BIOGEOKEMIJA

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Biogeokemija
Course title:	Biogeochemistry
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	3. letnik	2. semester	izbirni

Univerzitetna koda predmeta/University course code:	0562056
Koda učne enote na članici/UL Member course code:	11407

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	0	0	0	45	3

Nosilec predmeta/Lecturer:	Nastja Rogan Šmuc
Vrsta predmeta/Course type:	Izbirni/Elective

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Pogoj za pristop k izpitu je opravljen izpit iz Kemije in Geokemije.	The condition to take an exam are passed exams of Chemistry and Geochemistry.

Vsebina:	Content (Syllabus outline):
Predavanja: • Uvod v Biogeokemijo. Osnovna načela v geobiokemiji. Prehod iz geokemije v biogeokemijo. • Izvor življenja. • Geomikrobiologija in mikrobna geokemija. Mikrobne značilnosti in raznolikost, mikrobni metabolizem in mikrobno preperevanje. Mikrobne okoljske niše. Mikrobi in geokemija. • Biomineralizacija. Biološko povzročena mineralizacija, biološko kontrolirana mineralizacija in fosilizacija. • Organska snov in biomarkerji. Viri in kroženje organske snovi v jezerskem in morskem okolju. Identifikacija biomarkerjev v sedimentih in morski vodi.	**Lectures:** • Introduction to Biogeochemistry. Basic principles in geobiochemistry. Transition from geochemistry to biogeochemistry. • The origin of life. • Geomicrobiology and microbial geochemistry. Microbial characteristics and diversity, microbial metabolism and microbial weathering. Microbial environmental niches. Microbes and geochemistry. • Biomineralization. Biologically induced mineralization, biologically controlled mineralization and fossilization. • Organic matter and biomarkers. Sources and circulation of organic matter in lake and marine

• Kisikov, Dušikov in Fosforjev biogeokemični cikel (preteklost, sedanjost in prihodnost). • Hipersalinsko okolje. Sistem sediment - mikrobna preproga - voda: procesi in dinamika. • Bio in fitoremediacija sedimentov in tal s pomočjo delovanja bakterij in rastlin (hiperakumulatorji). • Dendrogeokemija. Dinamika, interakcija in translokacija elementov v sistemu kamnina, tla in drevesa. • Terroir. Kamnine, tla, podnebje in vinska trta. **Seminar:** Seminarska naloga.	environments. Identification of biomarkers in sediments and seawater. • Oxygen, Nitrogen and Phosphorus biogeochemical cycle (past, present and future). • Hypersaline environment. Sediment System - Microbial mat - Water: Processes and Dynamics. • Bio and phytoremediation of sediments and soil by the action of bacteria and plants (hyperaccumulators). • Dendrogeochemistry. Dynamics, interaction and translocation of elements in the rock, soil and tree system. • Terroir. Rocks, soil, climate and vines. **Seminar:** Seminar work.

Temeljna literatura in viri/Readings:

Izbrana poglavja iz knjig / Selected chapters from books:

Konhauser, K., 2007, Introduction to Geomicrobiology. Blackwell Publishing, str. 425.

Schlesinger, W. H. in Bernhardt E., 2013, Biogeochemistry, An Analysis of Global Change, 3rd edition. Academic Press, 688 str.

Schlesinger, W. H. et al., 2005, Biogeochemistry (Treatise on Geochemistry). Elsevier, str. 702.

Periodika, znanstvene in strokovne revije / periodicals, scientific and professional journals.

Cilji in kompetence:	**Objectives and competences:**
CILJI: Osvojiti koncept osnovnih načel biogeokemije in razvoj biogeokemije kot vede iz primarnih začetkov geokemije. Spoznati primarno vlogo geomikrobiologije in mikrobne geokemije, ter nadaljnje interrelacije med mikrobi in različnimi ekosistemi. Razumeti osnove pojava in prisotnosti različnih vrst biomineralizacije. Obvladati vire in kroženje organske snovi v jezerskem in morskem okolju. Osvojiti kisikov, dušikov in fosforjev biogeokemični cikel s poudarkom na prihodnosti. Prepoznati biogeokemično delovanje in karakteristike v različnih specifičnih recentnih okoljih: hipersalinsko okolje, remediacija sedimentov in tal, translokacija v sistemu kamnina - tla - drevesa in terroir. Samostojno reševanje konkretnih problemov s področja biogeokemije v specifičnih okoljih. KOMPETENCE: Sposobnost prepoznavanja osnov biogeokemije in razumevanja biogeokemičnih procesov ter lastnosti v specifičnih recentnih naravnih in onesnaženih ekosistemih.	OBJECTIVES: To master the concept of basic principles of biogeochemistry and the development of biogeochemistry as a science from the primary beginnings of geochemistry. Understand the primary role of geomicrobiology and microbial geochemistry, as well as further interrelationships between microbes and different ecosystems. Understand the basics of the occurrence and presence of different types of biomineralization. To master the sources and circulation of organic matter in the lake and marine environment. Conquer oxygen, nitrogen and phosphorus biogeochemical cycle with a focus on the future. Recognize biogeochemical activity and characteristics in various specific recent environments: hypersaline environment, remediation of sediments and soils, translocation in the rock - soil - trees and terroir system. Independent solving of specific problems in the field of biogeochemistry in specific environments. COMPETENCES: Ability to identify the basics of biogeochemistry and understand biogeochemical processes and properties in specific recent natural and anthropogenic ecosystems.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Študentje poznajo osnovni koncept biogeokemije kot vede. Poznajo primarno vlogo geomikrobiologije in mikrobne geokemije v tesni povezavi z biogeokemičnimi procesi ter lastnosti. Ukvarjajo se z aktualnimi biogeokemičnimi tematikami, in sicer z biomineralizacijo, organsko snovjo in biomarkerji ter z različnimi elementnimi biogeokemičnimi cikli.	Students know the basic concept of biogeochemistry as a science. They know the primary role of geomicrobiology and microbial geochemistry in close relation to biogeochemical processes and properties. They deal with topical biogeochemical topics, namely biomineralization, organic matter and biomarkers, and various elemental biogeochemical cycles.

Razumejo primarno vlogo biogeokemije v dotičnih okoljih in obvladajo biogeokemične procese v specifičnih naravnih okoljih.	Students understand the primary role of biogeochemistry in their respective environments and master the biogeochemical processes in specific natural environments.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja in seminarske vaje.	Lectures and seminar.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Pisni in/ali ustni izpit	80,00 %	Theoretical and/or oral exam
Seminar	20,00 %	Seminar work
Ocenjevalna lestvica: 51-60% (6); 61-70% (7); 71-80% (8); 81-90% (9); 91-100% (10) ob upoštevanju Statuta UL in fakultetnih pravil.		Evaluation scale: 51-60% (6); 61-70% (7); 71-80% (8); 81-90% (9); 91-100% (10) having regard to the Statute of UL and faculty rules.

Reference nosilca/Lecturer's references:

MEDAKOVIĆ, Davorin, DOLENEC, Tadej, KARLOVIĆ, Danijel, VRHOVNIK, Petra, ROGAN ŠMUC, Nastja, RONČEVIĆ, Sanda, PITAREVIĆ SVEDRUŽIĆ, Lovorka, DOLENEC, Matej. Trace metals in fish biominerals as environmental indicators: handheld XRF analyses. V: MARIN, Frédéric (ur.). Biomineralization: from fundamentals to biomaterials & environmental issues, (Key Engineering Materials, ISSN 1013-9826, Vol. 672). Pfaffikon: Trans Tech Publications. 2016, vol. 672, str. 328-339, doi: 10.4028/www.scientific.net/KEM.672.328.

GLAVAŠ, Neli, ROGAN ŠMUC, Nastja, DOLENEC, Matej, KOVAČ, Nives. The seasonal heavy metal signature and variations in the microbial mat (petola) of the Sečovlje Salina (northern Adriatic). Journal of soils and sediments: protection, risk assessment and remediation, ISSN 1439-0108, 2015, vol. 15, iss. 12, str. 2359-2368, doi: 10.1007/s11368-015-1273-5.

ROGAN ŠMUC, Nastja, DOLENEC, Tadej, SERAFIMOVSKI, Todor, TASEV, Goran, DOLENEC, Matej, VRHOVNIK, Petra. Heavy metal characteristics in Kočani Field plant system (Republic of Macedonia). Environmental geochemistry and health, ISSN 0269-4042, 2012, vol. 34, iss. 4, str. 513-526, doi: 10.1007/s10653-011-9439-6.

DIPLOMSKO DELO

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Diplomsko delo
Course title:	Diploma Thesis
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	3. letnik	2. semester	izbirni

Univerzitetna koda predmeta/University course code:	0067432
Koda učne enote na članici/UL Member course code:	11258

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
0	0	0	0	90	90	6

Nosilec predmeta/Lecturer:	
Vrsta predmeta/Course type:	Izbirni / Elective

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Vpisan izbirni predmet v 3. letniku študija. Opravljene vse ostale študijske obveznosti. Odobrena tema diplomske naloge.	Enrolled elective subject in the 3rd year of the study. Completed all others study prerequisites. Confirmation of the thesis theme.

Vsebina:	**Content (Syllabus outline):**
Diplomsko delo je lahko interdisciplinarno naravnano ali ožje specializirano na poljubno področje znotraj obveznih strokovnih ali izbirnih strokovnih vsebin s področja, ki ga pokriva prvostopenjski študij Geologija. Diplomsko delo vsebuje: - namen dela, predstavitev problema oz. razlog za raziskavo (identifikacija problema), - pregled znanj iz literature oz. tuje in domače izkušnje, - nakazane rešitve problema, - sklepi in priporočila. Diplomsko delo študent izdela pod mentorstvom izbranega učitelja ga javno predstavi in zagovarja.	Thesis may be interdisciplinary or specialized in any area within the compulsory or elective professional course from the area covered by the first-stage studies of Geology. Thesis includes: - the purpose of the work, the presentation of the problem or reason for a survey (identification of the problem), - review of literature and knowledge and/or foreign and domestic experiences, - implicit solution of the problem, - conclusions and recommendations. Student completes the diploma thesis under the supervision of a teacher and finishes the study with the public presentation and defend.

Temeljna literatura in viri/Readings:

Izbrana literatura glede na nalogo, ki jo opravlja. / Selected readings, depending on the thesis he/she is working on.

Cilji in kompetence:	**Objectives and competences:**
CILJI: Študent osvoji delo geologa v praksi. Izdelava diplomskega dela študenta usposobi za reševanje strokovnih ali preprostejših znanstveno-raziskovalnih problemov na področjih, ki jih pokriva prvostopenjski študijski program Geologija. KOMPETENCE: Praktično uporabi med študijem pridobljeno znanje.	OBJECTIVES: Student gets familiar with geologists work in practice. Through the work for diploma thesis student gets able to deal with professional or simpler scientific research problems in the areas covered by the first level study program in geology. COMPETENCES: Practical application of the knowledge gained during their studies.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Študent razume geološko stroko v širšem kontekstu kot interdisciplinarno panogo, dokaže samostojno reševanje konkretnih problemov s povezovanjem temeljnih znanj, ki jih uporabi pri izdelavi diplomskega dela. Sintetizira nove informacije, jih kritično analizira in uporabi pri določitvi problemov in njihovem reševanju. Pridobljeno znanje in rešitve konkretnega problema v diplomskem delu je sposoben podati in zagovarjati pred širšim krogom zainteresiranih uporabnikov.	The student will understand the geological profession in a broader context as an interdisciplinary branch. The student demonstrates his/her ability to solve concrete problems by integrating basic skills and uses them to prepare consistent diploma thesis. The student will synthesize and analyze new information and use it to identify and solve problems. The student is able to present and defend acquired knowledge and solutions to a specific problem in the thesis to a wider range of interested users.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Praktično delo, branje literature, konzultacije z mentorjem, pisanje naloge.	Practical work, literature reading, consultations with advisor, diploma thesis writing.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Ocena pisnega diplomskega dela	70,00 %	Assessment of the written thesis
Ocena javne predstavitve	20,00 %	Assessment of public presentation
Ocena zagovora diplome	10,00 %	Assessment of defending of the thesis

Reference nosilca/Lecturer's references:

Reference nosilcev razvidne iz učnih načrtov pri posameznih predmetih v okviru prvostopenjskega študija Geologija. / References of lecturers listed in the curricula of individual courses in the undergraduate program of Geology.

FIZIKA 1

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Fizika 1
Course title:	Physics 1
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	1. letnik	1. semester	obvezen

Univerzitetna koda predmeta/University course code:	0067457
Koda učne enote na članici/UL Member course code:	889

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
45	0	30	0	0	75	5

Nosilec predmeta/Lecturer:	Marko Žnidarič
Vrsta predmeta/Course type:	Obvezni / Compulsory

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Vpis v 1. letnik študija.	Entering the 1st year of program.

Vsebina:	Content (Syllabus outline):
UVOD: jezik fizike, skalarne, vektorske količine, enote, meritve. MEHANIKA: kinematika (premo gibanje enakomerno pospešeno, poševni met, kroženje), dinamika (sila, trenje, lepenje, gravitacijska sila, delo in energija (kinetična in potencialna, ohranitev energije, moč, izkoristek), gibalna količina (ohranitev gibalne količine, trki, sila curka), sistemi točkastih teles (težišče, togo telo), deformacije trdnih teles (Hookov zakon, stisljivost, strig, torzija, temperaturno raztezanje), hidrostatika (tlak, vzgon), hidrodinamika (kontinuitetna enačba, Bernoullijeva enačba, viskoznost, upor), nihanje (harmonsko nihanje, matematično, fizikalno nihalo, resonanca, dušenje), valovanje (hitrost valovanje, interferenca, Dopplerjev pojav). ELEKTROMAGNETIZEM: električni naboj, električna vezja (tok, Ohmov zakon, moč, meritev	INTRODUCTION: language of physics, scalar and vector variables, units, measurements. MECHANICS: kinematics (linear motion, acceleration, uniform acceleration, rotation), dynamics (force, friction, gravitational force), work and energy (kinetic and potential energy, energy conservation, power, efficiency), linear momentum (conservation, collisions, jet force), systems of point masses (center of mass), deformations (Hook's law, compressibility, torsion, shear, temperature expansion), hydrostatics (pressure, lift), hydrodynamics (continuity equation, Bernoulli equation, viscosity, drag), Oscillations (harmonic oscillator, mathematical and physical pendulum), wave phenomena (speed, interference, Doppler effect). ELECTROMAGNETISM: electric charge, electric circuits (current, Ohm's law, power, AC), magnetic

toka in napetosti, izmenicna napetost), magnetno polje (sila, polje vodnika, tuljava, nabiti delci v polju, indukcija, motor, generator, transformator).	field (force, field of a conductor, coil, induction, motor, generator, transformer).

Temeljna literatura in viri/Readings:

1) I. KUŠČER, A. MOLJK, T. KRANJC, J. PETERNELJ: Fizika za srednje šole – 1. del. DZS, Ljubljana (1999), 195 str.
2) I. KUŠČER, A. MOLJK, T. KRANJC, J. PETERNELJ: Fizika za srednje šole – 2. del. DZS, Ljubljana (2000), 259 str.
3) I. KUŠČER, A. MOLJK, T. KRANJC, J. PETERNELJ, M. ROSINA, J. STRNAD: Fizika za srednje šole – 3. del. DZS, Ljubljana (2002), 399 str.
4) I.D. OLENIK, B. GOLOB, I. SERŠA: Naloge iz fizike za študente tehniških fakultet (DMFA, 2003), 66 str.

Alternative readings:
1) H.D. YOUNG, R.A. FREEDMAN: Sears and Zemansky's University Physics, Addison-Wesley, ZDA, 2000;

Cilji in kompetence:	**Objectives and competences:**
CILJI: kratka ponovitev, nadgradnja srednješolske fizike; seznanitev študentov s temeljnimi poglavji fizike; poudarek na temah, za katere se pričakuje, da jih bodo študenti srečevali pri kasnejšem študiju in delu (opis vsebine v oklepajih); podajanje analitičnega reševanja zadanih problemov in upravičene poenostavitve le-teh. KOMPETENCE: razumevanje fizikalnih zakonitosti, na katerih temeljijo naravni pojavi in merske metode; sposobnost matematične formulacije problemov; obvladovanje fizikalnih osnov metod in tehnik, s katerimi se bodo študenti srečevali; formulacija problemov z izbiro potrebnih podatkov, metodo in interpretacijo meritev, ter upoštevanjem poenostavitev.	OBJECTIVES: short repetition and sophistication of high school physics; acquainting with the basic laws of physics; emphasize on the subjects which are expected to be encountered by students during the later studies and work; analytic problem solving and justified simplification of problems. COMPETENCES: understanding of laws of physics on which natural phenomena and measurement methods are based upon; ability of mathematical formulation of problems; mastering basic physics methods to be used by the students at later studies and work; formulation of problems by selection of necessary data, method and simplifications, measurements interpretation.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Osnovne fizikalne zakonitosti, opisno ter v matematični formulaciji; medsebojno povezovanje le-teh. Analitičen pristop k zadanim problemom, dedukcija na osnovne fizikalne zakonitosti, na katerih posamezni pojavi in merske metode temeljijo; nekateri primeri aplikacij na področju, s katerim se bodo študenti srečavali. Razumevanje pojavov v naravi na podlagi preprostejših abstraktnih zakonitosti; utemeljevanje uporabljenih poenostavitev in približkov. Modeliranje problemov z uporabo poenostavitev (zanemaritve nebistvenih lastnosti); izbira potrebnih podatkov; interpretacija meritev.	Basic laws of physics, descriptive and in mathematical formulation; interconnection among laws of physics. Analytic approach to problems and their deduction to basic physics mechanisms; examples of applications in the area of the program. Understanding of natural phenomena on the basis of simple (abstract) laws; justification of simplifications and approximations. Modelling of problems using simplifications; choice of necessary data and interpretation of measurements.

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

Predavanja z demonstracijskimi poskusi, vodeno in samostojno reševanje računskih vaj in problemov.	Lectures with demonstrations, assisted and individual problem solving.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
pisni izpit	50,00 %	written exam
teoretični izpit	50,00 %	theory part
Izpit je sestavljen iz dveh delov: pisni izpit, kjer se rešujejo računske naloge, ter teoretični izpit, kjer se odgovarja na teoretična vprašanja. Pisni izpit je mogoče opraviti tudi tako, da se piše dva kolokvija v povprečju vsaj 50%. Teoretični del se opravi s pisnim testom ob koncu kurza ali na ustnem izpitu. Ocenjevalna lestvica je določena v vlogi za pridobitev soglasja k pričujočemu študijskemu programu.		Examination composed of two parts: written exam (problem solving) and theory part (answering to questions on explained theory). Written exam can be passed also by passing two qolocquia (at least 50%). Theory part is organized either in a form of a written test or as an oral exam. Marks are defined in the study program application.

Reference nosilca/Lecturer's references:

ŽNIDARIČ, Marko. Spin transport in a one-dimensional anisotropic Heisenberg model. Physical review letters, ISSN 0031-9007. [Print ed.], 2011, vol. 106, str. 220601-1-220601-4, doi: 10.1103/PhysRevLett.106.220601. [COBISS.SI-ID 2357860], [JCR, SNIP, WoS do 19. 11. 2017: št. citatov (TC): 96, čistih citatov (CI): 87, Scopus do 24. 11. 2017: št. citatov (TC): 89, čistih citatov (CI): 79].
ŽNIDARIČ, Marko, SCARDICCHIO, Antonello, VARMA, Vipin Kerala. Diffusive and subdiffusive spin transport in the ergodic phase of a many-body localizable system. Physical review letters, ISSN 0031-9007. [Print ed.], 2016, vol. 117, iss. 4, str. 040601-1-040601-6, graf. prikazi, doi: 10.1103/PhysRevLett.117.040601. [COBISS.SI-ID 3010404], [JCR, SNIP, WoS do 26. 11. 2017: št. citatov (TC): 39, čistih citatov (CI): 36, Scopus do 29. 11. 2017: št. citatov (TC): 34, čistih citatov (CI): 31] .
ŽNIDARIČ, Marko. Exact solution for a diffusive nenequilibrium steady state of an open quantum chain. Journal of statistical mechanics, ISSN 1742-5468, 2010, vol. 5, 9 str., doi: 10.1088/1742-5468/2010/05/L05002. [COBISS.SI-ID 2251876], [JCR, SNIP, WoS do 19. 11. 2017: št. citatov (TC): 44, čistih citatov (CI): 31, Scopus do 23. 11. 2017: št. citatov (TC): 24, čistih citatov (CI): 15] .
ŽNIDARIČ, Marko, PROSEN, Tomaž, PRELOVŠEK, Peter. Many-body localization in the Heisenbeg XXZ magnet in a random field. Physical review. B, Condensed matter and materials physics, ISSN 1098-0121, 2008, vol. 77, str. 064426-1-064426-5, doi: 10.1103/PhysRevB.77.064426. [COBISS.SI-ID 2083172], [JCR, SNIP, WoS do 19. 11. 2017: št. citatov (TC): 238, čistih citatov (CI): 223, Scopus do 21. 11. 2017: št. citatov (TC): 228, čistih citatov (CI): 213] .
GORIN, Thomas, PROSEN, Tomaž, SELIGMAN, Thomas H., ŽNIDARIČ, Marko. Dynamics of Loschmidt echoes and fidelity decay. Physics reports, ISSN 0370-1573. [Print ed.], 2006, 435, nos. 2-5, str.3-156. [COBISS.SI-ID 1972068], [JCR, SNIP, WoS do 12. 11. 2017: št. citatov (TC): 288, čistih citatov (CI): 284, Scopus do 19. 11. 2017: št. citatov (TC): 258, čistih citatov (CI): 255] .

FIZIKALNA KEMIJA

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Fizikalna kemija
Course title:	Physical Chemistry
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	2. letnik, 3. letnik		izbirni

Univerzitetna koda predmeta/University course code:	0089594
Koda učne enote na članici/UL Member course code:	528

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
45	0	0	0	0	45	3

Nosilec predmeta/Lecturer:	Jurij Lah
Vrsta predmeta/Course type:	Izbirni / Elective

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Pogoj za vključitev v delo je vpis v tekoči letnik študija.	Matriculation into the programme.

Vsebina:	Content (Syllabus outline):
Osnovni pojmi: sistem, lastnosti sistema, stanje sistema, funkcije stanja, ravnotežje. Enačbe stanja: idealni plin, splošna plinska enačba, van der Waalsova enačba, virialna enačba, enačba stanja za plinske zmesi. Zakon termodinamike: toplota, delo, reverzibilni in ireverzibilni procesi, notranja energija, entalpija, toplotna kapaciteta, termodinamika idealnega plina; termokemija: reakcijska toplota, kalorimetrija, Hessov zakon, Kirchhoffov zakon. III. zakon termodinamike: entropija, entropija in ravnotežje; ravnotežni pogoji za zaprte sisteme: Helmholtzova in Gibbsova prosta energija, termodinamski potenciali, odvisnost termodinamskih funkcij od tlaka in temperature; III. zakon termodinamike. Fazna ravnotežja: faza, komponenta, prostostne	Basic concepts: system, system state and properties, state functions, equilibrium. Equations of state: ideal gas, van der Waals, virial, gas mixtures. Law of thermodynamics: heat, work, reversible and irreversible processes, internal energy, enthalpy, heat capacity, thermodynamics of ideal gas; thermochemistry: reaction heat, calorimetry, Hess law, Kirchhoff's law. III. law of thermodynamics: entropy, entropy and equilibrium; equilibrium conditions for closed systems: Helmholtz and Gibbs free energy; thermodynamic potentials, dependence of thermodynamic functions on temperature and pressure; III law of thermodynamics. Phase equilibria: phase, component, degrees of freedom, phase rule, phase diagrams, Clapeyron and

stopnje, fazno pravilo, fazni diagrami, Clapeyronova in Clausius-Clapeyronova enačba. Raztopine: idealne in neidealne raztopine, kemijski potencial, termodinamika mešanja; koligativne lastnosti: osmozni tlak, znižanje zmrzišča, zvišanje vrelišča. Kemijsko ravnotežje: konstanta ravnotežja in njena temperaturna odvisnost, homogena in heterogena ravnotežja.	Clausius-Clapeyron equation. Solutions: ideal and nonideal solutions, chemical potential, thermodynamics of mixing; colligative properties: osmotic pressure, boiling point elevation, freezing point depression. Chemical equilibrium: equilibrium constant and its temperature dependence, homogeneous and heterogeneous equilibria.

Temeljna literatura in viri/Readings:

W. J. MOORE, 1972, Physical Chemistry, Prentice-Hall, New Jersey, ISBN 0582442346, str. 1-570.
P. W. ATKINS, 1998. Physical Chemistry, Oxford University Press, Oxford., ISBN 019269068X, s 981, od str. 1-243.

Dopolnilni viri / Additional readings:
M. BEŠTER ROGAČ: 100 rešenih problemov iz fizikalne kemije za študente geologije, NTF, Oddelek za geologijo, september 1999.

Cilji in kompetence:	**Objectives and competences:**
CILJI: Študent(ka) bo osvojil(a) znanje o osnovnih fizikalno-kemijskih količinah, s katerimi popisujemo stanja in lastnosti sistemov. KOMPETENCE: Osvojil(a) bo znanje o zakonitostih, ki povezujejo posamične lastnosti sistemov, kot tudi zakonitosti, ki določajo smer spontanih sprememb. Z vključevanjem primerov iz geologije se bo naučil(a) tudi nekaterih osnovnih fizikalno-kemijskih principov, ki igrajo pomembno vlogo pri mnogih procesih v našem okolju.	OBJECTIVES: Students will obtain knowledge on basic physico-chemical quantities needed for description of state and system properties. COMPETENCES: Students will obtain knowledge on features connecting individual properties of systems as well as with laws that determine direction of spontaneous changes. By incorporating examples from geology students will learn some basic physico-chemical principals playing an important role in many processes in our environment.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Predmet daje študentu teoretično (predavanja) in praktično (laboratorijske vaje) znanje iz osnov fizikalne kemije. Pridobljeno znanje bo študentu koristilo pri razumevanju zakonitosti in uporabe kemijskih in fizikalnih procesov. Pridobljeno teoretično in praktično znanje je potrebno za uspešen študij drugih predmetov in za razumevanje in obvladovanje različnih problemov v geologiji. Predmet daje znanja, ki bodo omogočila študentu samostojnost pri kvantitativni obravnavi opazovanih naravnih procesov. Študent se nauči nekaterih teoretičnih principov, ki so osnova pri spremljanju procesov v geologiji.	Student will get theoretical (lectures) and practical (tutorial-lab exercises) knowledge of basic physical chemistry. With the acquired knowledge student will better understand various phenomena in chemistry and physics. The obtained theoretical and practical knowledge is required for successful study of other subjects in the programme and for understanding and solving various problems in geology. The presented physical chemistry course gives knowledge that will enable student independence in quantitative analysis of studied systems. Students will learn some theoretical principles which may represent solid basis for monitoring geological processes.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja: z uporabo različnih učnih pripomočkov (Power Point, prosojnice, kreda in tabla).	Lectures: performed by using various tools (Power Point, transparencies, chalk and board).

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
računske naloge	50,00 %	calculating tasks
teoretična vprašanja	50,00 %	theoretical questions
Pisni izpit v dveh delih: računske naloge (50%) in teoretična vprašanja (50%). Za		Written exam in two parts: calculating tasks (50%) and theoretical questions (50%).

pozitivno oceno mora biti pravilno rešenih najmanj 50% računskih nalog in hkrati najmanj 50% teoretičnih vprašanj. Ocenjevalna lestvica: 51-60% (6); 61-70% (7); 71-80% (8); 81-90% (9); 91-100% (10) ob upoštevanju Statuta UL in fakultetnih pravil.		Needed condition for passing the exam: 50% of calculating tasks and 50 % theoretical questions have to be answered correctly. Scale of giving marks: 51-60% (6); 61-70% (7); 71-80% (8); 81-90% (9); 91-100% (10) with consideration of UL and faculty rules.

Reference nosilca/Lecturer's references:

DROBNAK, Igor, DE JONGE, Natalie, HAESAERTS, Sarah, VESNAVER, Gorazd, LORIS, Remy, LAH, Jurij. Energetic basis of uncoupling folding from binding for an intrinsically disordered protein. J. Am. Chem. Soc., 2013, 135, no. 4, str. 1288–1294.

BONČINA, Matjaž, LAH, Jurij, PRISLAN, Iztok, VESNAVER, Gorazd. Energetic basis of human telomeric DNK folding into G-quadruplex structures. J. Am. Chem. Soc., 2012, 134, no. 23, str. 9657-9663.

LAH, Jurij, BEŠTER-ROGAČ, Marija, PERGER, Tine Martin, VESNAVER, Gorazd. Energetics in correlation with structural features : the case of micellization. J. Phys. Chem., B Condens. mater. surf. interfaces biophys., 2006, vol. 110, no. 46, str. 23279-23291.

PRISLAN, Iztok, LAH, Jurij, VESNAVER, Gorazd. Diverse polymorphism of G-quadruplexes as a kinetic phenomenon. J. Am. Chem. Soc. 2008, 130, 14161–14169.

LAH, Jurij, DROBNAK, Igor, DOLINAR, Marko, VESNAVER, Gorazd. What drives the binding of minor groove-directed ligands to DNA hairpins?. Nucleic Acids Res. 2008, 36, 897-904.

BUTS, Lieven, LAH, Jurij, DAO-THI, Minh-Hoa, WYNS, Lode, LORIS, Remy. Toxin-antitoxin modules as bacterial metabolic stress managers. Trends Biochem. Sci. 2005, 30, 672-679.

GEODEZIJA

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Geodezija
Course title:	Geodesy
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	2. letnik, 3. letnik		izbirni

Univerzitetna koda predmeta/University course code:	0089595
Koda učne enote na članici/UL Member course code:	963

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
30	0	15	0	0	45	3

Nosilec predmeta/Lecturer:	Goran Vižintin
Vrsta predmeta/Course type:	Izbirni / Elective

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Pogoj za vključitev v delo je vpisan izbirni predmet v dodiplomskem študiju.	The condition for inclusion is enrolled elective subject in undergraduate study.

Vsebina:	**Content (Syllabus outline):**
Oblika in velikost Zemlje, zemeljsko površje. Aproksimacije oblike Zemlje: krogla, rotacijski elipsoid, geoid. Koordinatni sistemi in koordinatni sestavi v geodeziji, vrste koordinat za opis lege točke v prostoru. Osnovni pojmi o kartografskih projekcijah, Prečna Mercatorjeva (TM) projekcija. Tipi višin v geodeziji. Prikazovanje zemeljskega površja na načrtih in kartah. Osnovni pojmi o merjenju, osnovni pojmi o kakovosti meritev. Metode geodetske izmere. Horizontalna terestrična geodetska izmera: triangulacija, trilateracija, poligonometrija. Višinska terestrična geodetska izmera: nivelman, gravimetrija. Osnove fotogrametrije, daljinskega zaznavanja in	The size and shape of the Earth, the Earth's surface. Approximations of the Earth's shape: sphere, rotational ellipsoid, geoid. Coordinate systems and coordinate compositions in geodesy, types of coordinates used to describe the position of a point in space. Types of heights in geodesy. Presentation of the Earth's surface on plans and maps. Basic concepts concerning measurement, basic concepts concerning the quality of measurements. Methods of geodetic measurement. Horizontal terrestrial geodetic measurement: triangulation, trilateration, polygonometry. Basics concerning photogrammetry, remote sensing and laser scanning.

laserskega skeniranja. Uporaba GNSS (Globalnih Navigacijskih Satelitskih Sistemov) v geodetski izmeri.	Use of GNSS (Global Navigation Satellite Systems) in geodetic measurements.

Temeljna literatura in viri/Readings:

VULIĆ, Milivoj, Metoda najmanjših kvadratov, 1.izd., Ljubljana: Naravoslovnotehniška fakulteta, Oddelek za geotehnologijo in rudarstvo, 2007, ISBN: 978-961-6047-49-4 234924288.
Charles D. GHILANI, Paul R. WOLF, Elementary Surveying: An Introduction to Geomatics, 13th Edition.
Spletne povezave na spletni strani predmeta / Links on the course webpage.

Cilji in kompetence:	**Objectives and competences:**
CILJI: Slušatelji spoznajo osnovne geometrijske lastnosti Zemlje kot planeta, njeno obliko in velikost ter aproksimacije oblike Zemlje. Spoznajo koordinatne sisteme in tipe koordinat za podajanje lege točke v prostoru ter principe preslikav površja Zemlje v ravnine kartografskih projekcij. Spoznajo sile, ki ustvarjajo težnostno polje Zemlje: silo teže, gravitacijsko in centrifugalno silo ter se seznanijo s povezavo med geometrijo prostora in silo teže. Spoznajo osnovne merske tehnike za potrebe pridobivanja prostorskih podatkov ter prikazov vsebin zemeljskega površja. Spoznajo tudi osnovne pojme o merjenju ter oceni kakovosti opravljenih meritev. KOMPETENCE: Pridobijo osnovna znanja o geometrijskih in fizikalnih lastnostih Zemlje kot planeta. Usposobijo se za pridobivanje osnovnih podatkov o geometriji prostora s preprostimi metodami geodetske izmere, njihovo obdelavo in interpretacijo.	OBJECTIVES: Students learn about the basic geometric properties of the Earth as a planet, its shape and size, and approximations of the Earth's shape. They learn about coordinate systems and types of coordinates needed to describe the position of a point in space, and about the principles to do with mapping the Earth's surface onto cartographic projection planes. They learn about the forces that generate the Earth's gravitational field: the force of gravity, the gravitational and centrifugal force, and they familiarise themselves with the connection between the geometry of a space and the force of gravity. They acquaint themselves with basic measurement techniques for the purpose of acquiring spatial data and displaying content of the Earth's surface. They acquaint themselves with basic concepts to do with measurement and measurement quality evaluation. COMPETENCES: They acquire basic knowledge concerning the geometrical and physical properties of the Earth as a planet. They are trained to acquire basic information about the geometry of a space through simple methods of geodetic surveying, processing and interpretation.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Študent spozna osnove geodezije in njeno terminologijo. Pozna geometrijske lastnosti Zemlje, njeno velikost in obliko. Razume osnovne pojme o koordinatnih sistemih in vzpostavitvah koordinatnih sestavov v geodeziji. Pozna osnovne tipe koordinat za opis lege točke v prostoru. Razume proces merjenja, napak in pogreškov pri merjenju ter zna oceniti osnovne parametre kakovosti opravljenih meritev, kot so natančnost, točnost, zanesljivost. Pozna osnovni namen in naloge terestrične geodetske izmere za določitev horizontalnega položaja in višine. Razume osnovne principe fotogrametričnega zajema ter daljinskega zaznavanja prostorskih podatkov. Spozna osnove terestričnega in letalskega laserskega skeniranja ter zna interpretirati pridobljene podatke. Razume možnosti uporabe GNSS v geodetski izmeri in povezavo GNSS metod geodetske izmere s klasičnimi terestričnimi postopki izmere. Poznavanje osnov geodezije je ključno za geološko terensko delo,	Students learn about the basics of geodesy and its terminology. They are acquainted with the geometric properties of the Earth, its shape and size. They understand basic concepts to do with coordinate systems and the establishment of coordinate compositions in geodesy. They know the basic types of coordinates needed to describe the position of a point in space. They understand the measurement process, measurement errors and are able to estimate the basic quality parameters of measurements, such as precision, accuracy, reliability. They know the basic purpose and functions of terrestrial geodetic measurements in determining horizontal position and height. They understand basic principles to do with photogrammetric capturing and remote sensing of spatial data. They are familiar with the basics of terrestrial and air laser scanning, and know how to interpret the acquired data. They understand the possibility of using GNSS in geodetic surveying and

kjer je pomemben tudi podatek o legi v prostoru. Poznavanje načinov opisa lege, njenega prikazovanja ter osnovnih parametrov njene kakovosti je pomembno na vseh področjih stroke, tako v raziskovalnem delu kot v operativni praksi. Poznavanje geodetskih merskih tehnik je pomembno pri praktičnih delih povezanih z določitvijo in spremljanjem lege za potrebe spremljanja stabilnosti naravnega okolja od posedanj zemeljskega površja, zemeljskih plazov do pridobivanja podatkov o aktivnih tektonskih procesih na ozemlju. Spoznavanje miselnega procesa postavljanja hipotez in modelov v geologiji, od deskriptivnega opisovanja (geometrija objekta) preko kinematskega modela (razlaga premikanj in deformacij, ki so privedle do današnjega stanja geološkega objekta) do mehanskega modela (kvantitativni opis mehanike procesov deformiranja). Na podlagi recentnih primerov morajo študenti razumeti tektonska dogajanja in okolja v geološki preteklosti. Naučijo se zbirati, vizualizirati in analizirati geološke podatke in generalizirati podatke v interpretativni model. Študent se nauči opazovanja in evidentiranja geoloških pojavov na terenu. Terenska opažanja se navadi interpretirati, generalizirati in sintetizirati. Nauči se podajanja rezultatov terenskega dela in lastnih interpretacij v obliki zaključenega terenskega elaborata (poročila). Študent se nauči iskanja po literaturnih virih in njihove kritične uporabe. Uči se timskega dela.	the connection between GNSS methods and conventional terrestrial surveying methods. Knowing the basics of geodesy is key to geological field work, wherein data concerning positions in space is also important information. Knowing the ways to describe position, present it, and its basic quality parameters is important in all areas of the profession, in research as well as in operational practice. Knowledge of geodetic measurement techniques is important in practical work associated with the defining and monitoring of position for the purposes of monitoring the stability of the natural environment due to subsidence of the Earth's surface, landslides, and for the purposes of obtaining data on active tectonic processes in the area. Getting to know the thought process of setting hypotheses and models in geology, from the descriptive description / descriptive characterisation (object geometry) through the kinematic model (an explanation of movements and deformations that have led to the present state of a geological object) to the mechanic model (a quantitative description of the mechanics of deformation processes). Based on recent examples, students must be able to understand tectonic events and environments in the geological past. Students learn to collect, visualise and analyse geological data and generalise the data into an interpretive model. Students learn to observe and document geological phenomena in the field. Students are accustomed to interpreting, generalising and synthesising field observations. They learn to present field work results and their own interpretations of them in the form of a completed field report. Students learn to search through literary sources and apply them critically. They learn to engage in teamwork.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, e-učenje, kabinetne vaje (učenje grafičnega in analitičnega reševanja praktičnih primerov), vaje v računalniški učilnici (učenje uporabe programske opreme za obdelavo podatkov geodetske izmere), terenske vaje (pri terenskih vajah študenti opravijo več praktičnih primerov geodetske izmere, podatke izmere in nato podatke samostojno obdelajo, analizirajo in prikažejo v grafični in digitalni obliki).	Lectures, e-learning, cabinet practicals (learning to solve practical problems graphically and analytically), computer lab practicals (learning to use software intended for geodetic measurement data processing), field work (during field work, students undertake many practical examples of geodetic measurements, then deal in data measurement and independently process, analyse and display the data in graphical and digital form).

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
pisni izpit	60,00 %	written exam
ustno izpraševanje	40,00 %	oral exam
Način: pisni izpit (60%) in ustno izpraševanje (40%). Pri praktičnem delu izpita študenti pisno rešujejo probleme s področja geodezije. Pri teoretičnem delu izpita študenti pisno odgovarjajo na vprašanja iz teoretičnih vsebin (snov predavanj): praktični del (25%) teoretični del		Type: written exam and oral exam. During the practical exam, students solve problems from the field of geodesy in written form. During the theoretical exam, students answer questions concerning theoretical content (lecture material): practical examination (25%) theoretical examination

izpita (50%) poročila (25%). Ocenjevalna lestvica: (6-10) pozitivno, ob upoštevanju Statuta UL in fakultetnih pravil.		(50%) reports (25%). Grades: (6-10) positive assessment, according to University Statute and Faculty Acts.

Reference nosilca/Lecturer's references:

VRZEL, Janja, LUDWIG, Ralf, VIŽINTIN, Goran, OGRINC, Nives. An integrated approach for studying the hydrology of the Ljubljansko polje aquifer in Slovenia and its simulation. *Water*, ISSN 2073-4441, 2019, vol. 11, no. 9, str. 1753-1-1753-23, doi: 10.3390/w11091753.

KALUĐEROVIĆ, Dragan, KOREN, Eva, VIŽINTIN, Goran. Application of analytic element method in hydrogeology = Uporaba metode analitičnih elementov v hidrogeologiji. *RMZ - Materials and geoenvironment : periodical for mining, metallurgy and geology*, ISSN 1408-7073. [Tiskana izd.], Mar. 2018, vol. 65, no. 1, str. 35-44, ilustr., doi: 10.1515/rmzmag-2018-0002.

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, doi: 10.1016/j.scitotenv.2017.11.017.

GEOFIZIKA

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Geofizika
Course title:	Geophysics
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	3. letnik	2. semester	obvezen

Univerzitetna koda predmeta/University course code:	0067479
Koda učne enote na članici/UL Member course code:	11247

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
30	0	30	0	0	60	4

Nosilec predmeta/Lecturer:	Andrej Gosar
Vrsta predmeta/Course type:	Obvezni / Compulsory

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Opravljen izpit iz Osnov geologije, Matematike 1 in Fizike 1 za pristop k izpitu.	Passed exams of Principles of Geology, Mathematics 1 and Physics 1 to take an exam.

Vsebina:	Content (Syllabus outline):
Uvod. Geofizikalne metode. Pridobivanje, obdelava in interpretacija podatkov. Direktna in inverzna interpretacija. Gravimetrija. Osnove težnosti. Referenčni sferoid in geoid. Težnostni popravki. Bouguerjava anomalija. Gostote kamnin. Gravimetri in meritve. Obdelava podatkov. Ločevanje težnostnih polj. Interpretacija podatkov: direktna, inverzna (modeliranje). Uporaba grav. metod in primeri. Grav. karte. Magnetometrija. Osnove magnetizma. Magn. lastnosti kamnin. Notranje in zunanje magn. polje Zemlje. Časovne variacije in korekcije. Magnetometri in meritve. Obdelava podatkov. Kvalitativna in kvantitativna interpretacija. Uporaba magn. metod. Magn. karte. Geoelektrične metode. Osnove električnih in elektromagnetnih polj. Električne lastnosti kamnin.	Introduction. Geophysical methods. Data acquisition, processing and interpretation. Forward and inverse interpretation. Gravity methods. Principles of gravity. Reference spheroid and geoid. Gravity corrections. Bouguere anomaly. Density of rocks and minerals. Gravity meters and measurements. Data processing. Separation of gravity fields, regional-residual. Data interpretation: forward and inverse modelling. Application of gravity methods with examples. Gravity maps. Magnetic methods. Principles of magnetism. Magnetic properties of rocks. Earth's internal and external magnetic filed. Temporal variations and their corrections. Magnetometers and measurements. Data processing. Qualitative and quantitative interpretation. Application of magnetic methods with

Lastni potencial. Telurika in magnetotelurika. Elektromagnetne metode: pasivne in aktivne. Kvalitativna in kvantitativna interpretacija. Georadar. Upornostne metode. Metoda navidezne specifične upornosti: vertikalno električno sondiranje in kartiranje. Inducirana polarizacija. Pri vsaki metodi: meritve, interpretacija, uporaba in primeri. Seizmične metode. Elastične lastnosti trdnih snovi. Vrste seizmičnh valov in njihova hitrost v kamninah. Seizmični viri, geofoni, seizmograf. Refleksijska metoda. Korekcije in obdelava refleksijskih podatkov. Geološka interpretacija. Refrakcijska metoda. Terenski postopki in obdelava podatkov. Globoke seizmične raziskave. Seizmična tomografija. Uporaba seizmičnih metod. Geotermija. Viri Zemljine toplote. Prehajanje toplote v Zemlji, kondukcija (prevajanje), konvekcija (strujanje), radiacija (sevanje), advekcija. Geotermalne značilnosti v notranjosti Zemlje. Gostota toplotnega toka. Zemljina toplota in globalna tektonika. Določevanje temperature, geokemične metode, geofizikalne metode. Geotermalna energija.	examples. Magn. maps. Geoelectrical methods. Principles of electric and electromagnetic fields. Electric properties of rocks. Self potential method. Telluric and magnetotelluric methods. Electromagnetic methods: passive and active. Qualitative and quantitative interpretation. Ground Penetration Radar. Resistivity methods. Apparent resistivity method, vertical electrical sounding and mapping. Induced polarisation. Acquisition, processing and interpretation of different electrical and EM methods with examples and applications. Seismic methods. Elastic properties of solid materials. Different types of seismic waves. Seismic velocities in rocks. Seismic sources, geophones and seismographs. Seismic reflection method. Corrections and processing of reflection data. Geological interpretation. Seismic refraction method. Filed procedures and data processing. Deep seismic sounding. Seismic tomography. Application of seismic method. Geothermy. Sources of Earth's heat. Transfer of heath in the Earth, conduction, convection, radiation, advection. Geothermal properties in the Earth's interior. Heat Flow Density. Earth's heat and global tectonics. Determination of temperature, geochemical methods, geophysical methods. Geothermal energy.

Temeljna literatura in viri/Readings:

GOSAR, A., RAVNIK, D. 2007: Uporabna geofizika. Učbenik NTF, 288 p.
FOWLER, C.M.R. 2005: The solid earth. An intruduction to global geophysics. Cambridge University Press, 2nd ed., 685 p.
KAEREY, P., BROOKS, M. 1991: An introduction to geophysical exploration. Blackwell Science, 2nd ed., 254 p.
REYNOLDS, J.M. 1997: An introduction to applied and environmental geophysics. John Wiley & Sons, 769 p.
TEFORD, W.M, GELDART, L.P., SHERIFF, R.E. 1990: Applied geophysics. Cambridge University Press, 2nd ed., 770 p.

