

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	PALEOBIOLOGIJA IN EVOLUCIJA VREtenČARJEV
Course title:	VERTEBRATE EVOLUTION AND PALEOBIOLOGY

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Okoljske in regionalne študije, doktorski študij 3. stopnje	Paleobiologija in sedimentarna geologija		
Environmental and Regional Studies, doctoral study 3 rd level	Palaeobiology and Sedimentary Geology		

Vrsta predmeta / Course type

Izbirni/Elective

Univerzitetna koda predmeta / University course code:

DIP02

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
30	30	30			180	9

Nosilec predmeta / Lecturer:

Izr. prof. dr. Aleksander Horvat
(ostali izvajalci: dr. Irena Debeljak)

**Jeziki /
Languages:**

**Predavanja / Lectures:
Vaje / Tutorial:**

slovenščina, angleščina / Slovene, English
slovenščina, angleščina / Slovene, English

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

Vpis v 1. letnik.

Prerequisite:

Inscription to the 1st academic year.

Vsebina:

Predavanja:

- Uvod v paleontologijo vretenčarjev
- Značilnosti in izvor vretenčarjev
- Brezčeljustnice (Agnatha)
- Ribe oklepnic (Placodermi)
- Akantodiji
- Hrustančnice (Chondrichthyes)
- Kostnice (Osteichthyes)
- Mesnatoplavutarice (Sarcopterygii); razvoj nog iz plavuti
- Dvoživke (Amphibia) – zavzetje kopnega
- Izvor amniotov in termoregulacija
- Anapsidi, diapsidi in sinapsidi; kladogrami

Content (Syllabus outline):

Lectures:

- Introduction to vertebrate palaeontology
- Characteristics and origin of vertebrates
- Jawless fishes (Agnatha)
- Armoured fishes (Placodermi)
- Acanthodians
- Cartilaginous fishes (Chondrichthyes)
- Bony fishes (Osteichthyes)
- Lobe-finned fish (Sarcopterygii); fins evolve into legs
- Amphibians – invasion of land
- Origin of amniotes and thermoregulation
- Anapsids, diapsids and synapsids; cladograms

- Permski sinapsidi; "sesalcem podobni plazilci"
- Permsko-triasna izumiranja
- Mezozojski morski reptili; vodne prilagoditve
- Želve
- Arhozavri; krokodili in pterozavri
- Izvor dinozavrov
- Ornithischia
- Zavropodi
- Teropodi
- Izvor ptičev (Aves) in njihovo širjenje
- Mezozojski sesalci
- Kredno-terciarna izumiranja
- Razcvet sesalcev v kenozoiku
- Eocenski sesalci in izvor današnjih skupin
- Oligo-miocenski sesalci in spreminjanje habitatov
- Pomen biogeografije
- Pleistocenski sesalci
- Pleistocensko-holocenska izumiranja

Vaje:

- Fosilni ostanki vretenčarjev
- Značilnosti kosti, dermalnih struktur in zob
- Zgradba in histologija skeletnih tkiv pri različnih skupinah vretenčarjev
- Laboratorijske tehnike
- Skeletna rast; ontogenetski razvoj
- Primerjalna osteologija I (lobanja)
- Primerjalna osteologija II (postkranialni skelet)
- Zobje; njihova oblika in funkcija pri različnih skupinah vretenčarjev
- Življenjska okolja, depozicijski in tafonomski procesi
- Uporaba filogenetske analize

Seminar:

- Izbrana poglavja iz paleontologije vretenčarjev

- Synapsids of the Permian; "mammal-like reptiles"
- Permo-Triassic extinctions
- Mesozoic marine reptiles; aquatic adaptations
- Turtles
- Archosaurs; crocodiles and pterosaurs
- Origin of dinosaurs
- Ornithischia
- Sauropods
- Theropods
- Origin of birds (Aves) and their radiation
- Mesozoic mammals
- Cretaceous-Tertiary extinctions
- Cenozoic mammal diversification
- Eocene mammals and origin of modern orders
- Oligo-Miocene mammals and changing habitats
- The importance of biogeography
- Pleistocene mammals
- Pleistocene-Holocene extinctions

