



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 | | 2 or 3 | 3 or 5 |

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:

Jih ni.

Prerequisites:

No.

Vsebina:

- Uvod v speleobiologijo
- Jame, špranje, umetni rovi, podzemeljsko površinsko okolje, tla
- Izviri, intersticialno okolje, hipotelminoreik, 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 diverzitetno 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, anophthalmy, apterism, physogastry, pseudophysogastry
- Troglobionts, troglophiles, trogloxenes; 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, second edition. Oxford Univ. Press, Oxford, New York.
- White, W. B., Culver, D. C., Pipan, T. (Eds.), 2019. Encyclopedia of caves. Elsevier/Academic Press, Amsterdam/Boston.
- Moldovan, O. T., Kováč, L., Halse, S. (Eds.) (2018). Cave ecology. Springer International Publishing. 545 str.
- Culver, D. C., Christman, M. C., Sket, B., Trontelj, P., 2004. Sampling adequacy in an extreme environment: species richness patterns in Slovenian caves. Biodiversity and Conservation, 13: 1209- 1229.
- Gunn, J., 2004. Encyclopedia of caves and karst science. Taylor & Francis Books Inc., New York/London.
- Juberthie, C. & Decu, V. (Eds.), 1992-1996. Encyclopaedia biospeologica I-III. Société de biospéologie, Moulis, Bukarest.

- Sket, B., Paragamian, K., Trontelj, P., 2004. A census of the obligate subterranean fauna of the Balkan peninsula. V: Griffiths, H. I., Kryštufek, B. (Eds.): *Balkan Biodiversity. Pattern and Process in Europe's Biodiversity Hotspot*. Kluwer Academic Publishers: 309-322.

Cilji in kompetence:

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

Objectives and competences:

- 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. Znajo 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:

Način (pisni izpit, ustno izpraševanje, naloge, projekt)

- Seminarska naloga
- Pisni izpit

Delež (v %) /

Weight (in %) /

Assessment:

Type (examination, oral, coursework, project):

- Seminar
- Written exam

Reference nosilca / Lecturer's references:

- 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
- Kozel, P., Pipan, T., Mammola, S., Culver, D. C., Novak, T., 2019. Distributional dynamics of a specialized subterranean community oppose the classical understanding of the preferred subterranean habitats. *Invertebrate biology*, 00:e12254. doi: 10.1111/ivb.12254
- 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
- Lipovšek, S., Leitinger, G., Janžekovič, F., Kozel, P., Dariš, B., Perc, M., Devetak, D., Weiland, N., Novak, T., 2019. Towards understanding partial adaptation to the subterranean habitat in the European cave spider, *Meta menardi*: an ecocytological approach. *Scientific reports*, 9 (9121): 1-15. doi: 10.1038/s41598-019-45291-z.