Cilji in kompetence:	**Objectives and competences:**
CILJI: poznavanje najpomembnejših metod uporabne geofizike, poznavanje osnov globalne geofizike in lastnosti geofizikalnih polj, uporaba in načrtovanje geofizikalnih metod pri različnih geoloških raziskavah, zmožnost osnovne obdelave in interpretacije geofizikalnih podatkov. KOMPETENCE: sposobnost uporabe geofizikalnih podatkov, sposobnost vključevanja geofizike v geološke raziskave, sposobnost izvajanja preprostejših geofizikalnih raziskav.	OBJECTIVES: knowledge of most important geophysical methods, knowledge of global geophysics and Earth's potential fileds , application and planning of geophysical methods in different geological investigations, capability of basic geophysical data processings and interpretation. COMPETENCES: capability to apply geophysical data, capability to include geophysics in geological investigations, capability to perform basic geophysical investigations.

Predvideni študijski rezultati:	Intended learning outcomes:
Znanje in razumevanje: fizikalnih polj in valovanj naravnega in umetnega izvora ter njihove uporabe v raziskovalne namene načrtovanja geofizikalnih raziskav za reševanje različnih geoloških problemov izvedbe preprostejših geofizikalnih meritev razumevanje osnovnih fizikalnih zakonov na primeru Zemlje razumevanje principa delovanja posameznih geofizikalnih metod na praktičnih primerih sposobnost fizikalnega obravnavanja geoloških problemov sposobnost sinteze geofizikalnih in geoloških podatkov	Knowledge and understanding: physical (potential) fields and waves of natural and artificial origin, and their application in geophysical research planning of geophysical investigations for solving different geological problems to perform simple geophysical investigations understanding basic physical principles related to the Earth understanding principles of different geophysical methods on practical examples capability of physical approach to geological problems capability of synthesis of geophysical and geological data

Metode poučevanja in učenja:	Learning and teaching methods:
predavanja, vaje, računalniške vaje	lectures, tutorials and computer tutorials

Načini ocenjevanja:	Delež/Weight	Assessment:
opravljene naloge iz snovi vaj	10,00 %	done tutorial excercises
pisni ali ustni izpit iz snovi vaj	35,00 %	written or oral examination - tutorial
pisni ali ustni izpit iz snovi predavanj	55,00 %	written or oral examination - lectures

Reference nosilca/Lecturer's references:

GOSAR, A. 1998: Seismic-reflection surveys of the Krško basin structure: Implications for earthquake hazard at the Krško nuclear power plant, southeast Slovenia. Journal of Applied Geophysics, 39/3, 131-153.
GOSAR, A. 2008: Gravity modelling along seismic reflection profiles in the Krško basin (SE Slovenia). Geologica Carpathica, 59/2, 147-158.
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: Analysis of the capabilities of low frequency ground penetrating radar for cavities detection in rough terrain conditions: the case of Divača cave, Slov. Acta carsologica, 41/1, 77-88.
GOSAR, A., ČERU, T. 2016: Search for an artificially buried karst cave entrance using ground penetrating radar: a successful case of locating the S-19 Cave in the Mt. Kanin massif (NW Slovenia). International Journal of Speleology, 45/2, 125-147.

GEOKEMIJA

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Geokemija
Course title:	Geochemistry
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	2. letnik	1. semester	obvezen

Univerzitetna koda predmeta/University course code:	0561901
Koda učne enote na članici/UL Member course code:	953

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
40	35	0	0	0	75	5

Nosilec predmeta/Lecturer:	Nina Zupančič
Vrsta predmeta/Course type:	Obvezni / Compulsory

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Ni pogojev.	No prerequisites.

Vsebina:	Content (Syllabus outline):
Uvod v geokemijo	Introduction to geochemical
Osnove termodinamike in uporaba v geokemiji	Fundamentals of thermodynamics and applications in geochemistry
Geokemične lastnosti prvin	Geochemical characteristics of the elements
Porazdelitev prvin	The distribution of the elements
Geokemija magmatskih procesov (skorja, plašč)	Geochemistry of magmatic processes (crust, mantle)
Interpretacija glavnih prvin v magmatski petrologiji	Interpretation of the major elements in igneous petrology
Interpretacija slednih prvin v magmatski petrologiji	Interpretation of trace elements in igneous petrology
Geokemični procesi pri preperevanju	Geochemical processes of weathering
Geokemija sedimentnih kamnin	Geochemistry of sedimentary rocks
Geokemija metamorfnih kamnin	Geochemistry of metamorphic rocks
Kozmogeokemija	Cosmogeochemistry
Radioaktivni izotopi v geologiji	Radioisotopes in geology
Stabilni izotopi v geologiji	Stable isotopes in geology
Geokemija vode	Geochemistry of water
Geokemija zraka	Geochemistry air
Geokemija organske snovi	Geochemistry of organic matter
Cikli glavnih prvin	
Geokemične analize	

	Cycles of the major elements Geochemical analysis

Temeljna literatura in viri/Readings:

En izmed učbenikov / One of the textboks: WHITE, W. M., 2013, Geochemistry.- Whiley-Blackwell, New York, 660 pp. ALBARÈDE, F., 2009, Geochemistry. An Introduction. Cambridge University Press, Cambridge, 248 pp. KRAUSKOPF, K. B. & BIRD, D. K., 1994, Introduction To Geochemistry. ROLLINSON, H., 1993, Using geochemical data: evaluation, presentation, interpretation.- Longman Scientific & Technical, 352 pp.

Cilji in kompetence:	**Objectives and competences:**
CILJI: Slušatelj osvoji osnovno vedenje o razporeditvi prvin v geosferi, hidrosferi in atmosferi ter procesih, ki vplivajo na njihovo obilnost in kroženje. KOMPETENCE: Iz geokemičnega zapisa v kamnini in vodah je sposoben kamnino klasificirati ter interpretirati pogoje ter procese njenega nastanka. Pozna povezave med kemijo, fizikalno kemijo, mineralogijo in petrologijo. Zna izračunati različne geokemične parametre in jih grafično predstaviti. Pridobi osnove za geokemično modeliranje.	OBJECTIVES: Student acquires basic knowledge about the distribution of elements in the geosphere, hydrosphere and atmosphere and the processes that affect their abundance and cicling. COMPETENCES: Student is able from geochemical record in rock and waters to classify the rock and to interpret conditions and processes of its genesis. He knows the connections between chemistry, physical chemistry, mineralogy and petrology. He can calculate various geochemical parameters and present them graphically. Gets the basics for geochemical modeling.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Študent opisno in fizikalno-kemično obvlada razporeditev prvin ter dejavnike, ki vplivajo nanje. Zna pridobiti in računsko obdelati podatke ter interpretirati dobljene rezultate. Kemične podatke zna uporabiti pri interpretaciji drugih področij geologije. Geološke procese razume s kemičnega vidika in zna znanje geokemije uporabiti na ostalih področjih. Uporaba domače in tuje strokovne literature, delo z računalniškimi programi, delo v skupini, komuniciranje s predstavniki drugih strok.	The student masters descriptively and physicochemicaly the distribution of the elements and the factors that influence them. Knows how to obtain and process data and interpret the results obtained. She can use chemical data to interpret other areas of geology. He understands geological processes from a chemical point of view and can apply the knowledge of geochemistry in other fields. Use of domestic and foreign professional literature, work with computer programs, work in a group, communicate with representatives of other professions.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, vodeno in samostojno reševanje računskih vaj in problemov, seminarske vaje, skupinsko delo, domače naloge.	Lectures, assisted and individual solving of calculus exercises and problems, seminars, group work, homework.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
teoretični del (pisni ali ustni izpit)	70,00 %	theoretical part (written or oral exam)
praktični del (pisni kolokvij)	20,00 %	practical part (written test)
domače naloge	10,00 %	homework
Izpit je sestavljen iz teoretičnega dela (pisni ali ustni izpit), praktičnega dela (pisni kolokvij) in domačih nalog.		Exam consists of theoretical part (written or oral exam), practical part (written test) and homework.

Reference nosilca/Lecturer's references:

ZUPANČIČ, Nina, TURNIŠKI, Rok, MILER, Miloš, GRČMAN, Helena. Geochemical fingerprint of insoluble material in soil on different limestone formations. Catena : an interdisciplinary journal of soil science, hydrology- geomorphology focusing on geology and landscape evolution, ISSN 0341-8162. [Print ed.], 2018, vol. 170, str. 10-24.
ŠEBELA, Stanka, ZUPANČIČ, Nina, MILER, Miloš, GRČMAN, Helena, JARC, Simona. Evidence of Holocene surface and near-surface palaeofires in karst caves and soils. Palaeogeography, palaeoclimatology, palaeoecology, ISSN 0031-0182. [Print ed.], 1 Nov. 2017, vol. 485, str. 224-235.
JARC, Simona, GORIČAN, Špela, SKABERNE, Dragomir, VERBIČ, Tomaž, MIŠIČ, Miha, ZUPANČIČ, Nina. K-feldspar rich shales from Jurassic bedded cherts in southeastern Slovenia. Swiss journal of geosciences, ISSN 1661-8726, 2013, vol. 106, issue 3, str. 491-504.

GEOLOGIJA KRASA

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Geologija krasa
Course title:	Karst Geology
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	3. letnik	2. semester	obvezen

Univerzitetna koda predmeta/University course code:	0067480
Koda učne enote na članici/UL Member course code:	11248

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
30	0	15	0	15	60	4

Nosilec predmeta/Lecturer:	Mihael Brenčič
Vrsta predmeta/Course type:	Obvezni / Compulsory

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Opravljene obveznosti iz predmetov: Osnove geologije, Fizika 1, Matematika 1, Mineralogija, Kristalografija, Petrologija magmatskih in metamorfnih kamnin, Kemija 1, GIS v geologiji, Geokemija, Statistika v geologiji, Sedimentna petrologija, so pogoj za pristop k izpitu.	Passed exams of Introduction to geology, Physics 1, Mathematics 1, Mineralogy, Crystallography, Igneous and metamorphic petrology, Chemistry 1, GIS in geology, Geochemistry, Statistics in geology, Sedimentary petrology are mandatory to take an exam.

Vsebina:	Content (Syllabus outline):
Pristop h geologiji krasa. Model čistega krasa. Geološki parametri zakrasevanja. Kemični parametri zakrasevanja. Hidrogeološki parametri zakrasevanja. Osnove speleogeneze. Površinske kraške oblike. Razno (aplikacija).	Approach to the karst geology. The model of "pure karst". Geological parameters for karstification. Chemical parameters for karstification. Hydrogeological parameters for karstification. Basics of speleogenesis. Surface karst forms. Other (application).

Temeljna literatura in viri/Readings:

GAMS: Kras. Založba ZRC SAZU, 2003, 516 str.
GILLIESON: Caves: processes, development and management. Blackwell 1996, 324 str.
FORD & WILLIAMS: Karst geomorphology and hydrology. Wiley, 2007, 601 str.

KLIMČUK: Speleogenesis, Evolution of Karst Aquifers. National speleological society, 2000, 527 str. WHITE: Geomorphology and hydrogeology of karst terrains. Oxford University press, 1988, 464 str.

Cilji in kompetence:	**Objectives and competences:**
CILJI: Izvesti kras kot geomorfni in transportni sistem iz osnovnih geoloških, fizikalnih in kemičnih načel. Podati osnovno informacijo o kraškem inventarju (geomorfologija, speleologija) in procesih. Spoznati praktično uporabne (npr. inženirska geologija, hidrogeologija) metode, ki izhajajo iz gornjega. KOMPETENCE: Razumevanje osnove delovanja kraškega geomorfnega sistema kot geološkega pojava. Sposobnost ocenjevanja pomena posameznih dogodkov v krasu za človekovo bivanje na krasu. Sposobnost tvornega sodelovanja pri manj zahtevnih tehničnih posegih na krasu.	OBJECTIVES: Realization of karst as geomorphic and transport system of basic geological, physical and chemical principles. Provide basic information of the karst inventory (geomorphology, speleology) and processes. Realize practically useful (eg, engineering geology, hydrogeology) methods. COMPETENCES: Understanding the basics of karst geomorphic system as a geological phenomenon. Ability to assess the importance of individual karst events for human living in the karst areas. Ability of active participation in the less demanding technical interventions in the karst area.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Slušatelj bo spoznal temeljne kraške procese in osnovne podzemske in nadzemske kraške oblike. Funkcionalna povezanost procesov in oblik podzemskega in nadzemskega krasa in v tem smislu znal nadgrajevati svoje znanje. Pri presoji in načrtovanju tehničnih posegov na krasu in umeščanju sonaravnega bivanja na krasu. Konkretno: inženirsko geološki, hidrogeološki, prostorski posegi na krasu. Slušatelj si bo pridobil osnovno veščino presoje lastnih idej in zaključkov v soočenju s konkretnostjo ter poiskati literaturo, da v primeru potrebe svoje znanje nadgradi.	Students will learn the basic of karst processes and basic subterranean and above ground karst forms. The functional connection of processes and forms of subterranean and above ground karst and to upgrade their knowledge. The assessment and planning of technical interventions in the karst region and the placement of sustainable living on karst. Specifically: geological engineering, hydrogeological, spatial interventions on karst areas. Student will gain basic skill to estimate their own ideas and conclusions in the confrontation with the concreteness and to find literature in the need of upgrade their knowledge.

Metode poučevanja in učenja:	**Learning and teaching methods:**
predavanja	lectures
predavanja na terenu	lectures on the field
študentsko terensko delo	students field work

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
pisni in/ali ustni izpit	70,00 %	written and/or oral exam
terenske vaje	20,00 %	field work
prisotnosti na vajah in predavanjih	10,00 %	presence at exercises and lectures

Reference nosilca/Lecturer's references:

BRENČIČ, Mihael. Hydrogeochemistry of coastal carbonate aquifer in Lucija-Portorož (Gulf of Trieste, northern Adriatic Sea, Slovenia). Acta carsol., 2009, let. 38, št. 2-3, str. 179-196. PAVLIČ, Urša, BRENČIČ, Mihael. Application of sequential trend analysis for discharge characterisation of Vipava karstic springs, Slovenia. Acta carsol., 2011, letn. 40, št. 2, str. 283-291. BRENČIČ, Mihael, 1995: Konceptualni model razvoja krasa. Geologija 37/38, 391-414.

GEOLOGIJA KVARTARJA

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Geologija kvartarja
Course title:	Quaternary Geology
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	2. letnik	2. semester	obvezen

Univerzitetna koda predmeta/University course code:	0067471
Koda učne enote na članici/UL Member course code:	958

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
30	0	0	0	15	45	3

Nosilec predmeta/Lecturer:	Andrej Šmuc, Tomislav Popit
Vrsta predmeta/Course type:	Obvezni / Compulsory

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Priporočljivo - opravljene obveznosti pri predmetih Paleontologija, Sedimentna petrologija, Stratigrafija.	Recommended - passed exams: Paleontology, Sedimentary petrology, Stratigraphy.

Vsebina:	Content (Syllabus outline):
Definicija kvartarja Klimatske spremembe v kvartarju Stratigrafija kvartarja: »alpska« stratigrafija Datiranje kvartarnih depozitov Ledeniki in poledenitev (nastanek, razvoj, procesi, odlaganje in okolja) Kvartar v Sloveniji	Definition of the Quaternary Climatic changes in the QuaternaryQuaternary stratigraphy Dating of Quaternary deposits Glaciers and glaciation (origin, evolution, processes and environments) Quaternary environments of Slovenia

Temeljna literatura in viri/Readings:

BENN D.I. & EVANS D.J.A. 2010: Glaciers and Glaciations, Hodder Education, 802pp.
WALKER M. 2005: Quaternary Dating Methods, Wiley, 286pp.
BRADLEY R.S.2015: Paleoclimatology, Reconstructing Climates of Quaternary, Elsevier-Academic Press675pp.
BENNET M. & GLASSER N. 2009: Glacial geology, Ice sheets and landforms, Wiley-Blackwell, 385pp.
BRODWKOWSKY K. & van LOON A.J.: Glacigenic sediments. Developments in sedimentology 49, 1991, 674 pp.
EHLERS & GIBBARD: Quaternary glaciations extent and chronology. Part I: Europe. Elsevier, 2004, 475

pp.
LOWE J.J. & WALKER M.J.C.: Reconstructing Quaternary environments. Prentice Hall, 2nd edition, 1997, 446 pp.
WILLIAMS M et al.: Quaternary environments. Arnold, 2nd edition, 2003, 329 pp.

Cilji in kompetence:	**Objectives and competences:**
CILJI: predmet obravnava klimatske spremembe v zadnji dveh milijonih let Zemljine zgodovine na podlagi raziskav različnih kontinentalnih in morskih sedimentov ter ledu, vzroke zanje, njihovo periodičnost in kronologijo ter antropogeni vpliv na klimatske spremembe. Namen predmeta je časovno in prostorsko razumeti kvartarne okoljske spremembe v odvisnosti klime, spremembe v sestavi flore in favne, pojav človeka in njegove kulture. KOMPETENCE: vsebina predmeta omogoča slušatelju prepoznati, genetsko in procesno opisati kvartarne sedimente, jih starostno in klimatokronološko opredeliti ter določiti njihovo sedimentacijsko okolje.	OBJECTIVES: subject deals with climatic changes in the last 2 Ma of Earth's history on the basis of research of diverse continental as well as marine sediments, ice, the reasons for them, their periodicity and chronology and anthropogenic influence. The goal of the subject is to gain temporal and spatial understanding of Quaternary environmental changes in dependence of climate, changes in the composition of flora and fauna, appearance of human and its culture. COMPETENCES: contents enables recognition and description in the light of genesis and processes of Quaternary sediments, to define their stratigraphy and climatochronology and sedimentary environment.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Predmet pomaga slušatelju razumeti klimatske spremembe in vzroke zanje, izbrati primerna orodja, metode in tehnike za reševanje različnih problemov v kvartarnih študijah. Slušatelj bo s pomočjo pridobljenega znanja znal izbrati in kritično vrednotiti relevantne terenske podatke ter na osnovi njih rekonstruirati in interpretirati nekdanja okolja in klimatske spremembe. Predmet omogoča slušatelju razmislek o povezanosti vseh procesov, ki so povzročili pojav in periodičnost ledenih dob v zadnjih dveh milijonih let Zemljine zgodovine ter njihovo povezanost z današnjimi klimatskimi spremembami. Slušatelj se seznani s praktičnimi aplikacijami pridobljenega znanja na druga področja (pedologija, neotektonika, arheologija, inženirska geologija).	Subject helps the student to understand climatic changes and reasons for them, to choose appropriate tools, methods and techniques for resolution of diverse problems in the Quaternary studies. Gaining the knowledge, student will be able to critically evaluate relevant fieldwork data and on their basis reconstruct and interpret former environments and climatic changes. Subject enables students rethinking about connection of processes that forced the origin and periodicity of ice-ages in the last 2Ma of Earth's history and their connection to present-day climatic changes. Additionally, Student becomes familiar with practical applications of gained knowledge on others scientific fields (pedology, arheology, engineering geology).

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, terensko delo.	Lectures, field work.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Pisni in/ali ustni izpit	100,00 %	Written and/or oral Examination
Ocena: 6-10 pozitivno, 1-5 negativno: ob upoštevanju Statuta UL in fakultetnih pravi.		Degree: 6-10 positive, 1-5 negative, according to Senat UL and faculty rules.

Reference nosilca/Lecturer's references:

NOVAK, Ana, ŠMUC, Andrej, POGLAJEN, Sašo, VRABEC, Marko. Linking the high-resolution acoustic and sedimentary facies of a transgressed Late Quaternary alluvial plain (Gulf of Trieste, northern Adriatic). Marine geology, ISSN 0025-3227. [Print ed.], 2020, vol. 419, str. 1-20.
ANDRIČ, Maja, SABATIER, Pierre, RAPUC, William, OGRINC, Nives, DOLENEC, Matej, ARNAUD, Fabien, GRAFENSTEIN, Ulrich von, ŠMUC, Andrej. 6600 years of human and climate impacts on lake-

catchment and vegetation in the Julian Alps (Lake Bohinj, Slovenia). Quaternary science reviews, ISSN 0277-3791, 2020, vol. 227, str. 1-18.
NOVAK, Ana, ŠMUC, Andrej, POGLAJEN, Sašo, CELARC, Bogomir, VRABEC, Marko. Sound velocity in a thin shallowly submerged terrestrial-marine Quaternary succession (Northern Adriatic Sea). Water, ISSN 2073-4441, 2020, vol. 12, iss. 2, str. 1-19.
NOVAK, Andrej, POPIT, Tomislav, ŠMUC, Andrej. Sedimentological and geomorphological characteristics of Quaternary deposits in the Planica-Tamar Valley in the Julian Alps (NW Slovenia). *Journal of maps*, ISSN 1744-5647. [Spletna izd.], 2018, vol. 14, no. 2, str. 382-391, doi: 10.1080/17445647.2018.1480975.
MENCIN GALE, Eva, JAMŠEK RUPNIK, Petra, TRAJANOVA, Mirka, GALE, Luka, BAVEC, Miloš, ANSELMETTI, Flavio S., ŠMUC, Andrej. Provenance and morphostratigraphy of the Pliocene-Quaternary sediments in the Celje and Drava-Ptuj Basins (eastern Slovenia) = Provenienca in morfostratigrafija pliocensko-kvartarnih sedimentov v Celjskem in Dravsko-Ptujskem bazenu (vzhodna Slovenija). Geologija, ISSN 0016-7789. [Tiskana izd.], 2019, 62, št. 2, str. 189-218.

GEOLOGIJA RUDIŠČ

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Geologija rudišč
Course title:	Ore Deposit Geology
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	3. letnik		izbirni

Univerzitetna koda predmeta/University course code:	0089606
Koda učne enote na članici/UL Member course code:	964

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	0	0	15	90	6

Nosilec predmeta/Lecturer:	Matej Dolenec
Vrsta predmeta/Course type:	Izbirni / Elective

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Opravljeni izpiti iz Mineralogije, Petrologije magmatskih in metamorfnih kamnin, Sedimentne petrologije in Mineralnih surovin za pristop k izpitu.	Passed exams of Mineralogy, Igneous and metamorphic petrology, Sedimentary petrology and Mineral materials to take an exam.

Vsebina:	Content (Syllabus outline):
Razvoj teorije nastanka rudišč Značilnosti rudonosnih magem in rudonosnih raztopin Proces izločanja rudnih mineralov in nastanka rudišč Identifikacija pogojev ob nastanku rudišč: geotermometrija, geobarometrija in izotopske analize Odnosi med strukturo in teksturo rudnih mineralov, njihovim nastankom in značilnostmi rude, ki vplivajo na optimalni način njihove predelave Osnovne metode bogatenja rud in pomen mineraloških analiz za njihovo optimizacijo Morfologija rudnih teles in razvoj ustreznih odkopnih metod - anatomija rudnika Mineralna sestava rud in najustreznejše metode predelave rudnih mineralov v kovine Odlaganje rudnih jalovin	Development of ore deposits genetic studies Characteristics of ore-bearing magmas and ore-bearing fluids Proces of ore minerals and ores deposition and ore bodies formation Identification of ore formation conditions: geothermometry, geobarometry and isotope studies Links between ore mineral texture and structure, their genetic environment, and ore type characteristics which influence on their optimal beneficiation Basics of ore beneficiation methods and importance of mineralogical analyses for their optimisation Ore bodies morphology and development of appropriate mining methods – mine anatomy Ore mineral composition and most appropriate methods of transforming ore minerals to metals

Kisle rudniške vode Sodobne metode rudarjenja z varovanjem okolja	Ore beneficiation tailings disposal Acid Water Mine Drainage Modern mining methods with environment protection

Temeljna literatura in viri/Readings:

GUILBERT J.M. & PARK C.F., 1986: The geology of ore deposits. Waveland press, inc., 985 p.
SPITZ K. & TRUDINGER J., 2009: Mining and the Environment from ore to metal. CRC Press, Taylor & Francis Group, 891 p.
BUSTILLO REVUELTA M., 2018: Mineral Resources: From Exploration to Sustainability Assessment, pp. 121-222, Springer International Publishing, Cham.

Cilji in kompetence:	**Objectives and competences:**
CILJI: Slušatelj osvoji znanja o nastanku rudišč in o uporabi raziskovalnih metod, ki omogočajo identifikacijo pogojev njihovega nastanka. S prepoznavanjem rudnih struktur in tekstur ter ustrezno mineraloško analizo sestave osvojijo poznavanje lastnostih kovinskih mineralnih surovin, ki so pomembne za optimizacijo njihovega pridobivanja, predelave in lastnosti končnih produktov (rudnih koncentratov in jalovine) ter njihovega morebitnega vpliva na okolje. Slušatelji osnovijo osnove znanja o metodah odkopavanja in bogatenja rude ter o predelavi v kovine ali druge materiale. Poseben poudarek je na osvajanju znanja za prepoznavanje in izogibanje možnih vplivov odkopavanja in predelave na okolje. KOMPETENCE: Slušatelj je sposoben povezati znanja iz predmetov "Mineralogija, Petrologija, Geokemija, Mikroskopija rud in Mineralne surovine in jih uporabiti za projekte raziskovanja, pridobivanja in predelave v kovine in druge materiala iz mineralnih surovin.	OBJECTIVES: Students learn about the origin and the possible use of analytical methods for identification of ore forming conditions. Students learn about appropriate ore structure, texture and mineralogical analyses which enable recognition of metal ore characteristics which are important for optimization of their exploitation and beneficiation, and final products characteristics (ore concentrates and tailings),and their possible environmental impact. Students learn foundamental methods of ore exploitation, beneficiation, and transformation into metals and other materials. Special focus will be given to learn about in time recognition and avoiding of possible mining and beneficiation processes environmental impacts. COMPETENCES: The student is able to link knowledge from previous subjects: "Mineralogy, Petrology, Geochemistry, Ore Microscopy, and Mineral Resouces and use it for projects of exploration, exploitation and beneficiation and transforming into metal from mineral deposits.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Slušatelj razume in prepozna rude in okolje njihovega nastanka, kakor tudi tiste njihove značilnosti, ki vplivajo na metode njihovega raziskovanja, odkopavanja in predelave do končnega izdelka, obenem pa tudi možne neugodne vplive teh postopkov na življenjsko okolje, da bi jih lahko preventivno onemogočili. Slušatelj pozna in razume verigo lastnosti rud in potrebnih analiz rud, rudišč ter osnovnih metod raziskovanja, odkopavanja, bogatenja ter predelave vse do končnih produktov ter njihovih možnih vplivov na okolje, ki jih je potrebno minimalizirati z definiranjem ustreznih rešitev. Slušatelj mora biti sposoben prepoznati problem in predložiti osnovne metode za njegovo rešitev. Slušatelj ima osnovne izkušnje in je sposoben uporabiti osnovna znanja in metode ter poiskati dodatne v literaturi, ki so nujno potrebna kot predlog za konkretno projektno delo pri raziskovanju, pridobivanju in predelavi mineralnih surovin. Slušatelj je sposoben uporabiti lastnosti rud in rudišč za	The student understands and recognizes ores and env ironment of their formation as well as their characteristics, which influence the methods of their exploration, exploitation, beneficiation and fransformation into the final product, and their potential unfavourable impacts onto the living environment , to be able to preventionally avoid it. The student is able to understand and explain the chain of charasteristics and the neccessary analytical methods of ores, ore deposits, foundamental methods of mining and beneficiation and metalurgicall processes till the final products, and their potential impact onto the environment, which need to be minimalised with the proposal of appropriate techniques. Students must be able to find/define and be able to propose appropriate initial solutions. The student has basic experiences and is able to use foundamental knowledge and also to be able to find additional one into the literature, on the base of which can propose appropriate methods for

izdelavo projektnih nalog za njihovo raziskovanje, priodobivanje - exploatacijo, bogatenje ter vse do končne metalurške predelave in ekološko sprejemljivost navedenih postopkov. Pri delu je slušatelj sposoben sodelovati s strokovnjaki iz področij pridobivanja in predelave mineralnih surovin (rudarji in geotehnologi in metalurgi ter materialisti in okoljskimi specialisti), uporabljati domačo in tujo strokovno in znanstveno literaturo.	exploration, mining, and processing of mineral resources. He is able to use ore and ore deposit characteristics for definition of the project design starting parametres for their exploration, exploitation – mining, beneficiation till the final metalurgic processing , and environmental suitability of all used procedures. The student is able to work with professionals from other fields of ore resources (miners, geotechnologists, metallurgists and material scientists and environmental specialists), and he/she is able to use domestic and foreign professional and scientific literature.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja Laboratorijske vaje 2 dni terenskega dela PowerPoint predstavitve V okviru predavanj študentje izdelajo seminarsko nalogo, ki jo javno predstavijo.	Lectures Lab Tutorials 2 days of field work PowerPoint Presentations Within the lectures students will prepare and present a seminar work.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Pisni in/ali ustni izpit	55,00 %	Written and/or oral exam
Praktično delo in/ali oddane domače naloge	30,00 %	Practicum and/or homeworks
Predstavitev seminarske naloge	5,00 %	Presentation of seminar
Terenska poročila	5,00 %	Field reports
Aktivno sodelovanje pri predmetu	5,00 %	Active participation in Course

Reference nosilca/Lecturer's references:

ŠOSTER, Aleš, ZAVAŠNIK, Janez, O'SULLIVAN, Paul, HERLEC, Uroš, POTOČNIK KRAJNC, Barbara, PALINKAŠ, Ladislav A., ZUPANČIČ, Nina, DOLENEC, Matej. Geochemistry of Bashibos-Bajrambos metasedimentary unit, Serbo-Macedonian massif, North Macedonia : implications for age, provenance and tectonic setting. Chemie der Erde, ISSN 0009-2819, [in press] 2020, 44 str., doi: 10.1016/j.chemer.2020.125664.
TASEV, Goran, SERAFIMOVSKI, Todor, DOLENEC, Matej, ROGAN ŠMUC, Nastja. Contribution to understanding of ore fluids in the Zletovo mine based on fluid inclusion data. RMZ - Materials and geoenvironment : periodical for mining, metallurgy and geology, ISSN 1408-7073. [Tiskana izd.], 2019, str., doi: 10.2478/rmzmag-2019-0008.
DOLENEC, Matej, SERAFIMOVSKI, Todor, DANEU, Nina, DOLENEC, Tadej, ROGAN ŠMUC, Nastja, VRHOVNIK, Petra, LOJEN, Sonja. The case of the carbonatite-like dyke of the Madenska River complex at the Kriva Lakavica section in the Republic of Macedonia : oxygen and carbon isotopic constraints. Turkish journal of earth sciences, ISSN 1300-0985, 2015, vol. 24, no. 6, str. 627-639, doi: 10.3906/yer-1502-28.

GEOLOGIJA SLOVENIJE

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Geologija Slovenije
Course title:	Geology of Slovenia
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	3. letnik	1. semester	obvezen

Univerzitetna koda predmeta/University course code:	0067481
Koda učne enote na članici/UL Member course code:	11242

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
30	0	0	0	45	75	5

Nosilec predmeta/Lecturer:	Andrej Šmuc, Luka Gale
Vrsta predmeta/Course type:	Obvezni / Compulsory

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Opravljene obveznosti pri predmetih Osnove geologije, Petrologija magmatskih in metamorfnih kamnin, Paleontologija, Hidrogeologija, Stratigrafija, Strukturna geologija, Sedimentna petrologija so pogoj za pristop k izpitu.	Passed exams of Introduction to Geology, Igneous and Metamorphic petrology, Paleontology, Hydrogeology, Stratigraphy, Structural Geology, Sedimentary petrology to take an exam.

Vsebina:	Content (Syllabus outline):
Slovenija kot del Alpskega prostora	Slovenia as part of the Alpine orogen
Tetidin riftogenetski cikel (Meliata, Vardar, Alpska Tetida, Valais ter Evropska, Afriška in Jadransko-Apulijska mikroplošča)	Tethys cycle (Meliata, Vardar, Alpine Tethys, Valais, and the European, African and Adriatic-Apulian microplate)
Tektonska rajonizacija Slovenije	Tectonic division of Slovenia
Južne Alpe	Southern Alps
Zunanji Dinaridi in prehodna cona med Zunanjimi in Notranjimi Dinaridi	External Dinarides and the transitional zone between the outer and inner Dinarides
Jadransko-Apulijsko predgorje	Adriatic-Apulian foreland
Vzhodne Alpe	Eastern Alps
Panonski bazen	Pannonian Basin
Kvartarni intramontani bazeni	Quaternary intramontane basins
Glavni sistemi gub ter prelomov v Sloveniji	Major fault and fold systems in Slovenia
Generalni paleogeografski razvoj območja Slovenije	

	General paleogeographic development of the territory of Slovenia

Temeljna literatura in viri/Readings:

Razni avtorji: Osnovne geološke karte SFRJ v merilu 1: 100 000 ter njihovi tolmači.
Razni avtorji: izbrani članki na temo regionalne geologije.
PAVŠIČ, J., GOGALA, M., SELIŠKAR, A. 2019: Slovenska Istra: I neživi svet. Slovenska Matica. 458 pp.
PLENIČAR, M., OGORELEC, B., NOVAK, M. 2009: Geologija Slovenije.- GeoZS. 612 pp.
JURKOVŠEK, B., TEŠOVIĆ, B.C., JURKOVŠEK, T. 2013: Geologija Krasa. GeoZS.205 pp.

Cilji in kompetence:	**Objectives and competences:**
CILJI: najpomembnejši splošni cilj predmeta je spoznavanje temeljnih značilnosti geološkega razvoja Slovenije. V ožjem smislu je to spoznavanje in povezovanje znanih dejstev, oblikovanje pojmov in zakonitosti, kar vodi v razumevanje ter predvsem v uporabo geološkega znanja. Predvsem je pomembno spoznati razvoj in različne smeri (ali hipoteze) slovenske geološke miselnosti, z namenom razvijanja študentu lastnega mnenja in predstave o okolju v katerem živi. KOMPETENCE: Slušatelj bo pridobil osnovno znanje o geološkem razvoju slovenskega prostora. Slušatelj bo nadgradil in v celoto povezal znanje pridobljeno pri drugih strokovnih predmetih. Pridobljeno znanje o geološki zgradbi in zgodovini Slovenije bo omogočalo slušatelju reševanje različnih aplikativnih problemov v praksi.	OBJECTIVES: The main overall objective of the course is to learn the basic features of geological development of Slovenia. In a narrower sense, it is the study and integration of known facts, concepts and principles, which leads to understanding, and in particular the use of geological knowledge. In particular, it is important to recognize different directions of Slovenian geological thinking in order to develop the student's own perceptions and beliefs about the environment in which they live. COMPETENCES: Students will acquire the basic knowledge on the geological development of the Slovenian territory. Students will build on and integrate knowledge from a whole other geological courses. Knowledge on the geological structure and history of Slovenia will allow a student to resolve various applied problems in practice.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Slušatelj pozna in razume geološko zgodovino slovenskega prostora in njihovo povezavo z geološko evolucijo alpskega in mediteranskega območja. Slušatelj je na podlagi pridobljenega znanja sposoben razumeti nastanek in razvoj tektonskih provinc, ki gradijo današnje območje Slovenije. Slušatelj je sposoben abstraktnega razumevanja geološke zgodovine Slovenije v prostoru in času. Poznavanje geološkega razvoja in geoloških posebnosti slovenskega prostora omogoča slušateljem neposredno aplikacijo znanja za reševanje okoljskih, energetskih, vodovarstvenih in ekoloških problemov.	Students know and understand the geological history of the Slovenian territory and its relationship with the geological evolution of the Alps and the Mediterranean area. The student on the basis of knowledge able to understand the evolution of tectonic provinces that build today's territory of Slovenia. Students gain an abstract understanding of the geological history of Slovenia in space and time. Knowledge of the geological development and geological features of the Slovenian territory provides students with direct application of knowledge to solve environmental, energy, water protection and ecological problems.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja in terensko delo.	Lectures and field work.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Pisni in/ali ustni izpit	80,00 %	Written and/or oral exam
Poročilo in/ali kratek test iz terenskega dela	20,00 %	Fieldwork reports and/or a short written exam about the field stops
Ocena: 6-10 (pozitivno) oz. 1-5 negativno; ob upoštevanju Statuta UL in fakultetnih pravil.		The mark: 6-10 (positive); 1-5 (negative); in agreement with Statute UL and the Faculty rules.

Reference nosilca/Lecturer's references:

ROŽIČ, Boštjan, GERČAR, David, OPRČKAL, Primož, ŠVARA, Astrid, TURNŠEK, Dragica, KOLAR-JURKOVŠEK, Tea, UDOVČ, Jan, KUNST, Lara, FABJAN, Teja, POPIT, Tomislav, GALE, Luka. Middle Jurassic limestone megabreccia from the southern margin of the Slovenian Basin. *Swiss journal of geosciences*, ISSN 1661-8726, 2019, vol. 112, iss. 1, str. 163-180, doi: 10.1007/s00015-018-0320-9.

GALE, Luka, PEYBERNES, Camille, CELARC, Bogomir, HOČEVAR, Manca, ŠELIH, Vid Simon, MARTINI, Rossana. Biotic composition and microfacies distribution of Upper Triassic build-ups : new insights from the Lower Carnian limestone of Lesno Brdo, central Slovenia. *Facies*, ISSN 0172-9179, Jul. 2018, vol. 64, iss. 3, str. 1-24.

GALE, Luka, KOLAR-JURKOVŠEK, Tea, KARNIČNIK, Barbara, CELARC, Bogomir, GORIČAN, Špela, ROŽIČ, Boštjan. Triassic deep-water sedimentation in the Bled Basin, eastern Julian Alps, Slovenia. *Geologija*, ISSN 0016-7789, 2019, 62, št. 2, str. 153-173, ilustr., doi: 10.5474/geologija.2019.007.

MENCIN GALE, Eva, JAMŠEK RUPNIK, Petra, TRAJANOVA, Mirka, GALE, Luka, BAVEC, Miloš, ANSELMETTI, Flavio S., ŠMUC, Andrej. Provenance and morphostratigraphy of the Pliocene-Quaternary sediments in the Celje and Drava-Ptuj Basins (eastern Slovenia). *Geologija*, ISSN 0016-7789, 2019, 62, št. 2, str. 189-218, doi: 10.5474/geologija.2019.009.

IVANČIČ, Kristina, TRAJANOVA, Mirka, SKABERNE, Dragomir, ŠMUC, Andrej. Provenance of the Miocene Slovenj Gradec Basin sedimentary fill, Western Central Paratethys. *Sedimentary geology*, ISSN 0037-0738. [Print ed.], 2018, vol. 375, str. 256-267.

MENCIN GALE, Eva, JAMŠEK RUPNIK, Petra, TRAJANOVA, Mirka, BAVEC, Miloš, ANSELMETTI, Flavio S., ŠMUC, Andrej. Morphostratigraphy and provenance of Plio-Pleistocene terraces in the south-eastern Alpine foreland : the Mislinja and Upper Savinja valleys, northern Slovenia. *Journal of quaternary science*, ISSN 0267-8179, 2019, str. 1-7.

GEOMEDICINA

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Geomedicina
Course title:	Geomedicine
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	3. letnik		izbirni

Univerzitetna koda predmeta/University course code:	0089607
Koda učne enote na članici/UL Member course code:	530

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	0	0	0	45	3

Nosilec predmeta/Lecturer:	Nastja Rogan Šmuc, Nina Zupančič
Vrsta predmeta/Course type:	Izbirni / Elective

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Opravljen izpit iz Kemije in Geokemije za pristop k izpitu.	Passed exam of Chemistry and Geochemistry to take an exam.

Vsebina:	Content (Syllabus outline):
Naravna obilnost in porazdelitev prvin vs. antropogenim virom	Natural distribution and abundance of elements vs. antrophogenic sources
Kemijski vidik vnosa prvin	Uptake of elements from a chemical point of view
Biološki vidik vnosa prvin	Uptake of elements from a biological point of view
Biološka funkcija prvin	Biological functions of the elements
Geološki vpliv na prehrano	Geological impact on nutrition
Biološki odzivi na prvine	Biological responses of elements
Vulkanske emisije in zdravje	Volcanic emissions and health
Izbrani elementi (radon, fluor, jod, selen, potencialno strupenih elementov ...), v zraku, tleh, vodi	Selected elements (radon, fluoride, iodine, selenium, potentialy toxic elements…) in air, soil, water
Biološka razpložljivost prvin v tleh	Bioavailability of elements in soil
Geofagija	Geophagy
Živali in medicinski geologija	Animals and medical geology
Okoljska epidemiologija	Environmentala epidemiology
Okoljska patologija	Environmental pathology
Toksikologija	Toxicology

Speciacija prvin Mineralogija kosti	Speciation of elements Mineralogy of bone

Temeljna literatura in viri/Readings:

SELINUS, O., 2005, Essentials of Medical Geology. Elsevier, 812 p.

Cilji in kompetence:	**Objectives and competences:**
CILJI: Slušatelj pridobi znanje o povezavi in vplivu nekaterih mineralov in geokemičnih prvin na zdravje, v smislu izpostavljenosti in vnosa toksičnih in koristnih substanc v organizem ter vpliva geoloških faktorjev na bivalno okolje. KOMPETENCE: Študent je sposoben prepoznati koristne in toksične geološke materiale v človekovem okolju ter predlagati rešitve za zmanjšanje/povečanje njihovega vpliva na človeka.	OBJECTIVES: Students will learn about the connection and the impact of certain minerals and geochemical elements on health, in terms of exposure and intake of toxic substances in the organisms, and the impact of geological factors on the living environment. COMPETENCES: The student is able to recognize the benificial and toxic geological materials in the environment, and to propose solutions to reduce / increase their impact on humans.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Študent razume prisotnost kemijskih prvin in mineralov v človeškem telesu in njegovi neposredni okolici, pozna njihov pomen in pomembnost glede na delovanje in nastajanje. Iz drugih področij (medicina, kemija,...) je slušatelj sposoben pridobiti in uporabiti potrebna znanja za celostno reševanje problematike s področja vpliva geoloških dejavnikov na zdravje in bivalno okolje. Pri delu je sposoben sodelovati s strokovnjaki iz ostalih področij (medicina, kemija, fizika, biologija, ...) pozna analitske naprave, domačo in tujo strokovno literaturo ter relevantne računalniške programe.	The student understands the presence of chemical elements and minerals in the human body and its immediate surroundings, gets familiar with their meaning and significance in relation to the operation and production. The student is able to anticipate, identify and solve the problems of interaction of living environment and the human body with the mineralogical and geochemical aspects. The student is able to acquire and apply the necessary skills from the other fields (medicine, chemistry, ...), to for comprehensive problem solving of the geological factors influence on the health and living environment. Student is able to work with professionals from other fields (medicine, chemistry, physics, biology, ...), knows the analytical devices, domestic and foreign professional literature and relevant computer programs.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja in seminarske vaje.	Lectures and seminar work.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Seminarske vaje	20,00 %	Seminar work.
Pisni ali ustni izpit	80,00 %	Written or oral examination

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.
ZUPANČIČ, Nina. The influence of vegetation type on metal content in soils. RMZ-mater. geoenviron., 2012, vol. 59, no. 2/3, str. 229-244.
GLAVAŠ, Neli, MOURELLE, Lourdes Maria, GÓMEZ, Carmen P., LEGIDO, José Luis, ROGAN ŠMUC, Nastja, DOLENEC, Matej, KOVAČ, Nives. The mineralogical, geochemical, and thermophysical

characterization of healing saline mud for use in pelotherapy. *Applied clay science*, ISSN 0169-1317. [Print ed.], 2017, vol. 135, str. 119-128, ilustr., doi: 10.1016/j.clay.2016.09.013.
ROGAN, Nastja, DOLENEC, Tadej, SERAFIMOVSKI, Todor, JAĆIMOVIĆ, Radojko, DOLENEC, Matej. Major and trace elements in rice seeds from Kočani field, Macedonia. Acta chim. slov., [Tiskana izd.], 2007, vol. 54, no. 3, str. 623-634.
DOLENEC, Tadej, LOJEN, Sonja, KNIEWALD, Goran, DOLENEC, Matej, ROGAN, Nastja. Nitrogen stable isotope composition as a tracer of fish farming in invertebrates Aplysina aerophoba, Balanus perforatus and Anemonia sulcata in central Adriatic. Aquaculture, [Print ed.], 2007, vol. 262, is. 2-4, str. 237-249.

GEOMEHANIKA

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Geomehanika
Course title:	Soil Mechanics
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	1. letnik	2. semester	obvezen

Univerzitetna koda predmeta/University course code:	0067458
Koda učne enote na članici/UL Member course code:	891

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
30	0	15	0	0	45	3

Nosilec predmeta/Lecturer:	Vojkan Jovičić
Vrsta predmeta/Course type:	Obvezni / Compulsory

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Pred pristopom k izpitu mora imeti študent opravljene izpite iz predmetov Matematika 1, Fizika 1 in Osnove geologije.	Before entering the exam the student must have passed exams in Mathematics 1, Physics 1 and Introduction to Geology.

Vsebina:	Content (Syllabus outline):
Nastanek tal. Klasifikacija tal. Faze v tleh (trdnina, voda, zrak), odnos med fazami. Zbitost tal. Geotehnične lastnosti zemljin, načini določanja teh lastnosti z laboratorijskimi preiskavami (stisljivost tal, strižna trdnost tal, konsolidacija tal). Določanje zbitosti in vodoprepustnost v laboratoriju, meje plastičnosti in stanja konsistence. Trdnost tal. Preizkusi v laboratoriju: edometerski preizkus, preizkus direktnega striga, triosni preizkus. Aplikacija splošnih izsledkov mehanike in mehanike fluida na zemljine: princip efektivnih napetosti, kapilarni dvig vode v tleh, sukcija.	The origin of soils. Soil Classification. Phases in soil (soil skeleton, water, air), relationship between phases. Soil densification. Geotechnical characteristics of soils, determination of characteristics in the laboratory (soil deformability, shear strength, consolidation). Determination of density and permeability in the laboratory, limits of plasticity, state of consistency. Soil strength. Laboratory tests: edometer, direct shear and triaxial tests. The application of the general findings of mechanics and mechanics of fluids to soils: the principle of effective stresses, capillary rise of water in soils,

Enodimenzionalno in dvodimenzionalno precejanje vode čez zemljine, proces konsolidacije.	suction. One dimensional and two dimensional seepage in soils; consolidation process.