Tutorials:

- Vertebrate fossils
- Characteristics of bones, dermal structures and teeth
- Structure and histology of skeletal tissues in different vertebrate groups
- Laboratory techniques
- Skeletal growth; ontogenetic development
- Comparative osteology I (cranium)
- Comparative osteology II (postcranial skeleton)
- Teeth; their form and function in different vertebrate groups
- Life environments, depositional settings, and taphonomy
- Using phylogenetic analysis

Seminar:

- Special topics in vertebrate paleontology

Temeljna literatura in viri / Readings:

Izbrana poglavja in članki iz/Selected chapters and papers from:

- Anderson, J. S. & Suess, H.-D. (eds.), 2007: *Major Transitions in Vertebrate Evolution (Life of the Past)*. – Indiana University Press, 1-432.
- Benton, J. M., 2014: *Vertebrate Palaeontology*. – Wiley-Blackwell, 4th ed., 1-480.
- Brett-Surman, M. K., Holtz, T. R. & Farlow, J. O., (eds.) 2012: *The Complete Dinosaur (Life of the Past)*. – Indiana University Press, 2nd ed., 1-984.
- Carroll, R. L., 1988: *Vertebrate Paleontology and Evolution*. – W. H. Freeman and Company, 1-698.
- Cowen, R., 2013: *History of Life*. – Wiley-Blackwell; 5th ed., 1-312.
- Hall, B. K., 2015: *Bones and Cartilage: Developmental and Evolutionary Skeletal Biology*. – Academic Press, 2nd ed., 1-920.
- Schmid, E., 1972: *Atlas of Animal Bones*. – Elsevier, 1-159.
- Thomason, J. J. (ed.), 2008: *Functional Morphology in Vertebrate Paleontology*. – Cambridge University Press, 1-296.
- Journal of Vertebrate Paleontology (Society of Vertebrate Paleontology)

Cilji in kompetence:

Pri tem predmetu bodo študentje dobili poglobljen pregled evolucije vretenčarjev skozi geološki čas s poudarkom na njihovih filogenetskih povezavah, paleobiologiji, funkcionalni morfologiji, specifičnih adaptacijah na različne paleoekološke pogoje in posledicah sprememb v okolju. Temu teoretičnemu delu bo pridruženo še praktično usposabljanje, ki bo osredotočeno na različne laboratorijske tehnike, histologijo skeletnih tkiv, primerjalno osteologijo, določanje skeletnih delov in študij fosilnih primerkov glavnih vretenčarskih skupin. Namen tega predmeta je tudi razvijati študentove sposobnosti za iskanje odgovorov na znanstvena vprašanja s področja paleontologije vretenčarjev.

Objectives and competences:

In this course, students will receive a comprehensive overview of the evolution of the vertebrates through geologic time with emphasis on their phylogenetic relationships, palaeobiology, functional morphology, specific adaptations to different palaeoecological conditions and responses to environmental change. In addition to this theoretical part, practical training will cover various laboratory techniques, histology of skeletal tissues, comparative osteology, skeletal identification and studying fossil specimens of major vertebrate groups. The aim of this course is also developing students' ability to answer scientific questions in the field of vertebrate palaeontology.

