UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	GEOKEMIJA OKOLJA
COURSE TITLE:	GEOCHEMISTRY OF THE ENVIRONMENT

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Varstvo okolja in ekotehnologije, 1. stopnja	Modul: Raba in varstvo tal	2. in 3.	/
Environmental Protection and Eco-technologies, 1st level	Module: Use and protection of soil	2nd and 3rd	/

Vrsta predmeta / Course type	Modularni predmet / Modular subject
Univerzitetna koda predmeta / University course code:	GEO

Predavanja Lectures	Seminar Seminar	Sem. Vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
20	/	15	10	/	70	4

Nosilec predmeta / Lecturer:	izr. prof. dr. Borut Vrščaj, Katja Črnec, mag. / Borut Vrščaj, Ph.D., Associate Prof., Katja Črnec, M.sc.

Jeziki / Languages:	**Predavanja / Lectures:**	Slovenski / Slovenian
	Vaje / Tutorial:	Slovenski / Slovenian

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisits:**
Pogojev ni.	No formal prerequisites.

Vsebina:	**Content (Syllabus outline):**
- Pregled vsebin in cilji predmeta. - Izrazoslovje s področja geokemije. - Nastanek Zemlje in tektonika plošč. - Geosfera, prvine in minerali - Predstavniki in kemična sestava glavnih mineralov (primarni, sekundarni minerali; oksidi, karbonati, haloidi, sulfati in sulfidi). - Fizikalne lastnosti mineralov. - Skupine kamnin (magmatske, sedimentne in metamorfne); glavni predstavniki kamnin. - Fizikalno in kemijsko preperevanje kamnin. - Prvine, težke kovine, hranila/onesnaževala. - Geokemična naravna ozadja. - Sfere Zemlje (geosfera, litosfera, pedosfera, hidrosfera, atmosfera, kriosfera, biosfera). - Kroženje prvin in snovi v sferah. - Izbrani geokemični problemi okolja.	- Overview of course content and objectives. - Terminology in the field of geochemistry. - Earth formation and plate tectonics. - Geosphere, elements, and minerals - Representatives and chemical composition of the main minerals (primary, secondary minerals; oxides, carbonates, halides, sulphates, and sulphides). - Physical properties of minerals. - Rock groups (igneous, sedimentary and metamorphic); the main representatives of rocks. - Physical and chemical weathering of rocks. - Elements, heavy metals, nutrients/pollutants. - Geochemical natural backgrounds. - Spheres of the Earth (geosphere, lithosphere, pedosphere, hydrosphere, atmosphere, cryosphere, biosphere). - Cycling of elements and matter in the spheres.

	- Selected geochemical problems of the environment.

Obvezna literatura

- Principles of Environmental Geochemistry, G. Nelson Eby, Waveland Press Inc., 2016.

Priporočena literatura

- Geochemistry, William M.White, Wiley-Blackwell, 2013;
- actual articles and books