Temeljna literatura in viri/Readings:

ŠUKLJE, L., (1984). Mehanika tal. Univerza v Ljubljani, Fakulteta za arhitekturo, gradbeništvo in geodezijo, Ljubljana, str. 212-235 in 268-312.
NONVEILLER, E., (1990). Mehanika tla i temeljenje građevina. Školska knjiga, Zagreb, str. 309-400 in 495-768.
MAKSIMOVIĆ, M. (2008). Mehanika tla. AGM knjiga, Beograd, str. 517.
MAJES, B. (2006). Skripta za predmet Mehanika tal, Ljubljana (dostopno na spletnem portalu http://www.fgg.uni-lj.si/kmtal/)
LOGAR, J., MAJES, B. (2006). Skripta za predmet Zemeljska dela, Ljubljana (dostopno na www.fgg.uni-lj.si/kmtal).

Cilji in kompetence:	**Objectives and competences:**
CILJI: Cilj predmeta je, da bo študent osvojil osnovno znanje iz geomehanike (mehanike tal), kar bo po študiju potreboval za praktično delo pri posegih in gradnji na terenu (temeljenje zgradb, prometnice, sanacija plazov, itd.), različnih zemeljskih delih in geotehničinih gradnjah, kjer sodeluje kot inženirski geolog. KOMPETENCE: Slušatelji pridobijo osnovne sposobnosti za opravljanje del, ki jih opravlja inženirski geolog pri najrazličnejših posegih v teren in pri sodelovanju z gradbeno projektivo in operativo.	OBJECTIVES: The aim of the subject is that students gain fundamental knowledge of Soil Mechanics, which would be needed for practical work for the interventions in built environment and construction on the site (foundation of structures, roads and railways construction, landslides stability measures etc.), ground and geotechnical works, in which he/she takes place as engineering geologist. COMPETENCES: The students gain fundamental capabilities for carrying out the work, done by engineering geologist for different interventions in built environment and for collaborating with the Civil Engineering designers and construction engineers.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Po kursu študent pridobi osnovno znanje iz področja del geomehanike, ki ga rabi pri gradnji različnih tipov objektov (temeljenje zgradb, prometnice, idr.), kjer sodeluje kot geolog; opremljen je za razumevanje osnovnih postopkov povezanih z izvajanjem laboratorijskih raziskav v geomehanskem laboratoriju. Študent je usposobljen za osnovno inženirsko-geološko delo na geoloških, gradbenih, rudarskih in drugih gospodarskih družbah. Sposoben je sodelovanja pri različnih gradbenih posegih v teren in obvlada laboratorijske preiskave za določitev geomehanskih razmer.	After the course the students gain fundamental knowledge from the areas of Soil Mechanics, which is needed for the construction of different types of structures (foundation of structures, roads and railways construction, landslides stability measures etc.), ground and geotechnical works, in which he/she takes place as engineering geologist. The students are enabled to understand the basic procedures related to the laboratory testing. Students are qualified for basic engineering-geological work on geological, civil engineering, mining and other companies. They are capable of collaborating for different interventions in the built environment and is competent in laboratory testing for determination of geological conditions.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, laboratorijske vaje, računske vaje.	Lectures, laboratory tutorials, computational tutorials.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
pisni in/ali ustni izpit	50,00 %	written and/or oral exam
ustni izpit	40,00 %	oral exam
izdelava elaborata računskih vaj	10,00 %	production of the elaborate of the computational tutorials

Oceno sestavljajo: pisni izpit, ustni izpit in izdelava elaborata računskih vaj. Ocena: 6-10 (pozitivno) oz. 1-5 negativno; ob upoštevanju Statuta UL in fakultetnih pravil.		The rating consists of: written exam, oral exam and production of the elaborate of the computational tutorials. The mark: 6-10 (positive); 1-5 (negative); in agreement with Statute UL and the Faculty rules.

Reference nosilca/Lecturer's references:

VILHAR, Gregor, JOVIČIĆ, Vojkan, COOP, Matthew. The role of particle breakage in the mechanics of a non-plastic silty sand. Soil found., 2013, vol. 53, no. 1, str. 91-104.
JUREČIČ, Nina, ZDRAVKOVIĆ, Lidija, JOVIČIĆ, Vojkan. Predicting ground movements in London Clay. Proc. Inst. Civ. Eng., Geotech. eng.. [Print ed.], 2012, vol. 164, issue 4, str. 1-17, doi: 10.1680/geng.11.00079.
JOVIČIĆ, Vojkan, ŠUŠTERŠIČ, Jakob, VUKELIČ, Željko. The application of fibre reinforced shotcrete as primary support for a tunnel in flysch. Tunn. undergr. space technol.. [Print ed.], 2009, vol. 24, no. 6, str. 723-730.

GEOMORFOLOGIJA

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Geomorfologija
Course title:	Geomorphology
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	2. letnik	2. semester	obvezen

Univerzitetna koda predmeta/University course code:	0067472
Koda učne enote na članici/UL Member course code:	959

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	0	0	15	45	3

Nosilec predmeta/Lecturer:	Andrej Šmuc, Tomislav Popit
Vrsta predmeta/Course type:	Obvezni / Compulsory

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Ni pogojev.	No prerequisites.

Vsebina:	Content (Syllabus outline):
Uvod: definicije in osnovni zakoni Glavni geomorfološki procesi Gomorfologija velikih meril Pobočna, fluvialna, eolska, glacialna, tektonska in antropogena geomorfologija Kabinetne vaje: Uvod v uporabno geomorfološko kartiranje Tehnike geomorfološkega kartiranja na terenu Digitalno kartiranje: vizualizacija, interpretacija in kvantifikacija Zemljinega površja Kartografija: oblikovanje, simbolizacija in vizualizacija geomorfoloških kart Primer kartiranja kvartalnih pobočnih sedimentov na konkretnem primeru Terensko delo:	Introduction: definitions and universal geomorphology laws Basic geomorphological processes Large scale geomorphology Geomorphology of slopes, fluvial systems, aeolian systems, glacial systems, tectonic and anthropogenic geomorphology Tutorial: Introduction to applied geomorphological mapping Techniques in applied geomorphological mapping Digital mapping: visualization, interpretation and quantification of landforms Cartography: design, symbolization and visualization of geomorphological maps Case studies: Mapping Quaternary slope deposit Field work:

Terenska merjenja v geomorfologiji Prepoznavanje in kartiranje geomorfnih oblik	Field measurements in geomorphology Recognition and mapping of different landscape features

Temeljna literatura in viri/Readings:

ANDERSON, R.S. & ANDERSON S.P.2010: Geomorphology The mechanics and Chemistry of landscape. - Cambridge,637 pp.
SUMMERFIELD, M.A. 1991: Global Geomorphology. - Longman, 537 pp., ISBN: 0-582-30156-4.
LEOPOLD L.B., WOLMAN G.M. & MILLER J.P. 1995: Fluvial processes in geomorphology. - Dover, 522 pp.
SZABO J., DAVID L. & LOCZY. 2010: Anthropogenic geomorphology: A guide to man-made landforms. – Springer. 298 pp.
BURBANK, D.W. & ANDERSON R.P. 2001: Tectonic geomorphology. – Blackwell Science, 274 pp.
SMITH, M.J., PARON, P. & GRIFFITHS, S. 2011: Geomorphological mapping, methods and applications. – Elsevier. 612 pp.McKean, J., Roering, J. (2004). Objective landslide detection and surface morphology mapping using high-resolution airborne laser altimetry. Geomorphology, 57(3-4), 331–351.
JABOYEDOFF, M., OPPIKOFER, T., ABELLÁN, A., DERRON, M.-H., LOYE, A., METZGER, R., PEDRAZZINI, A. (2012). Use of LIDAR in Landslide Investigations: A Review. Natural Hazards, 61(1), 5–28.
GLENN, N. F., STREUTKER, D. R., CHADWICK, D. J., THACKRAY, G. D., DORSCH, S. J. (2006). Analysis of LiDAR-derived topographic information for characterizing and differentiating landslide morphology and activity. Geomorphology, 73(1-2), 131–148.
GROHMANN, C. H., SMITH, M. J., RICCOMINI, C. (2011). Multiscale Analysis of Topographic Surface Roughness in the Midland Valley, Scotland. IEEE Transactions on Geoscience and Remote Sensing, 49(4), 1200–1213.

Cilji in kompetence:	**Objectives and competences:**
CILJI: Slušatelj osvoji osnovno znanje o interakciji med eksogenimi in endogenimi procesi na zemeljski površini in o rezultatih tega medsebojnega učinkovanja. Študent se nauči principov terenskih merjenj in jih zna vpeti v prostor. Nauči se nadgraditi znanje pridobljeno pri posameznih poglavjih v okviru predmetov iz 1. letnika. Naučijo se tehnike geomorfološkega kartiranja, vizualizacije, interpretacije in kvantifikacije Zemljinega površja. Naučijo se opremiti in oblikovati geomorfološko karto s simboli in primerno vizualizacijo in izdelati lastno geomorfološko karto kvartarnih sedimentov. KOMPETENCE: Vsebina predmeta študentu omogoča in hkrati od študenta zahteva, da na konkretnih primerih posamezne geomorfne oblike ustrezno kvalitativno opiše in jih kvantitativno izmeri ter genetsko in procesno opredeli.	OBJECTIVES: Students learn about basic interactions between endogenic and exogenic processes and the resulting landforms. Students learn basic of field measurments and mapping. They learn about techniques in applied geomorphological mapping, vizualization, interpretation and quantification of landforms. Students learn design, symbolisation and visualization of geomorphological maps and wil made own geomorphological map of Quaternary slope deposits. COMPETENCES: Student is able to describe and quantitatively measure different geomorphological features and interpret processes of their formation.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Študent pozna in razume vzročne povezave med geomorfnimi procesi in oblikami. V različnih praktičnih situacijah je na podlagi pridobljenega znanja sposoben genetsko razumeti posamezno geomorfno obliko ali proces in razumeti ter oceniti njen (njegov) morebiten vpliv na naravno in antropogeno okolje. Predmet študentu omogoča razmislek o povezanosti vseh geomorfnih oblik z antagonizmom in sinergizmom med eksogenimi in	Student is able to understand the connection between the geomorphic process and form. In practical situations the students understands genetic origin of particular geomorphic form or a process and is able to evaluate its influence on natural and anthropogenic environment. The student is able to ponder over interconnections between all endogenic and eksogenic processes reflected in a speciphic form. The student is able to woek with processionals from

endogenimi procesi v konkretnih terenskih situacijah. Študent zna povezovati znanje, ki ga je pridobil pri posameznih poglavjih v okviru drugih predmetov. Hkrati se seznani s praktičnimi aplikacijami pridobljenega znanja na druga področja.	other fields (civil engineers, biologists, ..) and is able to use domestic and foreign professional and scientific literature.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja in terensko delo.	Lectures and field work.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Pisni in/ali ustni izpit	80,00 %	Written and/or oral exam
Poročilo in/ali kratek test iz terenskega dela	20,00 %	Fieldwork reports and/or a short written exam about the field stops
Ocena: 6-10 (pozitivno) oz. 1-5 negativno; ob upoštevanju Statuta UL in fakultetnih pravil.		The mark: 6-10 (positive); 1-5 (negative); in agreement with Statute UL and the Faculty rules.

Reference nosilca/Lecturer's references:

NOVAK, Andrej, POPIT, Tomislav, LEVANIČ, Tom, ŠMUC, Andrej, KACZKA, Ryszard J. Debris flooding magnitude estimation based on relation between dendrogeomorphological and meteorological records. *Geomorphology : an international journal of pure and applied geomorphology*, ISSN 0169-555X. [Print ed.], 2020, str. 1-52.

MENCIN GALE, Eva, JAMŠEK RUPNIK, Petra, TRAJANOVA, Mirka, GALE, Luka, BAVEC, Miloš, ANSELMETTI, Flavio S., ŠMUC, Andrej. Provenance and morphostratigraphy of the Pliocene-Quaternary sediments in the Celje and Drava-Ptuj Basins (eastern Slovenia) = Provenienca in morfostratigrafija pliocensko-kvartarnih sedimentov v Celjskem in Dravsko-Ptujskem bazenu (vzhodna Slovenija). *Geologija*, ISSN 0016-7789. [Tiskana izd.], 2019, 62, št. 2, str. 189-218.

NOVAK, Andrej, POPIT, Tomislav, ŠMUC, Andrej. Sedimentological and geomorphological characteristics of Quaternary deposits in the Planica-Tamar Valley in the Julian Alps (NW Slovenia). *Journal of maps*, ISSN 1744-5647. [Spletna izd.], 2018, vol. 14, no. 2, str. 382-391.

VERBOVŠEK, Timotej, POPIT, Tomislav, KOKALJ, Žiga. VAT method for visualization of mass movement features : an alternative to hillshaded DEM. *Remote sensing*, ISSN 2072-4292, 2019, vol. 11, iss. 24, str. 1-14, doi: 10.3390/rs11242946.

GIS V GEOLOGIJI

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	GIS v geologiji
Course title:	GIS in Geology
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	1. letnik	1. semester	obvezen

Univerzitetna koda predmeta/University course code:	0067459
Koda učne enote na članici/UL Member course code:	885

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
30	0	15	0	0	45	3

Nosilec predmeta/Lecturer:	Timotej Verbovšek
Vrsta predmeta/Course type:	Obvezni / Compulsory

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Opravljen kolokvij je pogoj za pristop k izpitu.	Student must first positively pass the examination from exercises and later also the written exam.

Vsebina:	Content (Syllabus outline):
Uvod (Kaj je GIS, zgodovina, zakaj uporabiti GIS, njegove prednosti pred klasičnim pristopom, standardi, logika GIS-a, modeli realnega sveta, kako je uporaben za geologe, pravni vidiki, zaščita avtorskih pravic). Vrste podatkov, podatkovne baze (definicija in struktura podatkovne baze, konceptualni model podatkov – entiteta, atribut, domena, primeri geoloških podatkovnih baz, logični modeli podatkov – odnosi 1:1, 1:n, n:n). Zajem podatkov (primarno, sekundarno; GNSS, digitalizacija). Georeferenciranje, osnove daljinskega zaznavanja. Zgradba GIS-a (sestavni deli GIS-a (strojna oprema, programska oprema, podatki, strokovnjaki, tehnologija dela). Geografske projekcije (geografske in projekcijske;	Introduction (What is GIS, history, why GIS, advantages over classical approach, standards, GIS logic, real-world models, legislation, user rights). Data types, databases (structure and definition of databases, conceptual data model - entity, attribute, domain, examples of geological databases, cardinality– relationships 1:1, 1:n, n:n). Acquisition of data (primary, secondary; GNSS, digitalization). Georeferencing, basics of remote sensing. GIS components (hardware, software, data, people, work technology). Geographic projections (geographic and projected; most used coordinate systems in world and in Slovenia). Data visualization (symbology of vector and raster data).

glavni koordinatni sistemi v svetu in pri nas), karte. Vizualizacija podatkov (simbologija vektorskih in rastrskih podatkov). Analize (atributne in prostorske poizvedbe). Izdelava splošnih geoloških kart z GIS-om (prenos terenskih podatkov v računalnik – opisnih in grafičnih, mobilni GIS, priprava geoloških podatkov – izdelava legende, priprava karte za izris) Osnove rastrskih in 3-D analiz.	Analyses (queries by attributes and by location). Preparation of geological maps (transformation of tabulated and spatial field data in GIS, mobile GIS, preparation of legend and other map components for plotting). Basics of raster data and 3-D analyses.

Temeljna literatura in viri/Readings:

GORR & KURLAND, 2011: GIS tutorial 1 : basic workbook : for ArcGIS 10.
LONGLEY, P.A. et al., 2005: Geographic Information Systems and Science. 2nd ed., Wiley, 517 str.
VERBOVŠEK, T. & KOMAC, M., 2010: Študijsko gradivo za predmet GIS v geologiji : (prosojnice s predavanj in vaj). Ljubljana: UL, Naravoslovnotehniška fakulteta, Odd. za geologijo, 267 str., Ljubljana, http://www.ntf.uni-lj.si/og/timotej-verbovsek/
Zborniki GIS v Sloveniji, https://giam.zrc-sazu.si/sl/publikacije/gis-v-sloveniji
Spletno gradivo za program QGIS: https://www.qgis.org/en/docs/index.html

Cilji in kompetence:	**Objectives and competences:**
CILJI: Slušatelj osvoji osnovno poznavanje obdelave in shranjevanja prostorskih podatkov ter prostorskih analiz preko sodobnih GIS orodij. KOMPETENCE: Slušatelj je sposoben upravljati s pridobljenimi neprostorskimi in prostorskimi podatki z GIS orodji, jih integrirati v podatkovne baze, izdelati osnovno geološko karto ter analizirati podatke v GIS okolju.	OBJECTIVES: Student acquires a basic knowledge about analysis and storage of spatial data and analyses by modern GIS approach. COMPETENCES: Student is able to manage the acquired non-spatial and spatial data and to integrate them into spatial databases, to prepare a geological map and analyze the data in GIS environment.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Študent obvlada teoretično in praktično znanje, kako uporabiti GIS orodja za izdelavo geoloških kart in analiz prostorskih podatkov. Študent zna uporabiti GIS program (QGIS, delno tudi ESRI ArcGIS) za reševanje problemov v geologiji. Študent način razmišljanja, ki ga je pridobil pri predmetu, lahko praktično uporabi pri večini drugih geološko usmerjenih predmetih za obdelavo prostorskih podatkov. S pridobljenim znanjem in GIS postopki je študent sposoben delovati na ostalih področjih geologije ter v ostalih vedah, ki se ukvarjajo s prostorskimi podatki.	Student understands theoretical and practical knowledge of usage of GIS tools to prepare geological maps and to analyze spatial data. Student is able to use the GIS program (QGIS, partly also ESRI ArcGIS) to solve the problems in geology. Learned workflow will be used practically at other geological fields for the analysis of spatial data. Gained knowledge and GIS will be obtained in such way that the student will be able to transfer this knowledge in other fields of geology and other fields with spatial data analysis.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja (30 ur), računalniške vaje (15 ur).	Lectures (30 hours), computer exercises (15 hours).

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
IZPIT: pisni in/ali ustni izpit (teoretični del)	60,00 %	EXAM: written and/or oral exam
KOLOKVIJ: pisni (praktični del na računalnikih)	40,00 %	EXERCISES: written examination (on computers)
Pogoji za pristop k izpitu: - pozitivno opravljen kolokvij. Ocenjevalna lestvica: 51-60% (6); 61-70% (7); 71-80% (8); 81-90% (9); 91-100% (10) ob upoštevanju Statuta UL in fakultetnih pravil		Prerequisites for written exam: - positively graded exercises. Grades: 51-60% (6); 61-70% (7); 71-80% (8); 81-90% (9); 91-100% (10), according to University Statute and Faculty Acts.

Reference nosilca/Lecturer's references:

VERBOVŠEK, Timotej, POPIT, Tomislav, KOKALJ, Žiga. VAT method for visualization of mass movement features : an alternative to hillshaded DEM. Remote sensing. 2019, vol. 11, iss. 24, str. 1-14. ISSN 2072-4292. DOI: 10.3390/rs11242946.

POPIT, Tomislav, ROŽIČ, Boštjan, ŠMUC, Andrej, KOKALJ, Žiga, VERBOVŠEK, Timotej, KOŠIR, Adrijan. A LIDAR, GIS and basic spatial statistic application for the study of ravine and palaeo-ravine evolution in the upper Vipava valley, SW Slovenia. Geomorphology : an international journal of pure and applied geomorphology. [Print ed.]. 2014, vol. 204, str. 638-645. ISSN 0169-555X. http://dx.doi.org/10.1016/j.geomorph.2013.09.010.

VERBOVŠEK, Timotej, POPIT, Tomislav. GIS-assisted classification of litho-geomorphological units using Maximum Likelihood Classification, Vipava Valley, SW Slovenia. Landslides : Journal of the international consortium on landslides. [Print ed.]. 2018, vol. 15, iss. 7, str. 1415-1424. ISSN 1612-510X. DOI: 10.1007/s10346-018-1004-2.

HIDROGEOLOGIJA

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Hidrogeologija
Course title:	Hydrogeology
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	3. letnik	1. semester	obvezen

Univerzitetna koda predmeta/University course code:	0067483
Koda učne enote na članici/UL Member course code:	11243

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
45	0	30	0	15	90	6

Nosilec predmeta/Lecturer:	Mihael Brenčič
Vrsta predmeta/Course type:	Obvezni / Compulsory

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Za opravljanje izpita iz hidrogeologije mora imeti študent opravljene izpite iz Fizike 1, Matematike 1 in Kemije 1. Opravljen kolokvij iz vaj je osnova za pristop k izpitu.	To perform an exam student must have passed exams in Physics 1, Mathematics 1 and Chemistry 1. Passed colloquium is required before for the exam.

Vsebina:	**Content (Syllabus outline):**
Osnovni koncepti hidrološkega kroga in vodne bilance, koncept poroznega medija in pojavljanje poroznosti v sedimentih in kamninah, osnove toka vode skozi porozni medij, hidrodinamski modeli vodonosnikov, osnove hidrogeoloških metod (hidrogeološko kartiranje, črpalni in nalivalni poizkusi), osnove razvoja podzemnih vodnih virov, osnove zaščite podzemne vode, osnove varstva pred podzemnimi vodami, osnove izkoriščanja geotermalne energije.	Basic concepts of hydrologic cycle and water balance concepts of porous medium and the occurrence of porosity in sediments and rocks basics of water flow through porous medium hydrodynamics models of aquifers basics of hydrogeological methods (hydrogeological mapping, pumping and inflow tests) basics of ground water resources development basics of groundwater protection basics of negative influences of groundwater basics of geothermal energy exploitation.

Temeljna literatura in viri/Readings:

BRENČIČ, M. Splošna hidrogeologija – študijsko gradivo
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.

Cilji in kompetence:	**Objectives and competences:**
CILJI: Študent bo osvojil osnovno znanje o pojavljanju podzemne vode v sedimentih in kamninah. KOPETENCE: usposobljenost za praktično opredelitev pojavljanja podzemne vode v kamninah in sedimentih, usposobljenost za sodelovanje pri zajemih podzemne vode za potrebe vodooskrbe, usposobljenost za sodelovanje pri večjih gradbenih posegih v prostor tam, kjer je podzemna voda omejujoč dejavnik.	OBJECTIVES: Students will acquire basic knowledge on the occurrence of groundwater in sediments and rocks. COMPETENCES: ability to practically define the occurrence of groundwater in rocks and sediments, ability to participate in the capturing of groundwater for the need of water supply, ability to participate in the construction of major land development, where groundwater is the limiting factor.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Študent bo spoznal naravo vodonosnikov in pogoje pod katerimi v njih nastopa podzemna voda. To znanje mu bo omogočalo izdelavo osnovnih hidrogeoloških prognoz in napovedi možnosti za zajem podzemne vode. Pridobljeno znanje mu bo omogočalo tudi izdelavo strokovnih podlag za zaščito vodnih virov. Študent bo za potrebe praktičnih izračunov zajema in zaščite podzemne vode znal uporabiti Darcyev zakon s pomočjo katerega bo sposoben izvesti osnovne inženirske prognoze za zajem podzemne vode za potrebe vodooskrbe in za potrebe zaščite pred podzemno vodo pri gradbenih posegih v prostor. Pridobljeno teoretično znanje in opravljene praktične vaje mu bodo omogočale napovedovanje pojavov podzemne vode v pogojih, ki nastopajo na območju Slovenije. Pri predmetu se bo študent naučil identifikacije in osnov inženirskega reševanja praktičnih problemov.	Students will learn the nature of the aquifers and the conditions under which the groundwater appears. This knowledge will enable them to produce the basic hydrological prediction for possibilities to capture groundwater. The acquired knowledge will also enable them to make professional basis for the protection of water resources. Students will be able to use Darcy's law for the practical calculations and protection of groundwater. With that they will be able to perform basic engineering prognosis for capturing groundwater for water supply and be able to protect construction activities against groundwater. Acquired theoretical knowledge and performed practical exercises will enable them to predict the occurrence of groundwater in the Slovenian area. In this course the student will learn the identification and basics of engineerical solutions for practical problems.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predvidene so naslednje metode poučevanja: predavanja predavanja na terenu računske vaje terensko delo študentov projektno delo	Expected teaching methods: lectures lectures on the field exercises students' field work project work

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
prisotnosti na vajah in predavanjih	10,00 %	presence at exercises and lectures
ocene računskih vaj	40,00 %	assessment of calculating exercises
pisni in/ali ustni izpit	50,00 %	written and/or oral exam
Ocena pri predmetu se sestoji iz: prisotnosti na vajah in predavanjih, ocene računskih vaj in pisnega izpita. Ocenjevalna lestvica: (6-10) pozitivno, ob upoštevanju Statuta UL in fakultetnih pravil.		Assessment of the course consists of: presence at exercises and lectures, assessment of calculating exercises and written exam. Grades: (6-10) positive assessment, according to University Statute and Faculty Acts.

Reference nosilca/Lecturer's references:

ŠRAM, Dejan, BRENČIČ, Mihael, LAPANJE, Andrej, JANŽA, Mitja, 2012: Prostorski model visečih vodonosnikov na Ljubljanskem polju. Geologija. 55/1, 107-116.
VAUPOTIČ, Janja, OGRINC, Nives, BRENČIČ, Mihael, KOBAL, Ivan, 2011. Tritium mapping in spring waters in Slovenia. Geochem. J., 45/6, 505-512.
BRENČIČ, Mihael, 2006: Groundwater and highways interaction: past and present experiences of highway construction in Slovenia. Environ. geol. 49/6, 804-813.

INŽENIRSKA GEOLOGIJA

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Inženirska geologija
Course title:	Engineering Geology
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	3. letnik	1. semester	obvezen

Univerzitetna koda predmeta/University course code:	0067484
Koda učne enote na članici/UL Member course code:	11244

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
60	0	30	0	30	120	8

Nosilec predmeta/Lecturer:	Timotej Verbovšek
Vrsta predmeta/Course type:	Obvezni / Compulsory

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Ni pogojev.	No prerequisites.

Vsebina:	Content (Syllabus outline):
Uvod. Inženirsko-geološke (IG) značilnosti slovenskega ozemlja, klasifikacije, splošne lastnosti zemljin in hribin. Geološki destruktivni procesi in inženirska geologija. Metode geoloških raziskav (vrtanje, oprema, zakonodaja, strukturno-geološko vrtanje, geomehansko vrtanje, hidrogeološke raziskave in vrtanje, globinsko vrtanje, karotaža, vzdrževanje vrtin, popisi jeder), in-situ preiskave. Izdelava inženirskogeoloških kart in napovedi. Geologija okolja v inženirski geologiji in uporaba inženirske geologije pri odlaganju odpadkov, IG pri posegih v teren. IG in potresi ter seizmična mikrorajonizacija. IG in plazovi. Masna premikanja zemljin in hribin, klasifikacija plazov, elementi plazov, metode raziskav (IG kartiranje in posnemanje, geodetske in geofizikalne meritve, meritve deformacij, nivojev	Introduction. Engineering-geological (EG) characteristics of Slovenia's territory, classifications, properties of soil and rock masses. Geological destructive processes and engineering geology. Methods of geological research (drilling, equipment, legislation, structural drilling, geomechanical drilling, hydrogeological research methods and drilling, deep drilling, well logging, borehole maintenance), in-situ investigations. Engineering geology maps, risk assessment. Environmental geology in engineering geology and use of engineering geology for waste deposits construction, EG and environmental interventions. EG, earthquakes and seizmic microzonation. EG and landslides. Soil and rock mass movements, classification and elements of landslides, investigation methods (EG mapping, geodetic and geophysical

vode, inklinometri, geomehanske raziskave), sanacija plazov. Pregled glavnih plazov v Sloveniji in v tujini. Modeliranje plazov. Terensko delo: ogled izbranih slovenskih in bližnjih tujih plazov ter praktičnih in-situ terenskih raziskav.	investigations, deformations, water level measurements, inclinometers, geomechanical research). Mitigation of landslides. Outline of major Slovenian and foreign landlides. Landslide modeling. Field work: major Slovenian and foreign landlides and in-situ field measurements.

Temeljna literatura in viri/Readings:

Australian Drilling Industry Training Committee Limited, 1997: Drilling. The Manual of Methods, Applications, and Management CRC Press, ZDA.
CORNFORTH, D.H., 2005: Landslides in Practice, John Wiley & Sons.
FELL, R., 2000, Geotechnical Engineering of the Stability of Natural Slopes, and Cuts and Fills in Soil, GeoEng2000, Melbourne.
HIGHLAND, L. M. & BOBROWSKY, P., 2008: The Landslide Handbook— A Guide to Understanding Landslides, Geological Survey of Canada. USGS Circular 1325.
HOEK, E., 2007: Practical Rock Engineering, http://www.rocscience.com/hoek/PracticalRock
MARJORIBANKS, R., 2010: Geological Methods in Mineral Exploration and Mining. 2nd ed., Springer.
PRICE, D. G., 2009: Engineering Geology. Principles and Practice. Springer, Berlin.
RIBIČIČ, M., 2002: Skripta Inženirska geologija I, Naravoslovnotehniška fakulteta, 231 str., Ljubljana.
Verbovšek, Timotej. Inženirska geologija : študijsko gradivo za predmet Inženirska geologija na 1. stopnji UNI BOL študija geologije. Ljubljana: Univerza v Ljubljani, NTF, Oddelek za geologijo, 2017. 161 str., ilustr. https://www.ntf.uni-lj.si/og/employee/timotej-verbovsek/studijski-material/.

Cilji in kompetence:	**Objectives and competences:**
CILJI: Študent bo osvojil osnovno znanje iz inženirske geologije za praktično delo pri inženirskogeoloških posegih na terenu in pri ugotavljanju posledic posegov v teren (odlagališča odpadkov, geologija okolja, itd.) ter obvladovanje naravnih ogrožajočih pojavov (plazovi, potresi) ter iz metod geoloških raziskav ter vrtanja. KOMPETENCE: slušatelji pridobijo osnovne sposobnosti za opravljanje del, ki jih opravlja inženirski geolog pri najrazličnejših posegih v teren, odpravi posledic naravnih nesreč, itd.	OBJECTIVES: Student will gather the basic knowledge engineering geology for a practical work at field interventions, for determination of consequences of field interventions (waste deposits, environmental geology etc.) and for understanding of natural disasters (landslides, earthquakes) plus from geological research methods and drilling. COMPETENCES: Students gather the basic capabilities for performing work, which is done by engineering geologist at various field interventions, mitigation of natural disasters etc.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Po vsebini IG študent obvlada osnovno znanje del, ki jih inženirski geolog izvaja pri gradnji različnih tipov objektov (ceste, predori, odlagališča, idr.), znanje o posledicah teh posegov v teren, znanje, kako obvladovati naravne nesreče, kot so plazovi in potresi ter znanje o metodah raziskav in vrtanja za potrebe geologije, hidrogeologije, geotehnologije in gradbeništva. Študent je usposobljen za osnovno inženirskogeološko delo v geoloških, gradbenih, rudarskih in drugih podjetjih. Obvlada orodja, s katerimi se v IG izvajajo osnovni izračuni in napovedi. Predmet omogoča, da študent pri pristopu k reševanju problemov preide k samostojnem reševanju življenjskih in konkretnih problemov in ne ostane na nivoju teoretičnih pristopov. Znanje iz osnovnih naravoslovnih predmetov in znanje iz geoloških predmetov mora študent prenesti in uporabiti kot osnovno bazo, na kateri gradi inženirski pristop, potreben pri poznavanju metod geoloških	Student gains the basic knowledge, which an engineering geologist uses at the object construction (roads, tunnels, deposits etc.), knowledge of environmental interventions, how to react at natural disasters (landslides, earthquakes). Student is capable of basic engineering geology work at geological, civil engineering, mining and other companies. He/she can master the tools for basic calculations and predictions in engineering geology, and the methods of research and drilling for geology, hydrogeology and geotechnology and civil engineering. The subject permits the student to deal with problems and is able to solve life and concrete problems, not to be stay at theoretical level only. Student must use the knowledge of basic subjects (mathematics, physics and chemistry) and geological subjects as the basics for further geological research methods and engineering geological work. This knowledge can then be used at other practically focused subjects.

raziskav in predmetu Inženirska geologija. To znanje lahko nato uporabi pri drugih praktično usmerjenih predmetih.	

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja (60 ur), grafične/kabinetne/računalniške vaje (30 ur) terenske vaje na izbranih slovenskih in tujih plazovih ter lokacijah aktivnih terenskih raziskav (30 ur).	Lectures (60 hours), cabinet/ computer exercises (30 hours) and field exercise (30 hours) at major Slovenian and foreign landslides and practical research methods locations.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Pisni in/ali ustni izpit	60,00 %	Written and/or oral exam
Oddane vaje	20,00 %	Written exercises
Poročilo s terenskih vaj	20,00 %	Field trip report
Pisni izpit: teoretična vprašanja. Vaje: oddane grafične in računske vaje (praktični del). Terenske vaje: oddano terensko poročilo. Pogoji za pristop k izpitu: pozitivno opravljene vaje. Ocenjevalna lestvica: 51-60% (6); 61-70% (7); 71-80% (8); 81-90% (9); 91-100% (10) ob upoštevanju Statuta UL in fakultetnih pravil.		Written exam: theoretical questions. Exercises: positively passed work exercises. Field work: submitted field report. Prerequisites for written exam: positively graded exercises. Grades: 51-60% (6); 61-70% (7); 71-80% (8); 81-90% (9); 91-100% (10), according to University Statute and Faculty Acts.

Reference nosilca/Lecturer's references:

VERBOVŠEK, Timotej, KOŠIR, Adrijan, TERAN, Maša, ZAJC, Marjana, POPIT, Tomislav. Volume determination of the Selo landslide complex (SW Slovenia) : integrating field mapping, ground penetrating radar and GIS approaches. Landslides : Journal of the international consortium on landslides, ISSN 1612-510X. [Print ed.], 2017, vol. 14, iss. 3, str. 1265-1274, doi: 10.1007/s10346-017-0815-x.
NOVAK, Andrej, VERBOVŠEK, Timotej, POPIT, Tomislav. Heterogeneously composed Lozice fossil landslide in Rebrnice area, Vipava Valley = Heterogeni fosilni plaz Lozice na območju Rebrnic v Vipavski dolini. Geologija, ISSN 0016-7789. [Tiskana izd.], 2017, let. 60, št. 1, str. 145-155, doi: 10.5474/geologija.2017.011.
JEMEC AUFLIČ, Mateja, JEŽ, Jernej, POPIT, Tomislav, KOŠIR, Adrijan, MAČEK, Matej, LOGAR, Janko, PETKOVŠEK, Ana, MIKOŠ, Matjaž, CALLIGARIS, Chiara, BOCCALI, Chiara, ZINI, Luca, REITNER, Jürgen, VERBOVŠEK, Timotej. The variety of landslide forms in Slovenia and its immediate NW surroundings. Landslides : Journal of the international consortium on landslides, ISSN 1612-510X. [Print ed.], 2017, vol. 14, iss. 4, str. 1537-1546, ilustr., doi: 10.1007/s10346-017-0848-1

INŽENIRSKA GEOLOGIJA PRI POSEGIH V PROSTOR

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Inženirska geologija pri posegih v prostor
Course title:	Engineering Geology for Geotechnical Constructions
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	2. letnik, 3. letnik		izbirni

Univerzitetna koda predmeta/University course code:	0089596
Koda učne enote na članici/UL Member course code:	626

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
15	30	0	0	0	45	3

Nosilec predmeta/Lecturer:	Barbara Čenčur Curk
Vrsta predmeta/Course type:	Izbirni / Elective

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Vpis v 2. ali 3. letnik študija geologije.	Inscription to the 2nd or 3rd Course.

Vsebina:	Content (Syllabus outline):
Inženirska geologija - IG pri gradnji prometnic, daljnovodov, podzemnih vodov ipd. IG pri gradnji predorov, rudniških prog in velikih podzemnih prostorov, IG pri gradnji zemeljskih in AB pregrad ter akumulacijskih jezer, IG pri lociranju, projektiranju in izvedbi odlagališč, IG pri temeljenju manjših in večjih objektov IG karte napovedi in karte ranljivosti, ogroženosti in tveganja	Engineering geology for infrastructural projects: roads, land line, underground line construction Engineering geology for tunnel and mining constructions and for large underground facilities Engineering geology for soil and concrete dams Engineering geology for foundation Engineering geology for estimation of geological vulnerability, hazard and risk assessment

Temeljna literatura in viri/Readings:

CORNFORTH, D.H.: Landslides in Practice, John Wiley&Sons, 2005.
KLICHE, C.A.: Rock Slope Stability,Society for Mining, Metallurgy and Exploration, 1999.
RIBIČIČ, M., 2002: Skripta Inženirska geologija II, Naravoslovnotehniška fakulteta, 64, Ljubljana.
BRADY, B.H.G.: Rock Mechanics, Kluwer Academic Publisher, 2004.

Cilji in kompetence:	Objectives and competences:
CILJI: Slušatelj bo poglobil svoje znanje iz inženirske geologije, predvsem na področju uporabe različnih metod terenskih in laboratorijskih raziskav, terenski pristop k IG raziskavam, uporaba računalniških programov. KOMPETENCE: Slušatelji pridobijo dodatno znanje za opravljanje del, ki jih opravlja inženirski geolog pri najrazličnejših posegih v teren, odpravi posledic naravnih nesreč, itd.	OBJECTIVES: Students learn about engineering geology for geotechnical constructions, including In-situ and laboratory tests and the use of various software. COMPETENCES: Students are able to apply different geological methods and tests for geotechnical constructions and the risk assessment of natural disasters.

Predvideni študijski rezultati:	Intended learning outcomes:
Slušatelj razume in prepozna različne pristope in metode potrebne pri raziskavah različnih geotehničnih objektov. Slušatelj je sposoben opravljati delo Inženirskega geologa. Slušatelj se je sposoben takoj vključiti v praktično delo Inženirskega geologa. Pri delu je sposoben sodelovati s strokovnjaki iz ostalih področij (gradbeniki, geodeti, rudarji), uporabljati domačo in tujo strokovno in znanstveno literaturo.	The student understands and recognizes the different approaches and methods required for the research of various geotechnical structures. The student is able to perform the work of an engineering geologist. The student is able to include into the practical work of engineering geologist on the construction site and in the laboratory. The student is able to cooperate with specialists from other fields (civil engineers, geodesists, mining engineers), he is able to use domestic and foreign technical and scientific literature.

Metode poučevanja in učenja:	Learning and teaching methods:
Predavanja in seminarska naloga. V okviru predavanj študentje izdelajo eno seminarsko nalogo, ki jo javno predstavijo.	Lectures and seminar. Within the lectures students will prepare and present a seminar work.

Načini ocenjevanja:	Delež/Weight	Assessment:
Pisni in/ali ustni izpit: teoretična vprašanja	50,00 %	Written and/or oral exam: theoretical questions
Seminarji: predstavitev in seminar	45,00 %	Seminar work: presentation and seminar
Prisotnost na predavanjih in vajah	5,00 %	The presence at lectures and tutorials
Pogoji za pristop k izpitu: - vsaj 75% prisotnost na predavanjih in 100 % prisotnost na vajah - pozitivno opravljene vaje in seminarji (predstavitev, naloga) in seminarske vaje. Ocenjevalna lestvica: 51-60% (6); 61-70% (7); 71-80% (8); 81-90% (9); 91-100% (10) ob upoštevanju Statuta UL in fakultetnih pravil.		Conditions for the exam: - At least 75% attendance at lectures and 100 % attendance at tutorials - Successfully done tutorials and seminars (presentation and paper) and tutorials. Grading scale: 51-60% (6); 61-70% (7); 71-80% (8); 81-90% (9); 91-100% (10) having regard to the Statute of UL and faculty rules.

Reference nosilca/Lecturer's references:

ŠOT PAVLOVIČ, Leonida, ŽERDIN, Martin, VRBAJNŠČAK, Mojca, LIBNIK, Natalija, Turk, Boris, Vrabič, Katja, ČENČUR CURK, Barbara, JERMAN, Barbara, PERŠAK, Boštjan, DREV, Janez, MARHOLD, Rado, PERŠAK, Boštjan, MLAKAR, Aleš, CIGOJ, Nika. Okoljsko poročilo za DPN za državno cesto od razcepa Šentrupert do priključka Velenje jug. Ljubljana: Aquarius, 2016. 259 str. ilustr.
GOLOBIČ, Mojca, RAKOVEC, Jože, ČENČUR CURK, Barbara, FAZARINC, Rok, LOVKA, Milan, SMOLAR-ŽVANUT, Nataša, BERTOK, Marko, MARUŠIČ, Janez, COF, Alenka, BONČINA, Andrej, UDOVČ, Andrej, MARUŠIČ, Jakob, POLIČ, Marko, DOLŠEK, Matjaž, FAJFAR, Peter, ČETINA, Matjaž, ZAKRAJŠEK, Majda, KRZYK, Mario, RAJAR, Rudolf. Strateška presoja vplivov na okolje za HE Učja. Ljubljana: Biotehniška fakulteta, Oddelek za krajinsko arhitekturo, 2010. 178 str., ilustr.
MERHAR, Brane, ČADEŽ, Franc, ČENČUR CURK, Barbara, JUVAN, Grega, GALUF, Saša, ROJŠEK, Maja, MEŽNAR, Mitja, IVAČIČ, Boštjan. Geološko-geotehnično poročilo o sestavi tal in nasipov za IDP

ureditve Savinje za zagotavljanje poplavne varnosti med Ločico in Letušem : št.: ic 333/2008. Ljubljana: IRGO Consulting, julij 2008. 1 mapa (loč. pag.), ilustr., graf. prikazi, zvd., načrti.

IZBIRNI PREDMET 1

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Izbirni predmet 1
Course title:	Optional course 1
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	3. letnik	1. semester	obvezen

Univerzitetna koda predmeta/University course code:	0111828
Koda učne enote na članici/UL Member course code:	11301

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	0	0	5	45	3

Nosilec predmeta/Lecturer:

Vrsta predmeta/Course type:

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

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

Vsebina:	**Content (Syllabus outline):**

Temeljna literatura in viri/Readings:

Cilji in kompetence:	**Objectives and competences:**

Predvideni študijski rezultati:	**Intended learning outcomes:**

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

Načini ocenjevanja: **Delež/Weight Assessment:**

Reference nosilca/Lecturer's references:

IZBIRNI PREDMETI (1 ALI 2)

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Izbirni predmeti (1 ali 2)
Course title:	Optional course (1 or 2)
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	2. letnik	2. semester	izbirni

Univerzitetna koda predmeta/University course code:	0561910
Koda učne enote na članici/UL Member course code:	11300

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	15	0	15	90	6

Nosilec predmeta/Lecturer:	
Vrsta predmeta/Course type:	

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

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

Vsebina:	**Content (Syllabus outline):**

Temeljna literatura in viri/Readings:

Cilji in kompetence:	**Objectives and competences:**

Predvideni študijski rezultati:	**Intended learning outcomes:**

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

Načini ocenjevanja: **Delež/Weight** **Assessment:**

Reference nosilca/Lecturer's references:

IZBIRNI PREDMETI 1, 2, 3 ALI 4

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Izbirni predmeti 1, 2, 3 ali 4
Course title:	Optional course 1, 2, 3 or 4
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	3. letnik	2. semester	obvezen

Univerzitetna koda predmeta/University course code:	0111829
Koda učne enote na članici/UL Member course code:	11302

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
90	30	30	0	30	180	12

Nosilec predmeta/Lecturer:	
Vrsta predmeta/Course type:	
Jeziki/Languages:	Predavanja/Lectures:
	Vaje/Tutorial:

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

Vsebina:	**Content (Syllabus outline):**

Temeljna literatura in viri/Readings:

Cilji in kompetence:	**Objectives and competences:**

Predvideni študijski rezultati:	**Intended learning outcomes:**

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

Načini ocenjevanja: **Delež/Weight Assessment:**

Reference nosilca/Lecturer's references:

KEMIJA 1

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Kemija 1
Course title:	Chemistry 1
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	1. letnik	1. semester	obvezen

Univerzitetna koda predmeta/University course code:	0067460
Koda učne enote na članici/UL Member course code:	886

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
60	0	15	0	0	75	5

Nosilec predmeta/Lecturer:	Urška Lavrenčič Štangar
Vrsta predmeta/Course type:	Obvezni / Compulsory

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Ne	None

Vsebina:	Content (Syllabus outline):
Metode, definicije in osnovni pojmi v kemiji. Atomi, molekule, ioni in spojine. Kemijske reakcije splošno in reakcije v vodnih raztopinah. Termokemija. Elektronska zgradba atoma, periodičnost, kemijska vez in zgradba molekul. Plini, tekočine in trdne snovi in medmolekulske sile. Raztopine. Osnove kemijske kinetike. Kemijsko ravnotežje. Kisline in baze. Spontanost kemijskih reakcij. Elektrokemija. Osnove kemijskega računanja (množina snovi, elementna analiza, računanje množinskega razmerja pri reakcijah v plinskih zmeseh in raztopinah).	Methods, definitions and fundamental concepts in chemistry. Atoms, molecules, ions and compounds. Chemical reactions in general and reactions in aqueous solutions. Thermochemistry. Electronic structure of atom, periodicity, chemical bond and structure of molecules. Gases, liquids, solids and intermolecular forces. Solutions. Fundamentals of chemical kinetics. Chemical equilibrium. Acids and bases. Spontaneity of chemical reactions. Electrochemistry. The fundamental of stoichiometry (amount of substance, elemental analysis, calculation of amount

	ratio in chemical reactions taking place in gases or solutions).

