T%5BAuthor%5D&amp;cauthor=true&amp;cauthor_uid=31043646)5, [Chipman R](https://www.ncbi.nlm.nih.gov/pubmed/?term=Chipman%20R%5BAuthor%5D&amp;cauthor=true&amp;cauthor_uid=31043646)6, [Pieracci EG](https://www.ncbi.nlm.nih.gov/pubmed/?term=Pieracci%20EG%5BAuthor%5D&amp;cauthor=true&amp;cauthor_uid=31043646)4, [Cleaton J](https://www.ncbi.nlm.nih.gov/pubmed/?term=Cleaton%20J%5BAuthor%5D&amp;cauthor=true&amp;cauthor_uid=31043646)4, [Wallace R](https://www.ncbi.nlm.nih.gov/pubmed/?term=Wallace%20R%5BAuthor%5D&amp;cauthor=true&amp;cauthor_uid=31043646)4. [Environmental distribution of certain modified live-virus vaccines with a high safety profile presents a low-risk, high-reward to control zoonotic diseases.](https://www.ncbi.nlm.nih.gov/pubmed/31043646)Sci Rep. 2019 May 1;9(1):6783.  - Vos A, Freuling C, Ortmann S, Kretzschmar A, Mayer D, Schliephake A, Müller T. [An assessment of shedding with the oral **rabies** virus vaccine strain SPBN **GASGAS** in target and non-target species.](https://www.ncbi.nlm.nih.gov/pubmed/29325820) Vaccine. 2018 Feb 1;36(6):811-817.  - Margot Stuchin, Catherine C. Machalaba, and William B. Karesh (2016). VECTOR-BORNE DISEASES: ANIMALS AND PATTERNS. National Academies Press(US).  - Tuppurainen ESM, Venter EH, Shisler JL, Gari G, Mekonnen GA, Juleff N, Lyons NA, De Clercq K, Upton C, Bowden TR, Babiuk S, Babiuk LA. [**Review**: Capripoxvirus Diseases: Current Status and Opportunities for Control.](https://www.ncbi.nlm.nih.gov/pubmed/26564428) Transbound Emerg Dis. 2017 Jun;64(3):729-745  - Bouguedour R, Ripani A. [**Review** of the foot and **mouth** disease situation in North Africa and the risk of introducing the disease into Europe.](https://www.ncbi.nlm.nih.gov/pubmed/28332653) Rev Sci Tech. 2016 Dec;35(3):757-768.  - Sellon CD and Long TM (2014): Equine infectious Disease. Amsterdam, Elsevier science publishers |

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| Cilji in kompetence: | Objectives and competences: |
| Izobraževalni cilj predmeta je podati osnovna znanja o povzročiteljih aktualnih živalskih kužnih boleznih, o pojavnosti in razširjenosti teh bolezni, o načinih odkrivanja in zatiranja teh bolezni ter vplivih teh bolezni kakot tudi metod zatiranja na okolje. Študent se bo seznanil z osnovnimi epidemiološkimi pristopi vplivov na širjenje živalskih kužnih ter z nekaterimi mehanizmi širjenja bolezni v okolje. Namen tega predmeta je spoznati nekatere aktualne kužne bolezni in vzpodbuditi razmišljanje o pristopih, ki omogočajo zavarovati okolje in človeka pred njihovimi škodljivimi vplivi ter vspodbuditi k povezovanju tehnoloških ali socioloških znanj z biomedicinskimi znanji. | The academic objective of the course is to provide students with basic knowledge on the common causative agents of infectious animal diseases, the incidence and prevalence of these diseases, methods for their detection and control, as well as the impact of both diseases and their treatment on the environment. Students will be familiarised with the basics of epidemiological approaches to the spreading of infectious animal diseases and some mechanisms of their spread in the environment. The aim of this course is to introduce the students to some topical infecitous diseases and encourage them to reflect on approaches that provide protection from their harmful effects to the environment and and to humans. We aim to encourage the students to integrate technological and sociological skills with biomedical methods. |

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| Predvideni študijski rezultati: | Intended learning outcomes: |
| Znanje in razumevanje:  Predmet povezuje znanja iz področja kužnih bolezni živali,epidemiologije in analize rizika z znanjem iz področja vplivov živali na okolje in okolja na živali. | Knowledge and understanding:  The subject connetc the kowledge of animal contagious diseases,epidemiology and risk analysis with knowledge of influence of animals on environement and environemet on animals. |

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| Metode poučevanja in učenja: | Learning and teaching methods: |
| * predavanja * literatura | * lectures * literature |

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| Načini ocenjevanja: | Delež/Weight | Assessment: |
| Izdelava seminarske naloge | 80,00 % | Seminar paper |
| Izpit | 20,00 % | Examination |

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| Ocenjevalna lestvica: | Grading system: |
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| Reference nosilca/Lecturer's references: |
| Zecchin B, De Nardi M, Nouvellet P, Vernesi C, Babbucci M, Crestanello B, Bagó Z, Bedeković T, **Hostnik P**, Milani A, Donnelly CA, Bargelloni L, Lorenzetto M, Citterio C, Obber F, De Benedictis P, Cattoli G. [Genetic and spatial characterization of the red fox (Vulpes vulpes) population in the area stretching between the Eastern and Dinaric Alps and its relationship with rabies and canine distemper dynamics.](https://www.ncbi.nlm.nih.gov/pubmed/30861028)PLoS One. 2019 Mar 12;14(3)  Naglič T, Rihtarič D, **Hostnik P**, Toplak N, Koren S, Kuhar U, Jamnikar-Ciglenečki U, Kutnjak D, Steyer A. [Identification of novel reassortant mammalian orthoreoviruses from bats in Slovenia.](https://www.ncbi.nlm.nih.gov/pubmed/30176848) BMC Vet Res. 2018 Sep 3;14(1):264  **Hostnik P**, Picard-Meyer E, Rihtarič D, Toplak I, Cliquet F. [Vaccine-induced rabies in a red fox (Vulpes vulpes): isolation of vaccine virus in brain tissue and salivary glands.](https://www.ncbi.nlm.nih.gov/pubmed/24484500) J Wildl Dis. 2014 Apr;50(2):397-401.  Pfaff F, Müller T, Freuling CM, Fehlner-Gardiner C, Nadin-Davis S, Robardet E, Cliquet F, Vuta V, **Hostnik P**, Mettenleiter TC, Beer M, Höper D. [In-depth genome analyses of viruses from vaccine-derived rabies cases and corresponding live-attenuated oral rabies vaccines.](https://www.ncbi.nlm.nih.gov/pubmed/29439868) Vaccine. 2018 Feb 10. pii: S0264-410X(18)30156-7. |