Predvideni študijski rezultati:

Znanje in razumevanje:

Študentje bodo:

- pridobili široko znanje o fosilnem zapisu vretenčarjev
- sposobni prepoznati in opisati značilnosti glavnih skupin vretenčarjev
- sposobni interpretirati ključne dogodke in prehode v evoluciji vretenčarjev
- osvojili trenutno poznavanje filogenetskih povezav med glavnimi skupinami vretenčarjev (izumrlih in še živečih)

Intended learning outcomes:

Knowledge and understanding:

Students will:

- gain a broad knowledge of the vertebrate fossil record
- be able to identify and describe characteristics of the major groups of vertebrates
- be able to interpret key events and transitions in vertebrate evolution
- know current consensus on the phylogenetic relationships of major vertebrate groups (extinct and extant)

- razumeli paleogeografsko razširjenost glavnih skupin vretenčarjev v različnih geoloških obdobjih
- seznanjeni z razvojem našega razumevanja, kako so npr. dinozavri funkcionirali kot živa bitja
- imeli teoretično in praktično podlago za uporabo filogenetske analize
- sposobni določiti različna skeletna tkiva in elemente
- sposobni prepoznati sledi različnih tafonomskih procesov
- vedeli, kako priti do relevantnih informacij in uporabiti ustrezne raziskovalne metode na področju paleontologije vretenčarjev

- understand paleogeographic distribution of the major vertebrate groups throughout geologic time
- Students will be familiar with the development of our understanding of how e.g. dinosaurs functioned as living organisms
- have theoretical and practical basis for using phylogenetic analysis
- be able to identify different skeletal tissues and elements
- be able to recognise evidence of different taphonomic processes
- know how to find relevant information and use appropriate research methods in the field of vertebrate paleontology

Metode poučevanja in učenja:

Predavanja, e-učenje, diskusije, seminarji, praktične vaje

Learning and teaching methods:

Lectures, e-learning, discussions, seminars, practical sessions

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Način (pisni izpit, ustno izpraševanje, naloge, projekt): <ul style="list-style-type: none"> • Izpit – teoretični del • Izpit – praktični del • Seminar 	40 40 20	Type (examination, oral, coursework, project): <ul style="list-style-type: none"> • Exam – theoretical part • Exam – practical part • Seminar

Reference nosilca / Lecturer's references:

Izr. prof. dr. Aleksander Horvat

1. Bohinc, T., **Horvat, A.**, Andrić, G., Pražić Golić, M., Kljajić, P., Trdan, S. 2018: Comparison of three different wood ashes and diatomaceous earth in controlling the maize weevil under laboratory conditions. *Journal of Stored Products Research*, 79, 1-8. DOI: 10.1016/j.jspr.2018.06.007.
2. Moreau, L., Odar, B., Higham, T., **Horvat, A.**, Pirkmajer, D., Turk, P. 2015: Reassessing the Aurignacian of Slovenia: Techno-economic behaviour and direct dating of osseous projectile points. *Journal of Human Evolution*, 78, 158-180.
3. Bartol, M., Mikuž, V., **Horvat, A.** 2014: Palaeontological evidence of communication between the Central Paratethys and the Mediterranean in the late Badenian/early Serravalian. *Palaeogeography, Palaeoclimatology, Palaeoecology*, 394, 144-157.

Dr. Irena Debeljak

4. Rame, H.-M., Martindale, R. C., Ettinger, N. P., Bodin, S., **Debeljak, I.**, Vasseur, R., Lathuilière, B., Kabiri, L. 2019: Stratigraphic distribution and paleoecological significance of Early Jurassic (Pliensbachian-Toarcian) lithotid-coral reefal deposits from the Central High Atlas of Morocco. *Palaeogeography, Palaeoclimatology, Palaeoecology*, 514, 813-837.
5. **Debeljak, I.**, 2014: The age and sex structure of the cave bear population from Križna jama (Slovenia). – *Mitt. Komm. Quartärforsch. Österr. Akad. Wiss.* 20, 97-108, 97-108, Wien.
6. **Debeljak, I.** 2007: Fossil population structure and mortality of the cave bear from the Mokrica cave (North Slovenia). *Acta Carsologica*, 36/3, 475-484.
7. **Debeljak, I.**, Košir, A., Buffetaut, E., Otoničar, B., 2002: The Late Cretaceous dinosaurs and crocodiles of Kozina (SW Slovenia). *Memorie della Società Geologica Italiana*, 57/1, 193-202.