Temeljna literatura in viri/Readings:

B. ČEH: Splošna in anorganska kemija. Zbirka pojmov, vprašanj in nalog z odgovori in rešitvami, druga, dopolnjena izdaja, Univ. založba, Ljubljana, 2015, 240 str.
I. TUREL, I. LEBAN, M. ZUPANČIČ: Zbirka nalog iz kemijskega računanja, peta, dopolnjena izdaja, Univ. založba, Ljubljana, 2015, 129 str.
F. LAZARINI, J. BRENČIČ: Splošna in anorganska kemija, DZS, Ljubljana, 2005, 557 str.
S.S. ZUMDAHL, S.A. ZUMDAHL: Chemistry, deveta izdaja, Brooks Cole, Belmont, 2014, 1085 str.
R.H. PETRUCCI, F.G. HERRING, J.D. MADURA, C. BISSONNETTE, General Chemistry, Principles and modern applications, deseta izdaja, Pearson, Toronto, 2011, 1303 str.

Cilji in kompetence:	**Objectives and competences:**
Pri predmetu se študentje seznanijo s temeljnimi prijemi in koncepti, ki so potrebni za razumevanje lastnosti in obnašanja anorganskih in organskih snovi.	The students will be introduced to the basic concepts of chemistry and stoichiometry with the aim of understanding of the properties and behavior of the inorganic and organic substances as well as calculations regarding chemical reactions.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Razvijanje sposobnosti lastnega učenja osnovnih predmetov in nato prilagajanje ter uporaba znanja na svojem strokovnem področju.	Knowledge and understanding: The abilities of acquiring and sharing of fundamental chemical knowledge and concepts and linking them with other (related) topics.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja Pisanje na tablo PowerPoint predstavitev Prikazovanje kemijskih eksperimentov	Oral lectures Writing on the blackboard Power-Point presentation Demonstration of chemical experiments

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
vaje	30,00 %	exercises (coursework)
pisni izpit	70,00 %	written exam
Pozitiven kolokvij (računske naloge) so pogoj za pristop k izpitu. Pisni izpit je kombinacija vprašanj opisnega in izbirnega tipa. Dodatno študentom med predavanji ponudim tudi t.i. bonusne točke, ki se prištejejo k točkam, doseženim na pisnem izpitu. Bonusne točke lahko pridobijo s seminarskimi nalogami (do 10%) ali pa z aktivnim sodelovanjem na predavanjih in pravilnimi odgovori oz. izračuni (do 6%). Seminar ni obvezen. Končna ocena predmeta je kombinacija ocene vaj in pisnega izpita.		The precondition to enter the exam is a positive mark of written test (stoichiometry). Written exam is combination of multiple choice and essay questions. Additional points are offered to the students for seminars (up to 10 points) or/and for active participation and correct answers or calculations during the lectures (up to 6 points). The seminar is not obligatory. The final mark is combination of marks obtained for exercises and written exam.

Reference nosilca/Lecturer's references:

ŠULIGOJ, A., LAVRENČIČ ŠTANGAR, U., RISTIĆ, A., MAZAJ, M., VERHOVŠEK, D., NOVAK TUŠAR, N.: TiO2-SiO2 films from organic-free colloidal TiO2 anatase nanoparticles as photocatalyst for removal of volatile organic compounds from indoor air. Appl. Catal. B, Environ. 184: 119-131, 2016.

PLIEKHOV, O., ARČON, I., NOVAK TUŠAR, N., LAVRENČIČ ŠTANGAR, U.: Photocatalytic activity of zirconium- and manganese-codoped titania in aqueous media : the role of the metal dopant and its incorporation site. ChemCatChem, 8: 2109-2118, 2016.
DZIK, P., VESELY, M., KETE, M., PAVLICA, E., LAVRENČIČ ŠTANGAR, U., NEUMANN-SPALLART, M.: Properties and application perspective of hybrid titania-silica patterns fabricated by inkjet printing. ACS Appl. Mater. Interf. 7: 16177-16190, 2015.
SOKLIČ, A., TASBIHI, M., KETE, M., LAVRENČIČ ŠTANGAR, U.: Deposition and possible influence of a self-cleaning thin TiO2/SiO2 film on a photovoltaic module efficiency. Catal. Today 252: 54-60, 2015.
KETE, M., PAVLICA, E., FRESNO, F., BRATINA, G., LAVRENČIČ ŠTANGAR, U.: Highly active photocatalytic coatings prepared by a low-temperature method. Environ. Sci. Pollut. Res. 21: 11238-11249, 2014.

KRISTALOGRAFIJA

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Kristalografija
Course title:	Crystallography
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	1. letnik	1. semester	obvezen

Univerzitetna koda predmeta/University course code:	0561891
Koda učne enote na članici/UL Member course code:	887

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
15	0	30	0	0	45	3

Nosilec predmeta/Lecturer:	Simona Jarc
Vrsta predmeta/Course type:	Obvezni / Compulsory

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Ni pogojev.	No prerequisites.

Vsebina:	**Content (Syllabus outline):**
• Kristalografija in morfologija kristala: periodičnost zgradbe, simetrijske operacije in elementi, kristalni razredi, projekcije, stereografska projekcija, označevanje ploskev in smeri v kristalu, kristalografski liki, 2D in 3D mreže, prostorske grupe, dvojčki, polimorfizem • Kristalna kemija – osnove zgradbe mineralov (atomi, ioni, vezi, koordinacija), strukture kristalov • Optične lastnosti	• Crystallography and morphology of crystal: periodicity of structure, symmetry elements, crystal classes, projections, stereographic projection, determination of planes and directions, crystal forms, 2D and 3D lattices, space groups, twins, polymorphism • Crystal chemistry: basics of the atoms, ions, coordination and bonding forces; common structural types • Optical properties

Temeljna literatura in viri/Readings:

- BLOSS, F. Donald. Crystallography and crystal chemistry: an introduction. Washington: Mineralogical Society of America, 2000. 529 str.
- NESSE, William D. Introduction to optical mineralogy. New York : Oxford University Press, 1991. 323 str.
- KLEIN, Cornelis, HURLBUT, Cornelius S. Manual of mineralogy. New York : J. Wiley & Sons, 1999. 667 str., 1 CD ROM.

Cilji in kompetence:	Objectives and competences:
Študenti se naučijo osnov notranje zgradbe mineralne snovi - kristala, makroskopskega prepoznavanja morfologije kristalov, risanja kristalov v stereografski projekciji in osnov optične mikroskopije.	Students learn the basics of crystal structure and hence they recognise crystal morphology. Students are able to use stereographic projection. They are familiar with optical microscope and optical properties of the minerals.

Predvideni študijski rezultati:	Intended learning outcomes:
Razumevanje pojma notranja zgradba kristalne snovi. Povezava med strukturo, morfologijo in lastnostmi kristala. Sposobnost izbire in uporabe ustrezne domače in tuje literature s področja kristalografije. Sposobnost analize podatkov in sinteze.	Knowledge and understanding of crystal structure. Correlation of structure/morphology of crystal with macroscopic characteristics of crystal. Use of different literature data from crystallography. Ability of analysis and synthesis of relevant data.

Metode poučevanja in učenja:	Learning and teaching methods:
Predavanja (predavalnica ali on-line) in vaje – 60 % kabinetne vaje in 40 % laboratorijske vaje.	Lectures (lecture room or on-line) and tutorials - 60 % tutorials and 40 % lab tutorials.

Načini ocenjevanja:	Delež/Weight	Assessment:
pisni in/ali ustni izpit	50,00 %	written and/or oral exam
ustni in pisni kolokvij	50,00 %	two (oral and written) qolocquia

Reference nosilca/Lecturer's references:

JARC, Simona, MILER, Miloš, ŠEBELA, Stanka, ZUPANČIČ, Nina. Sources of sulphate minerals in limestone cave-a possible evidence of anthropogenic activity : a case study in Črna Jama Cave (Slovenia). *Environmental science and pollution research international*. [Print ed.]. 2017, vol. 24, iss. 34, str. 26865-26873. ISSN 0944-1344. DOI: 10.1007/s11356-017-0486-0.

ŠEBELA, Stanka, ZUPANČIČ, Nina, MILER, Miloš, GRČMAN, Helena, JARC, Simona. Evidence of Holocene surface and near-surface palaeofires in karst caves and soils. Palaeogeography, palaeoclimatology, palaeoecology. [Print ed.]. 1 Nov. 2017, vol. 485, str. 224-235, ilustr. ISSN 0031-0182. DOI: 10.1016/j.palaeo.2017.06.015.

ZUPANČIČ, Nina, MILER, Miloš, ŠEBELA, Stanka, JARC, Simona. Application of Scanning Electron Microscopy/Energy-Dispersive X-Ray Spectroscopy for characterization of detrital minerals in karst cave speleothems. Microscopy and microanalysis. [Print ed.]. 2016, vol. 22, iss. 1, str. 87-98. ISSN 1431-9276. DOI: 10.1017/S1431927615015688.

MATEMATIKA 1

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Matematika 1
Course title:	Mathematics 1
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	1. letnik	1. semester	obvezen

Univerzitetna koda predmeta/University course code:	0067462
Koda učne enote na članici/UL Member course code:	888

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
60	0	30	0	0	90	6

Nosilec predmeta/Lecturer:	Janko Bračič
Vrsta predmeta/Course type:	Obvezni / Compulsory

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Vpis v 1. letnik.	Entering first year class.

Vsebina:	Content (Syllabus outline):
Števila (realna števila; kompleksna števila). Osnove funkcij ene spremenljivke (osnovni pojmi, računanje s funkcijami, inverz bijektivne funkcije, pregled elementarnih funkcij; zveznost, limite). Odvod (definicija odvoda in odvodi elementarnih funkcij, pravila za odvajanje; geometrijski pomen odvoda, naraščanje/padanje funkcij, konveksnost/konkavnost, stacionarne točke in njihova klasifikacija; uporaba odvoda, diferencial funkcije). Integral (tabela nedoločenih integralov, tehnike integriranja: uvedba nove spremenljivke, metoda per-partes; integrali nekaterih racionalnih funkcij; definicija določenega integrala, uporaba določenega integrala pri računanju ploščin krivočrtnih likov in prostornin/površin rotacijskih teles, posplošeni integral).	Numbers (real numbers; complex numbers). Basics of real functions (basic notions, operations between functions, inverse, outline of elementary functions, continuity, limits). Derivative (definition of the derivative and derivatives of elementary functions, derivative rules , geometrical meaning of the derivative, increasing/decreasing of functions, convexity/concavity, stationary points and their classification; application of the derivative, diferential of a function). Integrals (table of indefinite integrals, different integration technics: new variable, per-partes; integration of rational functions; definition of definite integral, applications: area, volume, length, improper integral).

Temeljna literatura in viri/Readings:

VIDAV, Ivan, Višja matematika 1, Ljubljana: DMFA, 1994.
JAMNIK, Rajko, Matematika, Ljubljana: DMFA, 1994.
MIZORI-OBLAK, Pavlina, Matematika za študente tehnike in naravoslovja. Del 1, Ljubljana : Fakulteta za strojništvo, 2001.
SPIEGEL, Murray R., Schaum's outline of theory and problems of advanced mathematics for engineers and scientists, McGraw-Hill, 1990.

Spletni strani:
http://sl.wikipedia.org/wiki/Kategorija:Matematika
http://mathworld.wolfram.com/

Cilji in kompetence:	**Objectives and competences:**
Predmet obravnava osnove funkcij ene spremenljivke. Slušatelj osvoji ustrezno teorijo in njeno uporabo. Večina izrekov je podanih brez dokazov. Poudarek je na učenju standardnih metod za reševanje problemov. Namen vaj je utrditev predavane snovi in pridobitev računske prakse, predmet pa je kot temeljni podlaga tako za strokovne kakor za druge osnovne predmete (Fizika, Statika, Kemija, Geometrija v inženirstvu).	Basic theory of function of one variable is presented. A student learns some notions from the theory and get skilled in its use. The emphasis is on standard methods for solving problems in calculus. The aim of tutorial is in practising. The subject is a basis for many other subjects.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Razvijanje sposobnosti učenja osnovnih predmetov in prilagajanje ter uporaba znanja na svojem strokovnem področju.	Developing the ability of understanding of all basic subjects and adapting and using the knowledge in the own professional area.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja in vaje s praktičnimi računskimi primeri.	Lectures and tutorials with concrete numerical examples.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
pisni izpit	70,00 %	writing exam
teoretični izpit	30,00 %	theoretical test
Način (pisni izpit, ustno izpraševanje, naloge, projekt): pisni izpit in teoretični izpit. Opravljena kolokvija sta enakovredna pisnemu izpitu. Teoretični izpit je test, na katerem se preveri poznavanje in razumevanje teorije. Ocenjevalna lestvica: (6-10) pozitivno, ob upoštevanju Statuta UL in fakultetnih pravil.		Type (examination, oral, coursework, project): writing exam and theoretical test. Two partial exams are equivalent to the writing exam. The aim of the theoretical test is to check the understanding of the theory. Grades: (6-10) positive assessment, according to University Statute and Faculty Acts.

Reference nosilca/Lecturer's references:

AMBROZIE, Calin, BRAČIČ, Janko, KUZMA, Bojan, MÜLLER, Vladimir. The commuting graph of bounded linear operators on a Hilbert space. J. funct. anal., 2013, vol. 264, iss. 4, str. 1068-1087.
BESSONOV, Roman V., BRAČIČ, Janko, ZAJAC, Michal. Non-hyperreflexive reflexive spaces of operators. Stud. Math., 2011, vol. 202, no. 1, str. 65-80.
BRAČIČ, Janko, KLIŚ-GARLICKA, Kamila, MÜLLER, Vladimir, TODOROV, Ivan G. Operator hyperreflexivity of subspace lattices. Integr. equ. oper. theory, 2010, vol. 68, no. 3, str. 383-390.
BRAČIČ, Janko, MÜLLER, Vladimir, ZAJAC, Michal. Reflexivity and hyperreflexivity of the space of locally intertwining operators. J. oper. theory, 2010, vol. 63, no. 1, str. 101-114.
BRAČIČ, Janko, DRNOVŠEK, Roman, FARFOROVSKAYA, Yuliya B., RABKIN, Evgueniy L., ZEMÁNEK, Jaroslav. On positive commutators. Positivity (Dordr.), 2010, vol. 14, no. 3, str. 431-439.

MATEMATIKA 2

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Matematika 2
Course title:	Mathematics 2
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	2. letnik	2. semester	izbirni

Univerzitetna koda predmeta/University course code:	0089547
Koda učne enote na članici/UL Member course code:	11259

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
60	0	30	0	0	90	6

Nosilec predmeta/Lecturer:	Janko Bračič
Vrsta predmeta/Course type:	Izbirni / Elective

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Vpis v 2. letnik.	Entering second year class.

Vsebina:	Content (Syllabus outline):
Matrike in vektorji (računanje z matrikami, determinante, obrnljive matrike; sistemi linearnih enačb, Cramerjeva metoda, Gaussova metoda; vektorji v ravnini in prostoru, skalarni, vektorski in mešani produkt; premice in ravnine v prostoru). Linearne transformacije (predstavitev linearne transformacije z matriko, lastne vrednosti, lastni vektorji). Tenzorji (definicija, zgledi, operacije med tenzorji, uporaba). Krivulje in ploskve (krivulje v ravnini in prostoru, polarne koordinate, parameterizacija, ploskve).	Matrices and vectors (opeartions with matrices, determinants, inverse of a matrix; linear systems of equations, Cramer's method, Gauss' method; vectors in plane and space, inner product, vector product and mixed product; lines and planes in three dimensional space). Linear transformations (representation by a matrix, eigenvalues, eigenvectors). Tensors (definition, examples, operations with thensors, applications). Curves and surfaces (curves in plane and in three dimensional space, polar coordinates, parameterisation, surfaces).

Temeljna literatura in viri/Readings:

DEMMEL, James W., Uporabna numerična linearna algebra, Ljubljana: DMFA - založništvo, 2000.
MIZORI-OBLAK, Pavlina, Matematika za študente tehnike in naravoslovja. Del 1, Ljubljana : Fakulteta za strojništvo, 2001.

JAMNIK, Rajko, Matematika, Ljubljana: DMFA, 1994.
GRASSELLI, Jože, Linearna algebra. Linearno programiranje., Ljubljana: DMFA - založništvo, 2003.
DATTA, Biswa Nath, Numerical linear algebra and applications, International Thomson Publ., 1994.
LIPSCHUTZ, Seymour, 3000 solved problems in linear algebra, McGraw-Hill, 1989 (Schaum's solved problems series).

Spletni strani:
http://sl.wikipedia.org/wiki/Kategorija:Matematika
http://mathworld.wolfram.com/

Cilji in kompetence:	**Objectives and competences:**
Predmet obravnava osnove linearne algebre. Slušatelj osvoji ustrezno teorijo in njeno uporabo. Večina izrekov je podanih brez dokazov. Poudarek je na učenju standardnih metod za reševanje problemov. Namen vaj je utrditev predavane snovi in pridobitev računske prakse, predmet pa je kot temeljni podlaga tako za strokovne kakor za druge osnovne predmete (Fizika, Statika, Kemija, Geometrija v inženirstvu).	Basic linear algebra is presented. A student learns some notions from the theory and get skilled in its use. The emphasis is on standard methods for solving problems related to linear algebra. The aim of tutorial is in practising. The subject is a basis for many other subjects.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Razvijanje sposobnosti učenja osnovnih predmetov in prilagajanje ter uporaba znanja na svojem strokovnem področju.	Developing the ability of understanding of all basic subjects and adapting and using the knowledge in the own professional area.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja in vaje s praktičnimi računskimi primeri.	Lectures and tutorials with concrete numerical examples.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
pisni izpit	70,00 %	writing exam
teoretični izpit	30,00 %	theoretical test
Pisni izpit in teoretični izpit. Opravljena kolokvija sta enakovredna pisnemu izpitu. Teoretični izpit je test, na katerem se preveri poznavanje in razumevanje teorije. Ocenjevalna lestvica: (6-10) pozitivno, ob upoštevanju Statuta UL in fakultetnih pravil.		Writing exam and theoretical test. Two partial exams are equivalent to the writing exam. The aim of the theoretical test is to check the understanding of the theory. Grades: (6-10) positive assessment, according to University Statute and Faculty Acts.

Reference nosilca/Lecturer's references:

AMBROZIE, Calin, BRAČIČ, Janko, KUZMA, Bojan, MÜLLER, Vladimir. The commuting graph of bounded linear operators on a Hilbert space. J. funct. anal., 2013, vol. 264, iss. 4, str. 1068-1087.
BESSONOV, Roman V., BRAČIČ, Janko, ZAJAC, Michal. Non-hyperreflexive reflexive spaces of operators. Stud. Math., 2011, vol. 202, no. 1, str. 65-80.
BRAČIČ, Janko, KLIŚ-GARLICKA, Kamila, MÜLLER, Vladimir, TODOROV, Ivan G. Operator hyperreflexivity of subspace lattices. Integr. equ. oper. theory, 2010, vol. 68, no. 3, str. 383-390.
BRAČIČ, Janko, MÜLLER, Vladimir, ZAJAC, Michal. Reflexivity and hyperreflexivity of the space of locally intertwining operators. J. oper. theory, 2010, vol. 63, no. 1, str. 101-114.
BRAČIČ, Janko, DRNOVŠEK, Roman, FARFOROVSKAYA, Yuliya B., RABKIN, Evgueniy L., ZEMÁNEK, Jaroslav. On positive commutators. Positivity (Dordr.), 2010, vol. 14, no. 3, str. 431-439.

MIKROSKOPIJA KARBONATOV

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Mikroskopija karbonatov
Course title:	Microscopy of Carbonates
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	3. letnik	2. semester	izbirni

Univerzitetna koda predmeta/University course code:	0562055
Koda učne enote na članici/UL Member course code:	11406

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
15	0	30	0	0	45	3

Nosilec predmeta/Lecturer:	Boštjan Rožič
Vrsta predmeta/Course type:	Izbirni/Elective

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Priporočljivo - opravljeni izpiti iz Paleontologije, Sedimentne petrologije.	Recommended - passed exams: Paleontology, Sedimentary petrology.

Vsebina:	**Content (Syllabus outline):**
• Detailen prikaz pojavljanja neskeletnih karbonatnih zrn v zbruskih: peloidi, intraklasti, lupinasta zrna, agregatna zrna, kortoidi, ekstraklasti. • Osnovni pregled pojavljanja bioklastičnih zrn v zbruskih: kalcimikrobi, apnenčaste alge, foraminifere, radiolariji, kalpionele, kalcisfere, serpulidi, spongije, korale, briozoji, brahiopodi, školjke, polži, glavonožci, iglokožci, ostrakodi, trilobiti, mikroproblematika. • Pregled osnovnih diagenetskih sprememb v zbruskih: tipi in pomen cementov, dolomitizacija, piritizacija, disolucija, okremenitev. • Pregled faciesnih con v sedimentacijskem sistemu karbonatne platforme in karbonatne klančine.	• Detailed display of appearance of non-sceletal carbonate grains in thin-sections: peloids, intraclasts, coated grains, aggregate grains, cortoids, ekstraclasts. • Basic display of appearance of bioclastic grains in thin-sections: calcimikrobes, calcareous algae, foraminifers, radiolarians, calpionelas, calcispheres, serpulids, sponges, corals, briozoans, brachiopods, bivalves, gastropods, cephalopods, echinoderms, ostracods, trilobites, microproblematic organisms. • Overview of basic diagenetic alterations in thin-sections: types and significance of cements, dolomitisation, pyritisation, disolution, silification.

• Uporaba Standartnih mikrofaciesov kot orodja za osnovno umestitev v karbonatno sedimentacijsko okolje.	• Overview of facies zones in the sedimentary system of carbonate platform and carbonate ramp. • Use of Standart microfacies types as a tool of basic implacment inside carbonate sedimentary environment.

Temeljna literatura in viri/Readings:

Učbeniki / Textbooks:

- Flügel, E.& Munnecke, 2010: Microfacies of carbonate rocks : analysis, interpretation and application, Springer, Berlin, 976 p.

Atlasi za mikroskopijo / Atlas for microscopy:

- Adams, A.E., Mackenzie, W.S. & Guilford, C., 1994: Atlas of sedimentary rocks under the microscope. John Wiley & Sons, New York, 104 p.
- Adams, A.E. & Mackenzie, W.S., 2001: A Colour Atlas of Carbonate Sediments and Rocks Under the Microscope. Manson Publishing, London, 180 p.
- Scholle, P.A., 1978: A Color Illustrated Guide To Carbonate Rock Constituents, Textures, Cements, and Porosities. The American Association of Petroleum Geologists, Memoir 27, U.S.A., 241 p.
- Scholle, P.A., 1979: A Color Illustrated Guide To Constituents, Textures, Cements, and Porosities of sandstones and Associated Rocks. The American Association of Petroleum Geologists, Memoir 28, U.S.A., 201 p.

Cilji in kompetence:	**Objectives and competences:**
CILJI: Poglobljeno poznavanje sestave karbonatnih kamnin in sicer tako izredno širokega nabora različnih zrn, kot tudi veziva in diagenetskih procesov. Prepoznavanje mikrostrukturnih in mikroteksturnih značilnostih karbonatnih kamnin. Osnovna interpretacija sedimentacijskih okolij s pomočjo orodja Standardnih mikrofaciesnih tipov. KOMPETENCE: Študent je usposobljen za samostojno analizo mikrofacielnih značilnosti karbonatnih sedimentnih kamnin in njihovih tekstur ter osnovno interpretacijo sedimentacijskih, diagenetskih in paleookoljskih pogojev njihovega nastanka.	OBJECTIVES: Profound knowledge on composition of carbonate rocks including wide assemblage of grains as well as matrix, and diagenetic processes. Recognition of microstructural and micro textural characteristics of carbonate rocks. Basic interpretation of sedimentary environments with a tool of Standard microfacies types. COMPETENCES: Students are qualified for independent analysis of mikrofacies characteristics of carbonate and clastic sedimentary rocks and their textures and basic interpretation of sedimentary, diagenetic and paleoenvironmental conditions of their formation.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Študent nadgradi znanje o sestavi karbonatnih kamnin pridobljeno pri predmetu Sedimentna petrologija. Sposoben je samostojnega prepoznavanja večine karbonatnih zrn in diagenetskih prvin. Z orodjem Standardnih mikrofaciesnih tipov je zmožen osnovne interpretacije sedimentacijskih in postsedimentacijskih procesov.	Student upgrades knowledge on composition of carbonate rocks that he/she gained with course of Sedimentary petrology. He/she is capable of independent recognition of most of carbonate grains and diagenetic features. Using a tool of Standard Microfacies Types he/she is able to perform basic interpretation of sedimentary and postsedimentary processes.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, vaje.	Lectures, tutorial.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
pisni ali ustni izpit	100,00 %	written or oral exam

Reference nosilca/Lecturer's references:

ROŽIČ, Boštjan, POPIT, Tomislav, GALE, Luka, VERBOVŠEK, Timotej, VIDMAR, Ines, DOLENEC, Matej, ŽVAB ROŽIČ, Petra. Origin of the Jezero v Ledvicah lake : a depression in a gutter-shaped karstic aquifer (Julian Alps, NW Slovenia) = Nastanek Jezera v Ledvicah - globel v žlebu podobnem kraškem vodonosniku (Julijske Alpe, SZ Slovenija). *Acta carsologica*. [Tiskana izd.]. 2019, letn. 48, št. 3, str. 265-282
ROŽIČ, Boštjan, GALE, Luka, BRAJKOVIĆ, Rok, POPIT, Tomislav, ŽVAB ROŽIČ, Petra. Lower jurassic succession at the site of potential Roman quarry Staje near Ig (central Slovenia) = Spodnjejurske plasti na območju morebitnega rimskega kamnoloma Staje pri Igu. *Geologija*. [Tiskana izd.]. 2018, 61, št. 1, str. 49-71, ilustr. ISSN 0016-7789. DOI: 10.5474/geologija.2018.004.
GALE, Luka, SKABERNE, Dragomir, PEYBERNES, Camille, MARTINI, Rossana, ČAR, Jože, ROŽIČ, Boštjan. Carnian reefal blocks in the Slovenian Basin, eastern Southern Alps. *Facies*. [Print ed.]. 2016, vol. 62, iss. 4, str. 1-15. ISSN 0172-9179. DOI: 10.1007/s10347-016-0474-8.
ROŽIČ, Boštjan, ŠMUC, Andrej. Gravity-flow deposits in the Toarcian Perbla formation (Slovenian basin, NW Slovenia). *Rivista italiana di paleontologia e stratigrafia*. 2011, vol. 117, no. 2, str. 283-294.
ROŽIČ, Boštjan, KOLAR-JURKOVŠEK, Tea, ŠMUC, Andrej. Late Triassic sedimentary evolution of Slovenian Basin (eastern Southern Alps): description and correlation of the Slatnik Formation. *Facies*. [Print ed.]. 2009, vol. 55, no. 1, str. 137-155. ISSN 0172-9179. DOI: 10.1007/s10347-008-0164-2.

MINERALNE SUROVINE

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Mineralne surovine
Course title:	Mineral Deposits
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	2. letnik	1. semester	obvezen

Univerzitetna koda predmeta/University course code:	0067473
Koda učne enote na članici/UL Member course code:	954

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
45	0	30	0	15	90	6

Nosilec predmeta/Lecturer:	Matej Dolenec
Vrsta predmeta/Course type:	Obvezni / Compulsory

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Opravljen kolokvij iz vaj makroskopskega prepoznavanja rudnih mineralov, struktur in tekstur je pogoj za pristop h končnemu izpitu.	Successfully completed Tutorial of macroscopic identification of ore minerals, structures and textures is obligatory before final examination.

Vsebina:	Content (Syllabus outline):
Vsebina predmeta zajema geološke osnove nastanka nahajališč različnih kovinskih mineralnih surovin. Poudarek je na prepoznavanju procesov nastanka magmatskih, hidrotermalno-magmatskih, hidrotermalnih in sedimentnih rudišč. Pri vajah se študenti seznanijo z makroskopskim prepoznavanjem rude in različnih tipov rudišč ter njenimi teksturnimi in strukturnimi značilnostmi, ki so temeljna informacija za začetek vrednotenje ekonomičnosti nahajališča. Okolje in pogoji za nastanek nahajališč ogljikovodikov. Nekovinske mineralne surovine	The course content gives overview of geological bases of the different metal mineral deposits. There is an emphasis on the recognition of genetic processes of magmatic, hydrothermal-magmatic, hydrotermal and sedimentary mineral deposits. At the Microscopy Lab students get insight into microscopic identification of different ores and mineral deposits and their textural and structural characteristics, which are fundamental information for the start of economic evaluation of mineral deposits. Environment and genetic conditions for the formation of hydrocarbons. Non-metal mineral deposits

Temeljna literatura in viri/Readings:

RIDLEY, John. Ore deposit geology. Cambridge University Press, 2013.
ROBB, Laurence. Introduction to ore-forming processes. John Wiley & Sons, 2013.
DIMKOVSKI, Trajan, ROKAVEC Duška: Nahajališča nekovinskih mineralnih surovin v Sloveniji: površinski kopi. Ljubljana: Geološki zavod Slovenije, 2001. 123 str.
DROVENIK, Matija, Nahajališča mineralnih surovin. Ljubljana, Fakulteta za naravoslovje in tehnologijo, 1984, 375 str.
SINTON, Christopher W., Raw materials for glass and ceramics : sources, processes, and quality control. Hoboken : Wiley, 2006. 356 str.

Cilji in kompetence:	**Objectives and competences:**
Prepoznavanje značilnosti in pogojev nastanka nahajališč različnih rudnih, nekovinskih in organskih mineralnih snovi. Ima sposobnost vrednotenja naravnih mineralnih surovin in sekundarnih surovin in ugotavljanja njihove uporabne vrednosti ter preprečevanja vplivov na okolje.	The student is able to identify the characteristics and conditions of formation of various mineral deposits, non-metallic mineral and organic substances. Student has the ability to evaluate natural minerals and secondary raw materials and their use value assessment and prevention of environmental impacts.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Študent je sposoben makroskopsko določiti strukturne in teksturne načilnosti rude ter prepoznati glavne rudne minerale. Pozna glavne značilnosti in teorijo nastanka nafte in premoga. Študent spozna najpomembnejše nekovinske mineralne surovine in njihovo uporabno vrednost v nekovinski predelovalni industriji. Razume parametre, ki določajo njegovo uporabno vrednost. Spozna tudi možnost uporabe mineralnih odpadkov kot sekundarne surovine. Študent z osvojenim znanjem lahko sodeluje pri ovrednotenju nahajališč mineralnih surovin in pri določanju njihove uporabne vrednosti. Poznavanje mineralnih snovi in sposobnost ugotavljanja njihovih meneraloških, kemičnih in strukturnih karakteristik študentu omogoča karakterizacijo kovinskih, nekovinskih in organskih mineralnih surovin. organskih mineralnih surovin omogoča študentu modeliranje obnašanja le-te pri procesu predelave in omogoči predvideti lastnosti končnega mineralega izdelka. Poznavanje lastnosti kovinskih, nekovinskih in Prenosljive spretnosti: sposobnost izbire in uporabe ustrezne domače in tuje literature iz področja mineralnih surovin.	The student is able to determine the macroscopic structural and textural features of ore and to identify the main ore minerals. Knows the main characteristics and theory of the formation of oil and coal. Students learn about the most important non-metallic minerals and their applications in metal processing industry. Understand the parameters that determine its value. He also possibility to use mineral wastes as secondary raw material. The student with the acquired knowledge is able to participate in the evaluation of mineral deposits and in determining their utility value. Knowledge of minerals and their ability to identify mineralogic, chemical and structural characteristics allows to student allows the characterization of metallic, organic and non-metallic minerals. Knowledge of the properties of metallic, organic and non-metallic minerals allowing the students modeling of their behavior in the recovery process and allow them to prognose properties of the final mineral product. Transferable skills: use of different literature data from use of mineral raw materials. Ability of analysis and synthesis of particular data.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, vaje (10 ur mikroskopija, 20 ur kabinetne vaje) in terenske vaje. Študenti izdelajo terensko poročilo.	Lectures, Tutorials (10 hrs microscopy work, 20 hrs practicals) and fieldwork. Students will prepare a fieldwork report.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Pisni izpit in/ali oddane domače naloge	60,00 %	Written exam and/or given homework
Kolokvij: teksture in strukture	30,00 %	Exercises: structures and textures
Poročilo terenskega dela	5,00 %	Fieldwork report
Aktivno sodelovanje pri predavanjih	5,00 %	Active participation in lectures
Ocena je sestavljena iz: kolokvij in mikroskopija (po 1/3 vsebine iz kovinskih, nekovinskih in organskih mineralnih snovi);		The rating consists of: test on the microscopy and tutorial work (1/3 of the content from metal, non-metal and organic

seminarska naloga; pisni izpit (po 1/3 vsebine iz kovinskih, nekovinskih in organskih mineralnih snovi). Ocenjevalna lestvica: (6-10) pozitivno, ob upoštevanju Statuta UL in fakultetnih pravil.		mineral materials); seminar work; written examination (1/3 of the content from metal, non-metal, and organic mineral materials). Grades: (6-10) positive assessment, according to University Statute and Faculty Acts.

Reference nosilca/Lecturer's references:

ŠOSTER, Aleš, ZAVAŠNIK, Janez, O'SULLIVAN, Paul, HERLEC, Uroš, POTOČNIK KRAJNC, Barbara, PALINKAŠ, Ladislav A., ZUPANČIČ, Nina, DOLENEC, Matej. Geochemistry of Bashibos-Bajrambos metasedimentary unit, Serbo-Macedonian massif, North Macedonia : implications for age, provenance and tectonic setting. *Chemie der Erde*, ISSN 0009-2819, [in press] 2020, 44 str.

ROGAN ŠMUC, Nastja, SERAFIMOVSKI, Todor, TASEV, Goran, DOLENEC, Tadej, DOLENEC, Matej. Distribution of Pb and Zn and their chemical specieisations in the paddy soils from the Kočani field (Macedonia). Geol. Maced., 2009, vol. 23, str. 55-62.

TASEV, Goran, SERAFIMOVSKI, Todor, DOLENEC, Matej, ROGAN ŠMUC, Nastja. Contribution to understanding of ore fluids in the Zletovo mine based on fluid inclusion data. *RMZ - Materials and geoenvironment : periodical for mining, metallurgy and geology*, ISSN 1408-7073.

MINERALOGIJA

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Mineralogija
Course title:	Mineralogy
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	1. letnik	2. semester	obvezen

Univerzitetna koda predmeta/University course code:	0067463
Koda učne enote na članici/UL Member course code:	892

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
30	0	60	0	0	90	6

Nosilec predmeta/Lecturer:	Mirijam Vrabec
Vrsta predmeta/Course type:	Obvezni / Compulsory

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Ni pogojev.	No prerequisites.

Vsebina:	Content (Syllabus outline):
NASTANEK MINERALOV: kristalizacija iz magme, izločanje iz raztopin, kristalizacija med metamorfozo. LASTNOSTI MINERALOV: lastnosti vezane na kristalno strukturo (oblika, habitus); lastnosti, ki temeljujo na interakciji minerala s svetlobo (sijaj, barva, barva črte, prosojnost, luminiscenca, optični fenomeni); mehanske lastnosti (razkolnost in lom, trdota, trdnost); lastnosti vezane na maso minerala (gostota, specifična teža); ostale lastnosti (magnetnost, radioaktivnost, topnost v kislinah, senzibilne lastnosti, električne lastnosti). KRISTALNA IN MINERALNA KEMIJA: osnovni gradniki mineralov, kemijske vezi v mineralih, spremenljivost kemične sestave mineralov, izločnine ali eksolucije, izračun mineralne formule, grafični prikaz sestave mineralov, mineralne reakcije, stabilnost mineralov.	FORMATION OF MINERALS: magma crystallization, precipitation from solutions, crystallization during metamorphosis. MINERAL PROPERTIES: properties related to the crystal structure (shape, habitus); properties based on the interaction of the mineral with light (lustre, color, line color, transparency, luminescence, optical phenomena); mechanical properties (cleavage and fracture, hardness, strength); properties related to the mass of the mineral (density, specific gravity); other properties (magnetism, radioactivity, solubility in acids, sensible properties, electrical properties). CRYSTAL AND MINERAL CHEMISTRY: basic building blocks of minerals, chemical bonds in minerals, variability of chemical composition of minerals, exolution lamellas, calculation of mineral formula, graphic representation of mineral composition, mineral reactions, mineral stability.

SISTEMATIKA IN IDENTIFIKACIJA MINERALOV: kriostalokemična klasifikacija mineralov v 8 razredov, (1) samorodne prvine, (2) sulfidi (enostavni sulfidi in sulfosoli), (3) haloidi (enostavni haloidi, dvojni haloidi, oksihaloidi), (4) oksidi in hidroksidi, (5) karbonati, nitrati, borati, (6) sulfati, kromati, molibdati, volframati, (7) fosfati, arzenati, vanadati, (8) silikati (nezo-, soro-, ciklo-, ino-, filo-, tekto-).	SYSTEMATICS AND IDENTIFICATION OF MINERALS: cryostalochemical classification of minerals in 8 classes, (1) native elements, (2) sulphides (simple sulfides and sulfosols), (3) halids (simple halides, double halides, oxyhalids), (4) oxides and hydroxides, (5) carbonates, nitrates, borates, (6) sulfates, chromates, molybdates, tungstates, (7) phosphates, arsenates, vanadates, (8) silicates (nezo-, soro-, cyclo-, ino-, phyllo-, tecto-).

Temeljna literatura in viri/Readings:

KLEIN, C. & HURLBUT, C.S. Jr., 1993: Manual of Mineralogy. John Wiley & Sons, 681 p.
WENK, H.-R. & BULAKH, A., 2004: Minerals: Their Constitution and Origin. Cambridge University Press, 646 p.
DEER, HOWIE, ZUSSMAN: Rock-Forming Minerals. Book Series. The Geological Society.
VRABEC, M.: Gradiva za predmet mineralogija dostopna preko elektronskega sistema VIS. / Materials for the subject mineralogy are accessible via the VIS electronic system.

Cilji in kompetence:	**Objectives and competences:**
Študenti se naučijo prepoznavati najpomembnejše kamninotvorne minerale z optičnim mikroskopom v presevni svetlobi.	Students learn to recognize the most common rock forming minerals by macroscopic observations and under optical microscope in plane polarized light.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Poznavanje osnovnih preiskav mineralnih snovi z optičnim mikroskopom v presevni svetlobi. Prepoznavanje glavnih kamninotvornih mineralov na makroskopskem nivoju in z optičnim mikroskopom v presevni svetlobi. Povezava med poznavanjem lastnosti mineralov in petrologijo ter sedimentologijo. Sposobnost izbire in uporabe ustrezne domače in tuje literature iz področja mineralogije.	Knowledge of basic investigations of minerals with optical microscope in transmissive light. Identification of major rock forming minerals using macroscopic prospection and with optical microscope in plain polarized light. Linking the knowledge of mineral properties with petrology and sedimentology. Ability to choose and use relevant domestic and foreign literature in the field of mineralogy.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja in vaje.	Lectures and practical work.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
1. makroskopsko prepoznavanje mineralov	20,00 %	1. macroscopic identification of minerals
2. mikroskopsko prepoznavanje mineralov	20,00 %	2. microscopic identification of minerals
3. pisni in/ali ustni izpit	60,00 %	3. written and/or oral exam
Študent mora obveznosti opravljati v predpisanem vrstnem redu. Najprej makroskopsko prepoznavanje mineralov, nato mikroskopsko prepoznavanje mineralov, sledi pisni in nato ustni izpit. Ocenjevalna lestvica: 51-60 % (6); 61-70 % (7); 71-80 % (8); 81-90 % (9); 91-100 % (10) ob upoštevanju Statuta UL in fakultetnih pravil.		The student must perform the duties in the prescribed order. First, macroscopic identification of minerals, then microscopic identification of minerals, followed by written and then oral examination. Grades: 51-60 % (6); 61-70 % (7); 71-80 % (8); 81-90 % (9); 91-100 % (10), according to University Statute and Faculty Acts.

Reference nosilca/Lecturer's references:

JANÁK, Marian, UHER, Pavel, KROGH RAVNA, Erling J., KULLERUD, Kåre, VRABEC, Mirijam. Chromium-rich kyanite, magnesiostaurolite and corundum in ultrahigh-pressure eclogites (examples from

Pohorje Mountains, Slovenia and Tromsø Nappe, Norway). European journal of mineralogy, 2015, vol. 27, no. 3, str. 377-392, doi: 10.1127/ejm/2015/0027-2436.
ROGAN ŠMUC, Nastja, SERAFIMOVSKI, Todor, DOLENEC, Tadej, DOLENEC, Matej, VRHOVNIK, Petra, VRABEC, Mirijam, JAĆIMOVIĆ, Radojko, LOGAR ZORN, Vesna, KOMAR, Darja. Mineralogical and geochemical study of Lake Dojran sediments (Republic of Macedonia). Journal of geochemical exploration, ISSN 0375-6742. [Print ed.], 2015, vol. 150, str. 73-83, doi: 10.1016/j.gexplo.2014.12.019.
JANÁK, Marian, FROITZHEIM, Nikolaus, YOSHIDA, Kenta, SASINKOVÁ, V., NOSKO, Martin, KOBAYASHI, Tomoyuki, HIRAJIMA, Takao, VRABEC, Mirijam. Diamond in metasedimentary crustal rocks from Pohorje, Eastern Alps: a window to deep continental subduction. Journal of metamorphic geology, ISSN 0263-4929, 2015, vol. 33, str. 495-512, doi: 10.1111/jmg.12130.

MORSKA GEOKEMIJA 1

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Morska geokemija 1
Course title:	Marine Geochemistry 1
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	2. letnik, 3. letnik		izbirni

Univerzitetna koda predmeta/University course code:	0089597
Koda učne enote na članici/UL Member course code:	11289

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
30	0	0	0	15	45	3

Nosilec predmeta/Lecturer:	Matej Dolenec, Nastja Rogan Šmuc
Vrsta predmeta/Course type:	Izbirni / Elective

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Opravljeni izpiti iz Kemije in Geokemije za pristop k izpitu.	Passed exams of Chemistry and Geochemistry to take an exam.

Vsebina:	Content (Syllabus outline):
Oceani preteklosti.	Oceans of the past.
Oceani danes.	The seas of today.
Oceani in podnebje.	Oceans and climate.
Geološki ocean.	The geological ocean.
Vnos snovi v oceane.	The input of material to the oceans.
Transport materiala v oceane: rečne, atmosferske in hidrothermalne poti.	The transport of material to the oceans: river, atmosphereic and hydrothermal pathways.
Opisna oceanografija.	Descriptive oceanography.
Raztopljeni plini v morski vodi.	Dissolved gasses in sea water.
Nutrienti, organski ogljik in ogljikov cikel.	Nutrients, organic carbon and carbon cycle.
Partikularna snov v oceanih.	Particulate matter in the oceans.

Temeljna literatura in viri/Readings:

CHESTER, R., 2003: Marine Geochemistry. Blackwell Publishing, 506 p.
SHULZ, H.D. & ZABEL, M. (eds.), 2006: Marine Geochemistry. Springer, 574 p.
PRAGER, E.J. & EARLE S.A., 2000: The oceans. McGraw-Hill, 307 p.

Cilji in kompetence:	Objectives and competences:
CILJI: Slušatelj osvoji osnovno znanje o procesih, ki vplivajo na že znane časovne in prostorske spremembe v kemični sestavi morske vode, osvoji osnovo znanje in postopke vzorčenja ter analiznih tehnik za morske sedimente. Naučijo se, kako deluje moderno interdisciplinarno delovanje in raziskovanje morja. KOMPETENCE: Slušatelj je sposoben določiti mehanizme, ki spreminjajo povprečno vsebnost elementov v oceanih in njihov vpliv ter odzivni čas za različne elemente. Sposoben je identificirati procese vezane za kemično sestavo organske snovi in za antropogeni CO2 v morskem okolju.	OBJECTIVES: Students learn about the processes responsible for the observed temporal and spatial patterns in marine chemistry, learn about fundamental sampling methods and analyses techniques for marine sediments. Students learn to think in geological time scales and how modern interdisciplinary marine environment works. COMPETENCES: Students learn to identify mechanisms which change the mean concentration of elements in the ocean and the influence of residence time and response times for various elements. Identify the processes regulating carbon chemistry in the ocean and the uptake of anthropogenic CO2.

Predvideni študijski rezultati:	Intended learning outcomes:
Slušatelj razume in prepozna morske geokemične procese v času in prostoru. Slušatelj je sposoben prepoznati mehanizme, ki spremljajo porazdelitev in koncentracijo elementov s posebnim poudarkom na CO2, nutriente in partikulatno organsko snov. Slušatelj je sposoben uporabiti znanje o preteklih spremembah in na podlagi podatkov napovedati prihodnje scenarije. Sposoben je interpretirati geokemične podatke morskih sedimentov in ugotoviti procese, ki se dogajajo znotraj sedimenta. Pri delu je slušatelj sposoben sodelovati s strokovnjaki iz ostalih področij (biologi, kemiki…), uporabljati domačo in tujo strokovno in znanstveno literaturo.	The student understands and recognizes the processes generating the marine geochemical trends and time series. The student is able to identify mechanisms that changes the distribution and concentration of elements, with special emphasis of CO2, nutrients and POM. The student is able to use of knowledge on past changes to predict future scenarios and is able to interpretate the geochemical data relative to marine sediments and other processes occuring within the sediments. The student is able to work with professionals from other fields (biologists, chemists...), he is able to use domestic and foreign professional and scientific literature.

Metode poučevanja in učenja:	Learning and teaching methods:
Predavanja in 2 dni terenskega dela. PowerPoint predstavitve.	Lectures and 2 days of field work. PowerPoint presentations.