Cilji in kompetence:	**Objectives and competences:**
- Poznavanje osnovnega izrazoslovje s področja geokemije. - Nastanek Zemlje in tektonika plošč. - Seznanitev z geosfero, ločevanje med prvinami in minerali. - Seznanitev z bistvenimi kamninotvornimi minerali in njihovo kemično sestavo. - Poznavanje fizikalnih lastnosti mineralov. - Poznavanje nastanka in lastnosti skupin kamnin. - Fizikalno in kemijsko preperevanje kamnin. - Poznavanje bistvenih prvin v okolju. - Poznavanje težki kovine i njihovih geokemičnih naravnih ozadij v Sloveniji. - Poznavanje dileme hranila/onesnaževala. - Seznanitev s sferami zemlje - Sfere Zemlje (geosfera, litosfera, pedosfera, hidrosfera, atmosfera, kriosfera, biosfera). - Poznavanje kroženja prvin in snovi v sferah. - Seznanitev z izbranimi geokemičnimi problemi okolja.	- Knowledge of basic geochemistry terminology. - Earth formation and plate tectonics. - Introduction to the geosphere, separation between elements and minerals. - Introduction to essential rock-forming minerals and their chemical composition. - Knowledge of the physical properties of minerals. - Knowledge of the formation and properties of rock groups. - Physical and chemical weathering of rocks. - Knowledge of essential elements in the environment. - Knowledge of heavy metals and their geochemical natural backgrounds in Slovenia. - Knowledge of the nutrient/pollutant dilemma. - Familiarization with the spheres of the earth - Spheres of the Earth (geosphere, lithosphere, pedosphere, hydrosphere, atmosphere, cryosphere, biosphere). - Knowledge of the circulation of elements and matter in the spheres. - Familiarization with selected geochemical problems of the environment.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Študentje predmeta bodo: - Razumeli temelje geologije. - Razumeli področje geokemije okolja in njegovo povezavo z drugimi vedami. - Razumeli geokemično kroženje snovi. - Razumeli faktorje in procese, ki vplivajo na usodo in prenos onesnažil v različnih sferah okolja. - Razvijali veščine uporabe geokemičnega znanja na praktičnih okoljevarstvenih problemih.	Students will: - Understand the basics of geology. - Understand the field of environmental geochemistry and its connection with other sciences. - Understand the geochemical cycle of matter. - Understand the factors and processes that affect the fate and transfer of pollutants in different spheres of the environment. - Develop skills in applying geochemical knowledge to practical environmental protection problems.

Metode poučevanja in učenja:	**Learning and teaching methods:**

Oblike dela:	**Forms of teaching:**
- predavanja - laboratorijske in terenske vaje - samostojno delo študentov/tk **Metode dela:** - razlaga - dialog, diskusija - preučevanje praktičnih primerov - praktično delo na vajah	- In-class lectures - Laboratory and field work - Individual work of students **Teaching methods:** - Explanation - Discussion, debate - Practical demonstration - Practical work in lab

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
- kolokvij iz praktičnih vaj - pisni izpit Na vajah je obvezna vsaj 90-odstotna prisotnost. Študent mora izdelati seminar in kolokvij, potem lahko pristopi h končnemu pisnemu izpitu Ocenjevalna lestvica: ▪ zadostno 6: 60–67 % ▪ dobro 7: 68–75 % ▪ prav dobro 8: 76–83 % ▪ prav dobro 9: 84–90 % ▪ odlično 10: 91–100 %	**20** **80**	- colloquium of practical work - written exam At least 90% attendance at lab work is required. Students must first pass colloquium of practical work, presented seminar work, which is a prerequisite for final written examination. Grading scale: ▪ Sufficient D (6): 60–67% ▪ Good C (7): 68–75% ▪ Very good B (8): 76–83% ▪ Very good B+ (9): 84–90% ▪ Excellent A (10): 91–100%

Materialni pogoji za izvedbo predmeta :	**Material conditions for subject realization:**
- predavalnica z multimedijsko opremo; - laboratorij in osnovna oprema za prepoznavanje kamnin.	- classroom with the multimedia equipment - laboratory and basic equipment for determination of rocks

Obveznosti študentov:	**Student's commitments:**
- Obvezna udeležba na predavanjih - Opravljene vaje iz geokemije - Opravljen kolokvij iz geokemije	- Mandatory attendance at lectures - Completed exercises in geochemistry - Passed colloquium in geochemistry

