



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Speleobiologija
Course title:	Speleobiology

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Univerzitetni študijski program Ekologija z naravovarstvom, 1. stopnja		2. ali 3.	3. ali 5.
Undergraduate university programme Ecology with Nature Conservation, 1st degree		2nd or 3rd	3rd or 5th

Vrsta predmeta / Course type

Izbirni/Elective

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Lab. vaje Laboratory work	Terenske vaje Field work	Samost. delo Individ. work	ECTS
15	10		4	16	135	6

Nosilec predmeta / Lecturer:

Peter KOZEL

Jeziki /

Languages:

Predavanja /

Lectures:

slovenski/slovene

Vaje / Tutorial:

Slovenski/slovene

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

Vsaka izmed naštetih obveznosti v načinih ocenjevanja mora biti opravljena s pozitivno oceno.

Opravljena seminarska naloga in udeležba na terenskih vajah sta pogoja za pristop k pisnemu izpitu.

Prerequisites:

Each of the mentioned commitments must be assessed with a passing grade.

Passing grade of seminar paper and participation in field work are required for taking the written exam.

Vsebina:

- Uvod v speleobiologijo
- Jame, špranje, umetni rovi, podzemeljsko površinsko okolje, tla
- Izviri, intersticialno okolje, hipotelmioze, jezerske in morske globine, morske jame
- Troglomorfoze: velikost trupa in okončin, anoftalmija, depigmentiranost, apterizem, fizogastrija, psevdofizogastrija
- Troglobionti, troglofili, troglokseni; freatobionti; stigobionti
- Pregled organizmov v podzemlju: prokarioti; glive; rastline; živali
- Porifera, Protozoa, Cnidaria, Turbellaria, Nemertea, Nematoda, Mollusca, Polychaeta, Oligochaeta, Hirudinea, Chelicerata, Crustacea, Myriapoda, Insecta, Vertebrata
- Geografska razširjenost podzemeljskih živali
- Fiziologija in etologija podzemeljskih živali
- Evolucija podzemeljskih živali
- Slovenija kot država z največjo diverziteto podzemeljskih taksonov v svetovnem merilu
- Pregled najvažnejših podzemeljskih živali
- Vpliv turizma na podzemeljsko favno
- Zaščita in varovanje podzemeljskih habitatov

Content (Syllabus outline):

- Introduction to speleobiology
- Caves, fissures, artificial tunnels, shallow subterranean environments, soils
- Springs, interstitial environment, hypothelminoreic environment, deep lake and deep sea regions, marine caves
- Troglomorphoses: body and appendages size, anophthalmia, apterism, physogastry, pseudophysogastry
- Troglobionts, troglaphiles, troglaxenes; freatobionts; stygobionts
- Review of organisms in the subterranean environments: Procaryota, Fungi, Plants, Animals
- Porifera, Protozoa, Cnidaria, Turbellaria, Nemertea, Nematoda, Mollusca, Polychaeta, Oligochaeta, Hirudinea, Chelicerata, Crustacea, Myriapoda, Insecta, Vertebrata
- Geographical distribution of the hypogean organisms
- Physiology and ethology of the subterranean organisms
- Evolution of the subterranean organisms
- Slovenia as the state with the highest diversity of the subterranean organisms in the World
- Review of the most prominent subterranean animals
- Impact of tourism on subterranean fauna
- Protection and conservation of subterranean fauna

Temeljni literatura in viri / Readings:

- Culver, D. C., & Pipan, T. (2019). The biology of caves and other subterranean habitats (2nd ed., str. XX, 301). Oxford University Press. doi:10.1093/oso/9780198820765.001.0001
- *Encyclopedia of caves* (3rd ed., str. XXXII, 1225). Academic Press, an imprint of Elsevier.

Dodatna literatura:

- Cave ecology (Let. 235, str. vii, 545). (2019). Springer. <https://link.springer.com/book/10.1007/978-3-319-98852-8>
- *Encyclopedia of caves and karst science* (str. XVIII, 902). (2004). Fitzroy Dearborn.
- *Encyclopaedia biospeologica* (str. Zv. <1-3>). (1994). C.N.R.S.; Academie Roumaine.

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

- Podati pregled tipov in značilnosti podzemeljskih habitatov
- Podati pregled tipov in značilnosti podzemeljskih organizmov
- Predstaviti poseben status Slovenije glede diverzitete podzemeljskih taksonov

- To give an overview of typology and characteristics of subterranean habitats
- To give an overview of typology and characteristics of subterranean organisms
- To present the prominent position of Slovenia for the diversity of the subterranean taxa

Predvideni študijski rezultati:

Študenti poznajo zgodovino speleobiologije in trende modernih znanstvenih raziskav. Znano pojasniti ekološke značilnosti podzemeljskih habitatov in biotske značilnosti podzemeljskih organizmov. Poznajo osnovne vzorčevalne metode v podzemeljskih habitatih in njihovo uporabo. Prepoznavajo tipične troglomorfoze in troglomorfne organizme ter jih na podlagi prilagoditev uvrščajo v ekološke kategorije. Usposobijo se za biološko raziskovalno delo v podzemeljskih votlinah.

Intended learning outcomes:

Students know about the history of speleobiology and modern trends of scientific investigations. They are able to explain the ecological characteristics of subterranean habitats and biotic characteristics of subterranean organisms. Students are familiar with elementary sampling methods in subterranean habitats and its application. They are able to recognize troglomorphic traits and troglomorphic organisms and classify them into ecological categories according to their adaptations. Students are trained for scientific biological research in subterranean cavities.

Metode poučevanja in učenja:

- Predavanja
- Laboratorijske vaje
- Terenske vaje
- Seminar

Learning and teaching methods:

- Lectures
- Laboratory work
- Field work
- Seminar

Načini ocenjevanja:

- Seminarska naloga
- Pisni izpit

Delež (v %) /

Weight (in %)

Assessment:

- Seminar paper
- Written exam

Reference nosilca / Lecturer's references:

- Lipovšek, S., Vajs, T., Dariš, B., Novak, T., Kozel, P., 2024. Autophagic activity in the midgut cells of three arachnids responds selectively to different modes of overwintering in caves. *Protoplasma*. doi: 10.1007/s00709-024-02009-x
- Kozel, P., Novak, T., Janžekovič, F., Lipovšek, S., 2023. Starvation hardiness as preadaptation for life in subterranean habitats. *Scientific reports*, 13: 9643. doi: 10.1038/s41598-023-36556-9
- Kozel, P., Pipan, T., 2020. Specialized aquatic subterranean communities are probably most species-rich in the thickest epikarst. *Limnologica*, 81: 125756. doi: 10.1016/j.limno.2020.125756
- Kozel, P., Delić, T., Novak, T., 2020. *Nemaspela borkoae* sp. nov. (Opiliones: Nemastomatidae), the second species of the genus from the Dinaric Karst. *European Journal of Taxonomy* 717: 90–107. doi: 10.5852/ejt.2020.717.1103

- Galli, L., Janžekovič, F., Kozel, P., Novak, T., 2021. Protura (Arthropoda: Hexapoda) in Slovenian caves. *International journal of speleology*, 50 (1): 65-74. doi: 10.5038/1827-806X.50.1.2380