Načini ocenjevanja:	Delež/Weight	Assessment:
Pisni in/ali ustni izpit	45,00 %	Written and/or oral exam
Vaje - kolokvij	40,00 %	Tutorial exam
Terenska poročila	10,00 %	Field reports
Aktivno sodelovanje pri predmetu	5,00 %	Active participation in Course

Reference nosilca/Lecturer's references:

MEDAKOVIĆ, Davorin, DOLENEC, Tadej, KARLOVIĆ, Danijel, VRHOVNIK, Petra, ROGAN ŠMUC, Nastja, RONČEVIĆ, Sanda, PITAREVIĆ SVEDRUŽIĆ, Lovorka, DOLENEC, Matej. Trace metals in fish biominerals as environmental indicators: handheld XRF analyses. V: MARIN, Frédéric (ur.). Biomineralization: from fundamentals to biomaterials & environmental issues, (Key Engineering Materials, ISSN 1013-9826, Vol. 672). Pfaffikon: Trans Tech Publications. 2016, vol. 672, str. 328-339.

ŽVAB ROŽIČ, Petra, DOLENEC, Tadej, LOJEN, Sonja, KNIEWALD, Goran, DOLENEC, Matej. Use of stable isotope composition variability of particulate organic matter to assess the anthropogenic organic matter in coastal environment (Istra Peninsula, Northern Adriatic). Environmental earth sciences, ISSN 1866-6280, 2015, vol. 73, no. 7, str. 3109-3118.

KOMAR, Darja, DOLENEC, Matej, LAMBAŠA, Živana, SANJA SLAVICA, Matešić, LOJEN, Sonja, KNIEWALD, Goran, VRHOVNIK, Petra, DOLENEC, Tadej, ROGAN ŠMUC, Nastja. Geochemical characterization and environmental status of Makirina Bay sediments (northern Dalmatia, Republic of Croatia). Geologia Croatica : a journal of the Institute of Geology Zagreb and Croatian Geological Society, ISSN 1330-030X, 2015, vol. 68, no. 1, str. 79-92.

DOLENEC, Matej, ŽVAB ROŽIČ, Petra, MIHELČIĆ, Goran, LAMBAŠA, Živana, LOJEN, Sonja, KNIEWALD, Goran, DOLENEC, Tadej, ROGAN ŠMUC, Nastja. Use of stable nitrogen isotope signatures of anthropogenic organic matter in the coastal environment: a case study of the Kosirina Bay (Murter Island, Croatia). Geologia Croatica : a journal of the Institute of Geology Zagreb and Croatian Geological Society, ISSN 1330-030X, 2011, vol. 64, no. 2, str. 143-152.

NANOMATERIALI

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Nanomateriali
Course title:	Nanomaterials
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	3. letnik	2. semester	izbirni

Univerzitetna koda predmeta/University course code:	0160956
Koda učne enote na članici/UL Member course code:	11403

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
25	20	0	0	0	45	3

Nosilec predmeta/Lecturer:	Mirijam Vrabec, Sašo Šturm
Vrsta predmeta/Course type:	Izbirni/Elective

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Ni pogojev.	No prerequisites.

Vsebina:	Content (Syllabus outline):
Lastnosti nanomaterialov: uvod v nanotehnologijo, klasifikacija nanomaterialov, osnovne fizikalne lastnosti nanomaterialov v odvisnosti od velikosti delcev, koncept kvantne sklopitve, teorija energijskih pasov. Sinteza nanomaterialov: sinteza 0-, 1-, 2-dimenzionalnih nanostruktur, sintezni postopki po principu od zgoraj navzdol (top down) in od spodaj navzgor (bottom up), sinteza v matrici, samourejanje, hibridni nanodelci. Uporaba nanomaterialov v sodobnem svetu: nano-elektronske komponente, magnetni, polprevodni, kovinskih in keramični nanomateriali, nanodelci v katalizi, nanostrukturni senzorji. Plazmonski in fotokatalitični nanodelci. Samočiščenje in lotusov pojav v nanostrukturah. Nanomateriali v medicini; terapija in diagnostika.	Characteristic properties of nanomaterials: introduction to nanotechnology, classification of nanomaterials, basic physical properties of nanomaterials as a function of particle size, quantum confinement effects, potential well. Synthesis of nanomaterials: synthesis of 0-, 1-, 2-dimensional nanostructures, top down and bottom up synthesis procedures, template assisted synthesis, self-assembly, hybrid nanoparticles. Application of nanomaterials in the modern life: nano-electronic components, magnetic, semiconductor, metal and ceramic nanomaterials, nanoparticles in catalysis, nanostructured sensors. Plasmonic and photocatalytic nanoparticles. Self-cleaning and lotus effect in nanostructures. Nanomaterials in medicine; therapy and diagnostics. Characterization of nanomaterials: structural and chemical analysis of nanomaterials using X-ray

Karakterizacija nanomaterialov: strukturna in kemijska analiza nanomaterialov s pomočjo rentgenske praškovne difrakcije, elektronske mikroskopije in mikroskopije na atomsko silo. Določevanje elektronskih stanj nanostruktur z uporabo spektroskopije na izgubo energije elektronov.	powder diffraction, electron microscopy and atomic force microscopy. Determination of electronic states of nanostructures using electron energy-loss spectroscopy.

Temeljna literatura in viri/Readings:

Rogers B., Adams J., Pennathur S. 2014: Nanotechnology: understanding small systems, CRC Press
Khan, Z. H., 2015: Nanomaterials and Their Applications. Springer.
Gre za hitro razvijajoče področje znanosti. Temu vsled med temeljne študijske vire vključujemo tudi znanstvene članki objavljene v zadnjih letih predvsem v revijah Nature, Nature Materials, Advanced Materials, Materials Today, Science. / Latest articles from following scientific journals: Nature, Nature Materials, Advanced Materials, Materials Today, Science

Cilji in kompetence:	**Objectives and competences:**
Cilji: Slušatelj pridobi osnovno znanje o teoriji nanomaterialov in se seznani o najnovejših izzivih in dosežkih na področju nanomaterialov. Kompetence: • Razumevanje fizikalno-kemijskih lastnosti, obvladovanje metod sitneze in karakterizacije nanomaterialov. • Sposobnost za samostojno in skupinsko raziskovalno delo in uporabe znanj v praksi s poudarkom na razvoju multidisciplinarnega načina raziskovanja ter sposobnosti razumevanja najnovejših izsledkov na področju nanomaterialov znotraj relevantnih znanstvenih publikacij.	Objectives: Students acquire basic knowledge of the theory of nanomaterials and get acquainted of the latest challenges and achievements in the field of nanomaterials. Competences: • Understanding of nanomaterial's physicochemical properties, mastering of synthesis and characterisation methods of nanomaterials. • The ability for independent and group research work and the use of knowledge in practice, with an emphasis on the mastering of multidisciplinary research and the capability to understand the latest findings in the field of nanomaterials within relevant scientific publications.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Študent razume teorijo nanomaterialov, osvoji osnovne sintezne postopke za pripravo različnih skupin nanomaterialov, nauči se povezovanja med fizikalno-kemijskimi lastnostmi nanomaterialov in končno uporabo v sodobnem svetu. Študent bo sposoben izbiranja najoptimalnejših preiskovalnih metod za analizo različnih tipov nanomaterialov, v odvisnosti od analitičnega problema. Pri delu je študent sposoben sodelovati s strokovnjaki iz področja sinteze in uporabe nanomaterialov in uporabljati tujo strokovno in znanstveno literaturo.	The student understands the theory of nanomaterials, basic synthesis procedures for the preparation of various groups of nanomaterials, learns the connections between the physicochemical properties of nanomaterials and their final use in the modern world. The student is able to select the most optimal characterisation methods for analysing different types of nanomaterials, depending on the analytical problem. At work, the student can independently interact with experts in the field of nanomaterials and apply state-of-the-art up to date relevant scientific literature for future research.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, seminarske vaje in obisk raziskovalnih skupin, ki se ukvarjajo s sintezo in karakterizacijo nanomaterialov. Delo v laboratoriju in računalniški učilnici. V okviru predavanj študentje izdelajo seminarsko nalogo, ki jo javno predstavijo.	Lectures, practicals and visits to research groups engaged in the synthesis and characterisation of nanomaterials. Work in a laboratory and in a computer classroom. In the framework of lectures, students prepare a seminar paper, which they publicly present.

Načini ocenjevanja: **Delež/Weight** **Assessment:**

Pisni in/ali ustni izpit	75,00 %	Written and/or oral exam
Seminarska naloga	25,00 %	Seminar work

Reference nosilca/Lecturer's references:

TRAFELA, Špela, ZAVAŠNIK, Janez, ŠTURM, Sašo, ŽUŽEK ROŽMAN, Kristina. Formation of a Ni(OH)2/NiOOHNi(OH)2/NiOOH active redox couple on nickel nanowires for formaldehyde detection in alkaline medi. *Electrochimica Acta*, ISSN 0013-4686. [Print ed.], [in press] 2019, 25 str., doi: 10.1016/j.electacta.2019.04.060.

KOSTEVŠEK, Nina, ABRAMOVIĆ, Irena, HUDOKLIN, Samo, ERDANI-KREFT, Mateja, SERŠA, Igor, SEPE, Ana, VIDMAR, Janja, ŠTURM, Sašo, ŠČANČAR, Janez, SPREITZER, Matjaž, KOBE, Spomenka, ŽUŽEK ROŽMAN, Kristina. Hybrid FePt/SiO2/AuFePt/SiO2/Aunanoparticles as theranostic tool : in vitro photo-thermal treatment and MRI imaging. *Nanoscale*, ISSN 2040-3364, 2018, vol. 10, no. 3, str. 1308-1321, doi: 10.1039/C7NR07810B.

KOSTEVŠEK, Nina, ŠTURM, Sašo, ŽUŽEK ROŽMAN, Kristina, et al. The one-step synthesis and surface functionalization of dumbbell-like gold-iron oxide nanoparticles : a chitosan-based nanotheranostic system. *Chemical communications*, ISSN 1359-7345, 2016, vol. 52, issue 2, str. 378-381, doi: 10.1039/C5CC08275G.

ŠTURM, Sašo, ŽUŽEK ROŽMAN, Kristina, MARKOLI, Boštjan, SPYROPOULOS ANTONAKAKIS, Nikolaos, SARANTOPOULOU, Evangelia, KOLLIA, Zoe, CEFALAS, Alciviadis-Constantinos, KOBE, Spomenka. Pulsed-laser fabrication of gas-filled hollow CoPt nanospheres. *Acta materialia*, ISSN 1359-6454. [Print ed.], 2013, vol. 61, no. 61, str. 7924-7930, doi: 10.1016/j.actamat.2013.09.033.

LORENZETTI, Martina, DRAME, Anja, ŠTURM, Sašo, NOVAK, Saša. TiO2TiO2 (nano)particles extracted from sugar-coated confectionery. *Journal of nanomaterials*, ISSN 1687-4110, 2017, vol. 2017, str. 6298307-1-6298307-14, doi: 10.1155/2017/6298307.

KOSTEVŠEK, Nina, ŽUŽEK ROŽMAN, Kristina, ARSHAD, Muhammad Shahid, SPREITZER, Matjaž, KOBE, Spomenka, ŠTURM, Sašo. Multimodal hybrid FePt/SiO2/AuFePt/SiO2/Au nanoparticles for nanomedical applications ecombining photothermal stimulation and manipulation with an external magnetic field. *The journal of physical chemistry. C, Nanomaterials and interfaces*, ISSN 1932-7447, 2015, vol. 119, issue 28, str. 16374-16382, doi: 10.1021/acs.jpcc.5b03725.

SKRLJ GOLOB, Barbara, OLIVI, Giovanni, VRABEC, Mirijam, EL FEGHALI, Rita, PARKER, Steven, BENEDICENTI, Stefano. Efficacy of photon-induced photoacoustic streaming in the reduction of Enterococcus faecalis within the root canal : different settings and different sodium hypochlorite concentrations. *Journal of endodontics*, ISSN 0099-2399, 2017, vol. 43, iss. 10, str. 1730-1735, doi: 10.1016/j.joen.2017.05.019.

LESKOVAR, Blaž, VRABEC, Mirijam, DOLENEC, Matej, NAGLIČ, Iztok, DOLENEC, Tadej, DERVARIČ, Evgen, MARKOLI, Boštjan. Temperature-initiated structural changes in FeS[sub]2 pyrite from Pohorje, Eastern Alps, North-Eastern Slovenia = S temperaturo povzročene strukturne spremembe FeS[spodaj]2 pirita iz Pohorja, vzhodne Alpe, severovzhodna Slovenija. *Materiali in tehnologije*, ISSN 1580-2949. [Tiskana izd.], 2017, letn. 51, št. 2, str. 259-265, ilustr. http://mit.imt.si/Revija/izvodi/mit172/leskovar.pdf, doi: 10.17222/mit.2015.328.

VRABEC, Mirijam, JANÁK, Marian, FROITZHEIM, Nikolaus, DE HOOG, J.C.M. Phase relations during peak metamorphism and decompression of the UHP kyanite eclogites, Pohorje Mountains (Eastern Alps, Slovenia). *Lithos*, ISSN 0024-4937, 2012, vol. 144-145, str. 40-55, doi: dx.doi.org/10.1016/j.lithos.2012.04.004.

OKOLJSKA GEOLOGIJA

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Okoljska geologija
Course title:	Environmental Geology
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	3. letnik	1. semester	obvezen

Univerzitetna koda predmeta/University course code:	0067485
Koda učne enote na članici/UL Member course code:	11245

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
60	0	0	0	15	75	5

Nosilec predmeta/Lecturer:	Nastja Rogan Šmuc, Nina Zupančič
Vrsta predmeta/Course type:	Obvezni / Compulsory

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Ni pogojev.	No prerequisites.

Vsebina:	Content (Syllabus outline):
Temelji okoljske geologije Filozofija in osnovni koncepti Ekologija in geologija Kroženje izbranih prvin in spojin v naravi Procesi na Zemlji, ki predstavljajo nevarnost Uvod v naravne nesreče Obalna erozija Vremensko pogojene nevarnosti Padci zunajzemeljskih objektov Naravni viri in onesnaženje Tla in okolje Mineralni viri in okolje Geokemično kartiranje Metode ocenjevanja onesnaženja Remediacija Uvod v geomedicino Fosilna goriva in okolje Alternativni energijski viri	Foundations of Environmental Geology Philosophy and fundamental concepts Ecology and Geology Selected elements and compound natural cycles Hazardous Earth Processes Introduction to Natural Hazards Coastal Hazards Weather induced Hazards Impact of Extraterrestrial Objects Natural resources and Pollution Soils and Environment Mineral Resources and Environment Geochemical Mapping Methods of estimating pollution Remediation Introduction to Geomedicine

Jedrska energija Ravnanje z odpadki in njihova ponovna uporaba Organska onesnaževala Globalne klimatske spremembe Okoljska zakonodaja Aktualni okoljski problemi	Fossil Energy resources and Environment Alternative Energy resources Nuclear energy Waste management and reuse Organic pollutants Global climate change Environmental legislation Actual environmental issues

Temeljna literatura in viri/Readings:

KELLER E. A., 2011, Environmental Geology. PearsonPrentice Hall, 596 pp.
MONTGOMERY, C. W., 2006: Environmental Geology. McGraw&Hill, 540 pp.
VAUGHAN, D.J. & WOGELIUS, R.A., 2000. Environmental Mineralogy, European Mineralogical Union, 434pp.
VAUGHAN, D.J., 2006. Sulfide Mineralogy and Geochemistry (Ed.). Reviews in Mineralogy and Geochemistry, Geochemical Society and Mineralogical Society of America, 714pp.

Cilji in kompetence:	**Objectives and competences:**
CILJI: Slušatelj obvlada osnovne probleme ter zakonodajo v zvezi z ranljivostjo in varovanjem okolja ter vpetost različnih vej geologije (mineralogija, geokemija, inženirska geologija, hidrogeologija) pri varovanju in sanaciji okolja. KOMPETENCE: Študent je sposoben spoznati in predvideti okoljske vplive ter predlagati njihovo sanacijo. Zna se povezovati s strokovnjaki drugih strok pri presoji in reševanju okoljskih problemov.	OBJECTIVES: Students manage the basic problems and legislation relating to vulnerability and protecting the environment as well as integration of different branches of geology (mineralogy, geochemistry, engineering geology, hydrogeology) in the protection and rehabilitation of the environment. COMPETENCES: The student is able to recognize and anticipate environmental impacts and propose their rehabilitation. Knows how to liaise with experts in other fields of expertise in environmental issues.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Študent razume in prepozna okoljsko problematiko v širšem družbenem in naravoslovnem kontekstu. Pozna zakonske osnove varovanja okolja. Pozna dejavnike geohazarda in razume procese onesnaževanja ter posegov v okolje. Slušatelj je sposoben predstaviti vlogo geološkega znanja pri reševanju okoljske problematike ter poiskati ustrezne rešitve za preprečevanje in remediacijo škodljivih vplivov na okolje. Iz različnih vej geologije je sposoben izluščiti potrebna znanja za razumevanje in reševanje okoljske problematike ter predvideti škodljive posege v okolje ter predlagati njihovo sanacijo z vidika geološke stroke. Pri delu je sposoben sodelovati s strokovnjaki iz ostalih področij (gradbeniki, biologi, kemiki…), uporabljati domačo in tujo strokovno literaturo.	The student understands and recognizes environmental issues in a broader social and natural science context. Knows the legal basics of environmental protection. Knows the geohazard factors and understands the processes of pollution and environmental interventions. The student is able to present the role of geological knowledge in solving environmental problems and to find appropriate solutions for the prevention and remediation of harmful effects on the environment. He is able to use the necessary knowledge from various branches of geology the to understand and solve environmental problems, to anticipate harmful interventions in the environment and to propose their remediation from the perspective of the geological profession. He is able to work with experts in other fields (builders, biologists, chemists, etc.), use domestic and foreign professional literature.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja in dva dni obiska terena. V okviru predavanj študentje izdelajo eno seminarsko nalogo, ki jo javno predstavijo.	Lectures and two days of field visits. Within the lectures students will prepare and present a seminar work.

Načini ocenjevanja:	Delež/Weight	Assessment:
Pisni in/ali ustni izpit ali oddane domače naloge	90,00 %	Written and/or oral exam or given homework
Predstavitev seminarske naloge	5,00 %	Presentation of seminar
Aktivno sodelovanje pri predavanjih	5,00 %	Active participation in lectures

Reference nosilca/Lecturer's references:

OPRČKAL, Primož, MLADENOVIČ, Ana, ZUPANČIČ, Nina, ŠČANČAR, Janez, MILAČIČ, Radmila, ZALAR SERJUN, Vesna. Remediation of contaminated soil by red mud and paper ash. Journal of cleaner production, 2020, str. 1-33.

MLADENOVIČ, Ana, HAMLER, Sandra, ZUPANČIČ, Nina. Environmental characterisation of sewage sludge/paper ash-based composites in relation to their possible use in civil engineering. Environmental science and pollution research international, 2017, vol. 24, iss. 1, str. 1030-1041.

ZUPANČIČ, Nina. Influence of climate factors on soil heavy metal content in Slovenia. Journal of soils and sediments : protection, risk assessment and remediation, ISSN 1439-0108, 2017, vol. 17, iss. 4, str. 1073-1083.

ROGAN ŠMUC, Nastja, DOLENEC, Matej, KRAMAR, Sabina, MLADENOVIČ, Ana, Geochemical equilibrium and processes in seawater. Heavy metal signature and environmental assessment of nearshore sediments: Port of Koper (Northern Adriatic Sea). Geosciences, ISSN 2076-3263, 2018, vol. 8, iss. 11, 18 str., doi: 10.3390/geosciences8110398.

KOVAČ, Nives, GLAVAŠ, Neli, RAMŠAK, Teja, DOLENEC, Matej, ROGAN ŠMUC, Nastja. Metal(oid) mobility in a hypersaline salt marsh sediment (Sečovlje Salina, northern Adriatic, Slovenia). Science of the total environment, ISSN 0048-9697, 2018, vol. 644, str. 350-359, doi: 10.1016/j.scitotenv.2018.06.252.

GLAVAŠ, Neli, MOURELLE, Lourdes Maria, GÓMEZ, Carmen P., LEGIDO, José Luis, ROGAN ŠMUC, Nastja, DOLENEC, Matej, KOVAČ, Nives. The mineralogical, geochemical, and thermophysical characterization of healing saline mud for use in pelotherapy. Applied clay science, ISSN 0169-1317. [Print ed.], 2017, vol. 135, str. 119-128, doi: 10.1016/j.clay.2016.09.013.

OSNOVE GEOLOGIJE

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Osnove geologije
Course title:	Introduction to Geology
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	1. letnik	1. semester	obvezen

Univerzitetna koda predmeta/University course code:	0603049
Koda učne enote na članici/UL Member course code:	890

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
60	20	25	0	15	120	8

Nosilec predmeta/Lecturer:	Marko Vrabec
Vrsta predmeta/Course type:	Obvezni / Compulsory

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Ni posebnih pogojev.	None.

Vsebina:	Content (Syllabus outline):
Kamninotvorni minerali. Magmatske, metamorfne in sedimentne kamnine. Geološki čas: stratigrafija, geološka časovna lestvica, absolutne metode datiranja. Nastanek Vesolja in snovi, nastanek in diferenciacija Sončevega sistema in Zemlje. Notranja zgradba Zemlje, seizmologija, fizikalni pogoji v notranjosti Zemlje. Tektonika plošč, divergentni, konvergentni in transformni robovi, mehanizmi tektonike plošč, nastanek litosfere, tektonika plošč in kamninski krog. Nastanek in razvoj Zemljine atmosfere in hidrosfere. Nihanja nivoja morske gladine. Paleoklimatologija: planetarni oceanski in zračni tokovi, podnebni regulacijski mehanizmi in povratne zanke, podnebne razmere v Zemljini zgodovini. Razvoj življenja na Zemlji: fosili in evolucija, izvor življenja, pomembni mejniki razvoja življenja v	Rock-forming minerals. Igneous, metamorphic and sedimentary rocks. Geological time: stratigraphy, geological time scale, absolute dating methods. Origin of the Universe and matter, evolution and differentiation of the Solar system and the Earth. Internal structure of the Earth, seismology, physical conditions in the Earth's interior. Plate tectonics; divergent, convergent and transform margins, mechanisms of plate motion, origin of the litosphere, plate tectonics and the rock cycle. The origin and evolution of Earth's atmosphere and hidrosphere. Sea-level changes. Paleoclimatology: global oceanic and atmospheric circulation, climate regulation and feedbacks, climates in the Earth's history. Evolution of life on Earth: fossils and evolution, the origin of life, major milestones in development of life,

geološki zgodovini, masovna izumrtja. Geološki naravni viri. Geohazard. Geološke strukture, osnovne geometrijske tehnike analize struktur (karte, profili, strukturne izohipse), interpretacija geološke zgodovine ozemlja iz strukture, osnovne meritve z geološkim kompasom.	mass extinctions. Geological resources. Geohazard. Geological structures, basic geometrical techniques of structural analysis (maps, cross-sections, structural contours), interpretation of terrain history from structure, basic measurement techniques with geological compass.

Temeljna literatura in viri/Readings:

PLUMMER et al., 2010: Physical geology 13th ed. - McGraw-Hill.
ROGERS (ed.), 2008: An introduction to our dynamic planet. - Cambridge University Press.
COCKELL et al., 2008: An introduction to the Earth-Life system. - Cambridge University Press.
POWELL, 1996: Interpretation of geological structures through maps. – Longman.
VRABEC, ZUPANČIČ, 2017: Študijska gradiva za predmet Osnove geologije (prosojnice s predavanj in vaj). Univerza v Ljubljani, Naravoslovnotehniška fakulteta.

Cilji in kompetence:	**Objectives and competences:**
CILJI: študenti v tem uvodnem tečaju dobijo osnovni pregled nad geologijo in sorodnimi vedami o Zemlji. Spoznajo teorijo tektonike plošč kot podlago za razumevanje planetarnih geoloških procesov. Na holističen način so jim predstavljene medsebojne povezave in vplivi med geološkimi procesi in hidrosfero, atmosfero in biosfero. KOMPETENCE: študenti razumejo prostorsko in časovno dimenzijo, ki jo predstavlja geologija. Poznajo osnovne geološke procese ki delujejo na Zemlji, prepoznavajo osnovne minerale in kamnine, znajo brati geološke karte in iz njih interpretirati prostorsko zgradbo in časovni razvoj ozemlja.	OBJECTIVES: In this introductory course, the students get an overview of geology and other geoscientific disciplines. They get acquainted with the plate tectonics theory as the unifying platform for understanding planetary geological processes. They learn, by holistic approach, the mutual interactions and influences between geological processes and the hydrosphere, atmosphere and biosphere. COMPETENCES: Students understand the spatial and temporal dimension of geoscience. They are familiar with the principal geological processes operating on Earth, and are able to recognize major rock-forming minerals and rock types. They are capable of reading geological maps and using them to interpret the spatial architecture and temporal evolution of a given terrain.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Študenti osvojijo osnovno znanje o nastanku, sestavi in notranji zgradbi Zemlje in njenega atmosferskega ovoja. Spoznajo delovanje različnih geoloških procesov in prepoznavanje geoloških dogodkov v stratigrafskem zapisu. Poznajo in razumejo kompleksne medsebojne vplive, ki oblikujejo geološki razvoj Zemlje, globalnega podnebja, živih bitij, ter določajo nastajanje mineralnih surovin in geološko pogojenih tveganj za človeštvo. Pri tem predmetu študenti naredijo prehod iz srednješolskega nivoja razumevanja snovi k znanstvenemu pristopu, saj spoznajo zgodovinski razvoj različnih teorij, argumentacijo za in proti, ter tudi nekatere aktualne kontroverzne teme v geoznanosti. Pridobljeno znanje predstavlja osnovno podlago za strokovne predmete v nadaljevanju študija in jih postavlja v širši kontekst globalne geoznanosti. Pri predmetu pridobijo tudi praktične veščine dela z geološkim kompasom, spoznajo osnovne geometrijske tehnike za prikaz in interpretacijo geoloških podatkov na kartah, ter se	Students master the fundamental knowledge about the origin, composition and internal structure of the Earth and its atmospheric outer layer. They get acquainted with geological processes operating on Earth and learn to recognize evidence of geological events in the stratigraphic record. They know and understand the complex interactions which control the geological evolution of the planet, the global climate, the evolution of life, and also the formation of mineral depostis and geological hazards which affect the mankind. In this course students progress from high-school level of understanding towards the scientific approach by learning historical development of various theories, pro et contra argumentation, as well as by getting familiar with selected controversies in modern geoscience. The acquired knowledge forms a basic framework for subsequent specialist courses and puts them in the wider context of global geoscience. Students also acquire practical skills for working with geological compass and fundamental

naučijo prepoznavati glavne vrste mineralov in kamnin.	geometrical techniques for presenting and interpreting geological data on maps, and learn to recognize major minerals and rock types.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, kabinetne vaje, terenske vaje.	Lectures, lab exercises, fieldwork.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Pisni in/ali ustni izpit	65,00 %	Written and/or oral examination
Praktični preizkus znanja interpretacije geoloških kart	35,00 %	Test of geological map interpretation skills
Pozitivno opravljen preizkus prepoznavanja kamnin	0,00 %	Student must pass rock identification quiz

Reference nosilca/Lecturer's references:

TROBEC, Ana, ŠMUC, Andrej, POGLAJEN, Sašo, VRABEC, Marko. Submerged and buried Pleistocene river channels in the Gulf of Trieste (Northern Adriatic Sea) : geomorphic, stratigraphic and tectonic inferences. Geomorphology, 2017, vol. 286, str. 110-120.
WEBER, John, VRABEC, Marko, PAVLOVČIČ PREŠEREN, Polona, DIXON, Tim, JIANG, Yan, STOPAR, Bojan. GPS-derived motion of the Adriatic microplate from Istria Peninsula and Po Plain sites and geodynamic implications. Tectonophysics, 2010, vol. 483, iss. 3-4, str. 214-222.
VRABEC, Marko, ŠMUC, Andrej, PLENIČAR, Mario, BUSER, Stanko. Geološki razvoj Slovenije - Povzetek = Geological evolution of Slovenia - An Overview. V: PLENIČAR, Mario (ur.), OGORELEC, Bojan (ur.), NOVAK, Matevž (ur.). Geologija Slovenije. Ljubljana: Geološki zavod Slovenije, 2009, str. 23-40.

OSNOVE MIKROSKOPIJE RUD

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Osnove mikroskopije rud
Course title:	Ore Microscopy Basics
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	2. letnik, 3. letnik		izbirni

Univerzitetna koda predmeta/University course code:	0089550
Koda učne enote na članici/UL Member course code:	531

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
15	0	30	0	0	45	3

Nosilec predmeta/Lecturer:	Matej Dolenec
Vrsta predmeta/Course type:	Izbirni / Elective

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Opravljeni izpiti iz predmetov Mineralogija, in Petrologije magmatskih in metamorfnih kamnin in Mineralne surovine za pristop k izpitu.	Passed exams on Mineralogy, Igneous and metamorphic petrology and Minerals Deposit to take an exam.

Vsebina:	Content (Syllabus outline):
Osnove rudne mikroskopije Rudni mikroskop za prepoznavanje neprosojnih mineralov v odsevni polarizirani svetlobi in ostala raziskovalna oprema za določanje optičnih in fizikalnih lastnosti rudnih mineralov Optične lastnosti glavnih rudnih in jalovinskih mineralov v odsevni svetlobi na podlagi katerih prepoznamo omenjene minerale Praktično delo z mikroskopom za opazovanje v odsevni polariririrani svetlobi Določanje glavnih rudnih in jalovinskih mineralov v odsevni svetlobi Rudne strukture in teksture	Foundaments of the ore microscopy Reflective polarised light microscope for identification of opaque minerals and other investigaton equipment for determination of optical and physical characteriostics of ore minerals Optical characteristics of main ore and gangue minerals in reflective light used for their identification Practical work on reflective polarised light microscope Identification of main ore and gangue minerals in reflective light Ore textures and structures

Temeljna literatura in viri/Readings:

INESON, P. R. Introduction to practical ore microscopy. Routledge, 2014.
CRAIG, J. R., VAUGHAN, D. J., HAGNI, R. D. Ore microscopy and ore petrography. New York: Wiley, 1981.
PRACEJUS, B. The ore minerals under the microscope: an optical guide. Elsevier, 2015.
DROVENIK, M. Mikroskopija rud. Univerza v Ljubljani, Fakulteta za na naravoslovje in tehnologijo, Ljubljana, 197 str., 1978.
DOLENEC, T., DOLENEC, M. Mikroskopija rud (prosojnice) : študijsko gradivo. Ljubljana: NTF, Oddelek za geologijo, 66 str., 2007.

Cilji in kompetence:	**Objectives and competences:**
CILJI: Pridobiti temeljno znanje potrebno za mikroskopsko prepoznavanje rudnih mineralov in določanja zaporedja njihove kristalizacije ter prepoznavanja osnovnih strukturnih in teksturnih značilnosti rude. KOMPETENCE: usposobljenost za oceno mineralne sestave rude in produktov postopkov bogatenja rude usposobljenost za prepoznavanje pogojev nastanka rudnih in jalovinskih mineralov v rudi usposobljenost za oceno kvalitete produktov različnih metod bogatenja rude	OBJECTIVES: To learn fundamentals necessary for microscopic identification of ore minerals and determination of succession of their crystallization and recognition of basic textural and structural ore characteristics. COMPETENCES: Capacity for evaluation of ore mineral composition and products of ore beneficiation Capacity for recognition of ore and gangue minerals crystalisation conditions of ore and gangue minerals within the ore Capacity for evaluation of the quality of products of different ore beneficiations methods

Predvideni študijski rezultati:	**Intended learning outcomes:**
Študent spozna optične značilnosti glavnih rudnih mineralov v odsevni polarizirani svetlobi. Sposoben je prepoznati glavne rudne in jalovinske minerale in določiti zaporedje kristalizacije z mikroskopom. Na podlagi pridobljenega znanja je študent je sposoben oceniti mineralno sestavo in vrsto rude ter kvaliteto mineralizacije oziroma orudenja. Študent je sposoben razumevanja teoretičnih temeljev optične mikroskopije neprozornih mineralov in njihove uporabe pri delu z različnimi mikroskopi tako za presevno kot odsevno svetlobo. Pridobljeno znanje skupaj na osnovi predhodnega temeljnega znanja iz kristalografije, mineralogije in rudne petrografije omogoča reševanje različnih problemov v zvezi genezo in izločanjem rudnih mineralov. Ob uporabi znanstvene literature omogoča pridobljeno znanje tudi pisanje člankov.	Student know optical characteristics of main ore minerals in reflective polarised light. He/she is able to recognise main ore and gangue minerals with the microscope and determine succession of their crystalisation. On the base of aquired knowledge students is able to evaluate mineral composition and type of ore and quality of mineralisation and/or ore deposition. Student is able to understand theoretical foundaments of optical microscopy of opaque minerals and their use at th work with diffrent models of microscopes for translucent and reflective light. Aquired knowledge together with the previous foundamental knowledge of crystallography, mineralogy and ore petrography is going to enable solving of different problems concerning genetesis and precipitation of ore minerals. With the use of scientific literature they are able to start writing of professional papers.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja Laboratorijske vaje PowerPoint predstavitve	Lectures Lab Tutorials PowerPoint Presentations

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Pisni in/ali ustni izpit	55,00 %	Written and/or oral exam
Laboratorijske vaje: prepoznavanje rudnih mineralov pod mikroskopom	30,00 %	Lab Tutorials: Identification of Ore minerals under the microscope
Seminarska naloga	10,00 %	Seminar work
Aktivno sodelovanje pri predmetu	5,00 %	Active participation in Course

Reference nosilca/Lecturer's references:

SERAFIMOVSKI, Todor, ALDERTON, David H. M., DOLENEC, Tadej, TASEV, Goran, DOLENEC, Matej. Heavy metals in sediments and soils around the Bučim copper mine area. Geol. Maced., 2005, vol. 19, str. 69-81.

SERAFIMOVSKI, Todor, DOLENEC, Tadej, TASEV, Goran, ROGAN, Nastja, DOLENEC, Matej. The composition of major minerals from the Buchim porphyry copper deposit, Republic of Macedonia. Geol. Maced., 2008, vol. 22, str. 17-26.

SERAFIMOVSKI, Todor, DOLENEC, Tadej, TASEV, Goran, DOLENEC, Matej, ROGAN ŠMUC, Nastja. Acid mine drainage systems and metal pollution around the active polymetallic mines in the Eastern Macedonia. Geol. Maced., 2007, vol. 21, str. 69-73.

OSNOVE SEIZMOLOGIJE

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Osnove seizmologije
Course title:	Principles of Seismology
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	2. letnik, 3. letnik	2. semester	izbirni

Univerzitetna koda predmeta/University course code:	0089598
Koda učne enote na članici/UL Member course code:	535

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	0	0	0	45	3

Nosilec predmeta/Lecturer:	Andrej Gosar
Vrsta predmeta/Course type:	Izbirni / Elective

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Opravljeni izpiti iz Osnove geologije, Matematike 1, Fizike 1 za pristop k izpitu.	Passed exams: Principles of Geology, Physics 1, Mathematics 1 to take an exam.

Vsebina:	Content (Syllabus outline):
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	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,

nevarnosti, verjetnostno ocenjevanje potresne nevarnosti, vpliv lokalne geološke zgradbe na potresne valove (metoda referenčne točke, metoda spektralnega razmerja, metoda mikrotremorjev, numerično modeliranje), potresna mikrorajonizacija, klasifikacija tal (Eurocode 8), potresno inženirstvo 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	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, soil classification (Eurocode 8), earthquake engineering 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

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.

Cilji in kompetence:	**Objectives and competences:**
CILJI: seznanitev z osnovami 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 KOMPETENCE: razumevanje nastajanja in pojavljanja potresov razumevanje seizmoloških metod opredeljevanja potresnih parametrov obvladovanje geoloških raziskav potresov	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 COMPETENCES: comprehension of earthquake occurence comprehension of methods for earthquake parameters determination sills in geological investigations of earthquakes

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: osnovnih zakonitosti pojavljanja potresov geoloških metod raziskav potresov uporaba metod raziskav v seizmologiji uporaba osnovnih metod raziskav za potresno mikrorajonizacijo razumevanje osnovnih fizikalnih zakonov na primeru potresov sposobnost fizikalnega obravnavanja geoloških problemov sposobnost sinteze seizmoloških podatkov s tektonskimi in inženirskogeološkimi podatki	Knowledge and understanding: basic principles of earthquake occurence geological investigations of earthquakes application of research methods used in seismology application of methods for seismic microzonation understanding basic physical principles related to earthquakes capability of physical approach to geological problems capability of synthesis of seismological data with tectonic and engineering geology data

Metode poučevanja in učenja:	Learning and teaching methods:
predavanja, vaje, računalniške vaje	lectures, tutorials and computer tutorials

Načini ocenjevanja:	Delež/Weight	Assessment:
opravljene naloge iz snovi vaj	10,00 %	done tutorial excercises
pisni ali ustni izpit iz snovi vaj	30,00 %	written or oral examination – tutorials
pisni ali ustni izpit iz snovi predavanj	60,00 %	written or oral examination - lectures

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, iss. 2/4, str. 178-193.
GOSAR, A. 2010: Site effects and soil-structure resonance study in the Kobarid basin (NW Slovenia) using microtremors. Nat. hazards earth syst. sci., 10 vol. 10, no. 4, str. 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., vol. 12, no. 5, str. 1659-1670, doi: 10.5194/nhess-12-1659-2012.
GOSAR, A. 2017: Study on the applicability of the microtremor HVSR method to support seismic microzonation in the town of Idrija (W Slovenia). Nat. hazards earth syst. sci., vol. 17, 925-937.

PALEONTOLOGIJA

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Paleontologija
Course title:	Paleontology
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	1. letnik	2. semester	obvezen

Univerzitetna koda predmeta/University course code:	0067466
Koda učne enote na članici/UL Member course code:	894

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
45	0	45	0	15	105	7

Nosilec predmeta/Lecturer:	Luka Gale
Vrsta predmeta/Course type:	Obvezni / Compulsory

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
OBVEZNOSTI ŠTUDENTA: Aktivno sodelovanje na predavanjih, vajah in terenskih vajah, opravljen kolokvij iz poznavanja fosilov, pisni in/ali ustni izpit iz tematike predavanj.	STUDENT OBLIGATIONS: Active participation in lectures, tutorial and field trips, positive result in practical examination, written and/or oral examination at the lectures.

Vsebina:	**Content (Syllabus outline):**
Proces fosilizacije in kvaliteta fosilnega zapisa Teorija evolucije Nastanek življenja na Zemlji, predkambrijsko življenje in zgodnja diverzifikacija življenja v kambriju in ordoviciju Značilnosti in sistematika mikrofosilov, fosilnih rastlin in živali (nevretenčarji in vretenčarji) Ihnologija: veda o fosilnih sledovih Pravila poimenovanja in opisovanja vrst Vaje iz prepoznavanja mikrofosilov, fosilnih rastlin in nevretenčarjev; prepoznavanje nekaterih rodov in vrst, ki so značilni za slovenski prostor.	Process of fossilization, completeness of the fossil record Theory of evolution Initiation of life on Earth, Pre-Cambrian Life and early diversification of life in Cambrian and Ordovician Features and systematics of microfossils, fossil plant and animal (invertebrate and vertebrate) groups Ichnology: the study of fossil traces Rules of taxonomical nomenclature Tutorial in recognition of fossil plant, invertebrate and microfossil groups, identification of typical fossils encountered in Slovenia.

Temeljna literatura in viri/Readings:

BENTON, M. J. 2005: Vertebrate palaeontology (3rd edition). Blackwell Publishing, 455 pp.
BENTON, M. J. & HARPER, D. A. T. 2009: Introduction to paleobiology and the fossil record. Wiley-Balckwell, 592 pp.
CLARKSON, E. N. K. 1998: Invertebrate palaeontology and evolution. Wiley-Blackwell, 468 pp.
HORVAT, A. in GALE, L. 2009. Paleontologija : študijsko gradivo za vaje (CD-ROM). Naravoslovnotehniška fakulteta, Oddelek za geologijo, Ljubljana.
PAVŠIČ, J. 2003: Paleontologija, I. del, Paleobotanika in paleontologija nevretenčarjev. Naravoslovnotehniška fakulteta, Oddelek za geologijo, Ljubljana, 451 pp.
PROTHERO, D. R. 2004: Bringing fossils to life: An introduction to paleobiology (2nd edition). McGraw-Hill, New York, 503 pp.

Cilji in kompetence:	**Objectives and competences:**
Študent se spozna s paleontologijo kot enega od temeljnih področij geologije in njeno tesno povezanost z drugimi vedami, kot sta sedimentologija in stratigrafija. Praktično prepoznavanje fosilnih skupin mu omogoča sklepanje na starost sedimentnih kamnin in prepoznavanje okolja, v katerem so se odlagale.	The students gains the basic knowledge of Paleontology as one of the fundaments of Geology. He learns about its intertwining with other geological disciplines, such as Sedimentology and Stratigraphy. The practical knowledge gives him the ability to identify fossil groups in the field, to give the first assessment of the age of the lithological unit and to make interpretation of the paleoenvironment.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Študent razume paleontologijo kot osnovno disciplino geologije, pozna osnovno paleontološko sistematiko, razume razvoj življenja od prokariontskih oblik do človeka. Slušatelj je sposoben na osnovi skeletne morfologije prepoznavati glavne rastlinske in nevretenčarske živalske skupine in njihov pomen za biostratigrafijo.	The student recognizes Paleontology as one of the basic geological disciplines. He knows the basic systematics and understand the evolution of life. The student is able to recognize main fossil groups of invertebrates and plants and knows their biostratigraphic values.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja (PowerPoint predstavitve), vaje iz prepoznavanja fosilov in 2 dneva terenskih vaj.	Lectures (PowerPoint presentations), practical work and 2 days of field work.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
pisni in/ali ustni izpit	80,00 %	written and/or oral exam
praktični del - kolokvij	20,00 %	practical exam - colloquium
Ocena: 6-10 (pozitivno) oz. 1-5 negativno; ob upoštevanju Statuta UL in fakultetnih pravil.		Grades: 6-10 (positive), 1-5 (negative); taking into account rules set by the Senate of UL and by the faculty.

Reference nosilca/Lecturer's references:

GALE, Luka, PEYBERNES, Camille, MAVRIČ, Tilen, KOLAR-JURKOVŠEK, Tea, JURKOVŠEK, Bogdan. Facies and fossil associations in Ladinian carbonate olistoliths at Dole pri Litiji, Slovenia. *Facies*, 2020, vol. 66, iss. 3, str. 1-25, doi: 10.1007/s10347-020-00601-0.
GALE, Luka, RIGAUD, Sylvain, GENNARI, Valerio, BLAU, Joachim, RETTORI, Roberto, MARTINI, Rossana, GAETANI, Maurizio. Recognition of upper Triassic temperate foraminiferal assemblages: Insights from the Khodz Group (NW Caucasus, Russia). *Global and planetary change*, 2020, vol. 188, str. 1-13, doi: 10.1016/j.gloplacha.2020.103152.
GALE, Luka, NOVAK, Uroš, KOLAR-JURKOVŠEK, Tea, KRIŽNAR, Matija, STARE, France. Characterization of silicified fossil assemblage from upper Carnian Amphiclina beds at Crngrob (central Slovenia). Geologija, 2017, vol. 60, no. 1, str. 61-75, doi: 10.5474/geologija.2017.005.
GALE, Luka, KELEMEN, Matej. Early Jurassic foraminiferal assemblages in platform carbonates of Mt. Krim, central Slovenia. Geologija, 2017, vol. 60, no. 1, str. 99-115, doi: 10.5474/geologija.2017.008.

PALEONTOLOGIJA VRETENČARJEV

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Paleontologija vretenčarjev
Course title:	Paleontology of Vertebrata
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	2. letnik, 3. letnik	2. semester	izbirni

Univerzitetna koda predmeta/University course code:	0562057
Koda učne enote na članici/UL Member course code:	11408

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
45	0	0	0	0	45	3

Nosilec predmeta/Lecturer:	Luka Gale
Vrsta predmeta/Course type:	Izbirni/Elective

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Osnovno znanje geoloških, paleontoloških in/ali bioloških vsebin.	Basic knowledge in Geology, Palaeontology and/or Biology.

Vsebina:	**Content (Syllabus outline):**
Zgradba kosti, značilnosti in vrste kosti, fosilizacija kosti; tafonomski dejavniki. Značilnosti strunarjev in vretenčarjev ter njihov izvor. Pregled razvoja, diverzitete, paleobiologije in biogeografije glavnih skupin vretenčarjev: ribe, dvoživke, reptili (vključno s ptiči), sesalci. Ključni koraki evolucije, npr.: razvoj čeljusti, prehod na kopno, izvor amniotov, razvoj ptičev iz dinozavrov, radiacija sesalcev v paleogenu, razvoj človeka.	Bone structure, bone types, their properties and function, fossilization of bones, taphonomic processes. Main features of chondrates and vertebrates and their origin. Overview of features, development, diversity, paleobiology and biogeography of main vertebrate groups: fish, amphibians, reptiles (including birds), mammals. Key steps in evolution of vertebrates: origin of jaw, amniotic egg, orign of birds and flight, radiation of mammals, evolution of human.

Temeljna literatura in viri/Readings:

ANDERSON, J. S. & SUESS, H.-D. (eds.), 2007, Major Transitions in Vertebrate Evolution, Indiana University Press, 432 str.

BENTON, J. M., 2004, Vertebrate Palaeontology, Wiley-Blackwell, 3rd ed., 472 str.

CARROLL, R. L., 1988, Vertebrate paleontology and evolution, W. H. Freeman and Company, 698 str.
SCHMID, E., 1972, Atlas of Animal Bones, Elsevier, 159 str.
THOMASON, J. J. (ed.), 2008, Functional Morphology in Vertebrate Paleontology, Cambridge University Press, 296 str.