Reference nosilca predmeta:	**Lecturer's references:**
Pedagoško delo: ▪ 2021 - <sedaj> Fakulteta za varstvo okolja, Velenje, delovno mesto: izr.prof.dr. nosilec/univ. učitelj premeta Geokemija okolja ▪ 2021 - <sedaj> Fakulteta za varstvo okolja, Velenje, delovno mesto: izr.prof.dr. nosilec/univ. učitelj premeta Tla in okolje ▪ 2008 - 2020 Fakulteta za varstvo okolja, Velenje, delovno mesto: izr.prof.dr. nosilec/univ. učitelj premeta Raba in varstvo tal ▪ 2009 -2017 Univerza v Mariboru, Fakulteta za kmetijstvo in biosistemske vede, delovno mesto: doc. dr., profesor, nosilec /univ. učitelj premetov Tla in okolje, Ekopedologija ter Raba in varstvo tal ▪ 2015 - 2017 Univerza na Primorskem, Fakulteta za matematiko, naravoslovje in informacijske	**Teaching:** ▪ 2021 - <present> Faculty of Environmental Protection, Velenje, Asoc. Prof., teaching Geochemistry of the environment. ▪ 2021 - <present> Faculty of Environmental Protection, Velenje, post: Assoc. Prof., univ.; teaching Soils and environment ▪ 2008 - 2020 Faculty of Environmental Protection, Velenje, post: Assoc. Prof., univ.; teaching Land use and soil protection course ▪ 2009 -2017 University of Maribor, Faculty of Agriculture and Life Sciences, Assist. Professor, subjects: Soils and environment, Ecopedology and Land use and soil protection ▪ 2015 - 2017 University of Primorska, Faculty of Mathematics, Natural Sciences and Information

tehnologije, delovno mesto: doc. dr., profesor, nosilec /univ. učitelj premeta Pedologija in raba tal

- 1984 - 2005 Univerza v Ljubljani, Biotehniška fakulteta, Center za pedologijo in varstvo okolja, delovno mesto: asistent predmetov Pedologija in Ekopedologija.

Raziskovalno delo:

- 2005 - <sedaj> Kmetijski inštitut Slovenije, Oddelek za kmetijsko ekologijo in naravne vire, Center za tla in okolje, delovno mesto: - višji znanstveni sodelavec na domačih in mednarodnih projektih s področja tal in okolja; - predstojnik oddelka.
- 2003 - 2004 EC Joint Research Centre, Institute for Environment and Sustainability, Soil Action, Ispra, Italija, delovno mesto: visiting scientist/ gostujoči znanstvenik za področje tal/pedologije in informatike tal
- 1984 - 2005 Univerza v Ljubljani, Biotehniška fakulteta, Center za pedologijo in varstvo okolja, delovna mesta: asistent za področje pedologije in ekopedologije; raziskovalec na domačih ter FP5 in drugih mednarodnih projektih; vodja laboratorija za pedološko informatiko

Pomembnejša raziskovalna dela:

- Znanstvena monografija **The Soils of Slovenia** (Springer Verlag www.springer.com/la/book/9789401785846)
- Monografija **Tla v okolju:** Lastnosti, pestrost in ekosistemske storitve tal www.mop.gov.si/fileadmin/mop.gov.si/pageuploads/publikacije/tla_v_okolju.pdf
- VRŠČAJ, Borut. Strukturne spremembe kmetijskih zemljišč, njihova urbanizacija in kakovost v obdobju 2002-2007 = The structural changes of agricultural land, their quality and urbanization between 2002-2007. Hmeljarski bilten, ISSN 0350-0756. [Tiskana izd.], 2008, letn. 15, str. 73-84. [COBISS.SI-ID 2870632]
- VRŠČAJ, Borut, POGGIO, Laura, AJMONE MARSAN, Franco. A method for soil environmental quality evaluation for management and planning in urban areas. Landscape and urban planning, ISSN 0169-2046. [Print ed.], 2008, vol. 88, iss. 2, str. 81-94, doi: 10.1016/j.landurbanplan.2008.08.005. [COBISS.SI-ID 2783336],
- VRŠČAJ, Borut, VERNIK, Tomaž. The structural changes of agricultural land, their quality and process of urbanisation in Slovenia between 2002 and 2007. Local land & soil news : the bulletin of the European Land and Soil Alliance (ELSA) e. V., I/09, no. 28/29, str. 28-31. [COBISS.SI-ID 3006056]

Strokovno delo:

- VRŠČAJ, Borut. Tla ali prst? Prispevek k razpravam o rabi izrazov 'tla' in 'prst' v slovenskem poljudnem in strokovnem izrazoslovju. Acta agriculturae Slovenica, ISSN 1581-9175.
- VRŠČAJ, Borut. Uredba in kmetijski ekosistemi. Embalaža, okolje, logistika : strokovna specializirana

Technology, post: assistant professor., teaching Soil Science and land use.