Cilji in kompetence:	**Objectives and competences:**
CILJI: Pridobivanje temeljnih znanj o evoluciji in lastnostih glavnih skupin vretenčarjev. KOMPETENCE: Študent pozna lastnosti in izvor glavnih izumrlih in obstoječih skupin vretenčarjev.	CILJI: Pridobivanje temeljnih znanj o evoluciji in lastnostih glavnih skupin vretenčarjev. KOMPETENCE: Študent pozna lastnosti in izvor glavnih izumrlih in obstoječih skupin vretenčarjev.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Slušatelji bodo pridobili osnovno znanje o razvoju glavnih skupin vretenčarjev v geološki preteklosti in filogenetskih povezavah današnjih vretenčarjev z izumrlimi. Poznavanje odzivov vretenčarjev na pretekle okoljske spremembe bo pripomoglo k širšemu razumevanju glavnih trendov, vzorcev in dejavnikov evolucije.	Students will obtain basic knowledge about development of major vertebrate groups from the geological past and their phylogenetic relationships with modern groups. Knowing about the response of vertebrates to major environental changes will help them to recognize main trends, samples and factors in evolution.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja z uporabo prezentacij.	Power-point presentation will be given to students.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Ustni in/ali pisni izpit iz teoretičnega dela	100,00 %	Written and/or oral exam from theoretical part
Ocena: 6-10 (pozitivno) oz. 1-5 negativno; ob upoštevanju Statuta UL in fakultetnih pravil.		Grades: 6-10 (positive), 1-5 (negative); taking into account rules set by the Senate of UL and by the faculty.

Reference nosilca/Lecturer's references:

GALE, Luka, NOVAK, Uroš, KOLAR-JURKOVŠEK, Tea, KRIŽNAR, Matija, STARE, France. Characterization of silicified fossil assemblage from upper Carnian Amphiclina beds at Crngrob (central Slovenia). Geologija, 2017, vol. 60, no. 1, str. 61-75, doi: 10.5474/geologija.2017.005.
ROŽIČ, Boštjan, KOLAR-JURKOVŠEK, Tea, ŽVAB ROŽIČ, Petra, GALE, Luka. Sedimentary record of subsidence pulse at the Triassic/Jurassic boundary interval in the Slovenian Basin (eastern Southern Alps). *Geologica Carpathica : international geological journal*. 2017, vol. 68, iss. 6, str. 543-561.
GALE, Luka, PEYBERNES, Camille, CELARC, Bogomir, HOČEVAR, Manca, ŠELIH, Vid Simon, MARTINI, Rossana. Biotic composition and microfacies distribution of Upper Triassic build-ups : new insights from the Lower Carnian limestone of Lesno Brdo, central Slovenia. Facies 2018, vol. 64, no. 3, str. 1-24.
GALE, Luka, KELEMEN, Matej. Early Jurassic foraminiferal assemblages in platform carbonates of Mt. Krim, central Slovenia. Geologija, 2017, vol. 60, no. 1, str. 99-115, doi: 10.5474/geologija.2017.008.

PEDOLOGIJA

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Pedologija
Course title:	Pedology
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	1. letnik	2. semester	obvezen

Univerzitetna koda predmeta/University course code:	0590564
Koda učne enote na članici/UL Member course code:	955

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
25	5	15	0	0	45	3

Nosilec predmeta/Lecturer:	Helena Grčman
Vrsta predmeta/Course type:	Obvezni / Compulsory

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Ni pogojev.	No prerequisites.

Vsebina:	**Content (Syllabus outline):**
Zgradba tal; tla kot trifazni sistem z vertikalno in horizontalno variabilnostjo. Tlotvorni dejavniki ter nastanek in razvoj tal: Matična podlaga: preperevanje kamnin, nastanek mineralnega dela tal. Relief: pobočni procesi, catene. Klima: odvisnost razvoja tal in talnih lastnosti od podnebnih parametrov. Organizmi v tleh: kopičenje in razgradnja organske snovi, sinteza humusa, lastnosti humusa in pomen za tla. Čas: razvoj tal in talne lastnosti v odvisnosti od časa. Morfološke, fizikalne in kemijske lastnosti tal: tekstura, struktura, gostota, poroznost, konsistenca, barva, novotvorbe, vodne lastnosti tal, zrak v tleh, toplotne lastnosti tal, zgradba talnih koloidov in sorpcijske lastnosti, lastnosti talne raztopine. Biogeokemično kroženje elementov (N, P ,K, Ca,	Soil structure; vertical and horizontal variability of soil properties. Soil forming factors and soil development: Parent material: weathering processes and mineral constituents of soil. Topography – soil relations with time, soil catenas Climate: influence of climatic parameters on soil soil development and soil properties. Soil organisms: accumulation and decomposition of organic residues, humus synthesis and its importance for soil properties. Time: weathering and soil development with time. Morphological, physical and chemical properties of soil: soil texture and structure, density, porosity, color; soil water, soil air and temperature, soil colloids, anion and cation sorption capacity, soil solution. Biogeochemical cycles of elements (N, P, K, Ca, Mg).

Mg). Osnovna pedološka analitika. Prepoznavanje in označevanje diagnostičnih horizontov, slovenska klasifikacija tal, tla Slovenije, osnove WRB klasifikacije, talni informacijski sistem. Degradacije tal.	Basic methods of soil analyses. Diagnostic soil horizons, Slovenian soil classification, soils of Slovenia, basis of WRB soil classification, soil information system. Soil degradation processes.

Temeljna literatura in viri/Readings:

Izbrana poglavja/selected chapters: BIRKELAND, P., 1999, Soils and Geomorphology. Oxford Univ. Press, 430 s. Izbrana poglavja/selected chapters: BRADY C. N., WEIL R.R. 2008. The Nature and Propreties of Soils, Prentice Hall , New Jersey, 121-676 str., ISBN: 0-13-016763-0. GRČMAN H., ZUPAN M. Navodila za vaje iz pedologije. [Ljubljana: Biotehniška fakulteta Oddelek za agronomiijo, 2008]. 46 str., ilustr. [COBISS.SI-ID 6221945].

Cilji in kompetence:	**Objectives and competences:**
CILJI: Slušatelj osvoji znanje o nastanku, zgradbi, lastnostih tal in procesih v tleh. V okviru vaj spozna osnovne metode pedološke analitike in klasifikacije tal. KOMPETENCE: Študent je sposoben opisati talni profil, prepoznati vrsto tal in korektno interpertirati rezultate pedoloških analiz.	OBJECTIVES: Student learns about the formation and structure of soil, soil properties and processes in soil. Within the practical work he/she learns the basic soil analyses and principals of soil classification. COMPETENCES: The student is able to describe the soil profile, to identify/classify soils and to correct interpret results of soil analyses.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Slušatelj razume zakonitosti nastajanja tal ter fizikalnih, kemijskih in biotičnih procesov v tleh. Zna prepoznati talne horizonte, poimenovati in razvrščati tla. Pozna metode osnovne pedološke analitike. Slušatelj je sposoben kritično interpretirati rezultate pedoloških analiz in uporabljati pedološke karte različnih meril. Sposoben je preprečevati degradacijske procese na osnovi poznavanja lastnosti tal. Slušatelj je sposoben na osnovi poznanih tlotvornih dejavnikov (matična podlaga, relief, odcednost) razumeti nastanek in lastnosti tal. Na osnovi fizikalnih, kemijskih in biotičnih lastnosti tal razumeti ranljivost tal ter predvideti ustrezne ukrepe. Pri delu je sposoben sodelovati s strokovnjaki iz ostalih področij (gradbeniki, biologi, kemiki, agronomi, gozdarji…), uporabljati domačo in tujo strokovno in znanstveno literaturo.	Knowledge and Understanding: The student understands the principles of soil formation and physical, chemical and biological processes in soil. He/she knows how to recognise soil properties, how to identify soil horizons and how to classify soils; knows the basic methods of soil analyses. The student is able to interpret the results of soil analyses, to use soil maps of different scales and to prevent degradaton processe, on the basis of known soil properties. The student is able to understand the formation and properties of soil on the basis of known soil forming factors (parent material, topography, and water regime).Furthermore, the student understands the vulnerability of soil and use the knowledge of physical, chemical and biological properties of soil in selecting preventive measures. The student is able to work with professionals from other fields (civil engineers, biologists, chemists, agronomists, ...), he is able to use domestic and foreign professional and scientific literature.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, laboratorijske vaje in 1 dan terenskega dela. V okviru seminarja študentje opišejo talni profil in predstavijo tla izbranega kraja v povezavi s tlotvornimi dejavniki in rabo tal.	Lectures, practical work in the laboratory and in the field. As part of the seminar, students describe the soil profile and prepare presentation of selected soils in relation to soil-forming factors and land use.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Pisni in/ali ustni izpit	85,00 %	Written and/or oral exam
Predstavitev seminarske naloge	15,00 %	Presentation of seminar

Reference nosilca/Lecturer's references:

GRČMAN H. , Vodnik D., Velikonja Bolta Š., Leštan D. Ethylenediaminedissuccinate as a new chelate for environmentally safe enhanced lead phytoextraction. J. environ. qual., 2003, vol. 32, str. 500-506.
GRČMAN H., Velikonja Bolta Š., Vodnik D., Kos B., Leštan D. EDTA enhanced heavy metal phytoextraction: metal accumulation, leaching and toxicity. Plant soil. [Print ed.], 2001, 235, str. 105-114.
Ajmone Marsan F., Biasioli M., Kralj T., GRČMAN H., Davidson C., Hursthouse A., Madrid L., Rodrigues Sonia. Metals in particle-size fractions of the soils of five European cities. Environ. pollut. (1987). [Print ed.], 2008, vol. 152, no. 1, str. 73-81.

PETROLOGIJA MAGMATSKIH KAMNIN

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Petrologija magmatskih kamnin
Course title:	Igneous Petrology
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	2. letnik	1. semester	obvezen

Univerzitetna koda predmeta/University course code:	0561904
Koda učne enote na članici/UL Member course code:	956

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
45	10	20	0	15	90	6

Nosilec predmeta/Lecturer:	Matej Dolenec
Vrsta predmeta/Course type:	Obvezni / Compulsory

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Obvezno opravljeni izpiti iz Osnov geologije, Kristalografije in Mineralogije so pogoj za pristop k izpitu.	Passed exams in Introduction to Geology, Crystallography and Mineralogy are mandatory to be able to take an examination.

Vsebina:	Content (Syllabus outline):
Vsebina predmeta je razdeljena na: • Teoretska petrologija (osnove geneze kamnin, splošna problematika njihove mineralne in kemične sestave, kristalizacija osnovnih dvokomponentnih in trokomponentnih sistemov, diferenciacija magme ter zaporedje izločanja mineralov za posamezne važnejše magme) • Sistematska petrologija (različne klasifikacije magmatskih kamnin, nastopanje magmatskih kamnin na območju Slovenije)Makroskopsko in mikroskopsko prepoznavanje mineralne sestave magmatskih kamnin • Teksturne in strukturne značilnosti glavnih tipov magmatskih kamnin • Uporaba različnih diagramov za klasifikacijo magmatskih kamnin	The content of the Syllabus is divided into: • Theoretical petrology (basic genesis of igneous rocks, general problems of their mineral and chemical composition, crystallization of basic binary and ternary systems, magma differentiation and mineral crystallization sequence of different types of magmas; • Systematic petrology (various classifications of igneous rocks, igneous rock occurrence in Slovenia); • Macroscopic and microscopic identification of the mineral composition of igneous rocks • Structural and textural features of the main types of igneous rocks • Use of different diagrams for the classification of igneous rocks

• Prepoznavanje in kartiranje magmatskih kamnin na terenu	• Identification and mapping of igneous rocks in the field

Temeljna literatura in viri/Readings:

DOLENEC, Matej. Študijsko gradivo za predavanja in vaje Petrologija magmatskih kamnin : uradno priznana klasifikacija magmatskih kamnin po IUGS. Ljubljana: NTF, Odd. za geologijo, 2020.
DOLENEC, T., DOLENEC, M. Študijsko gradivo s predmeta Petrologija magmatskih in metamorfnih kamnin : [vprašanja in odgovori]. Prva izd. Ljubljana: UL, NTF, Odd. za geologijo, feb. 2009.
DOLENEC M., DOLENEC, T.: Priročnik za vaje iz petrologije magmatskih in metamorfnih kamnin. Ljubljana: NTF, Oddelek za geologijo, 2001. 244 str., ilustr., graf. prikazi.
DOLENEC, Matej. Petrologija magmatskih in metamorfnih kamnin - strukture in teksture : Geologi 2. letnik. Ljubljana: NTF, Odd. za geologijo, 2016.
DOLENEC, Matej. Dvokomponentni diagrami : študijsko gradivo za predavanja Petrologija magmatskih in metamorfnih kamnin. Ljubljana: Univ. v Ljubljani, NTF, Odd. za geologijo, 2014.
YODER, Hatten Schuyler. Evolution of the Igneous Rocks. Princeton University Press, 2015. Project MUSE.
WINTER, J.D. Principles of Igneous and Metamorphic Petrology, 2014, Pearson Education.
BLATT, H., TRACY, R., OWENS, B. Petrology: igneous, sedimentary, and metamorphic. WH Freeman, 2005.
RAYMOND, L.A. Petrology: The Study of Igneous, Sedimentary and Metamorphic Rocks, Waveland Press. 2007.
RAGLAND, P.C. Basic analytical petrology. New York: Oxford University Press, 1989.
BARD, J.P.: Microtextures of Igneous and Metamorphic Rocks. D.Reidl Publishing Company, Dordrecht, Holland. 264 str., 1986.

Cilji in kompetence:	**Objectives and competences:**
CILJI: Slušatelj pridobi osnovno znanje o značilnostih in pogojih nastanka magmatskih kamnin, njihovi sestavi in okoljih nastopanja. KOMPETENCE: Slušatelj je usposobljen za prepoznavanje kamninotvornih mineralov magmatskih kamnin makroskopsko in mikroskopsko; sposoben je klasificirati in določiti značilnosti pogojev nastanka magmatskih kamnin. Na terenu je sposoben samostojnega dela in kartiranja magmatskih kamnin.	OBJECTIVES: Students learn about the characteristics and conditions of igneous rock formation, its composition and occurrence. COMPETENCES: Students are able to identify and classify, with the naked eye and under the microscope, igneous rock-forming minerals and to define the characteristics and conditions of igneous rock formation. Students are able to carry out individual fieldwork and mapping of igneous rocks.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Študent razume in prepozna značilnosti in pogoje nastanka magmatskih kamnin. Sposoben je klasificirati magmatske kamnine glede na najnovejše veljavne klasifikacije. Nauči se uporabljati tudi računalniške programe za interpretacijo geokemičnih značilnosti magmatskih kamnin. Študent je sposoben razumevanja teoretičnega znanja iz petrogeneze in njegove uporabe pri izvajanju laboratorijskih simulacij z različnimi talinami. Pri delu je sposoben sodelovati s strokovnjaki iz ostalih področij (gradbeniki, arheologi, rudnimi geologi...), uporabljati domačo in tujo strokovno in znanstveno literaturo ter je sposoben pisati znanstvene članke za objavo v domači ali tuji reviji.	The student understands and recognizes the characteristics and conditions of igneous rock formations. He/she is able to classify igneous rocks according to the latest valid classification. He knows and understands the use of computer programs to interpret the geochemical properties of igneous rocks. The student is able to understand the theoretical knowledge of petrogenesis and its application in laboratory simulations with different melts. During the work he/she is able to cooperate with experts from other fields (civil engineers, archeologists, ore geologists, ...), using domestic and foreign experts and scientific literature, and he/she is able to write scientific articles for publication in a journal.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, vaje v mikroskopirnici in predavalnici (mikroskopiranje preparatov najbolj tipičnih magmatskih kamnin in njihovo makroskopsko prepoznavanje), 2 dni terenskega dela. V okviru vaj	Lectures, practical work in the microscope laboratory and in the classroom (microscopy of most typical igneous and volcanic rocks in thin sections), 2 days of fieldwork. During the practical work the students will

študenti izdelajo poročilo o mikroskopskem in makroskopskem opisu izbranih kamnin in terensko poročilo.	prepare a report on the microscopic description of selected rocks and a report on the field work.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Pisni in/ali ustni izpit ali oddane domače naloge	60,00 %	Written and/or oral exam or given homework
Ustno preverjanje mikroskopskega in makroskopskega prepoznavanja kamnin	25,00 %	Oral exam of microscopic and macrocsopic identification of rocks
Poročilo terenskega dela	10,00 %	Fieldwork report
Aktivno sodelovanje pri predavanjih	5,00 %	Active participation in lectures

Reference nosilca/Lecturer's references:

DOLENEC, Matej, SERAFIMOVSKI, Todor, DANEU, Nina, DOLENEC, Tadej, ROGAN Å MUC, Nastja, VRHOVNIK, Petra, LOJEN, Sonja. The case of the carbonatite-like dyke of the Madenska River complex at the Kriva Lakavica section in the Republic of Macedonia : oxygen and carbon isotopic constraints. Turkish journal of earth sciences, ISSN 1300-0985, 2015, vol. 24, no. 6, str. 627-639, doi: 10.3906/yer-1502-28.

MILER, Miloš, AMBROŽIČ, Bojan, MIRTIČ, Breda, GOSAR, Mateja, ŠTURM, Sašo, DOLENEC, Matej, JERŠEK, Miha. Mineral and chemical composition of the Jezersko meteorite - a new chondrite from Slovenia. Meteoritics & planetary science, ISSN 1086-9379, 2014, vol. 49, no. 10, str. 1875-1887.

SERAFIMOVSKI, Todor, DOLENEC, Tadej, TASEV, Goran, ROGAN, Nastja, DOLENEC, Matej. The composition of major minerals from the Buchim porphyry copper deposit, Republic of Macedonia. Geol. Maced., 2008, vol. 22, str. 17-26.

PETROLOGIJA METAMORFNIH KAMNIN

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Petrologija metamorfnih kamnin
Course title:	Metamorphic Petrology
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	2. letnik	1. semester	obvezen

Univerzitetna koda predmeta/University course code:	0562053
Koda učne enote na članici/UL Member course code:	11404

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
35	20	20	0	15	90	6

Nosilec predmeta/Lecturer:	Mirijam Vrabec
Vrsta predmeta/Course type:	Obvezni/Compulsory

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Ni pogojev.	No prerequisites.

Vsebina:	Content (Syllabus outline):
• Uvod v metamorfno petrologijo • Klasifikacija metamorfnih kamnin • Strukture in teksture metamorfnih kamnin • Stabilne mineralne združbe v metamorfnih kamninah • Metamorfni facies in metamorfozirane mafične kamnine • Metamorfne reakcije • Termodinamika metamorfnih reakcij • Metamorfoza pelitskih kamnin • Metamorfoza karbonatnih in ultramafičnih kamnin • Metamorfni fluidi, snovni transport in metasomatizem	• An Introduction to Metamorphism • A Classification of Metamorphic Rocks • Structures and Textures of Metamorphic Rocks • Stable Mineral Assemblages in Metamorphic Rocks • Metamorphic Facies and Metamorphosed Mafic Rocks • Metamorphic Reactions • Thermodynamics of Metamorphic Reactions • Metamorphism of Pelitic Sediments • Metamorphism of Calcareous and Ultramafic Rocks • Metamorphic Fluids, Mass Transport, and Metasomatism

Temeljna literatura in viri/Readings:

BARD, J.P.: Microtextures of Igneous and Metamorphic Rocks. D.Reidl Publishing Company, Dordrecht, Holland, 1986.

BLATT, H., TRACY, R., OWENS, B. Petrology: igneous, sedimentary, and metamorphic. WH Freeman, 2005.
HOLLOCHER, K.: A Pictorial Guide to Metamorphic Rocks in the Field, CRC Press, Taylor & Francis Group, 2014.
RAGLAND, P.C. Basic analytical petrology. Oxford University Press, 1989.
RAYMOND, L.A. Petrology: The Study of Igneous, Sedimentary and Metamorphic Rocks, Waveland Press, 2007.
WINTER, J.D. Principles of Igneous and Metamorphic Petrology, Pearson Education, 2014.
VRABEC, M.: Gradiva za predmet dostopna preko elektronskega sistema VIS. / Materials for the subject are accessible via the VIS electronic system.

Cilji in kompetence:	**Objectives and competences:**
CILJI: Slušatelj pridobi osnovno znanje o značilnostih in pogojih nastanka metamorfnih kamnin, njihovi sestavi, strukturi, klasifikaciji in okoljih nastopanja. KOMPETENCE: Slušatelj je usposobljen za prepoznavanje in klasifikacijo metamorfnih kamnin v makroskopskem in mikroskopskem merilu. Sposoben je identificirati prisotne stabilne mineralne združbe in na njihovi osnovi določiti pogoje nastanka metamorfnih kamnin. Na terenu je sposoben samostojnega dela in kartiranja metamorfnih kamnin.	OBJECTIVES: The student acquires basic knowledge about the characteristics of metamorphic rocks and conditions of their formation, their composition, structure, classification and environments of their occurrences. COMPETENCES : The student is able to identify and classify metamorphic rocks on a macroscopic and microscopic scale. He/She is able to identify the present stable mineral assemblages and to determine the conditions of the formation of metamorphic rocks. In the field, he/she is capable of independent work and mapping of metamorphic rocks.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Študent razume in prepozna značilnosti in pogoje nastanka metamorfnih kamnin. Sposoben je klasificirati metamorfne kamnine glede na njihovo strukturo in sestavo. Nauči se uporabljati osnovne principe faciesov in metamorfnih reakcij v vseh osnovnih skupinah metamorfnih kamnin. Pri delu je sposoben sodelovati s strokovnjaki iz ostalih področij (gradbeniki, arheologi, rudnimi geologi...), uporabljati domačo in tujo znanstveno literaturo.	The student understands and recognizes the characteristics and conditions of metamorphic rocks formation. He/She is able to classify metamorphic rocks according to their structure and composition. He/she learns to apply the basic principles of facies and metamorphic reactions in all basic groups of metamorphic rocks. In his/her work he/she is able to cooperate with experts from other fields (civil engineers, archaeologists, ore geologists ...), to use domestic and foreign scientific literature.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, on-line predavanja, seminar, vodene vaje in seminarske vaje v mikroskopirnici in predavalnici, domače naloge, 2 dni terenskega dela doma ali v tujini.	Lectures, on-line lectures, seminar work, guided tutorials and seminar tutorials in the microscopy room and lecture hall, homework, 2 days of field work in Slovenia or abroad.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
kolokvij	20,00 %	colloquium
pisni in/ali ustni izpit	80,00 %	written and/or oral exam
Ocena je sestavljena iz kolokvija in pisnega izpita. Ocenjevalna lestvica: 51-60% (6); 61-70% (7); 71-80% (8); 81-90% (9); 91-100% (10) ob upoštevanju Statuta UL in fakultetnih pravil.		The rating consists of colloquium and written exam. Grades: 51-60% (6); 61-70% (7); 71-80% (8); 81-90% (9); 91-100% (10), according to University Statute and Faculty Acts.

Reference nosilca/Lecturer's references:

JANÁK, Marian, UHER, Pavel, KROGH RAVNA, Erling J., KULLERUD, Kåre, VRABEC, Mirijam. Chromium-rich kyanite, magnesiostaurolite and corundum in ultrahigh-pressure eclogites (examples from

Pohorje Mountains, Slovenia and Tromsø Nappe, Norway). *European journal of mineralogy*, 2015, vol. 27, no. 3, str. 377-392, doi: 10.1127/ejm/2015/0027-2436.
JANÁK, Marian, FROITZHEIM, Nikolaus, YOSHIDA, Kenta, SASINKOVÁ, V., NOSKO, Martin, KOBAYASHI, Tomoyuki, HIRAJIMA, Takao, VRABEC, Mirijam. Diamond in metasedimentary crustal rocks from Pohorje, Eastern Alps: a window to deep continental subduction. *Journal of metamorphic geology*, ISSN 0263-4929, 2015, vol. 33, str. 495-512, doi: 10.1111/jmg.12130.
VRABEC, Mirijam, JANÁK, Marian, FROITZHEIM, Nikolaus, DE HOOG, J.C.M. Phase relations during peak metamorphism and decompression of the UHP kyanite eclogites, Pohorje Mountains (Eastern Alps, Slovenia). *Lithos*, ISSN 0024-4937, 2012, vol. 144-145, str. 40-55, doi: dx.doi.org/10.1016/j.lithos.2012.04.004.

PRAKSA

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Praksa
Course title:	Practice Work
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	3. letnik		izbirni

Univerzitetna koda predmeta/University course code:	0089614
Koda učne enote na članici/UL Member course code:	934

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
0	0	0	0	90	90	6

Nosilec predmeta/Lecturer:	Luka Gale
Vrsta predmeta/Course type:	Izbirni / Elective

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Razpisane prakse s strani inštitucij.	Tendered practice work by institutions.

Vsebina:	Content (Syllabus outline):
Študent opravi 80 ur prakse v eni od geoloških inštitucij. Delo, ki ga opravlja mora biti strokovno. Prakso izbere iz spiska letno razpisanih praks. O opravljeni praksi izdela poročilo. Prakso lahko opravlja v Sloveniji ali v tujini.	The student completes 80 hours of practice work in one of the geological institutions. The work he does must be professional. He selects an internship from the list of annually announced internships. He prepares a report on the completed practice. He can perform his internship in Slovenia or abroad.

Temeljna literatura in viri/Readings:

Po potrebi glede na delo, ki ga na praksi opravlja. / If necessary, depending on the work he performs in practice.

Cilji in kompetence:	Objectives and competences:
CILJI: Študent spozna delo geologa v praksi. KOMPETENCE: Praktično uporabi med študijem pridobljeno znanje.	OBJECTIVES: The student gets to know the work of geologist in practice. COMPETENCES: A practical application of the knowledge gained during their studies.

Predvideni študijski rezultati:	Intended learning outcomes:
Študent utrdi ali na novo pridobi strokovno geološko znanje. Študent se nauči uporabiti teoretično znanje pri reševanju konkretnih geoloških problemov. Slušatelj je sposoben povezati šolsko znanje s konkretnimi geološkimi problemi. Uporaba literature, laboratorijskih in/ali terenskih tehnik, zajem in obdelava podatkov, pisanje poročil.	Students consolidate or newly obtain professional geological knowledge. The student will learn to apply theoretical knowledge in solving geological problems. The student is able to connect academic knowledge with specific geological problems. Using literature, laboratory and / or field techniques the collection and processing of data, writing reports.

Metode poučevanja in učenja:	Learning and teaching methods:
Praktično delo.	Practical work.

Načini ocenjevanja:	Delež/Weight	Assessment:
Ocena je opisna: opravil/ni opravil. Dokazilo o opravljeni praksi je izdelano in podpisano poročilo.		Descriptive assessment: passed/not passed. Proof of completed practice is signed report.

Reference nosilca/Lecturer's references:

MENCIN GALE, Eva, JAMŠEK RUPNIK, Petra, TRAJANOVA, Mirka, GALE, Luka, BAVEC, Miloš, ANSELMETTI, Flavio S., ŠMUC, Andrej. Provenance and morphostratigraphy of the Pliocene-Quaternary sediments in the Celje and Drava-Ptuj Basins (eastern Slovenia). *Geologija*, 2019, 62, št. 2, str. 189-218, ilustr., doi: 10.5474/geologija.2019.009.

ŠMUC, Andrej, DOLENEC, Matej, KIKELJ, Martina L., LUX, Judita, PFLAUM, Miran, ŠEME, Blaž, ŽUPANEK, Bernarda, GALE, Luka, KRAMAR, Sabina. Variety of black and white limestone tesserae used in ancient mosaics in Slovenia. Archaeometry, 2017, vol. 59, no. 2, str. 205-221, doi: 10.1111/arcm.12250.

GALE, Luka, KELEMEN, Matej. Early Jurassic foraminiferal assemblages in platform carbonates of Mt. Krim, central Slovenia. Geologija, 2017, vol. 60, no. 1, str. 99-115, doi: 10.5474/geologija.2017.008.

GALE, Luka, KOLAR-JURKOVŠEK, Tea, KARNIČNIK, Barbara, CELARC, Bogomir, GORIČAN, Špela, ROŽIČ, Boštjan. Triassic deep-water sedimentation in the Bled Basin, eastern Julian Alps, Slovenia. *Geologija*,2019, 62, št. 2, str. 153-173, doi: 10.5474/geologija.2019.007.

PREISKAVE MINERALNIH MATERIALOV

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Preiskave mineralnih materialov
Course title:	Instrumental Methods of Analysis
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	1. letnik	2. semester	obvezen

Univerzitetna koda predmeta/University course code:	0561898
Koda učne enote na članici/UL Member course code:	895

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
35	10	0	0	0	45	3

Nosilec predmeta/Lecturer:	Matej Dolenec, Mirijam Vrabec
Vrsta predmeta/Course type:	Obvezni / Compulsory

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Opravljen kolokvij je pogoj za pristop h končnemu izpitu.	Passing the colloquium is a prerequisite for admission to the final examination.

Vsebina:	Content (Syllabus outline):
• Vzorčenje • Priprava vzorcev za analizo • Optična mikroskopija: polarizacijski mikroskop, lastnosti svetlobe, refraktometrija, izotropni minerali, anizotropni minerali, morfološke lastnosti mineralov, optične lastnosti mineralov • Elektronska mikroskopija: SEM, TEM • Geokemične analize: mokra kemija, prašna in mokra spektroskopija, in-situ spektroskopija; ICP-MS/ES, LA, XRF, XRD, EDS, WDS, EMPA • Napaka meritve, natančnost in občutljivost	• Sampling • Preparation of samples for analysis • Optical microscopy: polarizing microscope, properties of light, refractometry, isotropic minerals, anisotropic minerals, morphological properties of minerals, optical properties of minerals • Electron microscopy: SEM, TEM • Geochemical analysis: wet chemical analysis, powder or wet spectroscopy, in-situ spectroscopy; ICP-MS/ES, LA, XRF, XRD, EDS, WDS, EMPA • Analytical error, precision and sensitivity

Temeljna literatura in viri/Readings:

CLARKE, EBERHARDT, 2002: Microscopy techniques for materials sciences. Woodhead Publishing Limited, 459 p.

EGERTON, R.F., 2016: Physical Principles of Electron Microscopy: An Introduction to TEM, SEM, and AEM, 2nd ed. Springer, 196 p.
GOLDSTEIN et al., 2003: Scanning Electron Microscopy and X-Ray Microanalysis, 3rd ed. Kluwer Academic/ Plenum Publishers, 689 p.
REED, S.J.B, 2005: Electron Microprobe Analysis and Scanning Electron Microscopy in Geology, 2nd ed. Cambridge, 191p.
SKOOG, D.A. HOLLER, F.J., 2018: Principles of instrumental analysis, 7th ed. Cengage Learning, 959 p.
VRABEC, M.: Gradiva za predmet dostopna preko elektronskega sistema VIS. / Materials for the subject are accessible via the VIS electronic system.

Cilji in kompetence:	**Objectives and competences:**
CILJI: Osnove vzorčevanja mineralnih snovi. Poznavanje osnov kemičnih in mineraloških instrumentalnih analiz. KOMPETENCE: Sposobnost prepoznavanja instrumentalnih metod za določanje mineralne in kemične sestave mineralnih snovi ter pravilna priprava vzorca za ustrezno analizo.	OBJECTIVES: Sampling of mineral materials. Principles of chemical and mineralogical intrumental analyses. COMPETENCES: Selection of instrumental methods for mineral and chemical analyses of mineral materials, sample preparing for selected analysis.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Razumevanje določanja lomnega količnika minerala, poznavanje možnosti kemičnih in mineraloških analiz mineralnega materiala. Prepoznavanje mineralne in kemične sestave mineralnih materialov. Povezava med mineralno in kemično sestavo mineralnega materiala in njegovo uporabno vrednostjo. Sposobnost izbire in uporabe ustrezne domače in tuje literature iz področja analitskih metod.	Determining of refractive index, use and selection of chemical and mineralogical analyses of mineral materials. Characterization of mineral and chemical composition of mineral material. Correlation of mineral and chemical composition of mineral material and its use. Use of different literature data from analytical methods of mineral materials. Ability of analysis and synthesis of particular data.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, on-line predavanja, laboratorijske vaje, vodeno in samostojno reševnje vaj in problemov, seminarske vaje, skupinsko delo, domače naloge.	Lectures, on-line lectures, lab tutorial, assisted and individual solving of exercises and problems, seminar tutorial, group work, homework.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
kolokvij	20,00 %	colloquium
pisni in/ali ustni izpit	80,00 %	written and/or oral exam
Ocena je sestavljena iz kolokvija in pisnega izpita. Ocenjevalna lestvica: 51-60% (6); 61-70% (7); 71-80% (8); 81-90% (9); 91-100% (10) ob upoštevanju Statuta UL in fakultetnih pravil.		The rating consists of colloquium and written exam. Grades: 51-60% (6); 61-70% (7); 71-80% (8); 81-90% (9); 91-100% (10), according to University Statute and Faculty Acts.

Reference nosilca/Lecturer's references:

KANDUČ, Tjaša, ŠLEJKOVEC, Zdenka, MORI, Nataša, VRABEC, Mirijam, VERBOVŠEK, Timotej, JAMNIKAR, Sergej, VRABEC, Marko. Multielemental composition and arsenic speciation in low rank coal from the Velenje Basin, Slovenia. *Journal of geochemical exploration*, 2019, vol. 200, str. 284-300, doi: 10.1016/j.gexplo.2018.08.001.
SKRLJ GOLOB, Barbara, OLIVI, Giovanni, VRABEC, Mirijam, EL FEGHALI, Rita, PARKER, Steven, BENEDICENTI, Stefano. Efficacy of photon-induced photoacoustic streaming in the reduction of Enterococcus faecalis within the root canal : different settings and different sodium hypochlorite concentrations. *Journal of endodontics*, 2017, vol. 43, iss. 10, str. 1730-1735, doi: 10.1016/j.joen.2017.05.019.
UHER, Pavel, JANÁK, Marian, KONEČNÝ, Patrik, VRABEC, Mirijam. Rare-element granitic pegmatite of Miocene age emplaced in UHP rocks from Visole, Pohorje Mountains (Eastern Alps, Slovenia): accessory

minerals, monazite and uraninite chemical dating. Geologica Carpathica, ISSN 1335-0552, 2014, vol. 65, iss. 2, str. 131-146, doi: 10.2478/geoca-2014-0009.;GLAVAŠ, Neli,
MOURELLE, Lourdes Maria, GÓMEZ, Carmen P., LEGIDO, José Luis, ROGAN ŠMUC, Nastja, DOLENEC, Matej, KOVAČ, Nives. The mineralogical, geochemical, and thermophysical characterization of healing saline mud for use in pelotherapy. Applied clay science, 2017, vol. 135, str. 119-128, ilustr., doi: 10.1016/j.clay.2016.09.013.
ŠMUC, Andrej, DOLENEC, Matej, KIKELJ, Martina L., LUX, Judita, PFLAUM, Miran, ŠEME, Blaž, ŽUPANEK, Bernarda, GALE, Luka, KRAMAR, Sabina. Variety of black and white limestone tesserae used in ancient mosaics in Slovenia. Archaeometry, 2017, vol. 59, iss. 2, str. 205-221, doi: 10.1111/arcm.12250.
LESKOVAR, Blaž, VRABEC, Mirijam, DOLENEC, Matej, NAGLIČ, Iztok, DOLENEC, Tadej, DERVARIČ, Evgen, MARKOLI, Boštjan. Temperature-initiated structural changes in FeS[sub]2 pyrite from Pohorje, Eastern Alps, North-Eastern Slovenia = S temperaturo povzročene strukturne spremembe FeS[spodaj]2 pirita iz Pohorja, vzhodne Alpe, severovzhodna Slovenija. Materiali in tehnologije, 2017, letn. 51, št. 2, str. 259-265, ilustr.http://mit.imt.si/Revija/izvodi/mit172/leskovar.pdf, doi: 10.17222/mit.2015.328.

PROJEKTNO DELO

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Projektno delo
Course title:	Project Work
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	3. letnik		izbirni

Univerzitetna koda predmeta/University course code:	0089557
Koda učne enote na članici/UL Member course code:	624

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
15	60	0	0	15	90	6

Nosilec predmeta/Lecturer:	Barbara Čenčur Curk
Vrsta predmeta/Course type:	Izbirni / Elective

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Za razumevanje predmeta je potrebno predhodno znanje iz Osnov geologije, Hidrogeologije, Inženirske geologije in Geofizike. Zaželeno je znanje iz Okoljske geologije.	To understand the course, prior knowledge in the areas of Introduction to geology, Hydrogeology, Engineering geology and Geophysics is required. Desirable knowledge of Environmental geology.

Vsebina:	Content (Syllabus outline):
Skupina študentov dela na konkretnem problemu, ki ga vsako leto določijo nosilci predmeta. Problem obsega aplikativne geološke vidike: inženirsko geologijo, hidrogeologijo, geofiziko in vplive na okolje. Študentje se seznanijo s pristopi k projektiranju in projektnemu delu. Seznanijo se z osnovami načrtovanja terenskega dela in raziskavami za različne faze projektov (študija izvedljivosti, idejni projekti, pridobivanje gradbenega dovoljenja, projekti za izvedbo in presoja vplivov na okolje). Skupina začne delo z zbiranjem in pregledom razpoložljive literature. Sledi terensko delo, laboratorijsko delo in delo na projektu, ki je samostojno. Študentom je delo razdeljeno glede na študijske usmeritve. Delo na projektu usmerjajo	A group of students works on a specific problem, which is determined each year by the lecturer. The problem covers applied geological areas: engineering geology, hydrogeology, geophysics and environmental issues. The students learn approaches of design and project work. Students learn the basics of planning field and research work for the various phases of project design (feasibility study, project for building permit, project for implementation, environmental impact assessment). The group begins its work by collecting and reviewing the available literature, followed by field work, laboratory work and project work, which is self-dependent. The work is distributed among the students according to their study orientation. The work on the project is guided

mentorji na tedenskih sestankih. Na koncu projekta študentje pripravijo skupno poročilo/seminar. Študentje predstavijo izsledke projekta vsem študentom geologije.	by mentors at the weekly meetings. At the end of the project the students prepare a joint report/seminar. The students present the results of the project to all students of geology.

Temeljna literatura in viri/Readings:

STARE, A. 2011: Projektni management – teorija in praksa.- Agencija Poti, Ljubljana, p.340.

Literatura, relevantna za posamezno tematiko projekta. Literatura za predmete hidrogeologija, inženirska geologija, hidrogeologija, geofizika in okolje. / Readings, relevant for particular project topic. References for subjects hydrogeology, engineering geology, hydrogeology, geophysics and environmental geology.

Cilji in kompetence:	**Objectives and competences:**
CILJI: Študent bo osvojil osnovno znanje na področju projektnega dela (timsko delo, koordinacija dela). KOMPETENCE: Študentje bodo sposobni izvajati delo na konkretnem problemu, ki obsega aplikativne geološke vidike: inženirsko geologijo, hidrogeologijo, geofiziko in vplive na okolje. Študent bo sposoben uporabiti integralno znanje osnovnih geoloških predmetov in aplikativnih geoloških predmetov.	OBJECTIVES: Students acquire basic knowledge of project work (teamwork, coordination of work). COMPETENCES: Students arebable to work on a specific problem ivolving applied geological fields: engineering geology, hydrogeology, geophysics and environmental impact. Students are able toapply the integral knowledge of basic geological subjects and applied geological subjects.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje projektnega dela v geološki praksi. Študent pridobi izkušnje za izvajanje projektov, spozna se s timskim delom in koordinacijo dela. Študent se nauči povezovati osnovna geološka znanja pri reševanju konkretnih problemov, ki se pojavljajo v geološki praksi. Študent je sposoben uporabljati domačo in tujo strokovno literaturo ter sodelovati s strokovnjaki ostalih področij (gradbeništvo, kemija, okolje).	Knowledge and understanding of project work in geological practice. The student gain experience in the implementation of projects, become aware of teamwork and the coordination of work. Students learn to combine basic geological knowledge in order to solve concrete problems that arise in geological practice. Students are able to use domectic and foreign literature and is able to cooperate with experts from other fields (civil engineering, chemistry, environment).

Metode poučevanja in učenja:	**Learning and teaching methods:**
Uvodna predavanja, seminarske vaje in terensko delo - reševanje praktičnih problemov, ki se pojavljajo v geološki praksi.	Introductory lessons, tutorials and fieldwork - solving practical problems that arise in geological practice.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
pisni in/ali ustni izpit	20,00 %	written and/or oral exam
delo na projektu	20,00 %	work on the project
seminarska naloga oz. poročilo	40,00 %	seminar work / report
predstavitev rezultatov	20,00 %	oral presentation of results
Pogoji za pristop k izpitu: vsaj 75% prisotnost na predavanjih in 100 % prisotnost na vajah, pozitivno opravljene vaje in seminarji (predstavitev, naloga) in seminarske vaje. Ocenjevalna lestvica: (6-10) pozitivno, ob upoštevanju Statuta UL in fakultetnih pravil. Ocenjevalna lestvica: 51-60% (6); 61-70% (7); 71-80% (8); 81-90% (9); 91-100% (10) ob upoštevanju Statuta UL in fakultetnih pravil.		Conditions for the exam: At least 75% attendance at lectures and 100 % attendance at tutorials, successfully done tutorials and seminars (presentation and paper) and tutorials. Grading scale: 51-60% (6); 61-70% (7); 71-80% (8); 81-90% (9); 91-100% (10) having regard to the Statute of UL and faculty rules.

Reference nosilca/Lecturer's references:

ČENČUR CURK, Barbara, BRAČIČ-ŽELEZNIK, Branka, BOGARDI, Istvan. Adaptation of water supply to changing climate and land-use activities, case of Ljubljana water supply, Slovenia. *Water*, ISSN 2073-4441, 2020, vol. 12, iss. 1, str. 1-15, doi: 10.3390/w12010288.

KANAKOUDIS, Vasilis, PAPADOPOULOU, Anastasia, TSITSIFLI, Stavroula, ČENČUR CURK, Barbara, KARLEUŠA, Barbara, MATIC, Branislava, ALTRAN, Enrico, BANOVEC, Primož. Policy recommendation for drinking water supply cross-border networking in the Adratic region. *Aqua*, ISSN 0003-7214, 1. nov. 2017, letn. 66, št. 7, str. 489-507, ilustr., doi: 10.2166/aqua.2017.079.

ČENČUR CURK, Barbara, BOGARDI, I. CC-WaterS Work Package 7 Water supply management measures. V: KOECK, Roland (ur.). /CC-WaterS Monograph : climate change and impacts on water supply/. Vienna: Vienna Water, 2012, str. 172-210.

MERHAR, Brane, ČADEŽ, Franc, KRIŽNIČ, Albin, PEČNIK, Blaž, FABJAN, Teja, ČENČUR CURK, Barbara, JUVAN, Grega, RATEJ, Jože, PREGL, Melhior, PEČOLAR, Tomaž, IVAČIČ, Boštjan, VESEL, Gregor, GALUF, Saša, VRANČIČ, Marjeta, VAJOVIĆ, Stanojle, ROJŠEK, Maja/. Geološko-geotehnični in hidrogeološki elaborat o sestavi tal in načinu gradnje suhih zadrževalnikov za zagotavljanje poplavne varnosti v Sp. Savinjski dolini : faza IDP/. Ljubljana: IRGO Consulting, 2010. 3 zv.

RABA PROSTORA IN PRESOJA VPLIVOV NA OKOLJE

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Raba prostora in presoja vplivov na okolje
Course title:	Land Use and Environmental Impact Assessment
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	3. letnik		izbirni

Univerzitetna koda predmeta/University course code:	0089558
Koda učne enote na članici/UL Member course code:	625

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
15	30	0	0	0	45	3

Nosilec predmeta/Lecturer:	Barbara Čenčur Curk
Vrsta predmeta/Course type:	Izbirni / Elective

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Za razumevanje predmeta je potrebno predhodno znanje iz Osnov geologije, Hidrogeologije in Okoljske geologije.	To understand the course prior knowledge in the Introduction to Geology, Hydrogeology and Environmental geology is required.

Vsebina:	Content (Syllabus outline):
Uvod (kaj je geookolje, trajnostni razvoj, globalna degradacija okolja, toksičnost) Dinamika geookolja (čas zadrževanja, dinamika procesov, človekov vpliv) Umetni posegi v okolje in čiste tehnologije (posegi v okolje majhne in velike razsežnosti (infrastrukturi objekti)) Vplivi na okolje in ukrepi za zmanjšanje vplivov Matrični diagrami Metode spremljanja stanja geookolja Upravljanje okolja (zakonodaja, lastninske pravice, gospodarjenje z naravnimi viri, družbeni razvojni interesi in raba prostora)	Introduction (what is geo-environment, sustainable development, global environmental degradation, toxicity) Dynamics of the geo-environment (retention time, dynamic processes, human impact) Artificial interventions in the environment and clean technologies (small and large interventions in the environment (infrastructure works)) Environmental impacts and measures to reduce impacts Matrix Diagrams Methods of environmental monitoring Managing the environment (law, property rights, management of natural resources, social development interests and land use)

Temeljna literatura in viri/Readings:

Izročki predavanj / Lecture handouts.
ASWATHANARAYANA, U., 1995: Geoenvironment, An introduction, A.A. Balkema, 270 p.
BOWERS MARRIOT, B., 1997: Environmental Impact Assessment: A Practical Guide, McGraw-Hill, 315 p.
HESS, K., 1997: Environmental Site Assessment, CRC Press LLC, 334 p.
ARTIOLA, J. F., PEPPER, I. L., BRUSSEAU, M. L., 2004: Environmental Monitoring and Characterization, Elsevier, 410 p.

Cilji in kompetence:	**Objectives and competences:**
CILJI: Študent spozna pomembnost spremenljivosti in ranljivosti okolja ter se seznani s pristopom sonaravnega upravljanja z okoljem. KOMPETENCE: Študent bo sposoben: uporabiti različna orodja pri določanju vplivov na geookolje (predvsem na geosfero-tla in hidrosfero-površinske in podzemne vode), določiti ukrepe za zmanjšanje vplivov, določiti spremljanja stanja.	OBJECTIVES: Students learn about the importance of the unsteadiness and vulnerability of the environment and get acquainted with the approach of sustainable environmental management. COMPETENCES: The students will be able to: use different tools to determine the impact on the geo-environment (especially on the geosphere - soil and hydrosphere - surface and groundwater) and determine measures to reduce the impact, define environmental monitoring.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Študentje se usposobijo povezovati različna znanja in metod pri ugotavljanju stanja okolja, določanju vplivov na okolje in ukrepov za zmanjšanje le-teh ter spremljanju stanja okolja. Pridobljeno teoretično znanje bo študentu omogočalo sodelovanje v procesih odločanja pri upravljanju okolja in ocenjevanju različnih človekovih posegov v okolje s strokovnjaki drugih strok.	Students learn to combine different skills and methods for determining the state of the environment, for determining environmental impacts and mitigation measures for their reduction, and for environmental monitoring. The theoretical knowledge enables students to participate in decision-making in environmental management and in the assessment of a wide range of human interventions in the environment together with experts from other disciplines.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, seminarske vaje in terensko delo - reševanje praktičnih problemov s področja ocene vplivov na okolje.	Lections, tutorials and field work - solving practical problems regarding environmental impact assessment.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
pisni in/ali ustni izpit	40,00 %	written and/or oral exam
ocene seminarskih nalog	35,00 %	seminar works
predstavitve seminarskih nalog	20,00 %	oral presentation of seminars
prisotnosti na predavanjih in vajah	5,00 %	the presence at lectures and tutorials
Pogoji za pristop k izpitu: vsaj 75% prisotnost na predavanjih in 100 % prisotnost na vajah, pozitivno opravljene vaje in seminarji (predstavitev, naloga) in seminarske vaje. Ocenjevalna lestvica: 51-60% (6); 61-70% (7); 71-80% (8); 81-90% (9); 91-100% (10) ob upoštevanju Statuta UL in fakultetnih pravil.		Conditions for the exam: at least 75% attendance at lectures and 100 % attendance at tutorials, successfully done tutorials and seminars (presentation and paper) and tutorials. Grading scale: 51-60% (6); 61-70% (7); 71-80% (8); 81-90% (9); 91-100% (10) having regard to the Statute of UL and faculty rules.

Reference nosilca/Lecturer's references:

ČENČUR CURK, Barbara, BRAČIČ-ŽELEZNIK, Branka, BOGARDI, Istvan. Adaptation of water supply to changing climate and land-use activities, case of Ljubljana water supply, Slovenia. *Water*, ISSN 2073-4441, 2020, vol. 12, iss. 1, str. 1-15, doi: 10.3390/w12010288.

KANAKOUDIS, Vasilis, TSITSIFLI, Stavroula, PAPADOPOULOU, Anastasia, ČENČUR CURK, Barbara, KARLEUŠA, Barbara. Water resources vulnerability assessment in the Adriatic Sea region : the case of Corfu Island. *Environmental science and pollution research international*, ISSN 0944-1344. [Print ed.], 2017, vol. 24, iss. 25, str. 20173-20186.

ŠOT PAVLOVIČ, Leonida, ŽERDIN, Martin, VRBAJNŠČAK, Mojca, LIBNIK, Natalija, Turk, Boris, Vrabič, Katja, ČENČUR CURK, Barbara, JERMAN, Barbara, PERŠAK, Boštjan, DREV, Janez, MARHOLD, Rado, PERŠAK, Boštjan, MLAKAR, Aleš, CIGOJ, Nika. Okoljsko poročilo za DPN za državno cesto od razcepa Šentrupert do priključka Velenje jug. Ljubljana: Aquarius, 2016. 259 str.

GOLOBIČ, Mojca, RAKOVEC, Jože, ČENČUR CURK, Barbara, FAZARINC, Rok, LOVKA, Milan, SMOLAR-ŽVANUT, Nataša, BERTOK, Marko, MARUŠIČ, Janez, COF, Alenka, BONČINA, Andrej, UDOVČ, Andrej, MARUŠIČ, Jakob, POLIČ, Marko, DOLŠEK, Matjaž, FAJFAR, Peter, ČETINA, Matjaž, ZAKRAJŠEK, Majda, KRZYK, Mario, RAJAR, Rudolf. Strateška presoja vplivov na okolje za HE Učja. Ljubljana: Biotehniška fakulteta, Oddelek za krajinsko arhitekturo, 2010. 178 str.

ČENČUR CURK, Barbara, RODELA, Romina, FRANKO, Mladen, KORTE KOBYLINSKA, Dorota, PETRIČ, Marta, MULEJ, Lucija. An assessment of environmental, economic and social impacts of a biofuel polygeneration system integrating MSW landfill gas and solar energy : case study Brstje. V Novi Gorici: Univerza, 2009. 34 str.

RAZISKOVALNA NALOGA

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Raziskovalna naloga
Course title:	Research Paper
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	3. letnik	2. semester	izbirni

Univerzitetna koda predmeta/University course code:	0089559
Koda učne enote na članici/UL Member course code:	11260

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
0	0	0	0	90	90	6

Nosilec predmeta/Lecturer:	
Vrsta predmeta/Course type:	Izbirni / Elective

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Vpisan izbirni predmet v 3. letniku študija. Razpisana raziskovalna naloga. Odobrena tema raziskovalne naloge.	Enrolled elective subject in the 3rd year of the study. Tendered research work. Confirmation of the research work theme.

Vsebina:	**Content (Syllabus outline):**
Raziskovalna naloga je lahko del raziskovalnega programa mentorja ali posebej razpisana glede na aktualne razmere. Pokriva ožje ali širše področje geologije, lahko pa je tudi interdisciplinarna. Delo se lahko izvaja na fakulteti ali na ustrezni drugi inštituciji. Raziskovalna naloga vsebuje: - povzetek - uvod s predstavitvijo problema in cilji naloge - predstavitev uporabljenih materialov in metod - predstavitev in interpretacijo rezultatov - sklepe Raziskovalno nalogo študent izdela pod mentorstvom izbranega učitelja. Z javno predstavijo in zagovarom pred komisijo, se raziskovalna naloga izenači z diplomskim delom.	The research project may be part of the mentor's research program or separately tendered according to the current situation. It covers a narrower or a wider field of geology, but can also be interdisciplinary. Work can be carried out at the faculty or at another appropriate institution. The research project includes: - Summary - An introduction with the presentation of the problem and the aims of the project - Presentation of the materials and methods - Presentation of results with interpretation - Conclusions Student completes the research work under the supervision of a teacher. The publicly presented and in front of a commission

	defended research work is equal to the diploma thesis.

Temeljna literatura in viri/Readings:

Izbrana literatura glede na nalogo, ki jo opravlja. / Selected readings, depending on the thesis he/she is working on.

Cilji in kompetence:	**Objectives and competences:**
CILJI: Študent osvoji delo geologa v praksi. Izdelava raziskovalne naloge študenta usposobi za reševanje znanstveno-raziskovalnih problemov na področjih, ki jih pokriva prvostopenjski študijski program Geologija. KOMPETENCE: Praktično uporabi med študijem pridobljeno znanje.	OBJECTIVES: The student acquires geologists work in practice. Working on a research project qualifies him/her to deal with scientific research problems in the areas covered by the first level study program in geology. COMPETENCES: Practical application of the knowledge gained during their studies.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Študent razume geološko stroko v širšem kontekstu kot interdisciplinarno panogo, dokaže samostojno reševanje konkretnih problemov s povezovanjem temeljnih znanj, ki jih uporabi pri izdelavi raziskovalne naloge. Sintetizira nove informacije, jih kritično analizira in uporabi pri določitvi problemov in njihovem reševanju.	The student will understand the geological profession in a broader context as an interdisciplinary branch. The student demonstrates his/her ability to solve concrete problems by integrating basic skills and uses them to prepare consistent diploma thesis. The student will synthesize and analyze new information and use it to identify and solve problems.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Praktično delo, branje literature, konzultacije z mentorjem, pisanje naloge.	Practical work, literature reading, consultations with advisor, diploma thesis writing.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Ocena pisne raziskovalne naloge	100,00 %	Assessment of the written research paper

Reference nosilca/Lecturer's references:

Reference nosilcev razvidne iz učnih načrtov pri posameznih predmetih v okviru prvostopenjskega študija Geologija. / References of lecturers listed in the curricula of individual courses in the undergraduate program of Geology.

REGIONALNA GEOLOGIJA

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Regionalna geologija
Course title:	Regional Geology
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	3. letnik	1. semester	obvezen

Univerzitetna koda predmeta/University course code:	0067486
Koda učne enote na članici/UL Member course code:	11246

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
45	0	0	0	0	45	3

Nosilec predmeta/Lecturer:	Boštjan Rožič
Vrsta predmeta/Course type:	Obvezni / Compulsory

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Priporočljivo - opravljene obveznosti pri predmetih Paleontologija, Petrologija magmatskih in metamorfnih kamnin, Sedimentna petrologija, Stratigrafija, Strukturna geologija.	Recommended - passed exams: Paleontology, Igneous and metamorphic petrology, Sedimentary petrology, Stratigraphy, Structural geology.

Vsebina:	Content (Syllabus outline):
Nastanek in diferenciacija Zemlje Ščiti in kratoni: predkambrijske province, najstarejše kamnine, evolucija oceanske in kontinentalne skorje ter nastanek orogenih procesov Pregled recentnih primerov Wilsonovega cikla: Rifting in nastanek pasivnih robov: geodinamika in sedimentarna geologija Oceani: značilnosti in nastanek ofiolitnih sekvenc Orogeni kontinentalnih robov: cone subdukcije, akrecijska tektonika in eksotični tereni Orogeni kontinentalne kolizije: Himalaja, Alpe, Alpsko-Karpatsko-Dinarski orogen, Pontinidi in Tauridi, tektonska inverzija v Pirenejih, Betiku in Atlasu, kenozojska deformacija zahodnega Mediterana.	Origin and differentiation of the Earth Shields and Cratons: Precambrian provinces, oldest rocks, evolution of oceanic and continental crust, initiation of orogenic processes Overview of recent examples of Wilson Cycle: Rifting in and origin of passive continental margins: geodynamics and sedimentary geology Oceans: characteristics and origin of ophiolitic sequences Orogens of continental margins: subduction zones, accretionary tectonics, exotic terrains Orogens of continental collision: Himalayas, Alps, Alpine-Carphatian-Dinaric Mountain Chain, Pontides and Taurides, tectonic inversion in Pyrenees, Bethics and Atlas Mountains, Cenozoic deformation of the

Pangea: geodinamska evolucija paleozoika in nastanek Kaledonidov in Variskidov ter Uralidov Proterozojski orogeni: Nastanek in razpad proterozojskih Superkontinetov; Panotija z Pan-afriško orogenezo, Rodinija z Grenvillsko orogenezo, Kolumbija s paleoproterozojskimi orogenezami.	Mediterranean. Pangaea: geodynamic evolution of Paleozoic era and origin of Caledonides, Variscides and Uralides. Proterozoic orogens: constitution and disintegration of Proterozoic supercontinents; Pannotia and Pan-African orogenesis, Rodinia and Grenvillian orogenesis, Columbia and paleoproterozoic orogenesis.

Temeljna literatura in viri/Readings:

ROŽIČ, Boštjan. Regionalna geologija: za študente geologije: Študijsko gradivo: prosojnice iz predavanj. Univ. v Ljubljani, NTF, Odd. za geologijo, 2011.

Poglavja v učbenikih in knjigah / Selected chapters in books:
PFIFFNER O.A: Geology of the Alps. Wiley-Blackwell, London, 2014, 375 str. ISBN 978-1-118-70813-2.
BUSBY & INGERSOLL: Tectonics of sedimentary basins. - Blackwell Sc. Publ., 1995, 579 pp., ISBN: 0-86542-245-1.
DERCOURT, J., GAETANI, M., VRIELYNCK, B., BARRIER, E., BIJU-DUVAL, B., BRUNET, M. F., CADET, J. P., CRASQUIN, S., & SANDULESCU, M.: Peri-Tethys Palaeogeographical Atlas. - CCGM-CGMW, 2000, 300 pp.
KEAREY, P., KLEIPEIS, K.A. & VINE, F.J.: Global Tectonics. Wiley-Blackwell, 2009, 482pp., ISBN: 978-1-4051-0777-8.
ROGERS, J.W: A history of the Earth. - Cambridge Uni. Press, 312 pp., 1993, ISBN: 0-521-39782-0.
ROGERS, N: Our Dynamic Planet. Cambridge Univ. Pr., 2008, 390pp., ISBN: 978-0-521-729543
WINDLEY, B.F.: The evolving continents. - J. Willey & Sons, 1995, 412 pp., ISBN: 0-471-91739-7.

Cilji in kompetence:	**Objectives and competences:**
CILJI: Poglabljanje ter razširjanje teoretičnih in praktičnih principov dosedaj pridobljenega geološkega znanja na regionalne – svetovne dimenzije planeta Zemlje. Temeljni cilj predmeta Regionalna geologija je razvijanje geološkega mišljenja študenta o planetu Zemlja. KOMPETENCE: Slušatelj bo sposoben spoznavanja, primerjanja in logičnega sklepanja v povezovanju navidezno različnih geotektonskih in evolucijskih procesov ter s tem pridobivanje regionalne oz. svetovne geološke predstave o Zemlji kot dinamičnem planetu.	OBJECTIVES: Enrichment and widening of the theoretical and practical principles of already attributed knowledge on regional – planetary dimensions of the Earth. Basic objective of the subject Regional Geology is the development of student's geological thinking about the planet Earth. COMPETENCES: Student will be capable of recognition, correlation and logical deduction in connecting virtually diverse geotectonic and evolutionary processes and thus the capable of attribution of regional as well as global geological understanding of the dynamic planet Earth.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Slušatelj pozna in razume bistvene geotektonske in evolucijske procese, ki so oblikovali planet Zemljo v različnih geoloških obdobjih. Slušatelj je na podlagi pridobljenega znanja sposoben razumeti nastanek in razvoj različnih geotektonskih provinc. Slušatelj je sposoben abstraktnega razumevanja geološkega prostora v geološkem času. Ker geotektonski razvoj pogojuje današnje oblike Zemljinega površja in razporeditev ter dostopnost naravnih virov, poznavanje geotektonskih modelov slušatelju omogoči praktične aplikacije na druga geološka področja. Predmet slušatelju/ici poda tudi pregled geologije sveta in s tem poveča njegovo/njeno znanstveno širino ter posledično tudi zaposljivost izven dražavnih meja.	Student knows and understands crucial geotectonic and evolutionary processes that shaped the planet Earth in past geological eras. On the basis of attributed knowledge, the student is capable to understand the origin and evolution of different geotectonic provinces. Student is capable of abstract understanding of geological space into the light of geological time. Because geotectonic development directs present-day of landforms and distribution of natural resources, the understanding of geotectonic models enables student's practical applications on other geological fields. Subject gives to the student the overview of the geology of the Earth and thou enriches his/her scientific view and consequently

	enlarges the employment-capability outside state boundaries.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, možnost seminarjev.	Lectures, optional seminars.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Pisni ali ustni izpit	100,00 %	Written or oral exam
Opcijsko seminarska naloga (do 20% izpitne ocene)	0,00 %	Optional seminar (up to 20% of exam grade)

Reference nosilca/Lecturer's references:

ROŽIČ, Boštjan, GERČAR, David, OPRČKAL, Primož, ŠVARA, Astrid, TURNŠEK, Dragica, KOLAR-JURKOVŠEK, Tea, UDOVČ, Jan, KUNST, Lara, FABJAN, Teja, POPIT, Tomislav, GALE, Luka. Middle Jurassic limestone megabreccia from the southern margin of the Slovenian Basin. *Swiss journal of geosciences*. 2019, 112, 63-180. DOI: 10.1007/s00015-018-0320-9.

ROŽIČ, Boštjan, POPIT, Tomislav, GALE, Luka, VERBOVŠEK, Timotej, VIDMAR, Ines, DOLENEC, Matej, ŽVAB ROŽIČ, Petra. Origin of the Jezero v Ledvicah lake : a depression in a gutter-shaped karstic aquifer (Julian Alps, NW Slovenia) 2019, 48, 265-282, DOI: 10.3986/ac.v48i3.7446.

ROŽIČ, Boštjan, ŠMUC, Andrej. Gravity-flow deposits in the Toarcian Perbla formation (Slovenian basin, NW Slovenia). Riv. ital. paleontol. stratigr., 2011, vol. 117, no. 2, str. 283-294.

ROŽIČ, Boštjan, KOLAR-JURKOVŠEK, Tea, ŠMUC, Andrej. Late Triassic sedimentary evolution of Slovenian Basin (eastern Southern Alps): description and correlation of the Slatnik Formation. Facies, 2009, vol. 55, no. 1, str. 137-155.

GORIČAN, Špela, KOŠIR, Adrijan, ROŽIČ, Boštjan, ŠMUC, Andrej, GALE, Luka, KUKOČ, Duje, CELARC, Bogomir, ČRNE, Alenka Eva, KOLAR-JURKOVŠEK, Tea, PLACER, Ladislav, SKABERNE, Dragomir. Mesozoic deep-water basins of the eastern Southern Alps (NW Slovenia). V: 29th IAS Meeting of Sedimentology [10-13 September 2012, Schladming] : field trip guides, (Journal of Alpine geology, Vol. 54). Wien: GEOAUSTRIA, 2012, 2012, vol. 54, str. 101-143.

SEDIMENTNA PETROLOGIJA

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Sedimentna petrologija
Course title:	Sedimentary Petrology
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	2. letnik	1. semester	obvezen

Univerzitetna koda predmeta/University course code:	0067476
Koda učne enote na članici/UL Member course code:	957

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
45	6	24	0	30	105	7

Nosilec predmeta/Lecturer:	Andrej Šmuc, Mirijam Vrabec
Vrsta predmeta/Course type:	Obvezni / Compulsory

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Obvezno opravljeni izpiti iz Osnov geologije, Paleontologije, Kristalografije in Mineralogije so pogoj za pristop k izpitu.	Passed exams in Introduction to Geology, Paleontology, Crystallography and Mineralogy are mandatory to take an exam.

Vsebina:	Content (Syllabus outline):
Uvod v sedimentno petrologijo Izvor, klasifikacija in nastopanje sedimentnih kamnin Preperevanje,transport in odlaganje sedimentov Struktura in tekstura sedimentnih kamnin Siliciklastične, vulkanoklastične in karbonatne sedimentne kamnine, evaporiti, roženci železove sedimentne kamnine, fosforiti, organske sedimentne kamnine	Introduction to sedimentary petrology Origin, classification, and occurrence of sedimentary rocks Weathering, transport and deposition of sediment materials Sedimentary texture and structure Siliciclastic, vulcanoclastic and carbonate sedimentary rocks, evaporites, cherts, iron-rich sedimentary rocks, phosporites and carbonaceous sedimentary rocks

Temeljna literatura in viri/Readings:

Učbeniki / Textbooks:

BOGGS, S. Jr., 2009: Petrology of Sedimentary Rocks. Cambridge Univ. Press, Cambridge, 600 p.
LEYRIT, H. & MONTENAT, C. (Eds.), 2000: Volcaniclastic Rocks, from Magmas to Sediments. Gordon and Breach Science Publishers, Amsterdam, 299 p.
NICHOLS, G., 1999: Sedimentology and Stratigraphy. Blackwell Science, Oxford, 355 p.

TIŠLJAR, J., 2001: Sedimentologija karbonata i evaporita, Institut za geološka istraživanja, Zagreb, 375 p.
TUCKER, M., 2011: Sedimentary Rocks in the Field, 4th ed., Wiley-Blackwell, UK, 275 p.
TUCKER, M., 2001: Sedimentary Petrology. 3rd ed., Blackwell Science, Oxford, 262 p.
TUCKER, M. (Ed.), 1988: Techniques in sedimentology. Blackwell Scientific Publications, Oxford, 394 p.

Atlasi za mikroskopijo / Atlas for microscopy:
ADAMS, A.E., MACKENZIE, W.S. & GUILFORD, C., 1994: Atlas of sedimentary rocks under the microscope. John Wiley & Sons, New York, 104 p.
ADAMS, A.E. & MACKENZIE, W.S., 2001: A Colour Atlas of Carbonate Sediments and Rocks Under the Microscope. Manson Publishing, London, 180 p.
SCHOLLE, P.A., 1978: A Color Illustrated Guide To Carbonate Rock Constituents, Textures, Cements, and Porosities. The American Association of Petroleum Geologists, Memoir 27, U.S.A., 241 p.
SCHOLLE, P.A., 1979: A Color Illustrated Guide To Constituents, Textures, Cements, and Porosities of sandstones and Associated Rocks. The American Association of Petroleum Geologists, Memoir 28, U.S.A., 201 p.

Cilji in kompetence:	**Objectives and competences:**
CILJI: Spoznavanje procesov nastanka, sestave ter strukturnih in teksturnih značilnostih vseh sedimentnih kamnin. KOMPETENCE: Študent zna prepoznati vse vrste sedimentnih kamnin. Usposobljen je za samostojno terensko delo, zna na izdanku in vrtini popisati vse lastnosti sedimentnih kamnin. Na podlagi terenskih in laboratorijskih raziskav je sposoben identificirati in interpretirati sedimetacijske in diagenetske procese nastanka sedimentnih kamnin.	OBJECTIVES: Students get familiar with the processes of origin, occurrence, composition, and structural and textural characteristics of sedimentary rocks. COMPETENCES: Students can recognize all kinds of sedimentary rock. Students are qualified for independent fieldwork, and knows how to profile and list all necessary properties of sedimentary rocks on an outcrop or borehole. On the basis of field and laboratory research students are able to identify and interpret sedimentary and diagenetic processes of sedimentary rocks.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Študent spozna, osvoji in razume osnovno sedimentološko terminologijo in metode proučevanja sedimentov in sedimentnih kamnin, prepozna vse vrste sedimentnih kamnin ter pridobi osnove makroskopske in mikroskopske analize sedimentnih kamnin za interpretacijo sedimentacijskih in postsedimentacijskih procesov.	Students learn, understand and conquer basic sedimentological terminology and methods for studying sediments and sedimentary rocks. Students are able to identify all types of sedimentary rocks, and learn the basics of macroscopic and microscopic analysis of sedimentary rocks necessary for the interpretation of sedimentary and postsedimentary processes.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, vaje v mikroskopirnici in predavalnici (mikroskopiranje preparatov najbolj tipičnih sedimentnih kamnin in njihovo makroskopsko prepoznavanje), 4 dni terenskega dela. V okviru terenskih vaj študenti izdajo terensko poročilo.	Lectures, practical work in the microscope laboratory and classroom (microscopy of most typical sedimentary rocks in thinsections), 4 days of fieldwork. Within the fieldwork students will prepare fieldwork report.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Pisni in/ali ustni izpit	60,00 %	Written and/or oral exam
Ustno preverjanje mikroskopskega in makroskopskega prepoznavanja kamnin	30,00 %	Oral exam of microscopic and macrocsopic identification of rocks
Poročilo in/ali kratek test iz terenskega dela	10,00 %	Fieldwork report and/or a short written exam about the field stops

Reference nosilca/Lecturer's references:

NOVAK, Andrej, POPIT, Tomislav, LEVANIČ, Tom, ŠMUC, Andrej, KACZKA, Ryszard J. Debris flooding magnitude estimation based on relation between dendrogeomorphological and meteorological records. *Geomorphology : an international journal of pure and applied geomorphology*, ISSN 0169-555X. [Print ed.], 2020, str. 1-52,
NOVAK, Ana, ŠMUC, Andrej, POGLAJEN, Sašo, VRABEC, Marko. Linking the high-resolution acoustic and sedimentary facies of a transgressed Late Quaternary alluvial plain (Gulf of Trieste, northern Adriatic). *Marine geology*, ISSN 0025-3227. [Print ed.], 2020, vol. 419, str. 1-20,
ANDRIČ, Maja, SABATIER, Pierre, RAPUC, William, OGRINC, Nives, DOLENEC, Matej, ARNAUD, Fabien, GRAFENSTEIN, Ulrich von, ŠMUC, Andrej. 6600 years of human and climate impacts on lake-catchment and vegetation in the Julian Alps (Lake Bohinj, Slovenia). *Quaternary science reviews*, ISSN 0277-3791, 2020, vol. 227, str. 1-18.
NOVAK, Andrej, POPIT, Tomislav, ŠMUC, Andrej. Sedimentological and geomorphological characteristics of Quaternary deposits in the Planica-Tamar Valley in the Julian Alps (NW Slovenia). *Journal of maps*, ISSN 1744-5647. [Spletna izd.], 2018, vol. 14, no. 2, str. 382-391,
RAPUC, William, SABATIER, Pierre, ANDRIČ, Maja, CROUZET, Christian, ARNAUD, Fabien, CHAPRON, Emmanuel, ŠMUC, Andrej, DEVELLE, Anne-Lise, WILHELM, Bruno, DEMORY, François, REYSS, Jean-Louis, RÉGNIER, Edouard, DAUT, Gerhard, GRAFENSTEIN, Ulrich von. 6600 years of earthquake record in the Julian Alps (Lake Bohinj, Slovenia). *Sedimentology : the journal of the International Association of Sedimentologists*, ISSN 0037-0746, 2018, 65, str. 1777-1799.
LIU, Bangjun, VRABEC, Mirijam, MARKIČ, Miloš, PÜTTMANN, W. Reconstruction of paleobotanical and paleoenvironmental changes in the Pliocene Velenje Basin, Slovenia, by molecular and stable isotope analysis of lignites. *International journal of coal geology*, ISSN 0166-5162. [Print ed.], 2019, vol. 206, str. 31-45, doi: 10.1016/j.coal.2019.03.006.
KANDUČ, Tjaša, VREČA, Polona, GREGORIN, Špela, VRABEC, Mirijam, VRABEC, Marko, GRASSA, Fausto. Authigenic mineralization in low-rank coals from the Velenje Basin, Slovenia. *Journal of sedimentary research : an international journal of SEPM*, ISSN 1527-1404, 2018, vol. 88, iss. 2, str. 201-213, doi: 10.2110/jsr.2018.7.
ROGAN ŠMUC, Nastja, SERAFIMOVSKI, Todor, DOLENEC, Tadej, DOLENEC, Matej, VRHOVNIK, Petra, VRABEC, Mirijam, JAĆIMOVIĆ, Radojko, LOGAR ZORN, Vesna, KOMAR, Darja. Mineralogical and geochemical study of Lake Dojran sediments (Republic of Macedonia). Journal of geochemical exploration, ISSN 0375-6742. [Print ed.], 2015, vol. 150, str. 73-83, doi: 10.1016/j.gexplo.2014.12.019.

STATISTIKA V GEOLOGIJI

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Statistika v geologiji
Course title:	Statistics in Geology
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	1. letnik	2. semester	obvezen

Univerzitetna koda predmeta/University course code:	0067468
Koda učne enote na članici/UL Member course code:	896

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
30	0	45	0	0	75	5

Nosilec predmeta/Lecturer:	Nina Zupančič
Vrsta predmeta/Course type:	Obvezni / Compulsory

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Ni pogojev.	No prerequisites.

Vsebina:	Content (Syllabus outline):
Zajem in priprava podatkov, kontrola kvalitete analitike Verjetnost in porazdelitve Statistike z eno spremenljivko Opisne statistike Testiranje hipotez Analiza variance Statistike z dvema spremenljivkama Neparametrične statistke Usmerjeni podatki in krožne statistike Podatki v času - osnove Uvod v multivariatne metode	Sampling and preparation of data, analytics quality control Probability and distributions Univariate statistics Descriptive statistics Statistical inference Analysis of variance Bivariate statistics Non-parametric statistics Oriented data and circular statistics Time series analysis – basics Introduction to multivariate methods

Temeljna literatura in viri/Readings:

SWAN, A.R.H. & SANDILANDS, M. 1995: Introduction to Geological Data analysis, Blackwell Science, 446 pp., Oxford. DAVIES, J., 1986: Statistics and data analysis in geology, 2nd Ed. Wiley, 645 pp., New York. ZUPANČIČ, N., 2013: Statistika v geologiji 1. Univerzitetni učbenik./ University textbook. Naravoslovnotehniška fakulteta, Oddelek za geologijo, 2013. 172 str., ISBN 978-961-6047-80-7.

Cilji in kompetence:	Objectives and competences:
CILJI: Slušatelj razume in zna uporabiti različne statistične postopke ter se nauči uporabljati ustrezne	OBJECTIVES: The student understands and can use a variety of statistical techniques, and learns to use

računalniške programe. KOMPETENCE: Pridobi sposobnost načrtovanja vzorčenja, usposobljenost za izbor in uporabo metod za analizo značilnosti geoloških podatkov in procesov, določitve velikosti vzorca in statističnih parametrov ter osnovno usposobljenost za delo s statističnimi funkcijami v Excelu in s statističnim programom Statistica.	appropriate computer software. COMPETENCES: Acquire the ability to plan sampling, ability for the selection and application of methods for the analysis of the characteristics of geological data and processes, determination of the sample size and statistical parameters, and basic skills to work with statistical functions in Excel and the statistical program Statistica.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Študent razume pomembnost statistične analize podatkov. Sposoben je pravilno načrtovati vzorčenje ter uporabiti ustrezne statistične metode za obdelavo podatkov. Pozna zahtevane predpogoje za uporabo določenih metod. Z računalniškimi programi Excel in Statistica zna obdelati podatke ter interpretirati dobljene rezultate. Sposoben je izbrati in uporabiti ustrezne statistične metode ter interpretirati dobljene rezultate. Na vseh področjih geologije je sposoben matematizacije podatkov. Zna uporabljati računalniške programe ter tujo in domačo strokovno literaturo.	The student understands the importance of data analysis. He is able to properly plan the sampling and apply appropriate statistical methods for data processing. He knows the required prerequisites for the use of certain methods. With the computer programs Excel and Statistica knows how process the data and interpret the results. He is able to select and use appropriate statistical methods and to interpret the results. In all areas of geology student is capable to recognize mathematics in the data. Knows how to use computer programs as well as foreign and domestic scientific literature.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja in vaje v računalniški učilnici.	Lectures and exercises in the computer lab.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
praktični del	70,00 %	practical work
pisni del	30,00 %	written examination
Izpit je sestavljen iz praktičnega dela, ki ga študent rešuje s pomočjo računalniških programov in ga ustno zagovarja ter pisnega preverjanja znanja teoretičnih osnov statistike.		The examination consists of practical work performed with computer programs and with oral examination, and of written examination of the theoretical basics of statistics.

Reference nosilca/Lecturer's references:

ZUPANČIČ, Nina, ŠEBELA, Stanka, MILER, Miloš. Mineralogical and chemical characteristics of black coatings in Postojna cave system = Mineraloške in kemijske značilnosti črnih prevlek v Postojnskem jamskem sistemu. Acta carsol., 2011, letn. 40, št. 2, str. 307-317.
SKOBE, Simona, MANIATIS, Yannis, DOTSIKA, E., TAMBAKOPOULOS, D., ZUPANČIČ, Nina. Scientific charaterization of the Pohorje marbles, Slovenia. Archaeometry, 2010, vol. 52, issue 2, str. 177-190.
ZUPANČIČ, Nina. Uporaba statističnih metod pri interpretaciji podatkov o geokemični sestavi pohorskih magmatskih kamnin. Rud.-metal. zb., 1996, let 43, št. 3/4, str. 171-177.

STRATIGRAFIJA

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Stratigrafija
Course title:	Stratigraphy
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	2. letnik	2. semester	obvezen

Univerzitetna koda predmeta/University course code:	0067477
Koda učne enote na članici/UL Member course code:	960

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
50	15	20	0	35	120	8

Nosilec predmeta/Lecturer:	Boštjan Rožič
Vrsta predmeta/Course type:	Obvezni / Compulsory

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Priporočljivo - opravljeni izpiti iz Osnov geologije, Paleontologije, Sedimentne petrologije, Stratigrafskih orodij.	Recommended - passed exams: Introduction to Geology, Paleontology, Sedimentary petrology, Stratigraphic tools.

Vsebina:	Content (Syllabus outline):
Sedimentarna evolucija območja današnje Slovenije v luči Variskičnega orogenega cikla: • splošen pregled regionalne sedimentarne evolucije v devonu, karbonu in spodnjem ter srednjem permu, • devonski pasivni robovi, • spodnjekarbonska flišna zaporedja • zgornjekarbonska do srednjepermska molasna sedimentacija Sedimentarna evolucija Slovenskega ozemlja v luči Alpidskega orogenega cikla: • splošen pregled regionalne sedimentarne evolucije v zgornjem permu, triasu, juri, kredi in spodnjem paleogenu, • poznopermska do jurska kompleksna riftna evolucija in nastanek pasivnih robov,	Sedimentary evolution of the present-day Slovenian territory in the light of the Variscian orogenic cycle: • general overview of regional sedimentary evolution during Devonian, Carboniferous, Early and Middle Permian, • Devonian passive margin, • lower Carboniferous flischoid sedimentation, • and Upper Carboniferous to Permian molasse sedimentation. Sedimentary evolution of the present-day Slovenian territory in the light of the Alpine orogenic cycle:

• kredni tektonski preobrat v konvergentni režim, • kenocojska kolizija Postorogena ekstenzija ozemlja današnje vzhodne Slovenije in sinorogeni sedimenti: • splošen pregled regionalne sedimentarne evolucije v zgornjem paleogenu, neogenu in kvartarju • izoblikovanje in sedimentacija pozno fleksurnega Paleogenskega Slovenskega bazena • rifting in sedimentacija Paratetide • izoblikovanje znotrajmontanih sedimentarnih bazenov in kvartarna sedimentacija.	• general overview of regional sedimentary evolution during Late Permian, Triassic, Jurassic, Cretaceous, and lower Paleogene, • Late Permian to Jurassic complex rifting and development of passive margins, • Cretaceous tectonic inversion into convergent regime, • Cenozoic collision Postorogenic extension of the eastern Slovenian territory and synorogenic sediments; • general overview of regional sedimentary evolution during upper Paleogene, Neogene and Quaternary • formation and sedimentation of flexural Paleogene Slovenian Basin • rifting and sedimentation of the Paratethys. • formation of intermontane sedimentary basins and quaternary sedimentation.

Temeljna literatura in viri/Readings:

- Pleničar M., Ogorelec B., Novak M. (ur): Geologija Slovenije. Ljubljana: Geološki zavod Slovenije, 2009, 612pp. ISBN 978-961-6498-24-1.
- Buser, S. 1989: Developement of the Dinaric and the Julian Carbonate Platforms and of the intermediate Slovenian Basin (NW Yugoslavia).- Memorie della Societa` Geologica Italiana, 40, 313–320
- Turnšek, D. 1997: Mezosoic Corals of Slovenia. - Založba ZRC, 512 pp., Ljubljana.
- Šmuc, A. 2005: *Jurassic and Cretaceous stratigraphy and sedimentary evolution of the Julian Alps, NW Slovenia*.- Založba ZRC/ZRC Publishing, pp. 98, Ljubljana.
- Jurkovšek, B., Cvetko Tešović, B. & T. Kolar-Jurkovšek, 2013: Geologija Krasa – geology of the Karst.- Geološki zavod Slovenije, pp.205, Ljubljana.
- Članki iz področja stratigrafije iz območja Slovenije (avtorji: Buser, Ramovš, Novak, Ogorelec, Čar, Goričan, Jurkovšek, Kolar Jurkovšek, Otoničar, Košir, Celarc, Jelen, Šmuc, Gale, Rožič, itd).
- Tolmači h geološkim kartam: vsi listi Osnovne geološke karte, novejše detailnejše karte Krasa (Jurkovšek et al., 1996; Jurkovšek, 2013), Idrije (Čar, 2010), Železnikov (Demšar, 2016), Krške kotline (Poljak, 2017).
- Torsvik, T. H., Cocks, L. R. M. 2017. *Earth history and palaeogeography*. Cambridge University Press, pp. 324, Cambridge.
- Wicander R. & Monroe J.S.: *Historical Geology*. Brooks/Cole, 2010, 444pp., ISBN: 978-0-495-56007-4.

Cilji in kompetence:	**Objectives and competences:**
CILJI: Slušatelj/ica pridobi znanje o kompleksnem stratigrafskem razvoju ozemlja današnje Slovenije vpetega v evolucijski kontekst širšega paleogeografskega prostora. S pridobljenim znanjem je pripravljen/a na geološko delo na terenu, saj je zmožen prepoznavati sedimentarna zaporedja in tako predvidevati 3D geološki prostor na raziskovani lokaciji. KOMPETENCE: Slušatelji so usposobljeni za samostojno prepoznavanje in interpretacijo stratigrafskih enot Slovenskega ozemlja ter dogodkov in njihovo uporabo pri drugih geoloških predmetih ter kasneje geološkemu delu.	OBJECTIVES: Student receives knowledge about complex stratigraphic evolution of the Slovenian territory within the evolutionary context of broader paleogeographic space. With gained knowledge he/she is prepared for geological field work, because is capable of recognition of sedimentary successions and consequently of predicting the 3D geological space on researched area. COMPETENCES: They gain skills for independent recognition and interpretation of stratigraphic units of Slovenian territory and events and their usage by other geological subjects and later in the geological work.

Predvideni študijski rezultati:	**Intended learning outcomes:**

Slušatelj spozna glavne stratigrafske razvoje in pomembnejše dogodke v Zemljini zgodovini in natančnejši pregled stratigrafije Slovenskega ozemlja. Poznavanje stratigrafskih enot in stratigrafskih razvojev predstavlja osnovno znanje s katerem lahko slušatelji razumejo in nadgradijo vsebine drugih geoloških predmetov. Poleg tega je osnovno stratigrafsko znanje nujno potrebno pri kvalitetni aplikaciji geoloških podatkov.	Student recognizes main stratigraphic units and prominent events in history of the Earth and gets detailed stratigraphic knowledge of the Slovenian territory. Recognition of geological units and stratigraphic developments represents basic knowledge that enables the student to understand and upgrade the content of other geological subjects. Additionally, basic stratigraphic knowledge is essential for quality of geological-data applications.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, vaje, možnost seminarja, terensko delo.	Lectures, tutorial, optional seminars, field work.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Pisni ali ustni izpit	80,00 %	Written or oral exam
Seminarska naloga	20,00 %	Seminar

Reference nosilca/Lecturer's references:

ROŽIČ, Boštjan, GERČAR, David, OPRČKAL, Primož, ŠVARA, Astrid, TURNŠEK, Dragica, KOLAR-JURKOVŠEK, Tea, UDOVČ, Jan, KUNST, Lara, FABJAN, Teja, POPIT, Tomislav, GALE, Luka. Middle Jurassic limestone megabreccia from the southern margin of the Slovenian Basin. *Swiss journal of geosciences*. 2019, vol. 112, iss. 1, str. 163-180. ISSN 1661-8726. DOI: 10.1007/s00015-018-0320-9.

REHÁKOVÁ, Daniela, ROŽIČ, Boštjan. Calpionellid biostratigraphy and sedimentation of the Biancone limestone from the Rudnica Anticline (Sava Folds, Eastern Slovenia) = Kalpionelidna biostratigrafija in sedimentacija Biancone apnenca Rudniške antiklinale (Posavske gube, vzhodna Slovenija). *Geologija*. 2019, 62, 89-101.

ROŽIČ, Boštjan, GALE, Luka, BRAJKOVIĆ, Rok, POPIT, Tomislav, ŽVAB ROŽIČ, Petra. Lower jurassic succession at the site of potential Roman quarry Staje near Ig (central Slovenia) = Spodnjejurske plasti na območju morebitnega rimskega kamnoloma Staje pri Igu. *Geologija,* 2018, 61, 49-71.

ROŽIČ, Boštjan, KOLAR-JURKOVŠEK, Tea, ŽVAB ROŽIČ, Petra, GALE, Luka. Sedimentary record of subsidence pulse at the Triassic/Jurassic boundary interval in the Slovenian Basin (eastern Southern Alps). *Geologica Carpathica : international geological journal*. 2017, vol. 68, iss. 6, str. 543-561. ISSN 1335-0552. DOI: 10.1515/geoca-2017-0036.

ROŽIČ, Boštjan, GORIČAN, Špela, ŠVARA, Astrid, ŠMUC, Andrej. The Middle Jurassic to Lower Cretaceous succession of the Ponikve klippe: the Southernmost outcrops of the Slovenian Basin in Western Slovenia. *Rivista italiana di paleontologia e stratigrafia*. 2014, vol. 120, no. 1, str. 83-102.

STRATIGRAFSKA ORODJA

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Stratigrafska orodja
Course title:	Stratigraphic tools
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	2. letnik	2. semester	obvezen

Univerzitetna koda predmeta/University course code:	0562054
Koda učne enote na članici/UL Member course code:	11405

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
38	0	0	0	7	45	3

Nosilec predmeta/Lecturer:	Boštjan Rožič
Vrsta predmeta/Course type:	Obvezni/Compulsory

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Priporočljivo - opravljeni izpiti iz Osnov geologije, Paleontologije, Sedimentne petrologije.	Recommended - passed exams: Introduction to Geology, Paleontology, Sedimentary petrology.

Vsebina:	**Content (Syllabus outline):**
• Temelji stratigrafije: zgodovina in razvoj stratigrafije kot znanstvene discipline, definicije in principi stratigrafske analize • Zajemanje in načini prikazovanja stratigrafskih podatkov • Litostratigrafija: klasifikacija in vrste litostratigrafskih enot, meje med enotami, diskontinuitete. • Biostratigrafija: vodilni fosili, vrste in določanje biostratigrafskih enot, definicije, meje • Dogodkovna stratigrafija: pregled in prepoznavanje stratigrafsko relevantnih dogodkov, korelacija, uporabnost • Kemostratigrafija: pregled tehnik, definicija KE in dogodkov, izotopska kemostratigrafija • Magnetostratigrafija: definicije, klasifikacije, magnetostratigrafske enote polarnosti	• Basics of Stratigraphy: history and development of stratigraphy as a science, definitions and principles of stratigraphic analysis • Sampling methods and visual presentations of stratigraphic data • Lithostratigraphy: classification and types of lithostratigraphic units, unit's boundaries, disconformities. • Biostratigraphy: leading fossils, types and determination of biostratigraphic units, definitions, boundaries • Event Stratigraphy: overview and recognition of stratigraphically relevant events, correlation, use • Chemostratigraphy: review of techniques, definition of chemostratigraphic units, isotope chemostratigraphy

• Sekvenčna stratigrafija: definicije, prepoznavanje, terminologija, korelacija • Ciklostratigrafija: prepoznavanje, načini analize, korelacija • Standardna kronostratigrafska in geokronološka časovna lestvica • Sedimentacijski bazeni: globalna geodinamika in nastanek sedimentacijskih bazenov • Historična geologija: osnovni pregled geološke preteklosti s stališča tektonike, klime in evolucije življenja.	• Magnetostratigraphy: definitions, classifications, magnetostratigraphic polarity units • Sequence Stratigraphy: definitions, recognition, terminology, correlation • Cyclostratigraphy: recognition, methods of analysis, correlation • Standard chronostratigraphic and geochronologic time scale • Sedimentary basins: global geodynamics and origin of sedimentary basins • Historical Geology: basic overview of geological past with focus on tectonics, climatic conditions, and evolution of life.

Temeljna literatura in viri/Readings:

- Blatt, H., Berry, W.B.N. & Brande, S.: Principles of stratigraphic analysis. Blackwell Sci. Publ., 512 pp., 1991, ISBN: 0-86542-069-6.
- Brookfield, M.E.: Principles of Stratigraphy. Blackwell Publ.., 340pp., 2004, ISBN: 1-4051-1164-X.
- Doyle, P. & Bennett, M.R.: Unlocking the stratigraphical record. Advances in modern stratigraphy. J. Wiley & Sons, 1998, 532 pp, ISBN: 0-471-97463-3.
- Doyle, P., Bennett, M.R. & Baxter. A.N.: The Key to the Earth History: an Introduction to Stratigraphy. John Wiley & Sons, 293pp., 2001, ISBN: 0-471-49215-9.
- Levin H.: The Earth Through Time. John Wiley & Sons, 2010, 562pp., ISBN: 978-0-470-387740.
- Nichols G.: Sedimentology and Stratigraphy. Wiley-Blackwell, 419pp., ISBN: 978-1-4051-3592-4.
- Prothero, D.R.: Interpreting the stratigraphic record. W.H. Freeman & Co., 1990, 410 pp., ISBN: 0-7167-1854-5
- Stanley, S.M.: Earth system evolution. W.H. Freeman & Co., 2005, 567 pp., ISBN: 0-7167-3907-0.
- Wicander R. & Monroe J.S.: Historical Geology. Brooks/Cole, 2010, 444pp., ISBN: 978-0-495-56007-4.