- 1984 - 2005 University of Ljubljana, Biotechnical Faculty, position: teaching assistant Pedology and Ecology.

Research work:

- 2005 - <now> Agricultural Institute of Slovenia, Department of Agricultural Ecology and Natural Resources, Center for Soil and Environment, post: - senior scientific assistant on domestic and international projects in the field of soil and the environment; - Head of Department.
- 2003 - 2004 EC Joint Research Center, Institute for Environment and Sustainability, Soil Action, Ispra, Italy, workplace: visiting scientist in the field of soil science and soil informatics
- 1984 - 2005 University of Ljubljana, Biotechnical Faculty, Pedology and Environmental Protection Center, jobs: Assistant in pedology and ecology; researcher at home and FP5 and other international projects; head of the laboratory for soil informatics
-
- Significant research work:
- Scientific monograph The Soils of Slovenia (Springer Verlag www.springer.com/la/book/9789401785846)
- Monography Soil in the environment: Properties, diversity and ecosystem services of the soil www.mop.gov.si/fileadmin/mop.gov.si/pageuploads/publikacije/tla_v_okolju.pdf
- VRŠČAJ, Borut. Structural changes of agricultural land, their urbanization and quality in the period 2002-2007 = The structural changes of agricultural land, their quality and urbanization between 2002-2007. Hopmine Bulletin, ISSN 0350-0756. [Printed Edition], 2008, year. 15, p. 73-84. [COBISS.SI-ID 2870632]
- VRŠČAJ, Borut, POGGIO, Laura, AJMONE MARSAN, Franco. A method for soil environmental quality assessment for management and planning in urban areas. Landscape and urban planning, ISSN 0169-2046. [Print ed.], 2008, vol. 88, iss. 2, p. 81-94, doi: 10.1016 / j.landurbanplan.2008.08.005. [COBISS.SI-ID 2783336],
- VRŠČAJ, Borut, VERNIK, Tomaž. Local land and soil news: the Bulletin of the European Land and Soil Alliance (ELSA) e. V., I / 09, no. 28/29, p. 28-31. [COBISS.SI-ID 3006056]
-
- Professional work:
- VRŠČAJ, Borut. Tla ali prst? Contribution to discussions on the use of terms 'tla' and 'prst' in Slovene popular and professional terminology. Acta agriculturae Slovenica, ISSN 1581-9175.
- VRŠČAJ, Borut. Regulation and agricultural ecosystems. Packaging, environment, logistics: specialist specialized magazine for packaging, environment and logistics, ISSN 1855-4849, Aug. 2016
- VRŠČAJ, Borut. The protection of agricultural land and the rational use of space are the basis of sustainable

revija za embalažo, okolje in logistiko, ISSN 1855-4849, avg. 2016

- VRŠČAJ, Borut. Varovanje kmetijskih zemljišč in racionalna raba prostora sta osnova trajnostnega razvoja. Kmečki glas, ISSN 0350-4093, 27. jan. 2010
- VRŠČAJ, Borut. Hrana bo ponovno strateško blago, zato so tudi rodovitna zemljišča strateška dobrina : varovanje kmetijskih zemljišč v okviru trajnostnega gospodarskega razvoja. Delo FT : gospodarsko-finančna priloga
- VRŠČAJ, Borut, POGGIO, Laura, AJMONE MARSAN, Franco. A method of soil quality evaluation for more sustainable urban planning = Eine Methode zur Bewertung von Bodenqualitäten für eine nachhaltigere räumliche Planung. V: Bodenbewertung : Vorsorgender Bodenschutz und kommunale Planung. München: Boden-Bündnis europäischer Städte, Kreise und Gemeinden. 2006, f. 52-55. [COBISS.SI-ID 2308456]

Izpopolnjevanja v tujini na področju tal

- 2002, delavnica FAO, Global Terrestrial Observing System, Praga
- 2001, EC Joint Research Centre, Soil Action, Ispra, Italija, študijski obisk
- 2000, United States Department of Agriculture, National Resource Conservation Service-
- USDA Cochran Fellowship (štipendija ameriškega ministrstva za kmetijstvo za področje informatike tal in talnih informacijskih sistemov. Štipendija je zajemala predvsem seznanjanje z US National Soil Information System (NASIS - Talni informacijski sistem ZDA)

Članstvo v pomembnejših nacionalnih komisijah

- 2006 Ministrstvo za obrambo RS, ekspertna skupina za oceno posledic suše v Sloveniji leta 2006.
- 2000: Vlada RS, Ekspertna skupina za izdelavo Dolgoročnega prostorskega plana Republike Slovenije - področje kmetijstva.