Cilji in kompetence:	**Objectives and competences:**
CILJI: stratigrafija je ključ za razumevanje Zemlje, njenih materialov, struktur in nekdanjega življenja. Zajema vse dogodke in procese, ki so se zgodili v geološki zgodovini planeta Zemlje. Stratigrafija je osnova za razumevanje časa, kar postavlja geologijo v unikaten položaj med naravoslovnimi vedami. Namen predmeta je spoznavanje terminov in tehnik stratigrafskih analiz in praktična uporaba le-teh; opisovanje in klasificiranje, razumevanje geološkega časa, stratigrafskih razvojev in pomembnejših dogodkov v predkambriju in fanerozoiku. KOMPETENCE: slušatelji pridobijo znanja o metodah raziskav sedimentarnih zaporedij in sicer ob najbolj osnovnih tehnik, do sodobnih, bolj interpretativnih stratigrafskih prostopov, pridobi znanje o pomenu in vzrokih členitve geološkega časa in osnovni pregled pomebnejših geoloških dogodkov v predkambriju in fanerozojku.	OBJECTIVES: stratigraphy is a key for the understanding of Earth, its materials, structures and former life. It confines events and processes that marked geological history of the planet Earth. Stratigraphy is the base for understanding the time, which positions the geology in unique place among natural sciences. The aim of the subject is the attribution of knowledge about terminus, techniques of stratigraphic analysis and their use; description and classification, understanding of geological time, stratigraphic successions and important events in Precambrian as well as Phanerozoic. COMPETENCES: students get knowledge about research methods of sedimentary successions, from the most fundamental technics to the contemporary. More interpretative methods, he/she gains knowledge about the significance and principles of subdivision of geological time, and general overview of prominent geological events in Precambrian and Phanerozoic

Predvideni študijski rezultati:	**Intended learning outcomes:**
Slušatelj pozna raziskovalne pristope pri pridobivanju stratigrafskih podatkov in razume koncept geološkega časa in stratigrafskih časovnih lestvic. Slušatelj spozna glavne geološke dogodke v Zemljini zgodovini, ki so	Student knows research approaches of gaining the stratigraphic data, and understands the concept of geological time and stratigraphic time scales. Student recognizes main geological events in history of the

nujni za razumevanje regionalne sedimentarne evolucije. Slušatelj je usposobljen za opisovanje, definiranje, klasificiranje in interpretacijo stratigrafskih enot in podatkov. Predmet omogoča slušateljem razmislek o konceptu geološkega časa, spremenljivosti in periodičnosti geoloških procesov.	Earth, which are essential for understanding of regional sedimentary evolution. Student is capable for description, definition, classification and interpretation of stratigraphic units and data. The subject enables the students thinking of geological time concept, variability and periodicity of geological processes.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, terensko delo.	Lectures, field work.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
pisni ali ustni izpit	100,00 %	written or oral exam

Reference nosilca/Lecturer's references:

REHÁKOVÁ, Daniela, ROŽIČ, Boštjan. Calpionellid biostratigraphy and sedimentation of the Biancone limestone from the Rudnica Anticline (Sava Folds, Eastern Slovenia) *Geologija*. 2019, 62, 89-101, DOI: 10.5474/geologija.2019.004.
ROŽIČ, Boštjan, KOLAR-JURKOVŠEK, Tea, ŽVAB ROŽIČ, Petra, GALE, Luka. Sedimentary record of subsidence pulse at the Triassic/Jurassic boundary interval in the Slovenian Basin (eastern Southern Alps). *Geologica Carpathica : international geological journal*. 2017, 68, 543-561. DOI: 10.1515/geoca-2017-0036.
ROŽIČ, Boštjan, GORIČAN, Špela, ŠVARA, Astrid, ŠMUC, Andrej. The Middle Jurassic to Lower Cretaceous succession of the Ponikve klippe: the Southernmost outcrops of the Slovenian Basin in Western Slovenia. *Rivista italiana di paleontologia e stratigrafia*, 2014, vol. 120, no. 1, str. 83-102.
ROŽIČ, Boštjan, VENTURI, Federico, ŠMUC, Andrej. Ammonites from Mt Kobla (Julian Alps, NW Slovenia) and their significance for precise dating of Pliensbachian tectono-sedimentary event = Amoniti s Koble (Julijske Alpe, SZ Slovenija) in njihov pomen pri natančnem datiranju pliensbachijskega tektonsko-sedimentarnega dogodka. *RMZ - Materials and geoenvironment : periodical for mining, metallurgy and geology*, 2014, vol. 61, no. 2/3, str. 191-201.

STRUKTURNA GEOLOGIJA

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Strukturna geologija
Course title:	Structural Geology
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	2. letnik	2. semester	obvezen

Univerzitetna koda predmeta/University course code:	0067478
Koda učne enote na članici/UL Member course code:	961

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
45	0	30	0	30	105	7

Nosilec predmeta/Lecturer:	Marko Vrabec
Vrsta predmeta/Course type:	Obvezni / Compulsory

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Priporočljivo je, da študent pozna glavne kamninotvorne minerale in njihovo kristalno strukturo. Pozna glavne tipe kamnin v litosferi ter petrologijo sedimentnih in metamorfnih kamnin na nivoju prvostopenjskega študija. Pozna osnovno teorijo tektonike plošč in značilnosti glavnih tektonskih okolij na Zemlji. Obvlada delo z geološkim kompasom in osnovne geometrijske konstrukcije iz analize geoloških kart.	It is recommended that the student is familiar with major rock-forming minerals and their crystal structure, and can recognize major litospheric rock types. A BSc-level competency is expected in petrology of metamorphic and sedimentary rocks, in fundamentals of plate tectonics theory, and in knowledge of major tectonic environments on Earth. Student should be comfortable with orientation measurements using geological compass and with basic geometrical techniques of geological map analysis.

Vsebina:	Content (Syllabus outline):
Osnove kinematske analize in analize deformacij. Deformacijski mehanizmi in mikrostrukure. Napetostna stanja, reologija kamnin in mehanika litosfere. Lomne deformacije: razpoke, splošne značilnosti prelomov, normalni prelomi, zmični prelomi, narivi. Gube in gubanje. Strukturiranost kamnin: klivaž, foliacije, lineacije.	Fundamentals of kinematic analysis and deformation analysis. Deformational mechanisms and microstructures in rocks. States of stress, rock rheology, and mechanics of the litosphere. Brittle deformation: fractures, general characteristics of faults, normal faults, strike-slip faults, thrusts.

Strižne cone, miloniti, kinematski indikatorji. Kontrakcijska tektonska okolja, orogeni. Ekstenzijska tektonska okolja. Zmična tektonska okolja. Aktivna tektonika.	Folds and folding. Rock fabrics: cleavage, foliations, lineations. Shear zones, mylonites, kinematic indicators. Contractional tectonic environments, orogens. Extensional tectonic environments. Strike-slip tectonic environments. Active tectonics.

Temeljna literatura in viri/Readings:

FOSSEN, 2010: Structural geology. Cambridge University Press.
Rowland, Duebendorfer & Schiefelbein, 2007: Structural analysis and synthesis, 3rd ed. - Blackwell Publishing.
LISLE & LEYSHON, 2004: Stereographic projection techniques for geologists and civil engineers, 2nd ed. Cambridge University Press.
VRABEC, 2017: Študijska gradiva za predmet Strukturna geologija in tektonika (prosojnice s predavanj in vaj). Univerza v Ljubljani, Naravoslovnotehniška fakulteta.

Cilji in kompetence:	**Objectives and competences:**
CILJI: Študenti spoznajo osnovne principe in mehanizme tektonskih deformacij (mehanika Zemljine litosfere, deformacijska teorija), geometrijske značilnosti tektonskih struktur in strukturnih stilov, ter razlago njihove geneze. Spoznajo osnovne zakonitosti tektonike v regionalnem merilu. Seznanijo se z glavnimi tektonskimi okolji na Zemlji, njihovo strukturo in časovnim razvojem. Spoznajo tudi osnovne značilnosti aktivnih tektonskih deformacij in metode njihovega preučevanja. KOMPETENCE: Študenti znajo prepoznati in interpretirati tektonske strukture od mikroskopskega do regionalnega merila. Sposobni so zbirati strukturne podatke na terenu, jih obdelati in interpretirati.	OBJECTIVES: Student gets acquainted with basic principles and mechanisms of tectonic deformation (litospheric mechanics, deformation theory), with geometrical characteristics of tectonic structures and structural styles, and with interpretation of their origin. Student learns basic principles of regional tectonic deformation, and becomes familiar with major tectonic environments on Earth, their structure and evolution. Additionally, the student gets acquainted with fundamentals of active tectonic processes and methods of their investigation. COMPETENCES: Student is able to recognize and interpret tectonic structures from microscopic to regional scale. Student is capable of field collection, processing and interpretation of structural data.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Študent spozna strukturnogeološko terminologijo. Pozna glavne geometrijske značilnosti geoloških struktur in jih je sposoben prepoznavati na terenu ter interpretirati njihovo geometrijo iz pomanjkljivih podatkov. Razume genezo posameznih struktur, more razlikovati deformacijske faze na ozemlju/izdanku/vzorcu in interpretirati generalne fizikalne pogoje, pri katerih so deformacije potekale. Nauči se terenskega opazovanja in popisovanja struktur, njihovega evidentiranja, merjenja orientacije strukturnih elementov, jemanja orientiranih vzorcev. Utrdi veščine dela z geološkim kompasom. Terenska opažanja zna analizirati, generalizirati in interpretirati v lokalnem in širšem kontekstu, tako na podlagi lastnih opažanj kot uporabi literaturnih virov. Zna uporabljati računalniške programe za analizo strukturnogeoloških podatkov.	Students learn the terminology of structural geology and tectonics. They are familiar with geometrical characteristics of geological structures and are capable to recognize them in the field and to reconstruct their geometry from incomplete field data. They understand the genesis of individual structures, and are able to distinguish phases of deformation in the region/outcrop/sample and to interpret general physical conditions during deformation. Students learn to observe and document structures in the field, to measure their orientation, and to take oriented samples. They master measurement skills with geological compass. They can analyze, generalize and interpret field observations both in local and regional context, using their own and published data. Students learn to use software for analyzing and processing of structural data.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, kabinetne vaje, terenske vaje.	Lectures, lab exercises, fieldwork.

Načini ocenjevanja:	Delež/Weight	Assessment:
Pisni in/ali ustni izpit	55,00 %	Written and/or oral examination
Preizkus znanja reševanja praktičnih strukturnih problemov	30,00 %	Test of structural problem solving skills
Terensko poročilo	15,00 %	Field report

Reference nosilca/Lecturer's references:

ŽIBRET, Lea, VRABEC, Marko. Palaeostress and kinematic evolution of the orogen-parallel NW-SE striking faults in the NW External Dinarides of Slovenia unraveled by mesoscale fault-slip data analysis. Geologia Croatica, 2016, vol. 69, no. 3, str. 295-305.
VRABEC, Marko, PAVLOVČIČ PREŠEREN, Polona, STOPAR, Bojan. GPS study (1996-2002) of active deformation along the Periadriatic fault system in northeastern Slovenia: tectonic model. Geol. Carpath., 2006, vol. 57, no. 1, str. 57-65.
ŽALOHAR, Jure, VRABEC, Marko. Kinematics and dynamics of fault reactivation: the Cosserat approach. Journal of Structural Geology, 2010, vol. 32, str. 15-27.
KASTELIC, Vanja, VRABEC, Marko, CUNNINGHAM, Dickson, GOSAR, Andrej. Neo - Alpine structural evolution and present day tectonic activity of the eastern Southern Alps: the case of the Ravne Fault, NW Slovenia. J. struct. geol., 2008, vol. 30, iss. 8, str. 963-975.

STRUKTURNOGEOLOŠKI PRAKTIKUM

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Strukturnogeološki praktikum
Course title:	Practical Structural Geology
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	3. letnik		izbirni

Univerzitetna koda predmeta/University course code:	0089615
Koda učne enote na članici/UL Member course code:	623

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
15	30	0	0	0	45	3

Nosilec predmeta/Lecturer:	Marko Vrabec
Vrsta predmeta/Course type:	Izbirni / Elective

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Ni pogojev.	No prerequsites.

Vsebina:	Content (Syllabus outline):
Analiza deformacij: pregled teoretičnega ozadja, glavne metode za določanje komponent deformacije (strain) kamnine, metode odvzema vzorcev na terenu ter merjenja na terenu in v laboratoriju. Mikrostrukture kamnin in deformacijski mehanizmi: spoznavanje glavnih tipov lomnih in duktilnih mikrostruktur v kamninah, interpretacija deformacijskih mehanizmov in fizikalnih pogojev deformiranja, mikrostrukture kot kinematski indikatorji. Uravnoteženje profilov: pregled glavnih metod uravnoteženja, praktično delo z ročnimi in računalniškimi metodami. Integralna strukturna analiza: praktični primeri sinteze podatkov z geoloških kart, profilov, vrtin, strukturnih podatkov s terena, geofizikalnih podatkov; izdelava strukturnega modela in strukturne interpretacije ozemlja.	Strain analysis: theoretical overview, principal methods for determining strain components in rocks, sampling methods in the field, field and lab measurements. Microstructures and deformation mechanisms: principal ductile and brittle microstructures in rocks, interpretation of deformation mechanisms and P,T conditions of deformation, microstructures as kinematic indicators. Cross-section balancing: overview of principal methods, practical work using manual and computer-assisted workflows. Integrated structural analysis: practical examples synthesising data from geological maps, cross sections, boreholes, structural measurements, geophysical surveys; deriving a coherent structural model and reconstructing structural evolution.

Temeljna literatura in viri/Readings:

MARSHAK & MITRA, 1988: Basic methods of structural geology. - Prentice Hall
ROWLAND, DUEBENDORFER & SCHIEFELBEIN, 2007: Structural analysis and synthesis, 3rd ed. - Blackwell Publishing.
VERNON, 2004: A practical guide to rock microstructure. - Cambridge University Press

Cilji in kompetence:	**Objectives and competences:**
CILJI: študenti nadgradijo znanje, ki ga pridobijo pri osnovnem predmetu Strukturna geologija z izbranimi praktičnimi metodami strukturnogeološke analize. KOMPETENCE: študenti so sposobni načrtovati in izvesti strukturnogeološko raziskavo terena. Sposobni so sintetizirati in interpretirati strukturnogeološke podatke.	OBJECTIVES: Students extend the knowledge acquired in the basic Structural Geology course with selected practical methods of structural analysis. COMPETENCES: Students are able to plan and execute a structural study of a terrain.They are capable to synthesize and interpret structural field data.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Pridobljeno znanje predstavlja osnovo za praktično delo na področju strukturne geologije in aplikativnih področjih, ki se na strukturno geologijo navezujejo (npr. geološko kartiranje, inženirska geologija, raziskave nahajališč surovin, metamorfna petrologija,…). Razen tega študenti s praktičnim delom utrdijo in razširijo temeljno znanje, ki so ga pridobili pri predmetu Strukturna geologija, denimo na področju analize deformacij in deformacijskih mehanizmov v kamninah. Študenti se naučijo dela z nekaterimi računalniškimi programi, ki se uporabljajo v strukturni analizi.	Acquired knowledge is fundamental for performing practical work and research in the field of structural geology and in related disciplines like geological mapping, engineering geology, mineral exploration, metamorphic petrology,... By learning additional practical techniques students upgrade their existing knowledge and understanding of Structural Geology, particularly in the fields of strain analysis and deformation mechanisms in rocks. Students learn to use various speciality software commonly used in structural analysis.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, kabinetne vaje, terenske vaje.	Lectures, lab exercises, fieldwork.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Seminar / indivudalni projekt.	100,00 %	Seminar / individual project.

Reference nosilca/Lecturer's references:

ŽALOHAR, Jure, VRABEC, Marko. Paleostress analysis of heterogeneous fault-slip data: the Gauss method. J. struct. geol., 2007, vol. 29, is. 11, str. 1798-1810.
VRABEC, Marko. Evidence of Quaternary faulting in the Idrija fault zone, Učja canyon, NW Slovenia = Znaki kvartarne tektonske aktivnosti v coni Idrijskega preloma pri Učji. RMZ-mater. geoenviron., nov. 2012, letn. 59, št. 2/3, str. 285-298.
ŽALOHAR, Jure, VRABEC, Marko. Kinematics and dynamics of fault reactivation: the Cosserat approach. J. struct. geol., 2010, issue 1, vol. 32, str. 15-27.

TERENSKO KARTIRANJE

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Terensko kartiranje
Course title:	Field Mapping
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	3. letnik	2. semester	obvezen

Univerzitetna koda predmeta/University course code:	0160954
Koda učne enote na članici/UL Member course code:	11401

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
0	0	0	0	105	105	7

Nosilec predmeta/Lecturer:	Marko Vrabec
Vrsta predmeta/Course type:	Obvezni/Compulsory

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Študent mora imeti solidno podlago v naslednjih predmetih prvostopenjskega študija: strukturna geologija, paleontologija, petrologija magmatskih, metamorfnih in sedimentnih kamnin, GIS v geologiji. Obvladati mora delo z geološkim kompasom in osnovne geometrijske konstrukcije strukturne analize. Na terenu mora biti sposoben prepoznavati in opisovati kamnine, fosile in tektonske strukture. Pred terenskim delom mora študent poslušati predmet Uvod v geološko kartiranje.	A solid, BSc-level competency is expected in the following subjects: structural geology, paleontology, petrology of magmatic, metamorphic and sedimentary rocks, GIS. Student must be comfortable with orientation measurements using geological compass and with basic structural geometrical techniques. Student should be able to recognize and describe rocks, fosils and tectonic structures in the field. Prior to fieldwork, student must complete the preparatory course Introduction to Geological Mapping.

Vsebina:	**Content (Syllabus outline):**
Študent pod vodstvom inštruktorja izvede geološko kartiranje manjšega zaključenega ozemlja v velikosti okoli 3 km2. Med terenskim delom vodi terensko dokumentacijo (terenski dnevnik, delovna karta, foto dokumentacija) in zbira reprezentativne vzorce. Na podlagi opravljenega terenskega dela in zbranih podatkov izdela geološko karto kartiranega ozemlja in	Under the supervision of instructor, student will map a small enclosed field area with the approximate size of 3 km2. During the fieldwork, student will maintain field documentation (field notebook, field map, photo documentation) and collect representative rock samples. From the acquired field data, student will prepare a fair copy map of the mapped area and write

geološko poročilo (tolmač karte) s pripadajočimi geološkimi profili.	the geological report with accompanying geological cross-sections.

Temeljna literatura in viri/Readings:

LISLE et al., 2005: Basic geological mapping (5th ed.). John Wiley & Sons.
MCCLAY, 1987: The mapping of geological structures. John Wiley & Sons.
COE (ed.), 2010: Geological field techniques. Wiley-Blackwell.
Osnovna geološka karta 1 : 100.000 s tolmačem in drugi objavljeni strokovni in znanstveni viri ki so relevantni za kartirano ozemlje / Basic geological map 1 : 100.000 with explanatory notes, and other scientific and professional literature pertaining to the mapped area.

Cilji in kompetence:	**Objectives and competences:**
CILJI: Študent razvije praktične kompetence za samostojno delo na terenu, ki vključujejo orientacijo na terenu, načrtovanje gibanja po terenu, opazovanje, popisovanje in interpretacijo geoloških elementov na terenu, ter vodenje sistematične, pregledne in urejene terenske dokumentacije. Iz zbranih terenskih podatkov študent izdela interpretacijsko geološko karto kartiranega ozemlja in napiše geološko poročilo. KOMPETENCE: Študent je sposoben samostojno izvajati geološko kartiranje terena in zbirati terenske geološke podatke, ter izdelati geološko interpretacijo kartiranega ozemlja in vso pripadajočo dokumentacijo (geološko karto in tolmač).	OBJECTIVES: Student develops practical competences for independet fieldwork, including orientation in the field, planing of field traverses, observing, recording and interpreting geological features in the field, and maintaining systematic, organized and neat field documentation. From the acquired field data, student will create the interpretative fair copy map and write a geological report. COMPETENCES: Student is able to independently map in the field and to acquire geological field data. Student is capable of producing a geological interpretation of the mapped area with supporting documentation (geological map and geological report).

Predvideni študijski rezultati:	**Intended learning outcomes:**
Študent razume in obvlada metode evidentiranja in interepretacije geoloških podatkov na terenu. Usposobi se za samostojno delo in funkcioniranje na terenu. Spozna in uporablja dobre prakse pri terenskem kartiranju in izdelavi geološke interpretacije ozemlja.	Student understands and masters methods for recording and interpreting geological field data. Student is trained for independent work and functioning in the field. Student learns and applies best practice in geological field mapping and in creating geological interpretation of the mapped area.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Terenske vaje, samostojni terenski projekt.	Field exercises, independent field project.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Ocena študentovega dela na terenu	35,00 %	Assessment of student's performance in the field
Preizkus praktičnih veščin	30,00 %	Test of practical skills
Zagovor končne geološke karte in tolmača	35,00 %	Defense of the final geological map and report

Reference nosilca/Lecturer's references:

VRABEC, Marko. Image analysis as a tool in geometrical description and structural analysis of outcrops. RMZ-mater. geoenviron., 1999, vol. 46, no. 3, str. 613-622.
STOPAR, Bojan, STERLE, Oskar, WEBER, John C., VRABEC, Marko. The role and importance of GNSS for Geodynamics. V: BAŠIĆ, Tomislav (ur.). 2. CROPOS konferencija, Zagreb, srpanj 2011. Zbornik radova, (CROPOS konferencija). Zagreb: Državna geodetska uprava: Sveučilište u Zagrebu. Geodetski fakultet: Hrvatska komora ovlaštenih inženjera geodezije: Hrvatsko geodetsko društvo, 2011, str. 39-42.

ŽIVEC, Tina, VEZOČNIK, Rok, ŽIBRET, Lea, VRABEC, Marko, VERBOVŠEK, Timotej. Primerjava zajema diskontinutet z bližnjeslikovno fotogrametrijo, terestičnim laserskim skeniranjem (TLS) in ročnimi meritvami v kamnolomu Žalostna gora. V: ROŽIČ, Boštjan (ur.). 21. posvetovanje slovenskih geologov, (Geološki zbornik, 22). Ljubljana: Univ. v Ljubljani, Naravoslovnotehniška fak., Oddelek za geologijo, 2013, str. 186.

UVOD V GEOLOŠKO KARTIRANJE

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Uvod v geološko kartiranje
Course title:	Introduction to Geological Mapping
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	3. letnik	2. semester	obvezen

Univerzitetna koda predmeta/University course code:	0160953
Koda učne enote na članici/UL Member course code:	11400

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
30	0	15	0	0	45	3

Nosilec predmeta/Lecturer:	Marko Vrabec
Vrsta predmeta/Course type:	Obvezni/Compulsory

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Študent mora imeti solidno podlago v naslednjih predmetih prvostopenjskega študija: strukturna geologija, paleontologija, petrologija magmatskih, metamorfnih in sedimentnih kamnin, GIS v geologiji. Obvladati mora delo z geološkim kompasom in osnovne geometrijske konstrukcije strukturne analize. Na terenu mora biti sposoben prepoznavati in opisovati kamnine, fosile in tektonske strukture.	A solid, BSc-level competency is expected in the following subjects: structural geology, paleontology, petrology of magmatic, metamorphic and sedimentary rocks, GIS. Student must be comfortable with orientation measurements using geological compass and with basic structural geometrical techniques. Student should be able to recognize and describe rocks, fosils and tectonic structures in the field.

Vsebina:	**Content (Syllabus outline):**
Zgodovina geološkega kartiranja Vrste geoloških kart Osnove geodezije in kartografije Državna kartografija Republike Slovenije: vrste razpoložljivih prostorskih podatkov Osnove tehnologije GNSS in njena uporaba pri geološkem terenskem delu Metode geološkega kartiranja Dopolnilne metode in tehnološki pripomočki: vrtanje, geofizikalne raziskave, geodetska izmera,	History of geological mapping Types of geological maps Fundamentals of geodesy and cartography National cartography of the Republic of Slovenia: an overview of available spatial data Fundamentals of GNNS technology and its application in geological fieldwork Methods and approaches to geological mapping Auxilary methods and technological aids: drilling, geophysical surveying, geodetic surveying,

fotogrametrija, LIDAR, fotogeologija in daljinsko zaznavanje, digitalno geološko kartiranje Gibanje na terenu. Varnostna pravila za terensko delo Etika geološkega terenskega dela Terenska dokumentacija (terenska karta, terenski dnevnik, fotografije, vzorci) Definiranje in ločevanje litoloških in litostratigrafskih enote na terenu, izris mej med litostratigrafskimi enotami ter strukturnih elementov na topografsko karto Uporaba standardov, simbolov Interpretacija in končna geološka karta, izdelava geoloških profilov	photogrammetry, LIDAR, photogeology and remote sensing, digital geological mapping Moving about in the field Safety rules for geological fieldwork Ethical guidelines for geological fieldwork Fieldwork documentation: field maps, field notebooks, photography, sampling Defining lithological units and mapping their boundaries, structural data collection Geological map symbology and standards Creating final interpretation, fair copy maps, geological sections

Temeljna literatura in viri/Readings:

LISLE et al., 2005: Basic geological mapping (5th ed.). John Wiley & Sons.
MCCLAY, 1987: The mapping of geological structures. John Wiley & Sons.
COE (ed.), 2010: Geological field techniques. Wiley-Blackwell.
VRABEC, 2019: Študijska gradiva za predmet Geološko kartiranje (prosojnice s predavanj in vaj). Univerza v Ljubljani, Naravoslovnotehniška fakulteta.

Cilji in kompetence:	**Objectives and competences:**
CILJI: Študent spozna in osvoji celoten proces izdelave geološke karte od zajema podatkov na terenu do izdelave končne karte v digitalni obliki. KOMPETENCE: Študent je sposoben načrtovati in izvesti geološko kartiranje terena, izbrati ustrezne dopolnilne raziskovalne metode, izdelati geološko interpretacijo in pripadajočo dokumentacijo (geološko karto in tolmač).	OBJECTIVES: Student gets acquainted with the entire process of geological map production from field data collection to creation of final geological map in digital format. COMPETENCES: Student is able to plan and execute a geological field campaign and to choose appropriate auxilary investigative methods where needed, to make a geological interpretation of the mapped area, and to create supporting documetation (fair copy map and geological report).

Predvideni študijski rezultati:	**Intended learning outcomes:**
Študent razume in obvlada postopke, dobre prakse in potrebne korake pri izdelovanju geoloških kart. Usposobi se za evidentiranje terenskih opazovanj na topografski podlagi. Razume in zna interpretirati prostorsko dimenzijo geologije iz terenskih podatkov. Pridobljeno znanje in veščine lahko uporabi pri terenskem delu na vseh področjih geologije in v sorodnih, terensko vezanih vedah.	Student understands and masters procedures, best practice, and necessary steps in making geological maps. Student is able to record and present field observations on topographic maps, and is able to comprehend and interpret the spatial dimension of geological field data. Acquired knowledge and skills are applicable in all fields of geology and in other field-related professions.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, kabinetne vaje.	Lectures, lab exercises.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Pisni in/ali ustni izpit	65,00 %	Written and/or oral examination
Preizkus praktičnih veščin	35,00 %	Test of practical skills

Reference nosilca/Lecturer's references:

VRABEC, Marko. Image analysis as a tool in geometrical description and structural analysis of outcrops. RMZ-mater. geoenviron., 1999, vol. 46, no. 3, str. 613-622.

STOPAR, Bojan, STERLE, Oskar, WEBER, John C., VRABEC, Marko. The role and importance of GNSS for Geodynamics. V: BAŠIĆ, Tomislav (ur.). 2. CROPOS konferencija, Zagreb, srpanj 2011. Zbornik radova, (CROPOS konferencija). Zagreb: Državna geodetska uprava: Sveučilište u Zagrebu. Geodetski fakultet: Hrvatska komora ovlaštenih inženjera geodezije: Hrvatsko geodetsko društvo, 2011, str. 39-42.

ŽIVEC, Tina, VEZOČNIK, Rok, ŽIBRET, Lea, VRABEC, Marko, VERBOVŠEK, Timotej. Primerjava zajema diskontinutet z bližnjeslikovno fotogrametrijo, terestičnim laserskim skeniranjem (TLS) in ročnimi meritvami v kamnolomu Žalostna gora. V: ROŽIČ, Boštjan (ur.). 21. posvetovanje slovenskih geologov, (Geološki zbornik, 22). Ljubljana: Univ. v Ljubljani, Naravoslovnotehniška fak., Oddelek za geologijo, 2013, str. 186.

UVOD V STROKOVNO-RAZISKOVALNO DELO

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Uvod v strokovno-raziskovalno delo
Course title:	Introduction Into Scientific and Research Work
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	1. letnik	2. semester	obvezen

Univerzitetna koda predmeta/University course code:	0067469
Koda učne enote na članici/UL Member course code:	897

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
15	30	0	0	0	45	3

Nosilec predmeta/Lecturer:	Barbara Čenčur Curk
Vrsta predmeta/Course type:	Obvezni / Compulsory

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Ni pogojev.	No prerequisites.

Vsebina:	Content (Syllabus outline):
Uvod v teorijo znanosti: pojem znanosti, znanost kot spoznavna dejavnost	Introduction to philosophy of science: importance of science; science as an ontology category
Znanstvene razlage: definicija, hipoteza, teorija, paradigma, falsifikabilnost	Scientific explanations: definition, hypothesis, theory, paradigm, falsifiability
Znanstveno in raziskovalno delo	Scientific and professional work
Iskanje virov - baze podatkov: COBISS, Web of Science, SICRIS	Literature sources - bibliographic databases: COBISS, Web of Science, SICRIS
Bibliografska pravila & citiranje literature	Bibliographic rules & literature citation
Sinteza različnih virov	Synthesis of different sources
Pisanje strokovnih tekstov	Professional writing of texts
Vrste strokovnih in znanstvenih tekstov: članki, poročila, seminarji, diplome, projekti	Scientific and professional work: scientific papers, reports, seminars, thesis/dissertations, projects
Vsebine znanstvenih in strokovnih tekstov	Content of scientific and professional work
Grafične priloge	Graphic annexes
Predstavitev znanstvenega ali raziskovalnega dela: predavanja in posterji	Presentation of scientific or expert work: oral presentations and posters

Temeljna literatura in viri/Readings:

BASTEN, G.: Introduction to Scientific Research Projects. Ventus Publishing, free e-book 2010.
KUHN, T.S.: Struktura znanstvenih revolucij. Temeljna dela, 211 str., 1998.
POPPER, K.R.: Logika znanstvenega odkritja. Studia humanitatis, 1998, 386 str.
DOLINAR, F. M: Uvod v znanstveno delo. Filozofska fakulteta, 2000, 76 str.
HALL, G. M. (ed.): How to write a paper (3rd edition). BMJ Publishing Group, 2003, 176 str.
ECO, U. 2003: Kako napišemo diplomsko nalogo. Vale-Novak, 2003, 266 str.
DAY, R. A. in GASTEL, B.: How to write and publish a scientific paper (7th ed.). Greenwood, 2011.

Cilji in kompetence:	**Objectives and competences:**
CILJI: Namen predmeta je slušatelje seznaniti z uvodom v teorijo in metodologijo znanosti, z načinom, vrstami in pravili strokovnega pisanja, seznaniti jih z različnimi oblikami strokovnih tekstov, prijavljanje na projekte ter iskanjem in uporabljanjem literaturnih virov po internetnih bazah podatkov. KOMPETENCE: Vsako strokovno in znanstveno delo zahteva poročilo o rezultatih. Pridobljeno znanje o pisanju strokovnih tekstov in iskanju literaturnih virov bodo slušatelji izkoriščali pri poročanju o rezultatih svojega dela pri drugih predmetih, za izdelavo seminarjev in diplomskega dela kakor tudi v kasnejši karieri.	OBJECTIVES: Introduction to the theory and methodology of science. Introduction to scientific and professional communication, lecturing and writing, as well as using different text forms. Basis for literature research on the internet and in the available databases. Introduction to public tendering procedures for scientific projects. COMPETENCES: The students are able to write reports on the results of scientific and professional work. This knowledge will be later used for the preparation of seminars, diploma theses and later in their professional work.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Predmet bo dal študentom bazična znanja strokovno-znanstvene metodologije. Skozi teoretično in praktično delo bodo slušatelji osvojili način, vrste in pravila strokovnega pisanja, seznanili se bodo z različnimi oblikami strokovnih tekstov in iskanjem ter uporabljanjem literaturnih virov po internetnih bazah podatkov. Slušatelji bodo na podlagi pridobljenega znanja sposobni poročati o rezultatih svojega dela, tako pri študiju, kot kasneje v poklicu. Slušatelj bo sposoben samostojno poiskati osnovne literaturne vire za svoje delo, samostojno predstaviti svoje delo in samostojno pisno poročati o rezultatih svojega dela. Pridobljena znanja bodo slušatelju omogočala pisati strokovne in raziskovalne tekste po pravilih, ki jih zahteva mednarodna periodika.	The students aquire basic knowledge and skills of professional and scientific methodology. Through theoretical and practical work, students will become familiar with different types of papers and texts in the profession and become familiar with the writing styles of different types of specialised texts and with exploration and searching in different data bases and literature sources. The students will be able to report on the results of their work during their further studies and later in their professional life. Students will be able to apply independently apply literature sources, to independently present their work and report on results of their research. Knowledge obtained can be used also at other courses and on other fields where these skills are needed.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, vaje in seminarji. Praktične vaj z iskanjem znanstvenih in strokovnih virov v mednarodnih računalniških bazah revij kot priprava na izdelavo seminarja.	Lectures, excercises and seminars. Practical look up excercises in scientific and professional paper (computer) data bases as preparation for the seminar work.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Pisni in/ali ustni izpit	50,00 %	Written and/or oral exam
Seminarske naloge	40,00 %	Seminars
Prisotnost na predavanjih in vajah	10,00 %	Presence during lectures and exercises

Reference nosilca/Lecturer's references:

BANOVEC, Primož, BRENČIČ, Mihael, CERK, Matej, CILENŠEK, Ajda, ČENČUR CURK, Barbara, DOMADENIK, Polona, GARTNER, Mohor, GUDURAŠ, Dejan, HVALIČ, Matjaž, VIDMAR, Vesna,

ŽVAB ROŽIČ, Petra. Povezovanje pri čezmejni oskrbi s pitno vodo v jadranski regiji : prispevek k izboljšani čezmejni dobavi pitne vode. Ljubljana: Fakulteta za gradbeništvo in geodezijo, 2016. 25 str., ilustr. ISBN 978-961-6884-38-9.
KANAKOUDIS, Vasilis, TSITSIFLI, Stavroula, PAPADOPOULOU, Anastasia, ČENČUR CURK, Barbara, KARLEUŠA, Barbara. Water resources vulnerability assessment in the Adriatic Sea region : the case of Corfu Island. *Environmental science and pollution research international*, ISSN 0944-1344. [Print ed.], 2017, vol. 24, iss. 25, str. 20173-20186, doi: 10.1007/s11356-017-9732-8.
ČENČUR CURK, Barbara, BRAČIČ-ŽELEZNIK, Branka, BOGARDI, Istvan. Adaptation of water supply to changing climate and land-use activities, case of Ljubljana water supply, Slovenia. *Water*, ISSN 2073-4441, 2020, vol. 12, iss. 1, str. 1-15, doi: 10.3390/w12010288.

VULKANOLOGIJA

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Vulkanologija
Course title:	Volcanology
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	2. letnik, 3. letnik		izbirni

Univerzitetna koda predmeta/University course code:	0089552
Koda učne enote na članici/UL Member course code:	899

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
25	5	0	0	60	90	6

Nosilec predmeta/Lecturer:	Mirijam Vrabec, Nina Zupančič
Vrsta predmeta/Course type:	Izbirni / Elective

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Ni pogojev. Predmet je primeren tudi za študente drugih fakultet, ki jih zanima tematika vezana na vulkane in vulkanske procese.	No prerequisites. The Course is appropriate also for students from other faculties who are interested in volcanoes and volcanic processes.

Vsebina:	**Content (Syllabus outline):**
Uvod v vulkanizem	Introduction to volcanism
Tektonika plošč in vulkanizem	Plate tectonics and volcanism
Fizikalne lastnosti magme	Physical properties of magma
Vulkanski izbruhi in produkti vulkanizma	Volcanis eruptions and their products
Klasifikacija vulkanskih izbruhov	Classification of eruptions
Izlivni vulkanski izbruhi in njihovi produkti	Effusive volcanic eruptions and their products
Eksplozivni vulkanski izbruhi in njihovi produkti	Explosive volcanic eruptions and their products
Vulkanski reliefne oblike in položaj vulkanov	Volcanic landforms and settigs
»Pozitivne« vulkanskega reliefne oblike	»Positive« volcanic landforms
»Negativne« vulkanskega reliefne oblike	»Negative« volcanic landforms
Procesi izgubljanja mase in njihovi produkti	Mass-wasting processes and products
Vulkani pod vodo, ledeniki in izven Zemlje	Submarine, Subglacial and extraterrestial volcanoes
Vulkani - življenje, podnebje in človeška zgodovina	Volcanoes – life, climate and human history
Vulkanske nevarnosti in tveganja	Volcanic hazards and risk
Gospodarska vulkanologija	Economic volcanology

Temeljna literatura in viri/Readings:

LOCKWOOD, J. P. & HAZLETT, 2010, Volcanoes, Global Perspectives.-Wiley-Blackwell, 541 pp.
FISHER, R. V., HEIKEN, G. & HULEN, J. B., 1997; Volcanoes, Crucibles of Change.-Princeton University Press, 317 pp.

Cilji in kompetence:	**Objectives and competences:**
CILJI: Slušatelj pridobi razširjeno znanje o nastanku vulkanov in vulkanskih kamnin, o vulkanskih procesih, vulkanski dejavnosti in pojavljanju vulkanov v specifičnih geoloških okoljih. KOMPETENCE: Slušatelj je usposobljen za prepoznavanje in klasifikacijo vulkanov ter vulkanskih kamnin in interpretacijo pogojev njihovega nastanka. Sposoben je prepoznati različne vrste vulkanizma in razume pogoje pojavljanja vulkanske aktivnosti v globalnem geološkem smislu.	OBJECTIVES: Students learn about the formation of volcanoes and volcanic rocks, about the volcanic processes, volcanic activity and occurence of volcanoes in specific geological environments. COMPETENCES: The student is able to identify and classify volcanoes and volcanic rocks, and to interpret the conditions of their formation. He is able to recognize different types of volcanism and understand the conditions of occurrence of volcanic activity in the global geological terms.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Študent razume in prepozna značilnosti in pogoje nastanka vulkanskih kamnin. Sposoben je klasificirati vulkane in vulkanske kamnine, prepozna glavne tipe vulkanske dejavnosti ter razume in pozna pomen vulkanizma za človeško populacijo, tako v smislu pozitivnih kot negativnih učinkov. Sposoben je uporabe strokovne literature, dela na terenu v laboratoriju ter z računalniškimi programi.	The student will understand and recognize the characteristics and conditions of formation of volcanic rocks. He is able to classify volcanoes and volcanic rocks, identify the main types of volcanic activity, and understand and know the importance of volcanism to the human population, in terms of both positive and negative effects. He is able to use the literature, to work in the field and in the laboratory, and to use computer programs.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, seminar in 8 dni terenskega dela. Študenti izdelajo terensko poročilo in seminarsko nalogo na dogovorjeno temo.	Lectures, seminar and 8 days of fieldwork. Students will prepare a fieldwork report and seminar work on an agreed topic.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Pisni in/ali ustni izpit in/ali oddane domače naloge	50,00 %	Written and/or oral exam and/or given homework
Seminarska naloga	25,00 %	Seminar work
Preverjanje terenskega dela	25,00 %	Fieldwork verification

Reference nosilca/Lecturer's references:

VRABEC, Mirijam, JANÁK, Marian, FROITZHEIM, Nikolaus, DE HOOG, J.C.M. Phase relations during peak metamorphism and decompression of the UHP kyanite eclogites, Pohorje Mountains (Eastern Alps, Slovenia). Lithos, 2012, vol. 144-145, str. 40-55, doi: dx.doi.org/10.1016/j.lithos.2012.04.004.
JANÁK, Marian, FROITZHEIM, Nikolaus, VRABEC, Mirijam, KROGH RAVNA, Erling J., HOOG, J.C.M. De. Ultrahigh-pressure metamorphism and exhumation of garnet peridotite in Pohorje, Eastern Alps. J. metamorph. geol., 2006, vol. 24, no. 1, str. 19-31.
JANÁK, Marian, FROITZHEIM, Nikolaus, LUPTÁK, Branislav, VRABEC, Mirijam, KROGH RAVNA, Erling J. First evidence for ultrahigh-pressure metamorphism of eclogites in Pohorje, Sloevnia : tracing deep continental subduction in the Eastern Alps. Tectonics (Washington, D.C.), 2004, vol. 23, no. 5, loč. pag.(TC5014).
ZUPANČIČ, Nina, ŠEBELA, Stanka, MILER, Miloš. Mineralogical and chemical characteristics of black coatings in Postojna cave system = Mineraloške in kemijske značilnosti črnih prevlek v Postojnskem jamskem sistemu. Acta carsol., 2011, letn. 40, št. 2, str. 307-317.

SKOBE, Simona, MANIATIS, Yannis, DOTSIKA, E., TAMBAKOPOULOS, D., ZUPANČIČ, Nina. Scientific charaterization of the Pohorje marbles, Slovenia. Archaeometry, 2010, vol. 52, issue 2, str. 177-190.
SKOBE, Simona, ZUPANČIČ, Nina. A cathodoluminescence and petrographical study of marbles from the Pohorje area in Slovenia. Chem. Erde, 2009, issue 1, vol. 69, str. 75-80.

ZGODOVINA GEOLOGIJE

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Zgodovina geologije
Course title:	History of Geology
Članica nosilka/UL Member:	UL NTF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	2. letnik, 3. letnik		izbirni

Univerzitetna koda predmeta/University course code:	0089601
Koda učne enote na članici/UL Member course code:	825

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	0	0	0	45	3

Nosilec predmeta/Lecturer:	Mihael Brenčič
Vrsta predmeta/Course type:	Izbirni / Elective

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Ni pogojev. Predmet je primeren tudi za študente drugih fakultet ali programov. Zaželeno je poznavanje geologije.	No prerequisites. For students from other faculties, who select it as elective course, basic knowledge of geology, desirable.

Vsebina:	**Content (Syllabus outline):**
Kronološki pregled konfrontacije idej in kontroverznosti v geoloških koncepcijah: - stari Grki in Rimljani - srednji vek - fosili kot dokumenti narave - neptunisti : vulkanisti : plutonisti - katastrofizem : uniformitarizem : gradualizem - ledene dobe - odkrivanje starosti Zemlje - geosinklinalna koncepcija : teorija o tektoniki litosferskih plošč - nastanek sodobne geološke misli po teoriji o tektoniki plošč in njen vpliv na druge naravoslovne znanosti - spremembe in omejitve v razumevanju aktualizma Zgodovina geološke misli na Slovenskem	Chronological overview of confrontation of ideas and controversies in geological conceptions: - Ancient Greeks and Romans - Middle Ages - fossils such as a documents of nature - neptunists: volcanists: plutonists - catastrophism, uniformitarianism: gradualism - Ice Age - Detection age of the Earth - Geosyncline concept and the theory of plate tectonics - the emergence of modern geologic thought under the theory of plate tectonics and its impact on other natural sciences - changes and limitations in understanding aktualism The history of geological thought in Slovenian

Temeljna literatura in viri/Readings:

Poglavja v učbenikih in knjigah: / Chapters in books and textbooks:
ADAMS, F.D.: The birth and development of the geological science. Dover Publ., 1954, 506 p.
ALBRITTON, C.C.: Catastrophic episodes in Earth history. Chapman & Hall, 1989, 221 p.
HALLAM, A.: Great geological controversies. Oxford Uni. Press, 2nd edition, 1989, 244 p.
HALLAM, A.: Revolutions in Earth History. Oxford Uni. Press, 1975, 127 p.
LEGRAND, H.E.: Drifting continents and shifting theories. Cambridge Uni. Press, 1990, 313 p.
RUDWICK, M.J.S.: Bursting the limits of time. The reconstruction of geohistory in the age of revolution. Uni. Chicago Press, 2005, 708 p.

Cilji in kompetence:	**Objectives and competences:**
CILJI: predmet bo slušateljem nudil kronološki vpogled v razvoj geološke misli od starih Grkov do sodobnih teorij filozofije znanosti. Geologija je vse od renesanse sledila sodobnih znanstvenim revolucijam in paradigmam. Velik del razvoja in napredka geologije je povezan prav z njenimi filozofskimi koncepti: uniformitarizem, katastrofizem, plutonizem, neptunizem, darwinizem, razvoj časovne zgodovine Zemlje, tektonika litosferskih plošč. KOMPETENCE: namen predmeta je seznaniti slušatelje z razvojem geoloških idej in njihove povezave z dejstvi in principi, ki jih bodo študentje absolvirali tekom študija, v celovito sliko geologije kot edinstvene naravoslovno-zgodovinske znanosti.	OBJECTIVES: This course will provide students with insight into the chronological development of geological thought from the ancient Greeks to modern theories of philosophy of science. Geology from the renaissance followed the modern scientific revolution and paradigm. Much of the development and progress of geology is connected also with its philosophic concepts: uniformitarizem, katastrofizem, plutonism neptunizem, darwinizem, the development of time-history of the earth lithosphere tectonics. COMPETENCES: This course is designed to acquaint students with the development of geological ideas and their links with the facts and principles, which took a degree course, students will study the overall picture of geology as a unique natural and historical sciences.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Predmet bo slušatelje seznanil z razvojem in razumevanjem geoloških idej in njihove povezave z dejstvi in principi, ki jih bodo študentje absolvirali tekom študija , v celovito sliko geologije kot edinstvene naravoslovno-zgodovinske znanosti. Principi, s katerimi se seznanijo slušatelji so do določene mere univerzalni za vse naravoslovne znanosti. Predmet študentu omogoča razmislek o razvoju idej, o paradigmatičnosti odkritev in o razvoju od ideje, preko hipoteze do teorije. Principi, s katerimi se seznanijo slušatelji so do določene mere univerzalni za vse naravoslovne znanosti.	The students will learn about the development and understanding of the geological ideas and their links with the facts and principles, they will gain a comprehensive picture of geology as a unique natural and historical sciences. The principles that the students will learn are to some extent universal to all natural sciences. The subject enables the student reflection on the development from ideas through a hypothesis to a theory. The principles that the students will learn are to some extent universal to all natural sciences.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja in seminarsko delo.	Lectures and seminar.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Izpit	20,00 %	Examination
Oddana seminarska naloga	80,00 %	Seminar

Reference nosilca/Lecturer's references:

BRENČIČ, Mihael, 2008: Zgodovina hidrogeologije: kratek oris življenja in dela Oskarja Smrekerja (1854-1935). Geologija, 51/2, 141-146.

BRENČIČ, Mihael, 2011: Izvor in pomen besede geologija. Geologija, 54/ 2, 177-192, doi: 10.5474/geologija.2011.014
BRENČIČ, Mihael, 2015: Odmev Idrije v ruski znanstveni literaturi 18. stoletja. Idrijski razgledi, 60/2, 37-43.