Sodelovanje v mednarodnih organizacijah:

- Predstavnik Slovenije v FAO/Global Soil Partnership - European Soil Partnership, Pillar 2 in Pilar 4
- 2014 – 2016 FAO Soil information consultant – Macedonian Soil Information System (MASIS)
- 2012 UNCCD 2nd Scientific Conference – UNCCD White Paper Working Group, član –(ISBN 978-92-95043-67-1)
- 2010 Digital Soil Mapping Working Group¸ EC Joint Research Centre, European Soil Bureau Network.
- 2010 European Soil Data Centre and INSPIRE WG; EC Joint Research Centre.

Članstva in sodelovanja v nacionalnih in mednarodnih pedoloških organizacijah

- Pedološko društvo Slovenije, predsednik
- Slovensko partnerstvo za tla, član ustanovne skupine
- Alpine Soil Partnership, član ustanovne skupine
- EC Joint Research Centre European Soil Bureau Network: Technical Expert, član

development. Agricultural voice, ISSN 0350-4093, Jan 27. 2010

- VRŠČAJ, Borut. Food will be again strategic goods, so fertile land is also a strategic asset: the protection of agricultural land in the context of sustainable economic development. FT: economic and financial contribution
- VRŠČAJ, Borut, POGGIO, Laura, AJMONE MARSAN, Franco. A method of soil quality assessment for more sustainable urban planning = Eine Methode zur Bewertung von Bodenqualitäten für eine nachhaltigere räumliche Planung. V: Bodenbewertung: Vorsorgender Bodenschutz und kommunale Planung. Munich: Boden-Bündnis europäischer Städte, Kreise und Gemeinden. 2006, f. 52-55. [COBISS.SI-ID 2308456]
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- Training abroad in the field of soil science
- 2002, FAO workshop, Global Terrestrial Observing System, Prague
- 2001, EC Joint Research Center, Soil Action, Ispra, Italy, study visit
- 2000, United States Department of Agriculture, National Resource Conservation Service-
- USDA Cochran Fellowship (scholarship of the US Department of Agriculture for the field of informatics of the soil and floor information systems. The scholarship was mainly to familiarize with the US National Soil Information System (NASIS - US Information System)
-
- Membership in major national commissions
- 2006 Ministry of Defense of the Republic of Slovenia, expert group for the assessment of the consequences of drought in Slovenia in 2006.
- 2000: Government of the Republic of Slovenia, Expert Group for the Preparation of the Long-Term Spatial Plan of the Republic of Slovenia - Agriculture.
-
- Participation in international organizations:
- Representative of Slovenia in FAO / Global Soil Partnership - European Soil Partnership, Pillar 2 and Pilar 4
- 2014 - 2016 FAO Soil Information Consultant - Macedonian Soil Information System (MASIS)
- 2012 UNCCD 2nd Scientific Conference - UNCCD White Paper Working Group, Member - (ISBN 978-92-95043-67-1)
- 2010 Digital Soil Mapping Working Group, EC Joint Research Center, European Soil Bureau Network.
- 2010 European Soil Data Center and INSPIRE WG; EC Joint Research Center.
-
- Membership and participation in national and international soil science organizations
- Soil Science Society of Slovenia, President
- Slovenian Soil Partnership, member of the founding group
- Alpine Soil Partnership, a member of the founding group

▪ Global Soil Partnership, član International Union of Soil Sciences, član	▪ EC Joint Research Center European Soil Bureau Network: Technical Expert, member ▪ Global Soil Partnership, member ▪ International Union of Soil Sciences, member